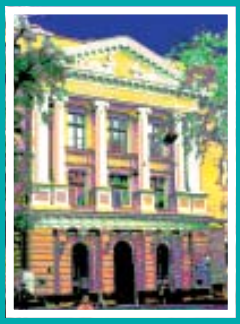

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UROLOGY

ОДЕСЬКИЙ МЕДУНІВЕРСИТЕТ

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Medical Student's Library

Initiated in 1999 to mark the Centenary of the Odessa State Medical University (1900 — 2000)

Edited and Published by V. M. Zaporozhan, the State Prize-Winner of Ukraine, Academician of the Academy of Medical Sciences of Ukraine

The Odessa State Medical University

Dear Reader,

When in 1999 the lecturers and researchers of the Odessa State Medical University started issuing a series of books united by the collection entitled "Medical Student's Library" they had several aims before them.

Firstly, they wanted to add new books to the Ukrainian library of medical literature that would be written in Ukrainian, the native language of the country. These books should contain both classical information on medicine and the latest information on the state of the art, as well as reflect extensive experience of our best professionals. Secondly, our lecturers and specialists wanted to write such books which reflected the newest subjects and courses that have recently been introduced into the curricula, and in general there have been no textbooks on these subjects and courses at that time.

These two aims have successfully been coped with. Some dozens of textbooks and workbooks published in these years have become a good contribution of their authors and publishers to the development and making of the Ukrainian national educational literature.

The next step that we decided to undertake was to issue a unique series of books in foreign languages. The foreign students taking their medical education in the Ukraine, our University included, are expecting such books to be published. Other countries are also waiting for them as the Odessa State Medical University is a Fellow Member of the International and European Association of Universities. Our Medical University is over a hundred years old and has long since become a center of various original medical schools and trends. These are headed by well-know medical professionals whose competence is acknowledged not only in this country, but abroad as well.

Valery ZAPOROZHAN,
Editor-in-Chief of the Series "Medical Student's Library"
the State Prize-Winner of Ukraine,
Academician of the Academy of Medical Sciences of Ukraine

UROLOGY

A course of lectures

Edited by prof. **F. I. Kostyev**

Recommended
by the Central Methodical Committee
for higher medical education of the
Ministry of Health of Ukraine as a manual
for students of higher medical educational
establishments of the III–IV levels of accreditation

Odessa
The Odessa State Medical University
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Authors: F. I. Kostyev, M. I. Ukhal, O. V. Borisov, V. D. Shvets, D. F. Tuchin, V. S. Grabazyuk, A. I. Malyarchuk

Reviewers: S. P. Pasyechnikov, professor of the Urology Department of the O. O. Bogomolets National Medical University, the chief urologist of the Ministry of Health of Ukraine, MD

V. I. Bachurin, professor, the Head of the Urology Department with the Course of Medical Radiology at the Zaporozhye State Medical University, MD

Translated by: O. V. Borisov, assistant professor of the Urology Department of the Odessa State Medical University, MD

S. L. Tchekanov, assistant of the Urology Department of the Odessa State Medical University, Candidate of medical sciences

The textbook contains lectures with innovation in urology taken into consideration. For better understanding of the material of lectures they are illustrated with algorithms and figures, supplied with criteria of making a diagnosis and strategy in treatment within the scope of the curriculum on urology.

Intended for students of higher medical educational establishments.

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Introduction

HISTORY OF THE ODESSA UROLOGICAL SCHOOL

The history of the Urology and Nephrology Department in Odessa has begun since organization of the first establishment for rendering ambulatory and in-patient aid to the citizens of the city.

On May 17, 1863 an operation for extraction of a bladder stone was performed by the founder and first head of the department, Teofil Gnatovich Vdovikovsky in the operating-room of the just opened, first in Russia (and third in Europe) urological department of the Odessa Municipal Hospital. The doctors participating in organization of the department, the head physician of the hospital Nikolay Vladimirovich Brousse and the young doctor who afterwards became the pride of our surgery — Nikolay Vasilyovich Sclifosovsky — were his assistants.

In 1902 the department was moved to a new, more spacious hospital in Slobodka, municipal clinical hospital N11 at present, where there were 75 beds.

An internship was opened at the hospital. As a rule about 15 doctors were enrolled to the internship. The interns lived in a hostel specially built for them at the hospital. This allowed them to acquire useful skills in giving first aid to the population of the city for 24 h.

T. G. Vdovikovsky headed the urological department for 26 years. The doctor Maryashess took up this post after him and headed the department for the same term.

In 1922 R. K. Uglyov became the head of the department and he worked there for 45 years. For the total scientific work R. K. Uglyov was given the rank of associate professor. His monograph "Reflex anuria" was published when the problems of nervism in pathology were widely discussed by medical public. In 1983 the department moved to a new, multiprofile regional clinical hospital in the Kotovskiy district.

In 1967–1997 a Candidate of medical sciences B. M. Reznik headed the department. Besides medical and organizational work (a lot of years he performed the duties of the regional urologist), he was engaged in scientific researches. And today his monograph "Tuberculosis of genitalia in men", a few bibliographic indices of urology are of current importance.

Since 1997 the department has been headed by a candidate of medical sciences A. V. Semenukha.

We refer to the history of the urological department in the Odessa Regional Hospital so thoroughly because this establishment is interlinked with the life of the Department of Urology of the Odessa Medical Institute named after N. I. Pirogov, later the Odessa State Medical University.

Before the opening of the medical faculty of the Novorosiysk University in Odessa in 1900, there was no teaching of urology as an independent course. The systematic urology course was organized at the department of faculty surgery only in 1931 (the head of the department — prof. P. G. Tchasovnikov).

The course that was conducted by L. R. Leytes consisted of 5 lectures and a few practical classes. The authority of this discipline in the medical institute was large due to P. G. Chasovnikov who was proficient in the urological operations techniques. His success in treatment of patients with urolithiasis was especially noticeable. A great attention was paid to this problem in the collection of works of the faculty surgery department staff, which was published in 1940.

In 1944 an independent Department of Urology was first organized at the Odessa Medical Institute which was headed by professor A. M. Gasparyan, a disciple of M. Fronstein. Simultaneously he was the rector of the Institute. A. M. Gasparyan has already proved himself to be an experimental clinician, energetic organizer, and talented researcher. He was the organizer of the Department of Urology at the Medical Institutes of Kharkov and Orenburg and simultaneously he was the rector of these establishments.

The range of his scientific interests was wide. A. M. Gasparyan studied urolithiasis both in clinic and experiment (his doctoral dissertation was devoted to this problem). He was the author of the monograph about intestinal plasty of the urinary tract, essays from history of the native urology, bibliographic reference books on urology, propositions on the improvement of technique of dif-

ferent operations (in traumas of the urethra, operations on the bladder, etc).

In a course of time A. M. Gasparyan was given the rank of the honoured worker of science of Russia and Armenia, for several years he was the chairman of the Medical Association of Urologists of Russia.

The associate professors L. R. Leytes, R. K. Uglyov, assistants A. A. Gurvich, O. B. Aga, M. A. Shostak worked at the department of the Odessa Medical Institute. In 1945–1950 clinical interns T. O. Bakhirova, N. M. Gromova, K. A. Velikanov, O. B. Malishevich, A. S. Portnoy were trained at the department.

Urology teaching to the students of the 4th year of the medical faculty was carried out on the basis of the specially organized urological department of the 2nd Municipal Clinical Hospital. The department with 20 beds had an operating room, dressing room, endoscopy and X-ray rooms. Urology teaching to the students of the pediatric faculty took place on the basis of the regional hospital.

3 candidate dissertations have been made for 5 years of existence of the department devoted to diagnosis and treatment of kidney tuberculosis (I. A. Gurvich); tissue therapy in strictures of the urethra (O. B. Aga); investigation of the mucous membrane of the bladder in physiological and pathological conditions (K. A. Velikanov). The department staff participated in renewal of work of the Odessa Regional Scientific Society of Urologists. A doctor of medical sciences Yuzefovich founded it as early as in 30-s but activity of the society was stopped during the Great Patriotic war. A. M. Gasparyan was elected the chairman of the renewed society. Scientific problems, measures on the improvement of urological aid to the population came into question on the monthly meetings.

In 1951 prof. A. M. Gasparyan was elected the head of the Urological department of the Leningrad Medical Institute. His departure from Odessa coincided with the decision of the Ministry of Health of the USSR about closing of urology departments in the majority of medical institutes. In Odessa the department of urology was transformed into the course of urology at the department of faculty surgery, headed by prof. M. P. Sokolovsky, later by prof. A. S. Sinovets. A candidate of medical sciences K. A. Velikanov was the head of the course till 1971. In 1968 he was given the rank of associate professor. The urological department of the 2nd Mu-

nicipal Clinical Hospital remained as a medical basis for teaching (at first with 30 and then with 45 beds). Not only pedagogical and medical work but also scientific research was conducted within the course. Such problems were studied at that time: cytological diagnosis of tumours of the bladder (a candidate dissertation of O. B. Malishkevich), chronic renal insufficiency (a candidate dissertation of N. P. Tchashchikhina), urolithiasis (a candidate dissertation of D. F. Tuchin), diagnosis of chronic pyelonephritis (a doctoral dissertation of K. A. Velikanov).

There were published works which first gave experience of peritoneal dialysis application in acute kidney insufficiency, results of intestinal plasty of the urinary tracts, surgical treatment of coral-like nephrolithiasis, cytological diagnostics of cancer of the prostate gland, improvement of treating operative technique of benign prostatic hypertrophy and so on.

In 1971 the course of urology was made into an independent department of urology (head of the department — prof. K. A. Velikanov who headed it till 1984).

During this period considerable organizational work had been conducted, the medical base of urology teaching became better. A Municipal Urological Centre with 100 beds was created at the Municipal hospital N 10. Besides of giving planned twenty-four-hour aid to the patients of the city, the urological centre influenced the improvement of diagnosis and treatment of patients of the municipal nephrological in-patient department and children's nephrological department which belonged to MCH N10. The urological in-patient department had the laboratory of radionuclide diagnostics, department of hemodialysis, operating-room and X-ray room of general type as well as a roentgen-operating room. It allowed to conduct diagnosis and treatment of urological diseases at the high modern level.

More time was devoted to teaching urology. The subject was taught in the 4th and 6th year. The cycles of specialization on urology, advanced training of doctors, pre-attestation training were conducted at the department. 1–2 postgraduate students and 2–3 clinical interns were constantly trained at the department. It allowed to provide the urological departments in the city and its region with the specialists-urologists of high qualification.

A pedagogical process was provided by visual aids, methodical materials. There was always a student's scientific group at the de-

partment which was the source of future postgraduate students, interns.

Good technical equipment of medical base of the department allowed to conduct both teaching, treatment of patients and research work at high level. The clinic performed operative treatment of patients with renal insufficiency by the scheme "dialysis — surgery" or "dialysis — surgery — dialysis". First in Ukraine there was performed autotransplantation of the kidney in urolithiasis with a positive remote result.

Important problems of urology were studied at the department: pyo-inflammatory diseases of organs of the urogenital system (mainly diagnosis and treatment of the immune disorders in specific and nonspecific infections), enzymatic diagnosis and treatment of pyelonephritis.

The theme of complex treatment of patients with chronic pyelonephritis and urolithiasis, nephrogenic symptomatic arterial hypertension has been developed with participation of other departments of the institute for a few years.

Great attention was paid to diagnosis and treatment of urodynamic disturbances as an important factor of pathogenesis of urinary infections (infravesical obstruction, vesico-renal reflux). The laboratory of urodynamic researches equipped by original devices the invention of which was protected by the copyright certificate was organized. For the first time in Ukraine pharmacouroflowmetry was mastered. The methods of radionuclide diagnostics were developed (diuresis renography, pharmacorenography with the usage of vasoactive preparations). Much attention in the clinic was paid to the problems of oncourology: intestinal cystoplasty, ureterosigmostomy as a method of urine derivation in cystectomy. Experience of application of cryodestruction was accumulated in benign prostatic hypertrophy, the original method of troacar cystostomy was developed, homeostasis in transvesical prostatectomy, transurethral resection was put into practice in benign prostatic hypertrophy and superficial tumours of the bladder.

During 1971–1984 15 candidate dissertations (M. I. Ukhal, V. A. Bogza, A. M. Novikov, V. S. Grabarzyuk, Ye. B. Polonsky, A. K. Bondarchuk, E. G. Brovarska, S. G. Antipov, T. T. Shimanko, M. F. Curiy, O. V. Borisov, B. Kiriacu, V. D. Shvets, S. K. Kulikov) and one doctoral (M. G. Skosogorenko) were made. Over 200 works, several inventions, innovations and methodical letters were published.

In 1984–1985 prof. A. S. Sinovets temporally carried out duties of the head of the department.

In January 1987 a doctor of medical sciences, prof. M. I. Ukhal was elected to be the head of the department. He occupied this post till March 1998. Pedagogical work was concentrated on teaching of students of the 4th and 6th years of the medical faculty. In accordance with a new programme, new methodical aids of lectures and practical classes were prepared. The important problems of urology were also studied at the department in the cycles of advanced training of gynaecologists, emergency and marine medicine. During this period the research workers of the department published 4 training aids and 5 papers on the problems of pedagogics; 2 methodical recommendations were published for optimization of the study of students and doctors. 5 clinical interns were prepared (three of them were foreigners).

The researches were made at the department on 5 budget scientific problems (inflammatory diseases of the urogenital organs and complication in operative treatment; men's fertility in liquidators of the Chornobyl Atomic Station accident under the action of long-term isotopes; prevention of wound infection in urological operations; prevention of urolithiasis relapses; prevention of relapses of superficial forms of the bladder cancer) and two problems running on a self-financing.

During this period 3 postgraduates and 4 students with master's degree studied at the department; 2 candidate and one doctoral dissertations were defended. Two more candidate and one doctoral dissertations were prepared for defence. The department had 96 scientific researches published, 8 patents for the inventions, and 14 certificates about innovations. Distance controlled lithotripsy was first carried out, development of endoscopic urology continued as well as methods of metaphilactic urolithiasis, immunotherapy in bladder tumours.

In 1995 an independent department of urology was opened at the faculty of advanced training of doctors. Prof. F. I. Kostyev headed this department. It was based at a few establishments of the Regional Clinical Hospital: the urological department consisted of 60 beds, nephrological — 40 beds, laboratory of extracorporal methods of detoxication — 15 beds.

The organization of the department of kidney transplantation became the top-priority task of the department. Such department with 30 beds was opened on November 11, 1997 (the head was a

candidate of medical sciences V. A. Sagatovich). An immunological laboratory, operating rooms, necessary equipment were organized at the department.

The first training class on extraction of a corpse transplant was conducted on November 20, 1997, and on December 24, 1997 successful operation was performed on transplantation of a cadaveric kidney (F. I. Kostyev, V. A. Sagatovich, M. S. Rak). The patient with chronic renal insufficiency got rid of necessity of permanent hemodyalisis, and got back to the active way of life.

At present over 60 kidney transplantations have been successfully performed at the department.

In February 1998 both departments of urology were united under the guidance of prof. F. I. Kostyev. A medical base developed (it grew due to the urological department of the Railway Hospital and on the whole amounted to 260 beds). The technical equipment of the base became better. New technologies in therapy of urological patients were mastered: vaporization in transurethral prostatectomy, lumbar percutaneous operations in nephroureterolithiasis. Possibilities of endoureteral lithotripsy and lithoextraction in stones of the kidney and ureter were greatly extended.

The staff of the department has increased having two professors (F. I. Kostyev, M. I. Ukhal), three associate professors (candidates of medical sciences V. D. Shvets, D. F. Tuchin, a doctor of medical sciences O. V. Borisov), junior members of the teaching staff.

Besides of teaching urology and nephrology to the students of the 4th and 6th years of medical university, there are 10–12 interns at the department annually. The courses of pre-attestation preparation of doctors are also conducted. Today 8 clinical interns (6 of them — foreigners), 2 postgraduates, 4 competitors for a science degree that prepare candidate dissertations in accordance with plans of study.

The department develops scientific problems: among them a long-term complex theme "Study of the reproductive health condition under the influence of unfavorable factors of environment", a number of other andrological themes (falloprosthesis in erection insufficiency, copulative function in operative treatment of benign prostatic hypertrophy, andrological rehabilitation of secondary disorders of the reproductive function). Study of diagnosis and treatment of inflammatory diseases of the urinary system is on (laser spectroscopy in differential diagnostics of glomerulo- and pyelone-

phritis, correction of therapy of pyelonephritis, infectious inflammatory diseases of the urinary tract in the postmenopausal period). In treatment of urolithiasis the methods of metaphylaxis of recurrent oxalate urolithiasis are used.

5 candidate dissertations have been defended by O. M. Lyubchak, S. L. Tchekanov, A. S. Nikolayev, D. A. Milenevsky, O. M. Ukhal), 8 more dissertations are being prepared according to the plan.

Thus, while meeting the 140th anniversary of foundation of the first urological department in Russia, opened in Odessa, the department of urology and nephrology constantly improves quality of the pedagogical process, develops educational and medical bases, perfects the methods of medical treatment of urological patients.

The research study of the department staff was always connected with the significant problems of the today's uronephrology. A lot of skilled specialists-urologists who work successfully in different regions of our country and abroad have been educated at the department.

Lecture 1

DEVELOPMENTAL ANOMALIES OF URINARY AND GENITAL ORGANS. VARICOCELE

Developmental urogenital anomalies can be found in more than 40% of all disorders in human body development. Some anomalies of the kidneys and urinary tracts represent a threat to continuation of a child's life, they promote development of other serious diseases, such as inflammation of the kidneys, urolithiasis, oncological diseases, etc.

These defects are various. Classification of the kidneys and urinary tract anomalies was elaborated at the II All-Union Congress of Urologists (Kiev, 1978). We shall consider some of them:

1. Anomalies related to quantity of the kidneys.
2. Anomalies related to the kidney size.
3. Anomalies in the kidney location and shape.
4. Structural abnormalities in the kidneys.
5. Anomalies of renal arteries and veins.
6. Anomalies in the upper and lower urinary tracts.
7. Genital defects in boys.

ANOMALIES IN QUANTITY OF THE KIDNEYS

Anomalies related to quantity of the kidneys (Fig. 1, 2) can be found in delay of organ development at the initial stage of embryogeny — agenesis (aplasia) of kidneys. Defects may be unilateral or bilateral. Thus, a child may be born without one kidney or without kidneys at all. Just opposite to this phenomenon is congenital increase in the number of kidneys or the urinary ducts.

Agenesis or aplasia of the both kidneys threatens child's life immediately after the delivery. Only transplantation of a parent's or a cadaveric kidney made in time can save the child. Such an operation is full of prospects as the child's body due to its immature

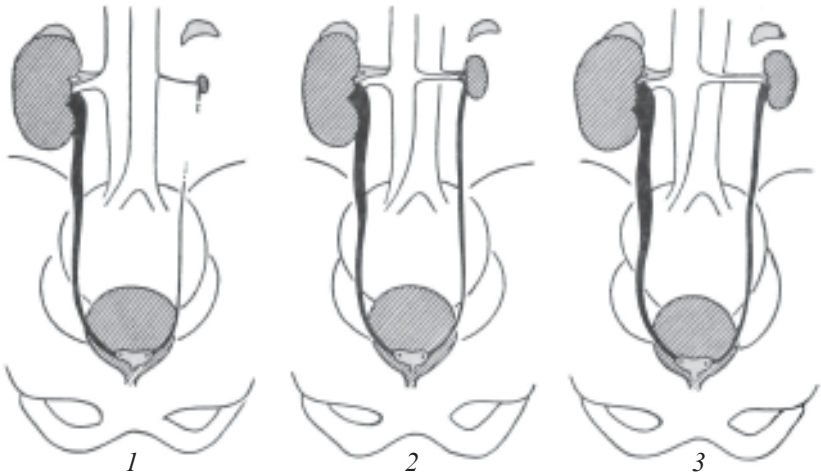


Fig. 1. Renal aplasia and hypoplasia (according to Arnold): *1* — aplasia; *2* — rudimentary kidney; *3* — dwarfish kidney

immunity gives the grounds to hope for engraftment of the kidney having been transplanted.

In case of the **unilateral anomaly**, work of the sole (solitary) kidney is sufficient for supporting vital activity of the body. At the same time one should keep in mind that treatment of patients having one kidney is a very responsible case for a physician of the highest qualification.

Diagnosis. In making the diagnosis of defects related to the quantity of the kidneys the significant role is played by chromocystoscopy, methods of X-ray, computer tomography, ultrasonic scanning, etc. By means of chromocystoscopy we can confirm or refute availability of the outlet opening of the ureter to the bladder.

The X-ray diagnosis is started with survey picture of the kidneys. Further on we introduce X-ray contrast substances (urographin, verographin, etc.) intravenously. These substances excreted by the kidneys give a possibility to find developmental anomalies in the kidneys. For more detailed definition of the size of kidneys one can additionally introduce oxygen (retropneumoperitoneum or pneumoren) to the retroperitoneal area.

For making a diagnosis one can enter X-ray contrast substance into the vessels (angiography). The isotopic methods — isotopic renography, scintigraphy and scanning of the kidneys have essential importance in making a diagnosis for kidney diseases.

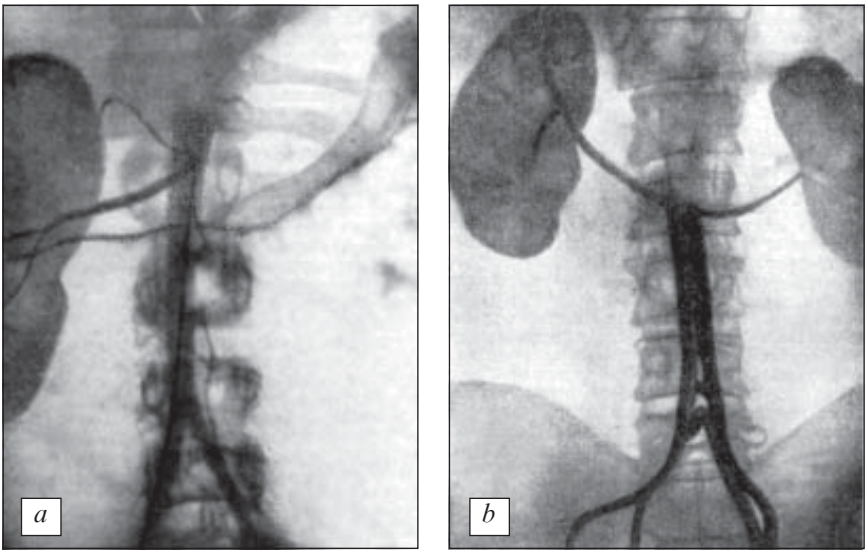


Fig. 2. Renal aplasia and hypoplasia. Aortography (according to Seldinger): *a* — aplasia of the left kidney; *b* — hypoplasia of the left kidney

Doubled upper urinary tracts — two renal pelves and two ureters may be found in 25% of all newborns with anomalies in the urinary tract and kidneys.

There may be full and partial doubling of the ureters.

ANOMALIES IN KIDNEY SIZE

Anomalies in kidney size are related to hypoplasia of the organ (see fig. 1, 2). In case of this anomaly the kidney mass is reduced. If the second normal kidney becomes affected, the hypoplastic kidney cannot support the electrolytic and water metabolism and it results in development of chronic renal insufficiency.

The hypoplastic kidney rather often becomes a target for infection and chronic pyelonephritis develops in it.

ANOMALIES IN KIDNEY LOCATION AND SHAPE

Renal dystopia (Fig. 3) occurs as a result of incomplete organ rotation along its vertical axis in embryogeny that is why the halus renalis remain turned towards the abdominal cavity. In uro-

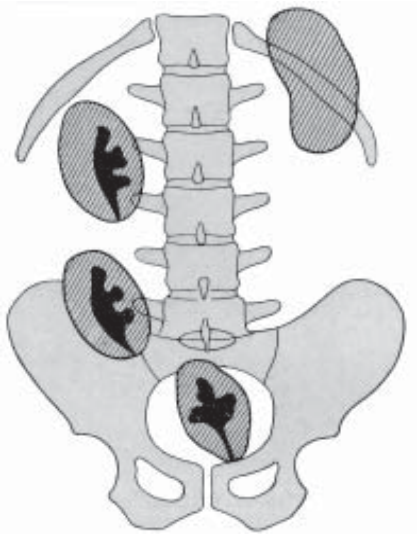


Fig. 3. Renal dystopia. Diagram

grams in the sagittal projection the calyx system is projected to both the medial and lateral side from the renal pelvis.

The dystopic kidneys are disposed to the pathologic process more often than the kidneys with normal location. Dystopic kidneys disposition to the pathology can be explained by several reasons. Changes in the main vessels are of great importance. The dystopic kidneys are more subjected to injury. Changes in urodynamics related to two peculiarities shown below do not rank to the last place.

1. The dystopic kidney has not sufficient excursion.

2. The ureter of the dystopic kidney does not coincide with fiber direction.

The clinical picture of the dystopic kidney reveals in the majority of patients with pain. In case of pelvic dystopia women suffer from pain more often during menorrhea and pregnancy.

Diagnosis. In case of the dystopic kidneys (more frequently than in other cases) there may be diagnostic mistakes. During examination the physician palpates a tumour in the abdominal cavity. In some cases physicians have recourse to surgical methods of treatment. Meanwhile it is possible to stave off operation if you keep in mind this pathology and examine the kidneys by X-ray. The renal dystopia can be differentiated in case of nephroptosis. Complication of nephroptosis is in hemorrhage (fornical hemorrhage) related to increase of venous pressure in the kidneys. The nephroptosis rather often occurs together with splanchnoptosis.

There are three stages in nephroptosis:

I stage — only the lower kidney segment is projected from under the costal arch.

II stage — a half of the kidney can be palpated.

III stage — the whole kidney (a floating one) can be palpated. In the latter case the kidney has no real holding levers except the renal vessels by means of which it is fixed.

In the clinical picture the nephroptosis most often is manifested with pain from the affected side and with rise in the arterial pressure. This evidence gives the grounds to perform a surgical operation to fix the kidneys in the lumbar region by using one of well-known techniques (Revoir—Pytel, Lyulko, Fyodorov, etc.).

Anomalies in kidney relationship are the result of their connection in different combinations. Thereby a single enlarged kidney with atypical location can be palpated and found in the patient by X-ray and US.

Depending on the type of fusion there may be found a fused kidney, L-shaped, S-shaped kidneys and a biscuit-shaped kidney (Fig. 4). The kidney fusion may be their unilateral and bilateral dystopia: in case of S-shaped kidneys one half is in its own place and the other one — in the region of the iliac dystopia.

The most frequent shape of fusion is a **horseshoe kidney**. Kidneys are connected with each other by the isthmus which is located towards the front of the aorta and the inferior vena cava. In most cases the isthmus consists of the renal tissue or of the fibrous cord. The kidneys in these case are in the position of the lumbar dystopia. The vascular system is comprised of many arteries, which pass from the aorta or other large arteries of the neighboring organs. The most frequent complications in case of the fused kidney are pyelonephritis and urolithiasis caused by a conflict between ureters and renal vessels and by disorder in urine outflow from the renal pelves.

Rather often a syndrome of the inferior vena cava develops. Children often have pain in the abdominal cavity (Martynov's and Rovsing's syndrome).

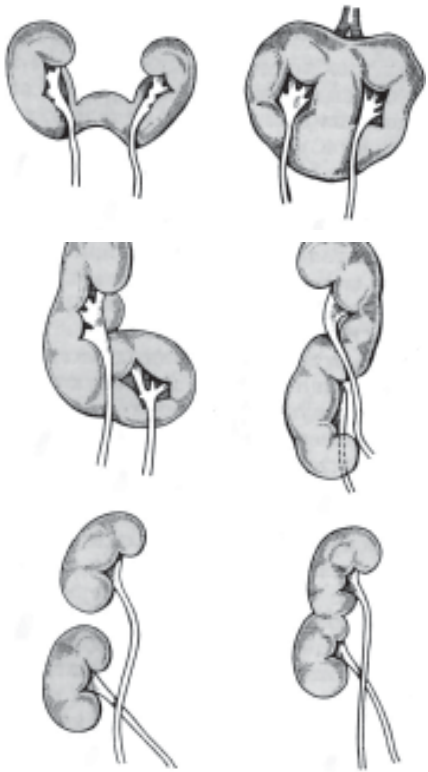


Fig. 4. Fused kidneys

Diagnosis. The diagnosis — a fused kidney — is made on the base of patient's complaints, objective examination, as well as X-ray and ultrasonic scanning.

Treatment depends on whether there is pain and complications mentioned above. In case of complications a surgery is advised: it is necessary to intersect the renal isthmus and to separate the renal poles.

STRUCTURAL ABNORMALITIES IN THE KIDNEYS

In case of structural abnormalities in the kidneys, hypoplasia often combines with dysplasia of the organ. Dysplasia from the both sides is followed with oligonephropathy: quantity of nephrons is reduced greatly and interstitial tissue vegetates in the parenchyma of the kidneys, therefore renal insufficiency soon develops. Death comes in the early age.

Among hereditary dysplasiae, the **idiopathic familial nephropathy** (a familial small kidney) has been studied rather well. Morphologically this anomaly is characterized with lesion of the tubules. The kidneys are reduced in size. Cystic formations are present in the atrophied cortical regions. Clinically nephropathy begins manifesting in the age of 2–4 years. The abnormality runs with a pattern of the chronic renal insufficiency. The diagnosis can be made on the base of family history and hypercalcinuria. The chronic renal insufficiency progresses gradually. The death comes under the age of 10 years.

Alport's syndrome — hereditary nephropathy followed by deafness and eye diseases. In the beginning there is no clinical picture of nephropathy. With appearance of pathologic elements (macrohematuria, proteinuria, etc.) a nephritic syndrome may develop in the nearest future. Nephropathy runs according to chronic pielonephritis or glomerulonephritis. In the former case three main clinical pictures take place — lesion of the organ of audition, eyes and kidneys. Sometimes only two symptoms are present: eye diseases and deafness.

Hereditary congenital tubulopathies are often combined with disorders of enzymatic processes in the tubules of the kidneys. On the background of enzymopathies urolithiasis develops. In case of progressive changes in microcirculation disorders of physical development and mental deficiency — the Fanconi's syndrome — take place.

Cystic processes are of great significance among abnormalities of the renal parenchyma structure.

Polycystic renal disease (Fig. 5, 6) — a hereditary disease which is transmitted according to a dominant or recessive type: the former one — from mother to a child, the latter — along the father's strain. The disease can run as a malignant or latent one. In case of a malignant type quantity of retained nephrons is small and the child dies in the age of 8–10 years, in the latter type quantity of nephrons is sufficient for normal kidney functioning. The disease in this case reveals in the age of 30–40 years when a chronic infectious

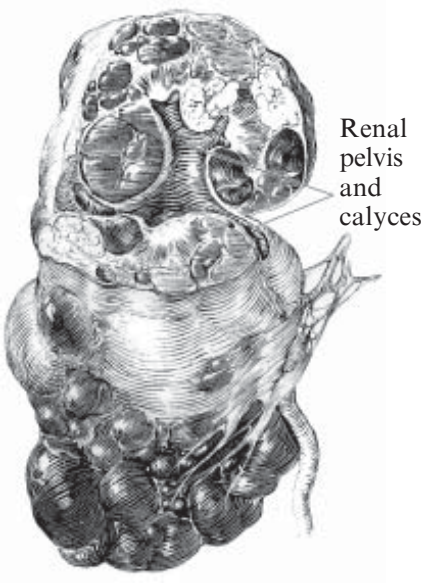


Fig. 5. Polycystic disease. Multiple cysts at the parenchyma and on the surface

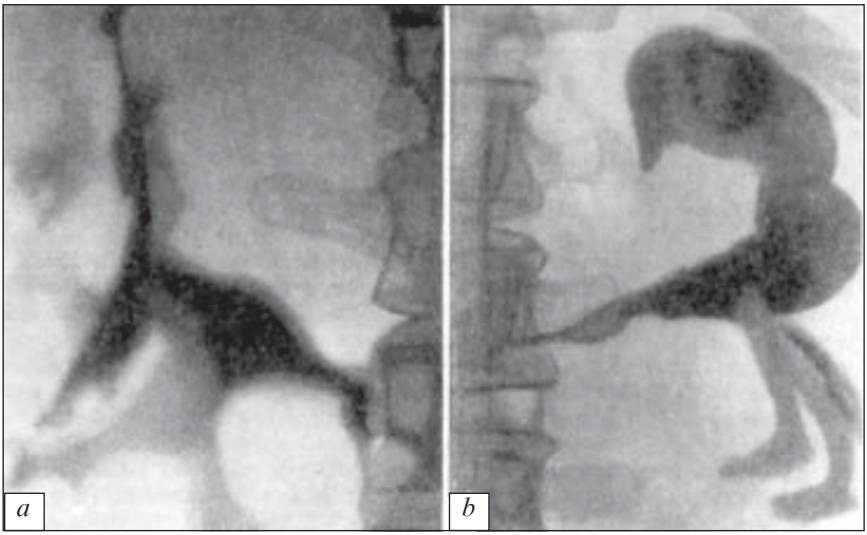


Fig. 6. Polycystic kidneys:
a — excretory urography; *b* — retrograde ureteropyelography

disease develops in kidneys — pyelonephritis. This anomaly develops due to a defect in connection of collecting tubules with the mesonephrogenic blastoma in the 2nd–3rd months of pregnancy. It results in disorders of urine discharging and cyst formation.

At the macroscopic examination the kidney has large dimensions, with many cysts of a various size. In case of complications the cysts have hemorrhagic or purulent mass.

Clinical picture. Polycystic disease is a disease of the both kidneys. The clinical sign of the polycystic disease is pain in the lumbar region. If pielonephritis develops, then its symptomatology reveals as follows: rise of the temperature, changes in blood and urine tests, chronic renal insufficiency.

Diagnosis. The diagnosis of polycystic disease is made on the base of the patient's history, complaints, data of the objective laboratory test, renal X-ray, ultrasonic and radioisotopic examination.

The differential diagnosis of polycystic disease is made in case of tumours of the kidneys. A renal tumour is almost always a unilateral disease. It reveals itself more often in monosymptomatic macrohematuria. Angiography and ultrasonic examination are reliable methods for making a diagnosis for renal tumours.

Treatment of patients with polycystic disease is conservative in the initial stages. First of all, it is necessary to reduce the load to the affected kidneys by means of the protective diet, still it should be sufficiently full of calories. Secondly, it is necessary to prevent from pyelonephritis or, in its presence, to prevent from the progressive inflammation with sanation of the loci of infection and with antibacterial therapy. In case of acute pain, increase of the kidney size and availability of purulent complications the surgery is advisable — decapsulation (nephrocapsectomy) of the walls of large cysts and puncture of the small ones. Such operation reduces renal pressure and improves the function of functioning nephrons. When finding a patient with polycystic disease it is necessary to examine the entire family. It gives a possibility to carry out prophylactic medical examination, prophylaxis of pyelonephritis and chronic renal insufficiency.

Renal multicystosis differs from the polycystic disease with complete absence of nephrons, it often combines with anomalies in ureters. The bilateral process is incompatible with life. In case of unilateral multicystosis it can be found by means of angiography. In practice, the diagnosis is made according to the results of histologic examination of the organ removed.

The solitary cyst of the kidney (Fig. 7) is a sole large cyst which is more often located at the level of the lower pole of the kidney, sometimes in the middle segment or in the upper pole (Fig. 8, 9). The cyst includes transparent yellowish liquid. The cyst formation is related to some developmenal anomaly and urine retention in the intrarenal ducts.

All solitary cysts can be diagnosed in the child's age when palpating the kidneys. It may happen that in some cases solitary cysts are not congenital but occur as a result of pathologic processes which lead to retention changes that appear more often on the background of pyelonephritis.

Diagnosis. The diagnosis of the solitary cyst is more often made by chance — after examination in connection with a palpated tumour or after ultrasonic examination. But before that patients suffer from pain in the lumbar region, hematuria or pyuria. In case of large cysts there may be constraining of the parenchyma, disorder in hemodynamics which result in nephrogenic hypertension.

The diagnosis is made on the grounds of a set of examinations. If the cyst is located in the lower segment of the kidney (see fig. 8), one can palpate a rigid tumour with a regular surface which is easily shifted when breathing. If the cyst is located in the upper

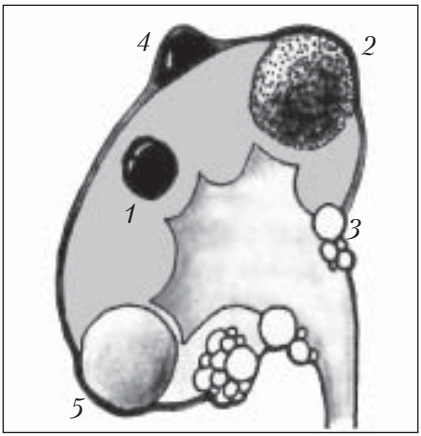


Fig. 7. Location of a renal solitary cyst: *1* — intraparenchymatous hemorrhagical*; 2* — cortical; *3* — parapelvical**;** *4* — subcapsular; 5 — cortical infected

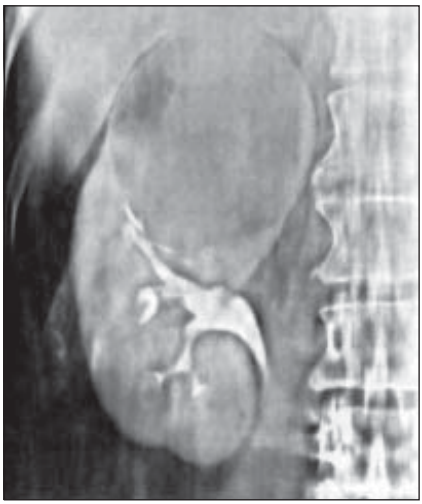


Fig. 8. A simple (solitary) renal cyst. A large cyst shifts the lower renal pole to the lateral direction

Fig. 9. Solitary cyst of the right kidney. Infusion nephrotomogram. A large cyst in the upper pole constricts the upper calices and shifts the upper part of the kidney to the lateral direction

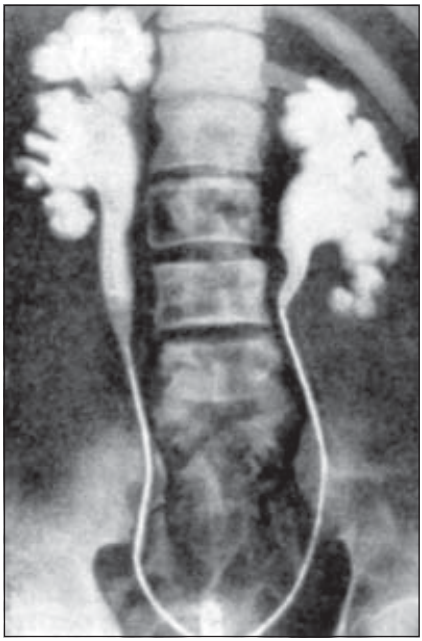


Fig. 10. Sponge kidney

part of the kidney (Fig. 9), it makes the kidney move down — a low kidney is palpated and it cannot be moved upwards as it is done in case of the lumbar dystopia.

The laboratory blood and urine tests do not find any pathologic changes, except complicated cases. In the excretory urograms one can find deformation of the calyx-renal pelvis system, in addition to cysts from the peripheral part of the parenchyma, the retropneumogram shows a round-shape shadow related to the kidney.

The angiograms show a vessel-free area in the location of the cyst. The ultrasonic examination is more informative for this type of pathology. By means of it one can define location of cysts, their number and size and their relationship to the calyx-renal pelvis system.

But not always one can exclude a probability of the renal tumour. In such case the decisive importance has a cyst puncture under ultrasonic control.

This manipulation is done with the patient lying on his belly. The skin is cleaned with iodine and alcohol. The cyst puncture and liquid evacuation are done by means of a special transmitter. This li-

quid is sent to be cytologically and biochemically tested. The cyst is introduced with a sclerosing substance, tetracycline and alcohol.

In case of giant cysts located in the vicinity of the calyx, the surgery technique is preferred. Dermoid cysts are found extremely rarely. Before the operation the diagnosis is made after finding bone tissue shadows in roentgenograms. The respective information can be obtained from ultrasonic examination.

A sponge kidney (Fig. 10) is a rather spread anomaly of development. As a result of expansion of collecting tubules, small cysts are formed in the substantia medullaris of the kidney wherein salts of Ca are deposited. This anomaly has a latent course. There are no signs of renal insufficiency. Small concrements are formed in cysts. In the excretory urograms there are small cavities located near the apices of calices in the shape of a sponge or a bunch of grapes.

Treatment is conservative. Small concrements can enter the urinary tracts and they often become nuclei for formation of larger concrements.

ANOMALIES OF RENAL ARTERIES AND VEINS

Anomalies of renal vessels are subdivided by M. O. Lopatkin into anomalies in quantity, location, shape and structure of arterial trunks. Anomalies in quantity and location include an additional artery, which is directed from the upper or lower pole, a double renal artery with availability of two equally valuable arterial trunks, multiple arteries. The latter ones are found in case of a horseshoe kidney and other types of fused kidneys.

Additional arteries can cross the renal pelvis-ureter segment and become the reason for development of hydronephrotic transformation of the kidney. In this case surgery intervention is preferred. During operation the vessel is to be shifted or plasty of the renal pelvis-ureter segment towards the front of the abnormal vessel (antevasal pyelo- or ureteroanastomosis) should be performed.

Abnormality of the shape and structure includes aneurysms and fibromuscular stenosis of the main or additional artery. In this case blood circulation in the kidneys is potentiated, renovascular hypertension develops. These abnormalities can be diagnosed according to angiographic data, ultrasonic Doppler examination data. In case of arterial hypertension a plastic vascular operation is preferable or resection of the affected part of the kidney.

Congenital anomalies of the renal veins are related to developmental abnormality of the lower vena cava. Anomalies of the right renal vein can be met rarely. Anomalies of the left renal vein may be found more often: the circle-shaped renal vein, the retroarterial left vein, extracaval confluence of the left renal vein. Compression of the pelves-ureter segment arises due to intersection with veins. Their ligation and intersection are not dangerous because there are intrarenal anastomoses. Confluence of the gonadal vein instead of the lower vena cava into the renal one in some cases complicates urine draining along the latter one and it results in development of the right-hand varicocele. In case of the circular vein, venous hypertension often arises. Hematuria and proteinuria are present. In case of the extracaval confluence of the renal vein it turns upwards or downwards and crosses renal arteries, thus resulting in disorder of venous outflow from the kidney. Rise of pressure in the left-hand renal vein results in development of varicocele recurrence.

ANOMALIES IN THE UPPER AND LOWER URINARY TRACTS

It is rather difficult to classify anomalies of the upper urinary tracts since it is connected with probability of various versions of anomalies, mainly of morphologic or functional nature. The most convenient classification is the one according to which anomalies are identified by their number, gauge and shape, as well as by the ureter trajectory.

The ureter may be absent in case of renal agenesia. Patients with renal agenesia sometimes, as it was stated before, have a ureter that has a blind termination at some distance from the bladder.

The most frequent anomaly is **doubling of the upper urinary tracts** (Fig. 11): there are two renal pelves, with two ureters directed to their extension. The ureter doubling is complete if both of them separately reach the bladder and are opened with two orifices. Incomplete doubling is in case when both ureters are connected and opened into the bladder with one orifice. This anomaly is called a "bifid ureter". The level of the ureter connection may be different — from the parapelvical section to the paravesical one. Some people have pelvis doubling. The renal pelves are interconnected and have one renal pelvis-ureter segment as continuation.

The complete doubling of ureters is subjected to the following rule: the ureter orifice of the upper half of the kidney is opened

more distant from the orifice of the lower half, nearer to the inner opening of the urethra. The second rule: the upper renal pelvis, as seen on the urograms (see fig. 11), has an unusual shape and there may be mistakes as a result. Finally, in case of upper urinary tract doubling, the upper part is less in its volume than the lower one.

The difference of ureter opening to the bladder has some practical significance since it is connected with disorder of the closing apparatus of the ureter orifices. The ureter of the lower part of the kidney penetrates the wall of the bladder almost horizontally, the upper one, as a rule, is in the oblique direction. Thus, the ureter of the lower part of the kidney is under conditions which promote the bladder-ureter reflux, urine motion from the bladder upwards.

People with a bifid ureter sometimes also have disorders related to uridynamics dyscoordination. Urine portions pass with different rhythm and urine comes from one ureter to the other one — i.e. ureter-ureter reflux.

Taking into account that doubling of the upper urinary tracts may be found considerably more frequently than the refluxes described are observed, one may think that there should be additional conditions for their occurrence, which are related to disorders in the neuromuscular apparatus of the ureter. The rate of doubling of the upper urinary tracts can be considered by the following digits: according to sectional findings it is within 0.68–4.0% of all cases of autopsy; according to the data from the urological hospitals — 2.8% of the amount of inpatients. Doubling of the upper urinary has an without complications has an asymptomatic course. In case of refluxes complications occur — pyelonephritis, hydronephrotic transformation (Fig. 12), with symptoms relevant to this disease.

Fig. 11. Double upper urinary tracts

Fig. 12. Hydronephrosis of the lower half of the doubled left kidney

The diagnosis is made on the basis of the endoscopic examination (three or four ureter orifices at bilateral anomaly), but mainly — by excretory urography (see fig. 3, 4), since the number of orifices remains unchanged in case of ureter splitting. There may be doubling with ectopy of one of the orifice. Tripling of urinary tracts occurs very rarely.

Anomalies of gauge and shape are found very rarely, but they have a great significance due to their severity. A change in gauge may be related to the renal pelvis, to the ureter as a whole, to the ureter section or only to the pelvis.

Increase of the pelvis size occurs at anomalies followed by a disorder in patency of the renal pelvis-ureter segment which may be a subsequence of the congenital valve stricture, chiasm and compression by an abnormal vessel, dense connective tissue. Thereby a hydronephrotic transformation develops, with progressive atrophy of the renal parenchyma. In cystoscopy the ureterocele is clearly seen. One can see urine ejections from a small orifice. In X-ray a distention of the distal part of the ureter can be found, which has a snake-head shape, then — the whole ureter in case of ureterocele progressing.

The clinical picture is in pain in the area of a corresponding kidney. The disease is complicated with a disorder in the kidney functioning, pyelonephritis, stones formation. Treatment in case of small ureterocele is in endovesical electroresection of a part of the wall with ureterocele. In case of large ureterocele the operation is preferable by means of a transvesical approach during which the ureterocele walls are cut out and antireflux protection is created.

At **achalasia** (neuromuscular dysplasia, megaloureter) there is no mechanical obstacle for urine outflow. Anyhow, the ureter catheter passes freely. The ureter is distended greatly. At achalasia dis-

tention is in the large pelvis area, at megaloureter — along the entire length. Then kidney cavities are distended and uretrohydronephrosis will be developed.

Clinical picture. The clinical picture of the congenital ureter distention in case of neuromuscular dysplasia, especially if the process can be found only in the large pelvis area, is very poor. Especially for the time when peristalsis retains and no infection arisen. Sometimes this anomaly can reveal itself in the elderly age in connection with diseases which cause infection of the urinary tracts.

Diagnosis. The main diagnostic technique is X-ray. It shows distended ureters at megaloureter or distention of the pelvic area only at achalasia. The ureter has many flexures which look like a loop of a small intestine. At urocinematography one can see a good peristalsis in the upper part of the ureter and a weak one — in the lower part.

Joining of the infectious process causes occurrence of pyelonephritis symptoms. Further on comes disorder in urodynamics and kidney destruction. As subsequence of pyelonephritis progression and hydronephrotic transformation, some signs of the chronic renal insufficiency occur.

Treatment is based on surgical correction of the ureter, struggle against infection and homeostasis disorders. Interventions to the ureter are complicated and they do not always lead to success, especially in the late stages of the disease.

Anomalies in ureter trajectory (Fig. 13) are related to its proximal, middle and terminal parts. In addition, the ureter may circumflex the lower vena cava. X-ray allows to determine the anomaly of the ureter development. Intervention includes transfer of the renal pelvis above the renal pelvis-ureter segment, ureter release from beneath the lower vena cava and restoration of the renal pelvis drainage. The renal pelvis-ureter segment plasty is more desirable than that of the ureter because it gives better patency of the anastomosis.

The testicular vein syndrome is related to compression of the ureter. It can be found more often in the right side.

An anomaly of the ureter terminal part trajectory is ectopy of its orifice. More often ureter doubling can be found. The ectopic orifice is the orifice of the ureter that goes from the upper part of the double kidney. The ureter is opened to the posterior urethra or to the vault of the vagina. It is very rarely found in the rectum or

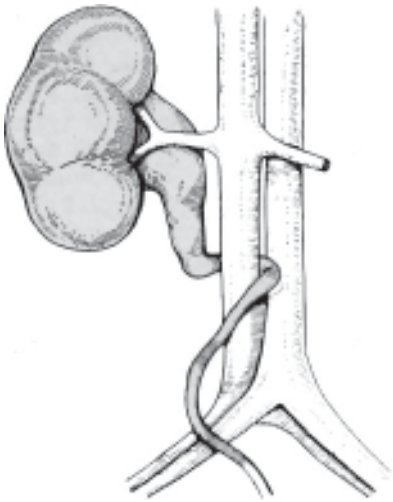


Fig. 13. Retrocaval ureter

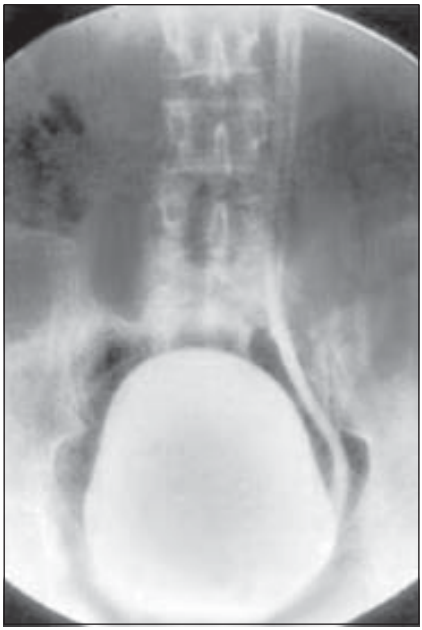


Fig. 14. A voiding cystogram: complete doubling of ureters, a bladder-ureter reflux on the left

seminal vesicles. The anomaly is found several times as frequent in girls compared to the boys.

The clinical picture of the ectopy of the orifice is very specific. Mother says that the child urinated normally, but the linen is always wet. The normal urination is provided in this case by a healthy kidney or by the lower half of the double upper urinary tracts. Incontinence of the urine is related to the ectopy of the orifice into the vagina, urethra.

Diagnosis. The diagnosis is made after examination of the genitalia with intravenous injection of indigo-carmine to facilitate finding of an abnormal orifice.

The urine incontinence in boys may be absent because the urine is retained by the inner sphincter of the urethra. The excretory urography in case of a doubled ureter allows to make a correct diagnosis.

Treatment, except a complete kidney destruction, should be organ-preserving. For this purpose the ureter is transplanted to the bladder. If the destruction occurs in one half of the doubled kidney, heminephrectomy is to be done.

The bladder-ureter reflux (Fig. 14) may depend on congenital insufficiency of the muscular apparatus of the orifice of the ureter or it may be acquired due

to disorder of the patency of the bladder-ureter segment and chronic inflammatory process.

There exist two contradictory opinions concerning the rate of reflux combination with the renal pelvis-ureter segment. Some urologists think that reflux occurs owing to enlargement of the bladder volume, ischuria and inflammation, the other ones — that it depends on anatomy of the closing apparatus of the orifice.

The closing apparatus of the orifice is ensured during increase in intravesical pressure: a) by oblique direction of the ureter while passing the muscular layer of the bladder wall and by pressing on it during detrusor contraction; b) by submicous location of the terminal section of the ureter for about 11 mm. This section presses into the muscular layer of the bladder wall with bladder pressure rising.

The reflux arises at the ureter passing through the muscular layer in the perpendicular direction or close to it, and also at shortening of the submucous channel. It is important, that for children the short submucous duct of the ureter at reaching the puberty can be prolonged, that will result in the reflux disappearance. This phenomenon is called maturation.

The satisfactory run towards maturation can be prevented by infection, or progressing failure of patency of the bladder-ureter segment. When treating the infection, reflux reveals much less. Actually, a vicious circle is seen: the reflux maintains an uprising infection of the urine paths, and the infection maintains the reflux. But it should be prevented by great amount of consumed drinking and antibacterial therapy.

Diagnosis. The diagnosis is made on the basis of cystography, radionuclide renography, etc. The obligatory component in making the diagnosis should be exposure of the bladder-ureter segment condition. At its failure the surgical intervention is indicated.

Anomalies of the urinary bladder

Extrophy of the urinary bladder is the absence of the front wall of the bladder and the front abdominal wall, respectively. The pubic bones are diverted at a large distance. When inspecting a newborn, a round wall of the urinary bladder at the pubic level is to be found, on its bottom orifices of ureters locate. The outbursts of the urine are visible. The extrophy of the urinary bladder in the child is accompanied with inflammation and maceration of the skin

integument. The most careful hygiene preservation measures for a child should be taken as well as prevention from skin integument changes.

In connection with a pelvis ring defect, the child is characterized with a waddling gait. Extrophy is combined with epispadias. It can be found 3 times as often in boys than in girls.

Treatment is surgical. It is in abducing urine to the sigmoid intestine, or in recovery of the urinary bladder by plastic operations. Unfortunately, it frequently fails. The urine abducing is executed by two ways: replacing ureters into the thick intestine, or anastomosis of the Lieutaud's triangle and thick intestine (Maidal's operation) or forming the bladder walls from the sigmoid intestine (most spread is the Michelson's operation).

The full absence of the urinary bladder — **agenesia** — occurs very seldom. It occurs together with other anomalies and is incompatible with life.

Besides, very seldom there may occur a **double urinary bladder**. In this case there is a septum between the right and left halves. The congenital hypertrophy of the detrusor has a figurative name — "bladder-myocardium" in connection with the bladder wall thickness. The bladder-urethral segment is freely permeable. The anomaly results in damage of the upper urinary tracts and kidneys due to a prelum of intramural areas of ureters. The only method of treatment is operation — removal of the urinary bladder (cystectomy) and its substitution by an intestine loop.

Congenital **diverticula of the urinary bladder** can be found more often as compared to acquired diverticula, which occur due to decompensation and extension of the detrusor of the bladder in patients with difficult patency of the bladder-urethral segment.

Since diverticula are manifested clinically more often in the maturity, in some cases there is a doubt concerning the genesis of a diverticulum, whether it is congenital or acquired. The congenital diverticulum is characterized with a narrow junction with the urinary bladder cavity. More often it is alone. Its wall consists of the same three strata, as well as the bladder's wall. The acquired diverticula are more often multiple: trabecularity of the bladder's wall is visible; junction between the cavity of the diverticulum and the urinary bladder is wider. The wall of the acquired diverticulum either is absolutely deprived of muscle fibres or contains them in a small amount. The decisive indication of the congeninal diverticulum is ureter opening into the cavity of the diverticulum. More of-

ten diverticula are located on side walls of the bladder, in the area of ureter orifices, causing additional technical complications in surgery.

Large diverticula of the urinary bladder are the reason for urination in two stages: at first the urinary bladder is emptied, and then urine flows from the diverticulum. Such diverticula sometimes can be palpated as round formations in the field of the urinary bladder if the latter is filled with urine. When the diverticulum is located near the neck of the urinary bladder, a child can have dysuric phenomena.

Complications of the diverticulum are in its penetration into the infected urine cavity. Thereby typical signs of the urinary infection are manifested, and they explain long life of unfound anomaly and its finding only in the mature age.

The diagnosis of the diverticulum is made on the base of cystoscopic data — entrance to the diverticulum is to be found. The best information about the diverticulum can be received from cystography in two projections. Cystography also allows to study the contractile capacity of walls of the diverticulum. A snapshot is to be repeated after urination.

Treatment is surgical — diverticulectomy with postoperative treatment of the kidneys and urinary tracts.

Different forms of the **patent urachus** which should be closed to the time of delivery can also considered as anomalies of the urinary bladder. The patent urachus can be full, may fall into the proximal, middle or peripheral part. Respectively, there may be different clinical pictures. In case of a full patent urachus there may appear a urinary fistula in the navel area. The urine goes out through it in urination. In case of the proximal part of the patent urachus a purulent fistula is developed. Patency of the bladder part causes creation of a peculiar diverticulum. Patency of the middle part results in creation of a median cyst of different sizes.

Making a diagnosis for the purulent navel fistula has no difficulty.

Treatment is conservative as a rule. It is in treating a fistulous passage with caustic silver solution. Patency of the bladder part requires intervention in case of availability of complicated diverticulum. The diagnosis of the patency of the middle part of the urachus is based on the results of palpation — along the center line of the belly one can palpate an oblong formation with low elastic consistency relating to the abdominal wall.

Treatment is surgical.

A large section of urinology is devoted to **developmental anomalies of the bladder-urethral segment.** Here we apply to the bottom of the urinary bladder, the Lieutaud's trigone, the neck of the urinary bladder, the proximal part of the urethra. Separation of such a segment is explained by anatomic, physiological and pathological features.

From anatomy: the longitudinal muscle fibers of the Lieutaud's trigone pass through the posterior lip of the neck and participates in forming a muscle stratum of the posterior urethra. A so-called internal sphincter respecting to the neck of the urinary bladder is composed of detrusor fibers. In the action of neck closing not only muscles take part but also elastic fibers of the neck of the bladder and posterior urethra. In the complicated action of urination both the terminating part of the bladder and urethra take part.

Hypertrophy of intraureter ligament is a fascicle of muscle fibers that passes from one orifice of the ureters to the other one. It is found during cystoscopy. On cystograms the urinary bladder looks like separated into two levels.

Treatment in the early stages is conservative. It is in a bougieurage of the urethra for improving urine outflow from the urinary bladder and antibacterial therapy, as the infection results in the urinary stasis and inflammatory-sclerotic changes of the neck of the urinary bladder. In more complicated cases the operative intervention is indicated. The resection of the intraureter ligament, of the posterior wall of the neck of the urinary bladder, and occasionally — plasty of the neck of the bladder is carried out.

Contracture of the neck of the urinary bladder is separated as an independent disease and as a component of other failures of the bladder-urethral segment. In patients of matured age it always concerns inflammatory and sclerotic changes. In these cases it is correctly to say about a sclerosis of the neck of the urinary bladder, often about a sclerosis of the neck as a component of the prostatic sclerosis. For children it is quite the other case. It is a congenital anomaly or complication of the other one. The diagnosis of the contracture is made in 30% in the early children's age, and in 70% — later. Such a situation can be explained by two reasons:

1. The initial stages of the disease has a latent course, and the first signs of the detrusor decompensation fall into more matured age.

2. Contracture as the secondary phenomenon correlates with the valve of the posterior urethra.

Histological study of resected samples is of great importance, here, according to reports of majority of explorers, muscular, fibrous and inflammatory elements are found.

The clinical course of the contracture is subdivided into three periods.

In the first period there is a disorder in urination, discharge of some drops of urine after its termination. It is a period of compensation, during which there is no residual urine.

In the second period there is a detrusor decompensation, volume of the residual urine occurs and increases; bladder-urethral refluxes, pyelonephritis arise or the upper urinary paths are involved in the process.

The third period relates to a full detrusor decompensation, full chronic retention of urine with a paradoxical ischuria, appearance of signs of chronic renal insufficiency.

The diagnosis is based on the results of instrumental studies. When conducting the bougie, some obstacle may be felt at the entrance to the bladder. At urethrocystoscopy one can see a defect of the prostatic part of the urethra, existing trabecularity of the wall of the urinary bladder. Cystography has only a relative importance. More informative is urethrocystography, at which one can find a sign of a "fountain spurt". At ultrasonic examination with a rectal sensor it is possible to measure dimensions and consistency of affected tissues with a greater accuracy. Uroflowmetry — study of the basic indices of the quality of urination — also has a great importance.

Treatment is in transurethral electroresection. Transvesical operations are seldom performed nowadays.

A valve of the posterior urethra was started to be diagnosed with appearance of fiber optics. When directing the catheters and bougies, they do not meet obstacles. The valve results in a pressure drop in the posterior urethra, thus causing pain. Treatment of this anomaly is carried out by means of transurethral resection of the valve.

Hypertrophy of the verumontanum exists independently or together with other anomalies of the segment. The hypertrophy of the verumontanum may be considerable, so that it can cover the lumen of the posterior urethra. Sometimes this anomaly exposes as erection during urination. Erections are painful. The diagnosis is based on the results of urethrocystoscopy during which an enlarged verumontanum can be found.

Treatment should be started as early as possible in order to prevent from progressing of decompensation of the urinary bladder and changes in the kidneys. The resection of the testicle is to be performed. As you can see, a lot of anomalies united under the title "congenital failure of the bladder-urethral segment" have an identical clinical course. Their early finding and treatment have a great importance. In treatment a decisive role is played by transurethral endoscopic intervention.

Anomales of the urethra

Among anomalies of the urethra there are as follows: a) congenital obliteration; b) congenital stricture; c) doubling of the channel; d) congenital diverticulum; e) hypospadia; f) epispadia.

The congenital obliteration of the urethra along its entire extent can be met very seldom and in case of simultaneous connection with other anomalies it is not incompatible with life.

The congenital stricture/urethrostenosis can be found in any part, but more often — in the distal part. At this anomaly the signs of disorders in urine outflow are developed slowly. The clinical picture is more clearly revealed in elderly age and is exhibited in the same symptomatic complex as stricture of the bladder-urethral segment.

Diagnosis: urethrocystography, uroflowmetry and urethrocystoscopy.

Treatment: transurethral urethrotomy and resection of the stenosed part.

Urethra doubling in some cases can be found together with doubling of the penis. In case of urethra doubling and availability of one penis, the doubled part of the urethra takes place not along the entire extent.

For making a *diagnosis* of urethra doubling it is necessary to carry out urethrocystography or urethrocystoscopy.

Treatment of the doubled urethra is operative — resection of the doubled part.

Congenital diverticulum of the urethra is a rather rare disease. It represents a saccular haustrum of the posterior wall which is connected to the urethra by a narrow passage. The diverticulum is more often met in the anterior part and rather seldom — in the posterior part of the urethra. The size of the diverticulum is within

1–5 cm in diameter. The diverticulum can be diagnosed by visual examination, palpation, and also by urethrocystography and urethrocystoscopy.

Treatment is operative. It is necessary to dissect the diverticulum and to recover the lumen of the urethra.

Hypospadia (Fig. 15) is characterized by absence of the posterior wall (distal part) of the urethra, and **epispadias** is a congenital cleavage of a part or the whole front wall of the urethra. This disease can be found more often in men and it is rather well depicted in the literature.

Diagnosis of the balanic and penile hypospadia and epispadia is simple — the visual examination is enough. In case of scrotal and perineal hypospadias there may be improper gender determination.

Treatment is operative. Operation should be done at the age under 2 years. There are many different methods of operations. The first stage is the same for all patients — it is cutting out the embryonal chorda deforming the penis and correction of a crooked

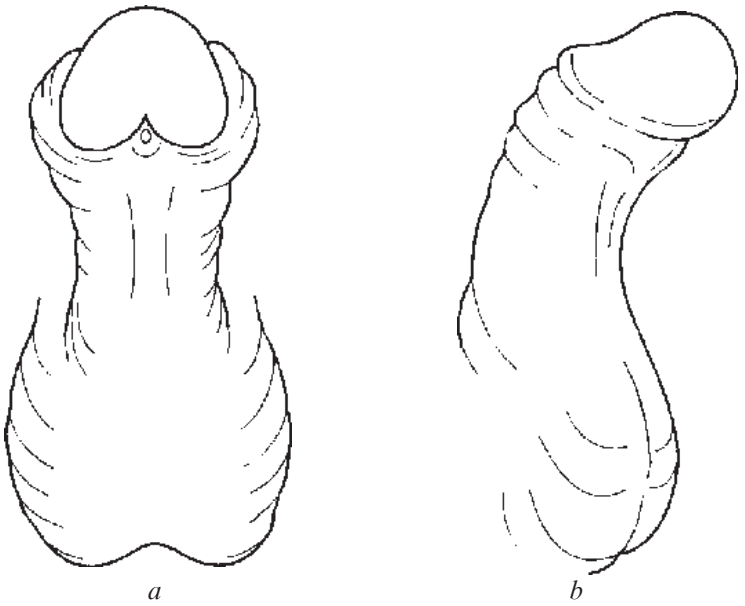


Fig. 15. Balanic hypospadia: *a* — ventral; *b* — lateral view. Changed position of the external orifice of the urethra, the front chord is present

penis. The urethra can be formed from the leaf of the prepuce or from the trunkal part of the penis. In case of epispadias it is necessary to make pubic bones more close to each other.

ANOMALIES OF GENITALIA IN BOYS

Anomalies of the penis

Anomalies of the penis include congenital absence of the organ; congenital absence of glans penis; hidden penis; doubling, or ectopy of penis; membranous penis; congenial phimosis.

Congenital penis absence, or absence of glans penis, as well as ectopy, hidden and membranous penis can be found very rarely.

Treatment — artificial penis creation — phalloplasty.

Congenital phimosis is a rather frequent disease. The abrupt narrowing of the prepuce can result in failure of urine outflow from the urinary bladder, progressing bladder-urethral refluxes, ureterohydronephrosis and chronic renal insufficiency. Thus, in order to prevent from these complications it is necessary to diagnose this pathology in the early stage of child's life.

Treatment can be conservative, if it is possible to expand the prepuce, or surgical — circumcision of the prepuce (Fig. 16). If the congenital phimosis is combined with a short frenulum, the surgical treatment should be added with an operation — frenulotomy with plasty of the frenulum (Fig. 17).

Anomalies of the testicles

Anomalies of the testicles include anorchism; monorchism (polyorchism, synorhism); hypoplasia of testicles; cryptorchism.

Anorchism is a congenital absence of both testicles. Anorchism is characterized with an eunuchoid constitution, underdevelopment of external genitalia and absence of the prostate.

Monorchism is a congenital absence of one testicle. At this anomaly the underdevelopment of a half of scrotum takes place. There is no sexual variations. The sexual function is not changed.

Polyorchism is an additional testicle. It can be found very seldom and, as a rule, the testicle has reduced size and is located near the basic testicles.

Synorhism is a congenial symphysis of both testicles, which have not moved down to the scrotum and are located in the abdominal cavity.

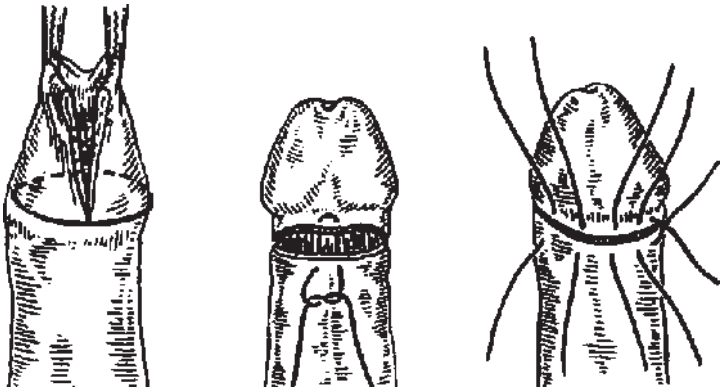


Fig. 16. Circumcision of the prepuce. Scheme of operation

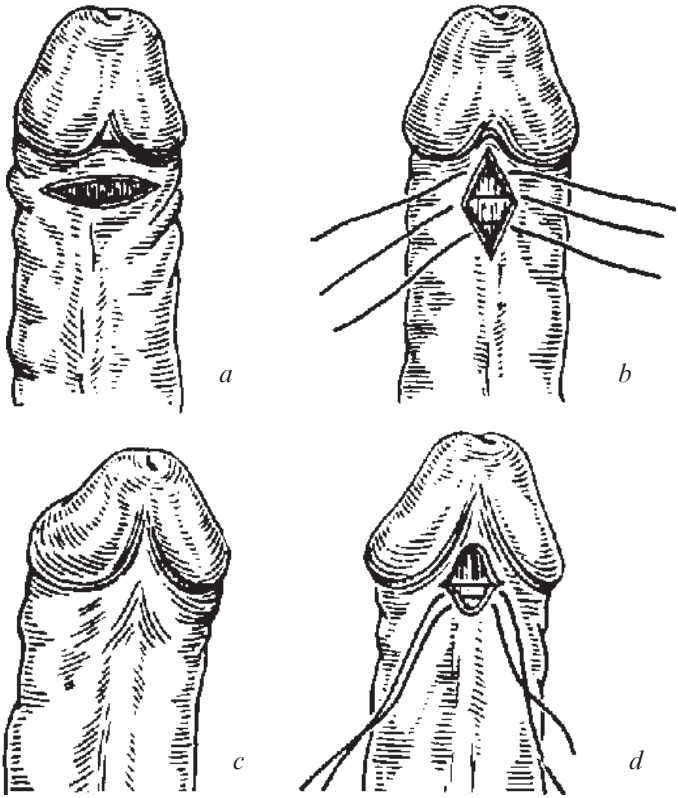


Fig. 17. Plastic operation on the prepuce of penis: *a–d* — stages of operation

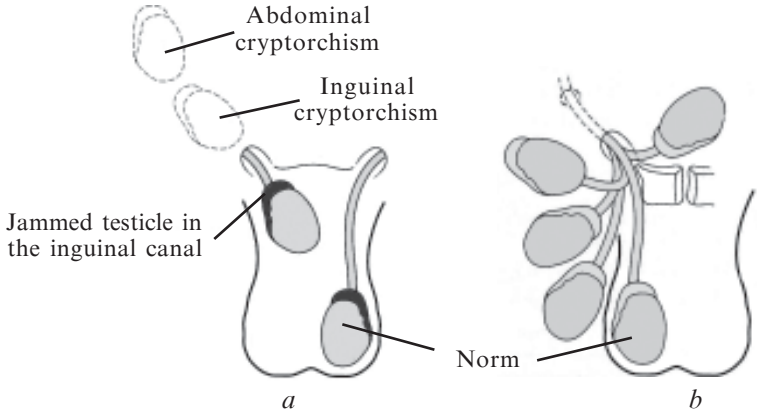


Fig. 18. Anomalies in testicle position: *a* — cryptorchism; *b* — versions of testicle ectopy

Treatment is surgical — cleavage of testicles and putting them down to the scrotum.

Hypoplasia of testicles occurs as unilateral and bilateral. In case of unilateral hypoplasia the underdeveloped testicle should be removed. The bilateral hypoplasia of testicles results in hypogonadism and eunuchoidism. In the latter pathology the hormone-replacement therapy is recommended.

Cryptorchism (Fig. 18) is testicle retention in the abdominal cavity or on the way to the scrotum — in the inguinal canal.

Diagnosis: visual examination, objective and ultrasonic and radionuclide examination.

Treatment is surgical (bringing down the testicle to the scrotum) and its fixation there according to one of 50 techniques.

Anomalies of the prostate

These anomalies include aplasia, hypoplasia and atrophy.

Aplasia is a complete absence of the prostate.

Hypoplasia is a congenital underdevelopment of the prostate.

Atrophy is a congenital reduction of the prostate. This pathology can be found very seldom.

Diagnosis: digital rectal examination and ultrasonic scanning of the prostate.

Lecture 2

NONSPECIFIC PYO-INFLAMMATORY DISEASES OF THE URINARY SYSTEM ORGANS

Nonspecific pyo-inflammatory diseases of organs of the urinary system occur under the influence of various infectious agents. However, the onset and chronic course of the disease depend on general state of the organism. Pyelonephritis is the most common among them.

PYELONEPHRITIS

Patients suffering from pyelonephritis have nonspecific infectious inflammatory process consisting in simultaneous or successive affection of the renal pelvis, calyces and renal parenchyma, mostly the interstitial tissue. There is no isolated purulent nephritis or isolated pyelitis; the infectious process changes from the kidneys onto the wall of the renal pelvis or from the pelvis onto the renal parenchyma. Depending on the site of the inflammatory process onset there are nephropyelourethritis and ureteropyelonephritis (Fig. 19, 20).

Pyelonephritis is observed in 20–40% of patients with affection of the kidneys and upper urinary tracts. Females are more frequently affected than males. It is associated with anatomical and physiological peculiarities of the urinary canal in women, it is wide and short, therefore infection penetrates more easily into the bladder and kidneys by the ascending way. Females largely fall ill with cystitis after defloration, during pregnancy, due to genital infections.

In primary pyelonephritis the urine outflow is not disturbed and secondary process occurs under the conditions of urostasis. According to the course of the disease we can distinguish chronic and acute pyelonephritis. Acute pyelonephritis has an intensive course. Chronic one has a slow, flaccid course with periodic exacerbation. In

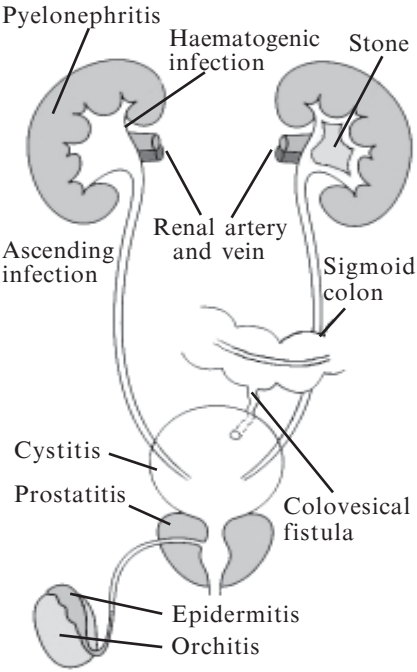


Fig. 19. Infectious processes in the urinary tract

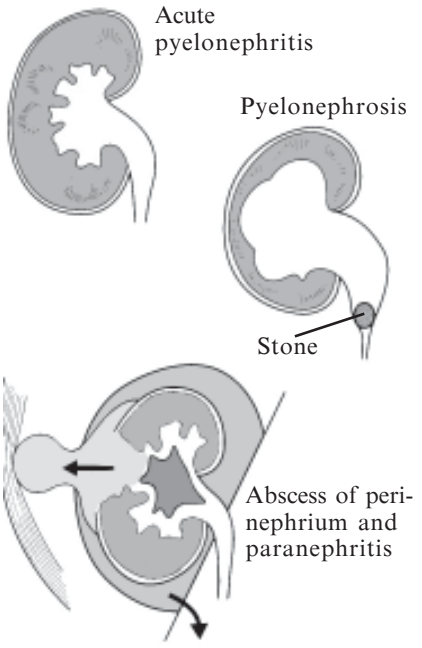


Fig. 20. Acute renal pyo-inflammatory diseases

some time it brings about sclerosis of the renal parenchyma resulting in arterial hypertension and chronic renal failure (CRF). The process may be uni- or bilateral.

As to the ways of infection penetration there are several kinds of pyelonephritis:

1. Hematogenic (descending).
2. Urinogenic (ascending):
   a) in impaired patency of the urinary tract (obstructive);
   b) in urolithiasis;
   c) in tuberculosis of the kidneys;
   d) in other affections of the kidneys.

According to the course peculiarities depending on the age and state of the organism there is pyelonephritis:

1) of newborns;
2) of elderly patients;
3) of pregnant women;
4) in diabetes mellitus and others.

Any microorganism may be a causative agent of pyelonephritis. Most frequently it is Escherichia coli, staphylococci, protea, enterococci and others. Not infrequently the microorganisms lose their membranes and transform into the L-forms and protoplasts under the influence of unfavourable factors (changes of the urine pH, intake of antibiotics). Under favourable conditions they again transform into the corresponding vegetative forms.

Pyelonephritis is characterized by presence of microorganism associates. Approximately 15% of patients can't be detected causative agents in usual culture media. In such cases we may assume that L-form bacteria, mycoplasma or viruses cause the process.

In acute pyelonephritis pathomorphologic changes depend on the stage of the inflammatory process. In the stage I (serous pyelonephritis) one may see enlargement of the kidneys, oedema of the surrounding cellular tissue. Numerous inflammatory infiltrates are revealed during the microscopic study. In the stage II (purulent pyelonephritis) purulent minute foci form. Apostematous (suppurative) nephritis (Fig. 21 *a*, see col. suppl. sheet) is characterized by formation of numerous minute foci under the kidney capsule and in the areas of its cortical layer. Purulent infiltrates spread to the renal papillae. Dense infiltrate is formed near the papillary base in some patients, which then transforms into abscess that impairs renovation of the papilla and causes its rejection. Fusion of minute purulent foci results in necrosis — renal carbuncle (Fig. 21 *b*, see col. suppl. sheet) or abscess. Formation of carbuncle is associated with development of septic emboli, which close the vessel lumen.

Chronic pyelonephritis is characterized by foci and variety (polymorphism) of changes in the renal tissue; in bilateral process there is affection asymmetry of different degree. Inflammatory areas are gradually substituted for areas of sclerotic connective tissue. At first the renal tubules become extended (shield-like kidney), then the affected kidney shrinks (Fig. 22). In case of bilateral shrinkage CRF progresses.

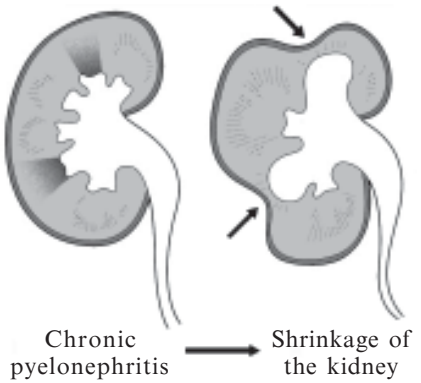


Fig. 22. Shrinkage of the kidney as a result of pyelonephritis

Acute pyelonephritis

The clinical picture of acute serous pyelonephritis is characterized by general and local manifestations. In primary inflammation general symptoms are observed: chill, significant fever, excessive sweating, headache, pain in the muscles and joints, nausea, vomiting, general malaise. The body temperature is of constant or intermittent character. Elevated temperature is followed by marked adynamia, arterial hypertension.

Local symptoms include pain in the lumbar area that spreads downward along the ureter, irradiates into the hip, rarely — in the upper part of the abdomen or back. Palpatory pain is determined in the area of the affected kidney, the Pasternatsky symptom is positive. There is observed tension of the lumbar and epigastric areas (the Pittel's symptom).

In obstructive (secondary) acute serous pyelonephritis local symptoms are more marked than in primary one. Many patients are palpated an enlarged painful kidney. The pain syndrome resembles the attack of renal colic. The temperature is of septic character. When antibacterial therapy is taken the symptoms of pyelonephritis are less marked though purulent changes of renal parenchyma persist.

Diagnosis. The diagnosis of the disease by presented typical symptoms is not difficult. The laboratory data may reveal bacteriuria, the number of microbes in 1 ml of urine ("microbial number of urine"), character of microflora, presence of leucocyturia, active leucocytes and Sternheimer—Malbin cells.

At the beginning of the disease moderate proteinuria (no more than 1g/l) and leucocyturia are revealed in urine. Later on leucocyturia increases.

Clinical study of blood in patients with acute serous pyelonephritis shows moderate reduction of hemoglobin, leucocytosis, left shift of leucogram (increased number of stab neutrophils and development of young forms of leucocytes, elevated ESR, toxic granularity of neutrophil granulocytes). If the patients took antibiotics in large doses, the leucocytes could be unmarked. In such cases informative test of local leucocytosis may be revealed: in blood taken at the side of affection it is more marked than in blood taken from the finger.

In severe forms of the disease with affection of the opposite kidney and liver there may be azotemia, hyperbilirubinemia, hyperglycemia, hypo- and disproteinemia.

Meanwhile in unilateral acute pyelonephritis there may be azotemia due to the renal pelvis — venous reflux caused by occlusion of the upper urinary tracts. In these cases an urgent operation is recommended to eliminate impaired urine outflow from the kidneys. Chromocystoscopy, radionuclide renography, examination urography allow to detect decreased functions of the kidneys and calculi in the upper urinary tracts. Ultrasound scanning, radionuclide scintigraphy are used for this purpose. They reveal size and consistence of the kidneys. Excretory urograms may show compression of the renal pelvis and calyces, disturbances of the kidney mobility during respiration. Roentgen-contrast substance appears on the affected side later than on the healthy one. It fills in the upper distended obstacles of the ureter, pelvis and calyces but in occlusion of the urinary tract we can't observe the renal function.

Differential diagnosis is made with acute cholecystitis, appendicitis and other acute infections.

Treatment of patients with acute serous pyelonephritis depends on the process character (primary or secondary), its form (uni- or bilateral), patient's age, concomitant disease. The main scheme of treatment includes the regimen, diet, hydration, detoxication, general strengthening of the organism, and antibacterial therapy. The bed regimen may be in the in-patient department. The feeding is sparing taking into consideration detoxication, catabolism, loading not only on the kidneys but also on the liver. The food allowance is energy-optimal at the expense of carbohydrates, and fats of vegetable origin. During the first days of treatment cheese, chicken egg white are sources of proteins; later on when the patient's condition becomes better, it is boiled fish and meat. Spicy flavouring should be avoided. The patients are supplied with vitamins. When the glomerular filtration is kept, it is allowed to take some salt and the amount of liquid taken may be increased. Elevated hydration is a main part of detoxication in complex therapy. About 3 l of liquid is introduced perorally and parenterally. It is glucose, solution of sodium chloride, rheopolyglucin that are added by vitamins and antibacterial drugs. Simultaneously albumin, blood plasma and γ-globulin are introduced.

Antibacterial medicines are the base of conservative therapy. In case of primary process antibacterial medicines in combination with detoxication and stimulation of the host defences are effective. The antibacterial therapy should be purposeful, i.e depend on microflora. Bacterial investigation of urine is made first on suspi-

cion of acute pyelonephritis. Before the results treatment is administered empirically or taking into account indirect signs, and determination of microflora kind is based on them. Cephalosporins and fluoroquinolones of III–IV generation are the most effective drugs.

In secondary pyelonephritis positive effect may be attained only in combination of antibiotic therapy with drainage of the kidney or in determination of the source of suppuration. To make drainage of the kidney ureteric catheterization is applied but it is better to make stent or intracutaneous puncture nephrostomy which is performed under ultrasound control. When these measures are insufficient, open nephrostomy is necessary for making kidney drainage. Antibacterial remedies can be used only after this.

A purposeful antibacterial therapy is based on determination of the bacterial sensitivity to different drugs. Not infrequently the cultured microorganisms are insensitive to all antibacterial drugs tested. But it does not mean that we should refuse antibiotics and chemical drugs. In contrast to laboratory conditions host defences, cellular and humoral factors join in the combat and in practice the remedy may prove to be effective. The strains of staphylococci isolated from urine are sensitive to methicillin, oxacillin, aminoglycosides (gentamycin sulfate), and gram-negative bacterial form is sensitive to carbenicillin, amidoglycosides, cephalosporins.

Efficacy of antibiotic therapy depends on sensitivity not only of the main causative agent of pyelonephritis but also of concomitant microflora. Therefore in acute pyelonephritis it is recommended to apply combined antibiotic therapy. Synergism to Bacillus pynocyaneus is determined in combination of aminoglycosides with carbenicillin or oxacillin with ampicillin. The strains of protea and *E.coli* isolated from urine are sensitive to combination of carbenicillin with ampicillin or cephalosporin.

In case of ineffective treatment for 2–3 days, repeated examination should be made to be sure of absence of focal infection. The focus may be revealed in the prostate gland as prostatitis frequently joins pyelonephritis or preceded it. Sometimes it has iatrogenic origin, i.e. develops after instrumental examination (chromocystoscopy, ureteric catheterization).

In **obturative acute serous pyelonephritis** the question of surgical intervention is raised from the very beginning of treatment. When there are no findings of secondary process during repeated examination and there are no other focal inflammations anti-inflam-

matory remedies should be substituted, and in ineffective further conservative treatment surgery is indicated. Absence of improvement for 5–7 days even in primary acute pyelonephritis and the severe course of the process is an indication to surgery — decapsulation of the kidney and taking urine out.

The choice of an antibacterial drug depends not only on these antibiotics but also on novelty of the remedy. In using new broad-spectrum antibiotics which do not have resistance to it, therapeutic efficacy may reach 100% (zinacef, thienam).

Efficacy criterion of antibiotic remedy is its active action against protea group (the remedies of nitrophurans — furacrilin, furasolidon or derivatives of nalidixic acid). Polymycin is an antibiotic of choice in pyelonephritis caused by Bacillus pynocyaneus. 1% solution of dioxidin (intravenously) or 0.1% solution of furagin (somefur) are also effective.

Plasmapheres is applied during treatment of patients with acute serous pyelonephritis. Compared with hemosorption this method does not lead to destruction of blood cells and allows to excrete up to 75–80% of bacteria and toxins circulating in blood as well as pathological immune complexes, cryoglobins and cryofibrinogens for a short time (1–1.5 years).

Antibiotics are abolished and only antiseptics are applied after effective treatment of patients (no chill, subsiding of body temperature, improved data of laboratory tests). The antibacterial therapy is stopped completely only in 2–3 weeks after normalization of laboratory indices of blood and urine. Total duration of antibacterial therapy in acute pyelonephritis is at least 6 weeks. Its abortion is a cause of the disease recurrence and transformation of the process into a chronic stage.

While treating with antibiotics it is necessary to take into consideration their side effects (candidomycosis, intestinal dysbacteriosis) that require additional therapy (levorin, bifidum-bacterin). The nonspecific ways of treatment include vitamins, hormones, enzymes, anticoagulants, blood and blood substituting drugs, medicinal herbs, immunocorrectors.

In case of the process progressing as well as in case of cepticopyemia nephrectomy is indicated in unilateral affection of the kidney. The patients who have had acute pyelonephritis should be followed up for a year and patients after surgery — for at least 5 years.

Acute purulent pyelonephritis

Apostematous pyelonephritis

One of the forms of acute purulent pyelonephritis is apostematous pyelonephritis (Fig. 21 *a*; see the suppl. sheet) having the same clinical course as sepsis: the body temperature of 41°C (hectic type of the curve), chill, increased sweating, decreased arterial pressure, hallucinations, sometimes icteric sclera and skin. On palpation there is pain in the area of the affected kidney. The symptoms are marked most distinctly in obstruction of the urinary tract. At first there may be no changes in urine, then protein-leukocyturia and bacteriuria are determined. High contents of leucocytes and marked left shift of leucogram are determined in the blood.

During bacteriotoxic shock patients have a very severe condition resulting from accumulation of endotoxins of bacterial flora in the blood.

Diagnosis. The surway X-ray and echogram show enlargement of the kidney, excretory urograms reveal its decreased function. Its mobility is limited during respiration. Disorders of vascularization, secretion and excretion are seen on the renogram. Obturative type of the renogram is evidence of the pathological process in the kidney and urodynamic disturbance. The process localization may be determined by means of dynamic scintigraphy with computer processing. There are foci with low content of radionuclides on the scanogram. In the secondary apostematous pyelonephritis one may notice manifestations of the initial disease on the X-ray film (calculus of the ureter, kidney, etc).

The disease is differentiated with infectious diseases, subdiaphragm abscess, acute cholecystitis, pancreatitis, cholangitis, pleurisy, etc.

Treatment of patients with apostematous pyelonephritis consists in urgent surgical intervention: decapsulation of the kidney, nephrostomy. Antibacterial and detoxication therapy and correction of general disturbances are given in the postoperative period. After subsidence of acute inflammatory signs the patients are treated by the scheme recommended for other forms of acute pyelonephritis. The kidney drainage is kept till restoration of urine outflow by the urinary tract. In total affection of one kidney and satisfactory function of the other one, marked intoxication and serious general state of patients over 50, nephrectomy is indicated.

Kidney carbuncle

Kidney carbuncle is a pyo-necrotic affection with formation of localized infiltrate in the cortical substance of the kidney (Fig. 21 *b*, see colour suppl. sheet). The disease is not infrequently manifests itself secondary with the presence of some purulent foci (hematogenically or urinogenically) in an organism.

The mechanisms of kidney carbuncle formation are as follows: a) penetration of the septic embolus into the renal artery; it causes septic infarction of the kidney and carbuncle; b) incomplete obstruction of the branch of the renal artery by the embolus with further development of infection in it; c) spreading of infection from the site of its penetration onto the renal tissue resulting in necrosis. The zone surrounding the affected area becomes inflamed with the formation of granulation-protective bank. The infiltrate involves the calyces and renal pelvis. Reactive oedema develops in the perirenal cellular tissue resulting in purulent inflammation. Macroscopically cyanotic swelling is seen on the renal surface in the area of carbuncle localization. In section the carbuncle has a wedge-like form and is composed of numerous fine fusing abscesses surrounded by inflammatory infiltrate and necrotic areas. Carbuncles can be of different size — from several millimetres in diameter to the size of a hen egg. The carbuncle is localized twice as frequently in the right kidney, mainly in the upper segment.

The inflammatory process develops in one kidney in 95% of cases. The most frequent causative agent of the kidney carbuncle is Aur. or White staphylococcus, E.coli, protea. In 30–40% of patients the kidney carbuncle is combined with apostematous pyelonephritis. Sometimes the carbuncles perforate into the renal pelvis resulting in growth of the granulation tissue at the site of the carbuncle and formation of cicatrix.

Clinical picture of the kidney carbuncle is similar to other forms of acute pyelonephritis. When the carbuncle is localized in the upper kidney segment infection may spread via lymphatic vessels onto the pleura. Irritation of the posterior layer of the peritoneal wall is accompanied by such manifestations as appendicitis, diverticulitis, salpingitis, pancreatitis, and cholecystitis (of acute abdomen type). In primary carbuncle urine is sterile at the early stage of the process, there is high leucocytosis. Moderate pyuria develops later. When the carbuncle has a course of pathology of the circulatory organ type the symptoms of the heart and vessel affection

prevail. In general there is a tendency to tachycardia and arterial hypotension, there may be elevated arterial pressure and bradycardia. There are marked symptoms of acute myocardial dystrophy and right arterial insufficiency. One may observe focal disturbances of the myocardium blood supply, intracardial conduction; there may be peripheral oedema of the circulatory type. Such course is observed in elderly people. Usually they are hospitalized in the therapeutic cardiological department with complaints of substernal pain, dyspnoe, high arterial pressure, and symptoms of pneumonia or in the neurological department due to acute cerebral circulation disorder. Not infrequently the final diagnosis is made post mortem.

The acute pain in the abdomen is marked in the abdominal manifestations. Such patients are often admitted to the general surgery department. Some patients may have frequent painful defecation with admixtures of blood and mucus in the faeces, nausea and vomiting. Such patients are admitted to the infectious department on suspicion of acute dysentery. The manifestations of mobile excitement, tonic and clonic convulsions, symptoms of dysfunction of the spinal cord dominate in patients with renal-psychomotor symptoms. Only profound analysis of the neurological symptoms can help to establish their secondary (intoxication) character. The thromboembolic impairments are caused by thromboembolism that may be the first manifestation of the disease.

Diagnosis of the kidney carbuncle is difficult. The diagnosis is made on suspicion that arises in case of the acute septic process. The diagnosis is easier when the carbuncle is combined with calyx-pelvic renal system and a great number of leucocytes appears in urine. It is very difficult to make a diagnosis in case when the carbuncle is localized in the cortical substance of the kidney and patency of the upper urinary tract is not disturbed.

Special attention is paid to X-ray examination: decreased respiratory excursion of the diaphragm, effusion into the diaphragmatic sinus. The examination urography may show enlargement of one of the kidney segments, disappearance of the transverse muscle on the affection side, shadows of urinal concrements. The excretory urograms reveal deformation and narrowing of the renal pelvis. Sometimes the carbuncle looks like a tumour on the X-ray films. Selective arteriograms in the arterial phase show reduced amount of the interlobular arteries. The arterial trunks in the area

of the suppurative focus lose lateral bifurcation; they are narrowed and extended. Defect of the renal parenchyma due to drop of the blood flow is determined by angiography in the nephrophase corresponding to localization of the purulent focus. The radionuclide scanning of the kidneys is an informative method of the kidney carbuncle diagnosis. Radionuclides are accumulated in the carbuncle area on scan. Ultrasound method of examination is of great diagnostic value. On echograms carbuncles look like clear areas of increased acoustic density located in the kidney parenchyma.

Treatment of the carbuncle is surgical. Urgent operation is indicated: lumbotomy or decapsulation. The character of surgery depends on changes revealed during the kidney examination, general state of the patient and function of the opposite kidney. The carbuncle membrane is incised over the cavity and then it is excised in a cone-shaped manner. In a considerable destruction of the kidney its pole is removed or nephrectomy is performed. Antibacterial and disinfecting therapy is given simultaneously with surgery.

Kidney abscess

It is one of the rare forms of acute purulent pyelonephritis. Kidney abscess arises due to purulent fusion of its parenchyma in the focus of the inflammatory infiltration or fusion of a group of small abscesses in apostematous pyelonephritis. A bank of the granulation tissue develops around the focus of suppuration that isolates it from the healthy tissue. Not infrequently the process involves the surrounding cellular tissue (paranephritis).

Kidney abscess often complicates the course of urolithiasis, forms additional difficulties during surgery. There may be hematogenic infection of the kidney (metastatic abscess as a result of pneumonia, etc.). The symptoms characteristic of acute pyelonephritis prevail in the clinical picture of the abscess. The most important data may be achieved during X-ray and radionuclide examination.

A plan film shows smoothing of the transverse muscle contours, swelling of the external kidney contour in the area of the abscess localization. Filling defect can be seen on scintigrams in this area.

Computer tomography is very informative, it is made on the background of excretory urography: the abscess looks like areas of decreased accumulation of the roentgen-contrasting substance

in the kidney parenchyma. The echograms reveal a cavity with some liquid (pus) in the abscess area.

Treatment is surgical: kidney decapsulation, wide incision of the abscess.

The abscess cavity is treated with antiseptic solution; it and its extrafocal area are drained. When the urine passage is disturbed, the operation is completed with nephrostomy. The intensive antibacterial and disinfecting therapy is continued in the postoperative period.

Prognosis is unfavourable in conservative treatment: 75% of cases have a lethal outcome. The patients recover in timely surgery.

Emphysematous pyelonephritis

It is an acute infectious inflammatory process caused by penetration of microorganisms into the kidney that bring about necrotic inflammation and they are aerogenic (E.coli, protea and bacteria of pseudoimonas species). They decompose glucose into gas and acid. Gas-formation is most frequently (80%) observed in patients with diabetes mellitus, predominantly in elderly women with high contents of glucose in blood and tissues and of low contents in urine. Obstruction of the ureters is of importance.

The *clinical picture* of emphysematous pyelonephritis is severe in most cases: dysfunction of the kidney, marked intoxication, and symptoms of acute pyelonephritis. Urine has a sharply acidic reaction. Sometimes there is pneumaturia.

Diagnosis is based on X-ray data and bacteriological studies. Sometimes the examination urogram shows spinal curvature to the side of the affected kidney and there is no transverse muscle shadow on this side. Computer tomography is made to be sure that gas is not in the intestines.

Treatment. There is no unified point of view on therapy of emphysematous pyelonephritis. Most authors consider that conservative therapy should be short-term in this disease and nephrectomy should be performed in case of its inefficacy. Kidney drainage is recommended only in very weakened patients in a considerable surgery risk. Nephrectomy may be a method of choice in combination of emphysematous pyelonephritis with kidney infarction and necrosis. A surgical intervention should be considered very thoroughly, as there may be affection of the opposite kidney. Bilateral nephrectomy is indicated in bilateral emphysematous pyelone-

phritis with patient's transference to programmed hemodialysis.

Lately a lot of authors have recommended early surgical treatment namely lumbotomy with incision and excision of the perirenal cellular tissue, decapsulation with resection of the necrotic foci of the kidney, nephrostomy. Wide drainage of the retrofocal area is required. When the patient's state becomes worse, nephrectomy is recommended.

In conservative treatment the mortality rate constitutes 50% in patients with diabetes mellitus and in 40% in those who does not have it. Nephrectomy allows to save life of 70–80% of patients.

Necrosis of the renal papilla or necrotic papillitis

It is observed in over 3% of patients suffering from pyelonephritis. It occurs twice as frequent in women as in men.

The necrotic process is most frequently localized in the papilla area of the renal pyramid; sometimes it involves the whole pyramid, very rarely the medullary substance of the kidney is involved. It looks like small infarction caused by disturbed circulation in the area of the renal papilla. Necrotization of the renal papillae is promoted by diabetes mellitus but the disease may also occur due to long vascular spasm, thrombosis, atherosclerosis, kidney trauma, shock, anemia, urine infection, organism allergization, abuse of analgesics, nephrolithiasis.

There is primary and secondary (as to pyelonephritis) necrosis of the renal papillae and also three forms of the disease:

1. Infectious (with obligatory preliminary development of pyelonephritis).

2. Angiopathic (due to disturbance of circulation in the medullary substance of the kidney on the background of atherosclerotic changes of the vessels, thrombosis, embolism).

3. Vasocompressive or ischemic (due to interstitial edema and sclerosis that cause vasoconstriction which nourish renal papillae).

There is definite influence of reno-pelvic refluxes associated with pelvic hypertension and calyculopelvic diskinesia, difficult urine outflow (obstruction) and obturation of the urinary tract lumen. It may cause accumulation of urine in the calyculopelvic system, stretching, squeezing of the renal parenchyma. It results in ischemia and favourable conditions for development of infection.

According to localization of the destructive changes papillary necrosis may be fornicated, papillary or total, that is involving a

great area of the medullar substance of the kidney. Bilateral papillary necrosis is observed in 25% of patients.

Clinical picture. Acute necrosis of the renal papillae is manifested by the same symptoms as acute pyelonephritis or a chronic one in the active phase. One of the most frequent signs of renal papillary necrosis is total macroscopic hematuria caused by exfoliation of the necrotized papilla or its lobes. In some cases the affected tissue as a result of purulent inflammation gets necrotized, in others the papilla or its part tears off and moves forward along the urinary tract. It brings about pain of different intensity and symptoms of obstructive pyelonephritis.

Diagnosis. Detection of necrotized tissues of the medullary substance in the kidney is a characteristic symptom. Urine salts are accumulated on the necrotized papilla in slow exfoliation that results in formation of a calculus. It infrequently has a form of a triangular and roentgen-negative nucleus. Such changes can be seen during examination and excretory urography.

Treatment of the patients is directed at elimination of the causes of renal changes, struggle with urine infection, renal insufficiency, hematuria, intoxication, etc. In case of disturbed patency of the upper urinary tract it is indicated to make catheterization of the ureter and renal pelvis. If ureter occlusion can't be eliminated by this procedure, nephrostomy is necessary: removal of the necrotic masses, restoration of the urine passage and resection of the kidney in profuse hematuria. Nephrectomy is important only in total necrosis of the medullary substance and in acute pyelonephritis when the renal function of the opposite kidney is satisfactory.

Chronic pyelonephritis

As a rule, the disease develops as a result of transference of the acute process into a chronic one but there may be primary chronic process. All structures of the kidney are affected: interstitial tissue, tubules of the kidney, vessels and glomeruli. One of the causes of the acute process transference into a chronic one is premature cessation of treatment that results in transference of the causative agent into a L-form.

In case of recurrences of unknown aetiology urine inoculation of medium should be made. One of the causes of the acute process transference into a chronic one may be concomitant disease (diabetes mellitus, gastritis, colitis, tonsillitis, sinusitis, pancreatitis, etc.,

disturbed lymph outflow, especially urine passage). An important role is played by hemodynamic disorders in the kidney, hormonal disturbances, accompanying nephrolithiasis.

There is uni- and bilateral, primary and secondary chronic pyelonephritis. According to the course of chronic pyelonephritis there are such variants as: a) latent that is not manifested by definite symptoms; b) recurrent when the exacerbation periods are alternating with latent ones; c) anemic (with predominance of anemia); d) hypertensive (with predominance of the syndrome of arterial hypertension); e) azotemic (with signs of chronic renal insufficiency (CRI)). All these variants may be observed in one and the same patient.

The stages of pathomorphological course of chronic pyelonephritis are as follows:

I stage — the glomeruli of the renal bodies are saved, interstitial tissue is moderately but diffusely infiltrated;

II stage — some part of the glomeruli is hyalinizated, the nephron glomeruli are partially atrophied, infiltrates are clearly bordered, cicatricial-sclerotic process has started;

III stage — a lot of glomeruli are lost, the nephron glomeruli are filled with colloid mass;

IV stage — the cortical substance becomes thinner and is substituted for cicatricial connective tissue (cicatrical kidney); the kidney is reduced, its surface is fine-grained, the tissue is solid, here and there it is substituted for the connective tissue. These pathomorphological changes can be observed in one kidney at the same time.

Clinical picture. The clinical picture of chronic pyelonephritis is various: in some patients pyelonephritis may be latent for a long time, manifested only by moderate pain, leucocyturia, in others it is interrupted by acute attacks that cause involvement of new parenchyma areas into the inflammatory process and results in shrinking of the kidney. Sometimes pyelonephritis is detected during autopsy.

The patients complain of fast fatigue, general weakness, malaise, sometimes groundless temperature elevation, pain in the lumbar region, headache, thirst, dryness in the mouth, etc. On examination the patient is pale, blood analysis will show anemia (in absence of CRI signs) which is difficult to correct. Arterial hypertension is a frequent sign; sometimes it has a tendency to a malignant course. There is inclination to poly- and nicturia.

The most frequent manifestation of pyelonephritis is leucocyturia in different stages. There is also moderate untrue proteinuria. There may be erythrocyturia. Bacteriuria is also a manifestation of pyelonephritis. When pyelonephritis develops on the background of obstruction of the upper and lower urinary tract, malformations, concrements or other urological pathological symptoms of this disease predominate in the clinical course. In about 70% of patients recurrence of nephrolithiasis is associated with chronic pyelonephritis that continues after surgery. Diseases of the prostate gland (hyperplasia, cancer, prostatitis) cause secondary pyelonephritis in 50% of males.

Diagnosis of chronic pyelonephritis is insufficient that may be explained by several reasons:

1. Absence of sufficient attention of physicians of the polyclinics and sometimes of in-patient departments who content themselves with general analysis of urine paying no attention to anemia and high ESR. The Nechiporenko test is not always made as well as challenge test and TTC (3-phenyl tetrazole chloride) test. Patients with suspicion on pyelonephritis are untimely directed to the urologist.

2. Insufficient attention to a patient's examination in dynamics. During general registration all the patients with urine pathology should be registered.

3. An attempt to make a diagnosis of chronic pyelonephritis on the basis of solitary symptoms. The diagnosis should be substantiated; the data obtained should be correctly interpreted using diagnostic methods from the simplest to complex ones if necessary.

Systemic study of urine allows to reveal insignificant proteinuria, Nechiporenko and Ambourget tests — leucocyturia. It is important to detect leucocytic casts in urine which is a pathognomic symptom of pyelonephritis. Steinheimer—Malbin cells and active leucocytes formed in low osmotic urine pressure (100–200 mmol/l) are revealed quite often. Pyrogenal and prednisolone are used as a challenge. The low level of leucocyturia in patients with latent pyelonephritis increases by 50–100% after injection of these drugs. Izokerit applications to the lumbar region are also used. There are early characteristic changes of relative density of urine as a disposition to hypostenuria which deepens during shrinking of the kidney due to pyelonephritis.

Microbiological study of urine is used not only for diagnosis of the inflammatory process in the kidneys and urinary tract but also

for determination of ways of infection penetration, detection of reinfection and relapse, administration of therapy and prediction of the disease consequences. We may establish the degree of inflammation activity on the basis of the microbe number of urine.

It is necessary to take into account the qualitative composition of urine microflora which gives the first view of bacteriuria character. It is determined by screening test. The method is simple and may be used in any bacteriological laboratory. It allows to obtain data about urine microflora composition in 18–24 h. Any bacterium may be the causative agent of chronic pyelonephritis but lately there has been a clear tendency of reduced number of cultured E.coli and staphylococci. Protea and bacillus pynocyaneus are most frequently isolated. There are such gradations of the microbe number of the urine in patients with inflammatory process of the urinary organs: up to 20,000 — low; from 20,000 to 100,000 — high; over 100,000 — true.

Three-fold microbiological urine analysis — the method of triple culture — is used to reveal true causative agent of the infectious process. Of value is the method of collecting urine for microbiological study. The most precise data are obtained by suprapubic puncture of the bladder.

It is quite difficult to detect the causative agent of infection in case of association of microorganisms, especially when the microbic number changes in repeated studies. In this case the homologic test is of value when the blood serum is studied with microorganisms isolated from the same patient's urine. The antibody titres are determined by repeated (in a week) agglutination reaction with various autostrains. Microbiological study of the urine, renal tissues as well as removed concrements allows to identify true causative agent of pyelonephritis with a high probability (even if urine is sterile). In 71.5% of patients with chronic pyelonephritis pathogenic microflora was cultured from the renal tissue and cellular tissue in the area of the hilus renalis. Bacteria from urine were cultured in 64.4% of cases (O.V. Lulko).

Normochromic anemia was found in almost half of the patients even in preservation of renal functions. There were significantly changed indices of peripheral red blood (increased number of reticulocytes, microspherocytosis, decreased osmotic resistance of erythrocytes, enhanced intensity of daily erythropoiesis and hemolysis, reduction of average erythrocyte life).

The change of enzyme activity (transaminase, leucinamine peptidase, lactate hydrogenase, basic phosphatase) is the index of activity of the inflammatory process in the kidney. Hypernatriuria is a characteristic sign of chronic pyelonephritis. Determination of the state of the coagulation system and blood fibrinolysis, thromboplastin, anticoagulant and fibrinolytic activity of urine in patients with chronic pyelonephritis allow to work out specific plan of treatment with anticoagulants and fibrinolytic drugs depending on the phase of the inflammatory process and stage of renal insufficiency. Chronic pyelonephritis in the phase of active inflammation occurs on the background of increased blood coagulation (hypercoagulation) in over 50% of patients. Besides, 70% of patients with chronic pyelonephritis have inhibited fibrinolytic activity of blood and urine depending on the process activity.

On instrumental examination (cystoscopy) pathological changes are not infrequently found in the bladder (cystitis, papillomae, etc). Excretory urography helps to assess the anatomical state and function of the urinary tract and detect signs of affection of the kidneys and calyculo-pelvic system. Some morphological changes of the kidney and calyculo-pelvic system are found in patients with chronic pyelonephritis with the help of excretory urography: diminished size of the kidney, clavate deformation of the calyces, narrowing and convergence (divergence) of the necks of the renal calyces (Hodson's symptom), reduced tonicity of the renal pelvis, etc. as well as determination of renal-cortical index (comparison of the calyculo-pelvic area with that of the whole kidney). Increased calyculo-pelvic index over 40% is evidence of chronic pyelonephritis. Radiological methods of diagnosis (radiorenography) can reveal minimal changes of the renal function, especially of the urinary tract.

Scanning allows to establish dysfunction and morphology of the kidney in patients with chronic pyelonephritis that cannot be detected by means of excretory urography. Activity of immunogenesis is assessed by determination of blasttransformation reaction of lymphocytes (BTRL), phagocytic activity of neutrophils, phagocytic number and completion of phagocytosis of sensitized lymphocytes.

To diagnose arterial hypertension there may be used angiotension infusion test, determination of plasma renin activity, investigation of some indices of the renal function.

It is also expedient to make pharmacorenographic tests with complamin or β-adrenoceptor antagonists for examination of the patients with arterial hypertension developed on the background of chronic pyelonephritis.

Important data are given by renal angiography. Three stages of vascular changes are distinguished in the kidney. In I stage there are reduced quantity of fine branches of the arteries up to their disappearance. Large segmental branches of the renal artery are short, narrowed to periphery, have no branches and their angiogram image resembles a burnt tree. In II stage there are diffused narrowings of the renal arteries with diminution of their size. In III stage the kidney is small, its vessels are sharply narrowed, deformed, their number is reduced.

The kidney size and its deformation are revealed by means of ultrasound scanning.

Treatment of secondary chronic pyelonephritis is elimination of the causes of disturbed passage of urine and circulation in the kidney. Drug therapy precedes surgery and continues in the postoperative period. In case of exacerbation of the inflammatory process catheterization of the ureters with the help of stent is used as a temporary method. The schemes of treatment of patients with primary and secondary chronic pyelonephritis are identical in other cases.

Drug therapy should be complex and individual. Individualization of treatment consists in elimination of the causes promoting development and progressing of the inflammatory process. Complex therapy in chronic pyelonephritis should be: aetiological (antibacterial drugs taking into account sensitivity of the causative agent of the process); pathogenic (elimination of inflammation); directed at increased functional abilities of the kidney and urinary tract and their resistance to the inflammatory process (normalization of urodynamics, improvement of blood circulation, microcirculation and metabolic processes in the kidney) as well as host defences (diet and balneotherapy).

Several groups of antibacterial drugs are utilized: antibiotics, sulfanilamides, derivatives of nitrofuran and naphthiridin (nalidixic acid), oxichinoline (nitoxolin), phenols (phenilsalicilate), etc. While administering drugs one should take into consideration synergism and antagonism. Sulfanilamides are administered together with vitamins of B group. But these drugs and derivatives of ni-

trofuran are antagonists. To enhance treatment efficacy it is recommended to administer paired drugs, for example, furadonin with erythromycin, nalidixic acid with levomycetin, trimethoprim with sulfanilamide (biseptol), etc.

Terms and schemes of treatment depend on the character of the inflammatory process. Nephrotoxic drugs (aminoglycosides, etc.) should be used by strict indications.

The first courses of treatment are administered taking into account urine cultures and antibioticograms. Later on when urine cultures do not grow, the condition becomes difficult. During treatment microorganism species and their biological properties may change and transform into L-forms. In such cases empiric treatment is necessary: continuation of therapy which was found effective, changing of drugs in case of development of leucocyturia, application of drugs of wide spectrum.

Long-term antibacterial treatment is effective. At first it is uninterrupted, then (in 6–8 weeks) interrupted (10 days interval monthly for 8–10 months). Antibacterial drugs should be combined with anti-inflammatory drugs (voltaren, herb tinctures). It is necessary to use anticoagulants and fibrinolytic remedies, disaggregants and vitamins. To improve blood circulation and activate metabolic processes in the kidney we may successfully use pentoxiphilin, immunostimulants — levomizol, methyluracil, gamma-globulin, thymogen, T-activin, vaccine therapy. The concentration of antibacterial drugs in the renal tissue can be elevated by means of diuretics (lasix). Sanatorium-spa treatment (Truskavets) is also of importance. On achieving the phase of remission it is recommended to follow up the patient once a 3 month for the first two years and then twice a year for the following three years. In CRI and nephrogenic arterial hypertension the terms of follow up are determined individually. Stable remission is achieved in 62% of cases (Yu. A. Pitel).

Xanthogranulematous pyelonephritis

It differs from other forms of the renal inflammation by characteristic granulematosis, development of macrophages that contain lipids and xanthomic cells. In 60% of patients this disease is combined with nephrolithiasis, in 18% — with diabetes mellitus. In xanthogranulematous pyelonephritis the kidney is revealed to have

tumour-like formations of 0.1–20 cm in diameter. There may be several of them. The kidney is enlarged; sometimes its mass is 1.5 kg. The section of the kidney parenchyma shows marked solid whitish tissue with characteristic inclusions that have intensive yellow (saffron) colour. The same tissues are revealed in the perinephral cellular tissue. Because of these signs xanthogranulematous pyelonephritis is not infrequently diagnosed as a malignant tumour and radical operation — nephrouretectomy is performed by mistake. In case of diffusion and filling of the calyxes with thick pus the diagnosis of kidney tuberculosis is made by mistake macroscopically.

The clinical picture of the disease does not differ much from usual pyelonephritis and urolithiasis. Cytological study of the urine gives valuable information that allows to reveal specific foamy xanthome cells whose cytoplasma is completely vacuolozed and the nucleus is located eccentrically. The echogram and computer tomography look like kidney tumour or tuberculosis.

Treatment. The only effective method of treatment is surgery: enucleation of the nodes of xanthome granulomas within the healthy tissues. Nephrectomy is required in case of complete destruction of the kidney.

Pyelonephritis in children

In 80–85% of patients pyelonephritis is a secondary process and it occurs as a result of mechanical or dynamic obstruction of the urinary tract. Natural factors, inherited immunodeficiency and enzymic pathologies cause development of pyelonephritis.

Children with anomalies of the urinary tract, especially of kidneys fall ill with pyelonephritis 8–10 times more frequent than healthy ones. Infravesical obstruction plays an important role in boys of early age while in girls pyelonephritis is caused by vesicoureteropelvic reflux in 22–76% of cases.

It's peculiar for a child's organism to have increased reactivity, acute development of the inflammatory process. It is also associated with fast generalization of the bacterial invasion. It is characterized by increase of acute dysfunctions of the liver, circulation organs, adrenal glands, digestive organs, water-electrolytic, protein and other kinds of metabolism.

The clinical manifestations of pyelonephritis consist of 5 syndromes:

1. The syndrome of general intoxication (high temperature, the patient feels bad with increased fatigue, flaccidity, no appetite, headache, faint, increased sweating, red demorphism, etc.).

2. The gastrointestinal syndrome (intestinal toxicosis, exicosis, vomiting, intermittent pain in the abdomen, diarrhea, sometimes constipation).

3. The urological pain syndrome (spontaneous pain in the lumbar and suprapubic areas, along the ureters, tenderness of the areas on palpation and percussion).

4. The dysuric syndrome — frequent and profuse urination (nicturia, enuresis, etc.).

5. The urinary syndrome — change of urine colour, its transparence, appearance of sediment, admixtures, etc.).

Diagnosis is based on laboratory data, X-ray and ultrasound examinations. Conservative therapy is effective only in complex with surgical treatment that provides urine outflow.

Pyelonephritis in elderly people

The disease is associated with decreased immunity and reactivity of the organism, atherosclerosis, cardiosclerosis, concomitant diseases and allergy to different preparations. In 90–92% of cases secondary acute pyelonephritis is observed but in most cases the course is latent and subacute. Especially severe course of pyelonephritis arises due to complications of surgical treatment of the prostatic hyperplasia. Therapy policy in this case should be more active and radical than in patients of middle age.

Pyonephrosis

It is a terminal stage of specific or nonspecific purulent destructive pyelonephritis (see fig. 20). The kidney looks like a big thin-walled cavity. Two factors are necessary for development of pyonephrosis: disturbed urine outflow out of the kidney and penetration of pathogenic microflora in it. Pyonephrosis may be primary (as a result of purulent pyonephritis) and secondary (due to infected hydronephrosis). When the passage between the renal cavity and bladder is preserved we call it open pyelonephrosis but when there is no outflow of urine it is complete pyonephrosis. Pyelonephrosis is always accompanied by marked sclerotic peri- and paranephritis, which results in thick solid formation around the kidney adhesive to adjacent tissues and organs.

Clinical picture. The clinical picture of pyonephrosis is dull pain on the side of affection, loss of weight, enlargement of the kidney, its tenderness on palpation, pyuria, subfebrile temperature. Elevation of the temperature, intoxication, increased pains and disappearance of pyuria are symptoms of the ureter obstruction. The shadow of the enlarged kidney is revealed on X-ray examination; there may be shadows of concrements and absence of renal function. These data are confirmed by US examination and tomography. Cystoscopy helps to detect release of thick pus from the ureter. Retrograde pyelography gives clear data of the state of the kidney cavity.

Treatment of patients with pyonephrosis is only surgical. Nephrectomy is used which is often performed subcapsularly (after S. P. Fedorov). When there are signs of intoxication nephrostomy is made and later the destroyed kidney is resected.

CYSTITIS

Cystitis (see fig. 19) is an inflammation of the bladder. Primary cystitis develops in the primary healthy organ and secondary one complicates any disease or anomaly of the urogenital system. By aetiology the following kinds of cystitis are distinguished: infectious, chemical, thermal, toxic, radiation, medication, alimentary, neurogenic, involution and postoperative.

Depending on the course of the disease there may be acute and chronic cystitis, diffuse and focal (cervical, trigonitis). According to the morphology cystitis is divided into catarrhal, hemorrhagic, purulent, ulcerous, necrotic, incrusting and interstitial. At first the inflammation may be aseptic but frequently it transforms into the infectious process due to penetration of infection by hematogenic, ascending or descending way, constant bacterial contamination of the urethra canal and perineum.

Various flora is cultured from the urine: *E.coli*, staphylococcus, microbial associations. In case of ulcerous cystitis mycoplasma is cultured in 100% of patients.

Acute cystitis

It occurs suddenly, in several hours after cooling or action of the other triggering factor. The main symptoms are frequent and painful urination, pain in the bladder area and pyuria. Frequently

cystitis begins with terminal hematuria. Vesical tenesmus are of imperative character.

The manifestations of acute cystisis are over in 5–8 days in timely rational therapy. In long-term duration of the disease the patients should require thorough X-ray and instrumental examination. The physician can surmise the presence of chronic, i.e. secondary cystitis. Women fall ill with cystitis, especially recurrent one much more often than men. During acute cystitis the temperature is usually normal or subfebrile. Chill, temperature elevation, and pain in the lumbar region are symptoms of the ascending infection of the kidneys (ascending pyelonephritis).

Chronic cystitis

In most cases it is a complication of the bladder or urethra infection: tumours, vesical concrement, hyperplasia or prostate cancer, urethral stricture, etc. Frequently cystitis is observed in persons with colpoptosis, metrocele, inflammatory process in the uterus and ovaries as well as in patients with diabetes mellitus, chronic colitis, gastritis, and different affections of the spinal cord.

Cystoscopy is an informative method of cystitis diagnosis. This method allows to detect inflammation of the bladder and determine its morphological picture. The patients with acute cystitis are contraindicated instrumental examination. Cystoscopy is expedient when the disease lasts over 2–3 weeks.

Treatment of the patients with acute cystitis starts with sparing regimen. It is recommended to avoid spicy food, alcohol; they are administered thermal procedures, herbal tinctures that promote bactericidal, bacteriostatic, anti-inflammatory and diuretic effect. Painkillers and spasmolytic drugs are indicated (preparations of belladonna, analgin, papaverin, no-spa) as well as derivatives of nitrofuran, nalidixic acid, bactrim.

While treating patients with chronic cystitis the use of drugs is not decisive. They are effective only after elimination of the cause of reinfection and restoration of urodynamics. To improve regeneration of the vesical walls the complex of treatment should include pyramidine bases, methyluracil, physiological procedures (UHF, SHI, phonophoresis). There are widely used instillations into the bladder of silver nitrate solution (1:20,000–1:5,000) for 10–15 days, hips oil, sea-buckthorn oil, diocide, etc. Presacral and suprapubic novocain blockades are effective.

URETHRITIS

It is inflammation of the urethra. Depending on etiological factors there are specific (gonorrheal, mycotic, candidal and tuberculous) and nonspecific bacterial urethritis.

Primary nonspecific bacteriological urethritis may occur due to sexual infection. In secondary nonspecific bacteriological urethritis the organs located nearby are affected first (the prostate gland, testes, etc.). As to the extent of distribution urethritis may be anterior (involving the anterior part of the urethra up to the external sphincter) and posterior (affecting the posterior part of the urethra involving the prostate, ovaries, seminal vesicles).

Urethritis may be acute and chronic according to the course character. The latter is always a result of insufficient treatment of the acute process.

The symptoms of acute gonorrheal urethritis are purulent discharge out of the external urethra foramen (initial pyuria in three-glass test), burning during urination. The tissues around the external urethra foramen are hyperemic and edematous. In chronic urethritis the discharge is mucous, posterior urethritis is often observed (initial and terminal pyuria, presence of urethral threads in urine in three-glass test). Thanks to microscopic study of the urethral discharge aetiological factors of urethritis can be determined — gonococci and the accompanying flora. Urethritis is treated with antibiotics and uroantiseptics depending on the character of the revealed flora. For example, to treat gonorrhea half-synthetic penicillin, bicilin, erythromycin, etc are applied.

Mycotic urethritis

It arises in 3–12 days after *Trichomonas vaginalis* get into the urethra from the vagina. It happens most frequently during the occasional sexual contacts. The discharge from the urethra is foamy, whitish, there is burning and some itching. In 15–20% it is combined with mycotic prostatitis. The diagnosis is made by means of microbiological methods. Treatment includes the use of metronidasol, naxogin, tiberal, etc.

Lately the rate of chlamydial urethritis has increased. To treat this viral infection other drugs are necessary — tarivid, vilprafen, doxacyclin.

The Reiter's syndrome is a special manifestation of urethritis, which is characterized by triad of inflammatory affections: urethra, conjunctiva and joints. The disease is caused by the virus of urethroconjunctivitis. Treatment consists of applying antibiotics together with corticosteroids (prednisolone, dexametasone).

Lecture 3

NONSPECIFIC PYO-INFLAMMATORY DISEASES OF MALE GENITAL SYSTEM

PROSTATITIS

This inflammatory disease of the prostate is one of the most prevailing diseases of man's genitalia (see fig. 19). It is considered that men in the age capable of work and reproduction — 20–45 years — suffer from prostatitis more often. For the past 1.5–2 decades the incidence of prostatitis has increased significantly. Thereby age limits have considerably extended: within 17–55 years.

Etiology. The inflammatory process in the prostate arises as a result of infection as well as a result of development of pathological responses. The infectious inflammatory process may be of two types:

1) specific;

2) nonspecific.

Causative agents of a nonspecific inflammation in the prostate are Staphylococci, sometimes Enterococci, Proteus, Escherichia coli (colon bacillus) and very rarely — Bacillus pyocyaneus. The specific inflammatory disease of the prostate is induced by tuberculous mycobacteria, gonococci, trichomonas, chlamydia, mycoplasma and viruses.

Paths of penetration for specific and nonspecific infection are mostly urethral and ascending ones. The tuberculous mycobacteria penetrate in a hematogenous way. The lymphogenous tract for penetration of infection is possible in inflammatory diseases of adjacent pelvic organs.

Factors that are favourable for localization of specific and nonspecific bacterial agents in the prostate are as follows:

— infectious inflammatory process in the urethra (specific and nonspecific);

— venous stasis;
— valves and urethra strictures;
— phlebitis of hemorrhoidal veins;
— hypertrophy of the seminal vesicle, etc.

Pathogenesis. Acute infectious inflammatory process in the prostate induces bacteriemia, toxemia, fermentemia, as well as accumulation of inflammation mediators in the blood. These factors promote increasing of coagulating and fibrinolytic blood systems, to failure in microcirculation in the focus of inflammation and in the peripheral vascular channel, as well as to endocrine disorders and immunological shifts. The immunological shifts in acute prostatitis are characterized not only by decrease of activity of the specific and nonspecific protective factors, but they result in development of immunopathological responses which promote prostatitis to become a chronic one. In progressing of immunopathological responses the important role is played by incomplete phagocytosis of the bacterial agents, microbial antigen in the focus of inflammation up to 6 and more months, formation of pathological immune complexes with the changed tissue structures of the prostate and medicinal preparations.

In case of chronic bacterial and abacterial prostatites there occurs a failure in mechanisms responsible for metabolism of testosteron which contributes to development of endogenic insufficiency. In progressing of the endogenic insufficiency the important role is played by vegetoneurotic disorders in organs of the small pelvis and reduction in activity of the releasing factors produced by the prostate.

Pathological anatomy of acute prostatitis. The inflammatory process in the prostate passes through three stages of progressing: alteration, exudation, granulation and cicatrization. The following clinical-morphological stages are distinguished:

1. superficial,
2. focal,
3. diffuse (parenchymatous).

While progressing, the inflammatory process (Fig. 23) may be diffused to the capsule and beyond its limits (periprostatitis and paraprostatitis). There may be pyesis and abscess formation in the prostate. In this case a purulent-abscess-forming prostatitis develops.

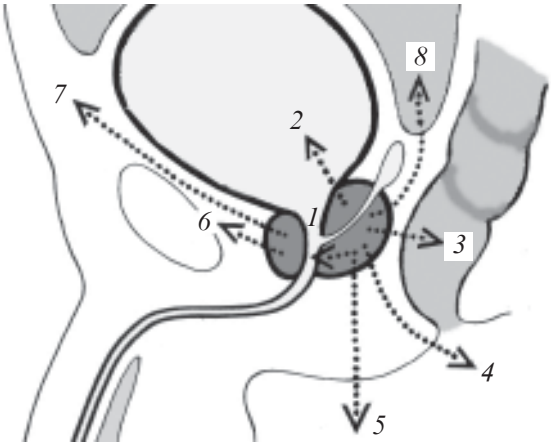


Fig. 23. Spreading of the infectious process in case of complications of acute prostatitis: *1* — urethra; *2* — urinary bladder; *3* — rectum; *4* — pararectal space; *5* — perineum; *6–7* — retrosymphysial space; *8* — Douglas cul-de-sac

With infection by tuberculous mycobacteria one can notice a characteristic pathomorphologic pattern: typical grey tubercles, extension of necrosis or formation of cavernous cavities.

The atypical forms of prostatitis are as follows:

— nonspecific prostatitis;
— sclerosis of the prostate;
— granulomatous prostatitis;
— calculous prostatitis.

Classification. According to etiology, there are infectious and noninfectious types of prostatitis. The infectious prostatites may be specific and nonspecific.

The nonspecific infectious prostatites may be:

— bacterial;
— viral;
— induced by mycoplasmae;
— candidomycotic;
— mixed.

The specific prostatites may be:

— gonorrheal;
— tuberculous;
— mycotic.

According to the clinical development there may be:

— acute prostatitis;
— chronic prostatitis.

Acute prostatitis

The acute prostatitis may be: a) catarrhal; b) follicular; c) parenchymatous; d) prostatic abscess.

The clinical symptoms of acute prostatitis in many respects depend on the extent of involution to the inflammatory process of acini of the prostate and progression of inflammation with development of pyo-destructive forms.

In case of an acute catarrhal prostatitis the characteristic features are: a more frequent act of urination, urodynia (especially in the end of urination) and moderate intoxication.

In case of a follicular prostatitis the dysuric disorders, morbidity and intoxication are more expressed. In case of a parenchymatous prostatitis and prostatic abscess a typical pattern of total severe intoxication is seen which is characteristic for pyo-inflammatory process, where next to the typical signs of local manifectations, the phenomena of total intoxication (headache, nausea, vomiting etc.) are full-blown. Urination is frequent. An acute urine retention may occur, temperature is sometimes raised up to 39–40°C.

The abscess of the prostate progresses according to the type of a septic disease with development of an infectiously toxic shock.

Diagnosis. The characteristic clinical manifestations in acute prostatitis allow the physician to make a correct diagnosis. In making the diagnosis, the digital rectal examination is of great importance. In the secretion of the prostate one can see a great number of leucocytes and reduction of lecithin granule concentration. The digital rectal examination should be carried out carefully. Increase of the amount of leucocytes and erythrocytes is seen in the first and third portions of the three-glass urine test. In the X-ray film one can find concrements of the prostate as a reason of acute prostatitis development and infectious inflammatory process in the prostate.

Treatment. Patients with acute prostatitis should be hospitalized and keep bed rest. Treatment of catarrhal, follicular and parenchymatous prostatites should be medicamental, etiotropic and nosotropic.

For patients with an infectious prostatitis the etiotropic treatment is in administration of antibacterial drugs depending on the pathogenic bacterial microflora or other inducers. Combinations of tetracyclines are considered very effective in treatment of viral and chlamydial prostatites. In case of acute prostatitis, such drugs

as 5-NOX (Nitroxolin), biseptol, gentamycin are used for treatment. Together with antibacterial drugs, the anticoagulants, heparin, inhibitors of proteolysis and fibrinolysis (contrical, E-aminocapronic acid, etc.), modulators and stimulators of immunological responses (vitamin A, decaris) are used.

Abscess of the prostate can independently be opened into the urine outflow channel or into the rectum. After opening and the draining it is necessary to carry out a complete medicamental and etiotropic treatment.

Chronic prostatitis

The chronic bacterial prostatitis may be induced by an acute inflammatory process in the prostate or it may develop as the primary inflammatory process due to venous stasis, sexual dysrhythmias, stressful situations and other factors.

In development of the chronic prostatitis the important role is played by immunopathological responses, and that is evidenced by availability of autoantibodies to the prostate in patients' blood, fixation of antibodies on the surface of the prostate tissue at the polarization fluoroimmunoassay.

Pathological anatomy. The pathological changes during chronic prostatitis depend on the stage and age of the process. In most patients within periods up to 1–2 years the prostate has a normal size or it is enlarged a little, and an induration can be found which is conditioned by atrophy of glands, as well as by their cystic degeneration. Histologically, acini are widened greatly, they have a cyst shape. There are infiltrative changes. In more late periods of the disease (3–5 years) the prostate is diminished in its sizes, has a dense consistency. Under the microscope the total fibrosis and sclerosis of the prostatic part of the urethra are seen. Changes in the neck of the urinary bladder and in the urethra result in development of atony in the upper urinary tracts, inflammatory process in kidneys, ureterohydronephrosis and chronic renal insufficiency.

Symptoms. The chronic prostatitis is characterized by polymorphism of complaints. The clinical picture can be grouped in some symptomatic complexes, which are manifested simultaneously in the same patient. Thus, the only symptomatic complex (a pain syndrome) is estimated as a definite clinical form of the chronic prostatitis. The pain symptoms are characterized by various intensity of pain in the rectum, urethra and in other areas.

To *urinary symptoms* we can refer pollakiuria (frequent urination), dysuria, stranguria, etc. The sexual symptoms depend on involution of the verumontanum, seminal vesicles, epididymes, testicles to the inflammatory process which is manifested in failure of the copulative function. This is a reason of physiological neuroses for men, as well as disorders of the sexual function.

Among the *general symptoms* of the chronic prostatitis it is necessary to emphasize rapid fatigability, reduced capacity for work conditioned by chronic intoxication and hormonal disorders. Sometimes subfebrile temperature of the body occurs. During a long disease course patients may have asthenia, bad sleep, apathy, headache, etc. In the course of the chronic prostatitis there may be active, latent phases and a phase of remission. During objective examination of the scrotum and penis, signs of inflammations of the exterior opening of the urethra, deformation of testicles and sometimes atrophy of the testicle itself can be found. At palpation of the prostate it is morbid and enlarged.

In case of a long disease sclerosis of the prostate may occur.

Diagnosis. Characteristic clinical picture and manual examination in combination with laboratory methods help to diagnose the disease.

One of the basic methods of making a diagnosis is examination of a native preparation of the prostatic secretion in order to determine quantity of leucocytes and lecithin granules. The three-glass test is used to diagnose urethritis.

Nowadays the basic method of prostatic secretion testing is an immunosensitive cytological assay.

For diagnosis of the disease, supplementary methods are also used, such as a test for crystallization of the prostatic secretion, and study of secretion leucocytes. For bacteriological study inoculation is done or the three-glass test of urine after massage of the prostate is carried out.

Among immunological methods determination of G, M, E, A immunoglobulins concentration is used.

Among X-ray methods — urethrography and urethrocystography are used. New tests — ultrasonic, echo-scanning and by radioactive isotopes have appeared lately.

Treatment. In chronic prostatitis treatment a complex therapy is administered — etiotropic and nosotropic.

Antibiotics are administered after studying the prostatic secretion and response of microflora to them.

In nosotropic therapy immunomodulators and immunostimulators are administered, as well as the drugs that improve microcirculation. The complex therapy lasts for 3–6 months.

PROSTATIC ABSCESS

Etiology and pathogenesis. Pathogenic bacteria which are the basic cause to induce prostatitis also induce a hematogenous abscess in the prostate.

Pathogenetically the prostatic abscess is developed in two forms: idiopathic (primary) and secondary as a consequence of the primary prostatitis or a hematogenous abscess of the prostate in the final stage of the acute prostatitis with the same running as in the idiopathic one.

The infection of the prostate is possible as a result of hematosepsis after hydradenitis, purulent osteomyelitis and other serous diseases.

Among the etiological factors of the disease there may be distinguished gram-positive bacteria. The infection of the prostate may occur in a hematogenous way from the foci of infection, from tonsils at a purulent chronic angina. Other probable causes are consequences of reduction of the immunoreactive protection of the body as a result of complications of diseases and venous obstructions. In the past, it might be caused by alcohol addiction and failures in sexual life, diseases of the pelvic organs.

The idiopathic and hematogenous abscess of the prostate in the incipient stage has the symptoms of septimecia, such as fever, tachycardia.

In the medical history there is a purulent inflammatory focus (furunculosis, hydradenitis, pyoderma, tonsillitis, etc.). The focal symptoms are pain in the perineum and difficulty in urination, which occur only after 3–4 days of fever. In the abscess of the prostate on the background of prostatitis in the active phase there will be a stronger pain with mainly unilateral localization. The progressing stage is characterized by an irradiating pain, high temperature without improving the patient's condition. In the both forms of the disease there is stranguria with a consequent urine retention and pain in the perineum.

Clinical picture. Two stages are distinguished:

1. Active form with an expressed pain in the perineum, which irradiates into the coccygeal bone, to the internal surface of the thigh, rectum, with a rise of temperature.

2. With a restricted serous focus in the stage of granulation which retards absorption of toxins, resulting in temperature falling down and decrease of pain. In this stage the patient feels healthy, but actually he is an infection carrier. Thereby, frequently there may be paresis of the intestine and formation of serous cavity in the small pelvis.

Diagnosis. During the objective examination there will be found intoxication symptoms, fever, ischuria, paresis of the intestine. The palpation through the rectum is the most informative.

The objective signs are the following:

1. Asymmetric enlargement and pain in the prostate, which are noted in the beginning of inflammation — a serous process.

2. Ballotement.

3. Notable digital pulsation.

4. Palpable fluctuation that predetermines a suppurative focus. In blood tests there is leucocytosis and left leucocytes shift with the ESR rise. There are changes in urine at the persistent urethra or urinary bladder infection. In X-ray the most important is urethrography, with the help of which one can determine enlargement and other changes in the prostate. Sonography allows to find an abscess of the prostate, its configuration and sizes.

Ultrasonic examination helps to detect unilateral or bilateral abscess of the prostate.

The differential diagnosis is carried out with acute purulent-parenchymatous prostatitis, with benign prostatic hypertrophy and cancer of the prostate.

The outcome of the abscess in the prostate may be a probable spontaneous burst of the suppurative focus to the urethra, urinary bladder and rectum. Clinically it brings recovery to the patient after pus being discharged together with urine. But it does not exclude appearance of a fistula (urethro-prostatic or prostato-rectal). During the burst of the pus into fatty tissue, around the prostate a paraprostatic phlegmon is formed which may appear due to complication of the acute purulent-parenchymatous prostatitis with infiltration of pathogenic microbes into the cells of the prostate lymphogenously.

VESICULITIS

It is inflammation of the seminal vesicle. It occurs without any doubt, but it may not be exposed clinically (see fig. 19).

Etiology. The disease reoccurs as complication of urethritis, funiculitis, prostatitis and epididymitis.

The main causative agent is staphylococcus.

Pathogenesis. Pathogenic bacteriae, mycoplasmae, chlamydiae penetrate into the seminal vesicles directly from the prostate and the posterior part of the urethra through the deferent duct. In some cases there is a hematogenous path for infection, for instance in case of pyelonephrites, bronchitis, etc.

Classification. Vesiculitis may be bacterial, acute, chronic.

1. Bacterial:
— specific;
— nonspecific.
2. Acute:
— catarrhal;
— purulent;
— empyema
3. Chronic.

Clinical picture. Acute catarrhal and purulent vesiculites are characterized by fever up to 38 °C and signs of intoxication: weakness, sleepiness, headache, nausea, arrhythmia, tachycardia. The pain is localized in inguinal and pelvis areas, with irradiation into the sacrum. The pain is unilateral, though the process itself is bilateral.

The patients with chronic vesiculitis suffer from dysuria, pain at erection and ejaculation which lasts for more than 2–3 h after coitus.

Rectal study: pain at palpation, enlargement of seminal vesicles.

Methods of taking ejaculate. It is necessary to perform catheterization of the urinary bladder. The bladder is to be filled with sterile physiologic salina, after that it is necessary to massage vesicles. In normal ejaculate there should not be leucocytes.

Vesiculography: To inject one portion of the contrast solution into seminal vesicles with the X-ray followed.

Ultrasound examination with a rectal sensor shows enlargement of the size and deformation of seminal vesicles.

Treatment. Conservative and surgical.

Conservative therapy: etiologic and nosotropic.

Etiologic therapy: broad-spectrum antibiotics (ampicillin, gentamycin, nitrofurans or sulfanilamides). The antimicrobial therapy gives the best result with usage of endolymphatic tract for introduction.

Nosotropic therapy: inhibitors of fibrinolysis and proteolysis (aminocapronic acid, contrical); immune stimulators (pentoxyl, methyluracil, vitamin A); disaggrevating therapy (trental, curantyl, aspirin); antistaphylococcal plasma; methyluracil as suppositories.

Treatment of empyema of seminal vesicles — surgical.

COLLICULITIS

Colliculitis is an inflammation of the verumontanum.

The verumontanum is located at a distance of 1–2 cm from the neck of the urinary bladder. The colliculitis may be caused by a congestive process in the prostate, urethra and seminal vesicles.

Clinical symptoms: patients who suffer from this disease, feel discomfort, itching in the posterior part of the urethra, particularly at the end of urination and erection.

Diagnosis is based on clinical symptoms and results of urethroscopy.

Treatment depends on the etiologic factor.

EPIDIDYMITIS AND ORCHITIS

Epididymitis is an inflammation of the epididymis.

Orchitis is an inflammation of a testicle.

The testicle or epididymus inflammation, practically always combines with the lesion of the both organs. Therefore, depending on the original localization of the acute focus of inflammation it is usual to differentiate orchiepididymitis and epididymoorchitis. The considerable place in the etiology of the infectious orchitis and epididymitis is taken by bacterial forms. Other reasons of nonspecific epididymitis and orchitis are mycoplasmae, chlamydiae. In adults suffering from the flue induced by virus A, viral epididymitis and orchitis are also developing.

In teenagers and young men a viral epididymitis and orchitis also may be developed at a viral disease — parotitis. Infection

reaches the epididymus and testicles via three basic paths — hematogenous, lymphogenous and canalicular.

The most significant factors which result in development of epididymitis and orchitis are urethritis, prostatitis, vesiculitis and colliculitis.

Pathological anatomy. In acute epididymitis and orchitis the epididymus and testicle are enlarged and tight. In the cross-section the epididymus and testicle are dark-red with mucous or mucopurulent exudate. Under the microscope the walls of the epididymus and testicle infiltrated with lymphocytes and neutrophils are very edematic. In parenchyma of the epididymus and on its surface there may be single abscesses.

Classification of epididymitis and orchitis:

1. According to the etiological signs there may be bacterial, viral, mycoplasmic and chlamydial epididymites and orchites.
2. Nonspecific and specific (gonorrheal, trichomonal, tuberculous).
3. Necrotic infectious.
4. Granulomatous (a seminal granuloma occurs).
5. Traumatic.
6. Congestive:

— personal injury;
— postoperative;
— enterogenous.

According to disease course:

— acute (serous and purulent);
— chronic;
— recurrent.

Clinical signs. The disease in acute orchitis and epididymitis starts abruptly. The basic symptom is an expressed pain syndrome. Pain is localized in testicles and in epididymus and also irradiates into the groin along the spermatic cord.

The affection of epididymes is accompanied by inflammatory process in deferent ducts and in seminal vesicles. In this connection pain quite often irradiates into mesogastrium of the stomach and into the lumbar area. At local examination the epididymus and testicle in acute period are enlarged, very painful at palpation, quite often a reactive hydrocele develops. Alongside with focal symptoms, there may be intoxication of the body. Temperature of the body is increased up to 39–40°C, the patient complains of pain

(headache), tachycardia, weakness, adynamia, nausea. In case of a purulent process, an abscess is developed. During objective examination in the strained testicle it is possible to palpate purulent cavities, fluctuation may be found. Usually such a picture often can be found in very old people, the acute inflammatory process in them starts not roughly and there is a tendency to abscess formation.

It is important to note that the acute orchitis can be found more rarely than acute epididymitis. At acute nonspecific epididymitis testicles are enlarged, the acute edema develops.

The scrotal oedema gives the grounds to diagnose an acute epididymous orchitis.

Diagnosis. The characteristic clinical symptoms and enlargement of testicles allow to make a diagnosis in the early periods of disease.

At acute epididymitis there are changes in blood tests — leucocytosis within 8–12 thousand, neutrocytosis, eosinophilia.

It should be kept in mind that palpation of the testicles at examination in case of inflammation is very painful. Almost always epididymitis and orchitis are accompanied with enlargement of these organs 2–3 times as much.

Treatment depends on the stage of nonspecific inflammatory processes in organs. The approach to treatment of such patients is carried out differentially, with specificity in respect to a certain patient, with the clinical forms taken into account.

The mild form is characterized by a restricted local inflammation with unclearly expressed clinical symptoms — it is subjected to conservative treatment. The patient is administered broad-spectrum antibiotics (cephalosporines, ampicillin 500,000 U 4 times a day for 5–7 days) as well as nosotropic therapy (ε-aminocapronic acid 1.0 g i/m 3 times a day for 5–7 days, aspirin 0.5 g 3 times a day for 5–7 days; aevit, methyluracil, etc.). In order to abate the pain syndrome it is necessary to administer analgin (50% solution, 2 ml i/m twice a day), to perform a novocainic blockade of the spermatic cord.

Moderate form is characterized by purulent lesion of the testicle with the expressed local signs of disease which tend to progressing or torpid progressing.

This form of the disease is subjected to surgical treatment — epididymotomy or ectomy and drainage of testicles by means of a rubber latex strip (Fig. 24–25). After operation patient's treat-

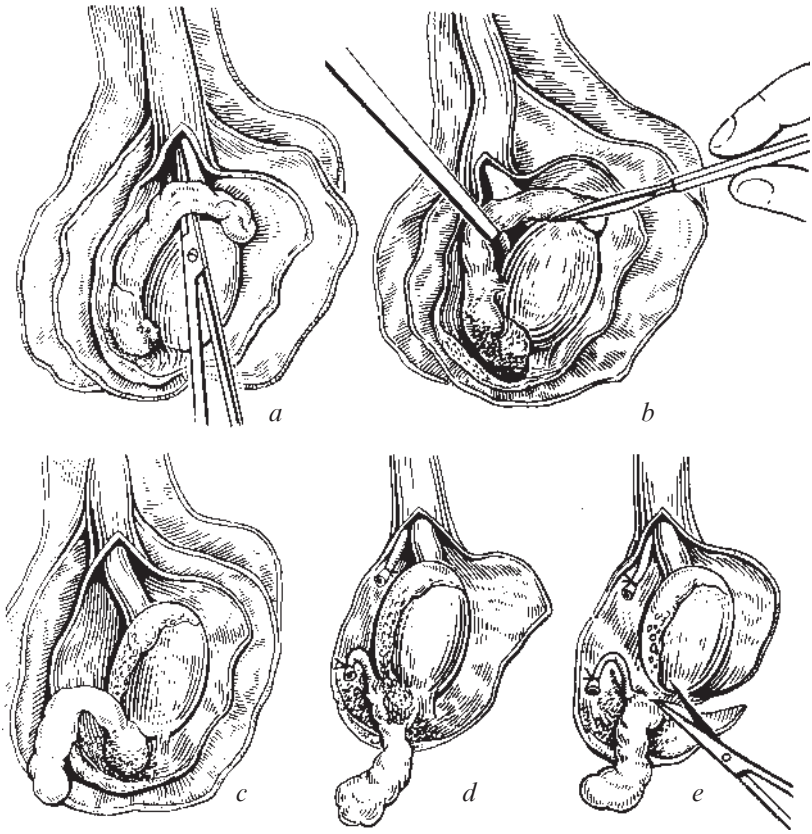


Fig. 24. Epididymectomy according to S. V. Kishevoy: *a–e* — stages of operation

ment is to be continued with the help of antibacterial and nosotropic therapy before liquidation of the inflammatory process.

Orchitis is a localized inflammatory process, which can be found only in 1.2% of total inflammatory diseases of male sexual organs. The symptomatology and clinical picture of acute and chronic orchitis are very similar to those of acute epididymitis. The difference is in the pain syndrome and less exhibition of edema for orchitis. Clinically at first pain occurs, chill, temperature is raised up to 38–39°C. Sometimes, in progressing of inflammation, the abscess formation takes place in the testicle. Treatment of chronic epididymitis and orchitis is conservative. Antibacterial and nosotropic

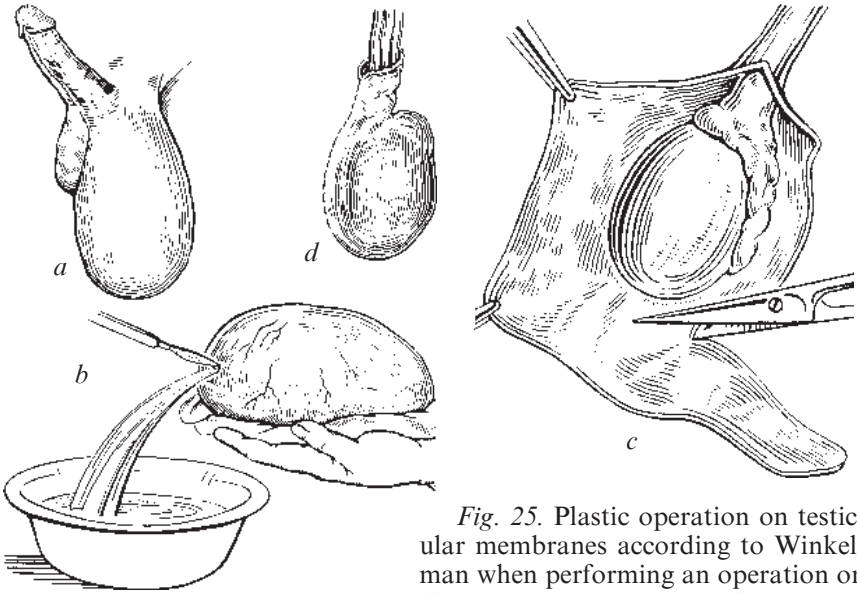


Fig. 25. Plastic operation on testicular membranes according to Winkelman when performing an operation on the scrotum: *a–d* — stages of operation

therapy is prescribed to patients. Antibiotics are used together with sulfanilamides. When choosing antibiotics, preference is given to tetracyclins, especially when mycoplasmae or chlamydia are found in inoculation. The diagnosis of orchitis is simple. The orchitis should be differentiated from tuberculosis and malignant tumours of the testicle.

INFLAMMATORY DISEASES OF THE PENIS

The inflammatory diseases of the penis are balanitis, balanoposthitis and cavernitis.

Balanitis and Balanoposthitis

The inflammation of the outer layer of the prepuce tissues is called balanitis. The inflammation of the prepuce is usually combined with inflammation of glans penis, this state is called balanoposthitis. It is frequently found in healthy men who do not make love and do not masturbate. Another reason for development of this disease is phimosis which is sometimes present in men of elderly age suffering from diabetes mellitus. The aseptic inflammation

if bacteriae are present becomes an infectious one.

Clinical picture. The glans penis at balanitis and balanoposthitis becomes hypermetic and edematic. On the inner surface of glans penis there is erosion and purulent exudates, erection and stimulation occur. The glans penis becomes infiltrative. While progressing, the disease is exposed as lymphangitis. Further on hyperemia progresses, the edema is increasing, lymphadenitis is exhibited in the inguinal area projection. As a complication, a penis gangrene is developed being manifested in intoxication and fever, and urosepsis may develop.

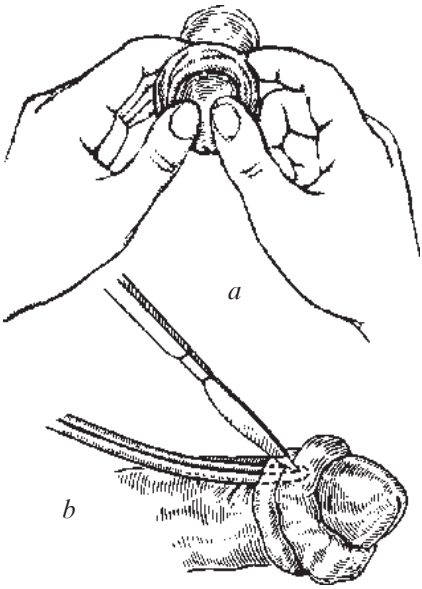


Fig. 26. Removal of paraphimosis: *a–b* — stages of operation

These diseases should be differentiated from syphilis.

Treatment consists of a careful toilet of the penis, hot bathing (40–41°C), cleaning of glans penis by a weak solution of potassium permanganate, by furacilin 1:5,000, etc. If balanoposthitis is developed in a patient with phimosis or in case of its absence — the surgical treatment is recommended, which is obligatory — circumferential dissection (circumcisio) (Fig. 26). In the acute form of the disease a limited longitudinal opening of the glans penis is recommended. In case of complications — broad-spectrum antibiotics in maximal doses, sulfanilamides and other chemical preparations are administered.

Cavernitis

Inflammation of the cavernous body occurs as a result of injury and inflammatory process in the urethra.

Cavernitis may occur in case of infection propagating along the lymphatic vessels from neighboring organs, as well as by means of a drift of pathogenic micro-organisms with blood from other distant foci.

The disease is manifested with the pain syndrome and edema of the penis. It is found as an infiltrate in the cavernous body of the penis. The body temperature rises. The pain in the penis is accompanied with erection. Sometimes because of edema of the cavernous body a patient may have urine retention. If treatment is not started in time, the infiltrate turns into an abscess. The purulent burst is opened into the urethra. Together with the pus, the necrotic masses of the cavernous body go out. From this moment the prognosis for the functional state of the penis becomes unfavorable. It may happen both in an acute and chronic process. The process is sometimes bounded in the middle part. Infiltrative changes in the cavernous body may be diffused.

Diagnosis. It should be differentiated from a syphilitic lesion of the cavernous bodies.

Treatment is anti-inflammatory, antibacterial (antibiotics, sulfanilamides), warming-up and physiotherapy. If the conservative treatment is not effective, the longitudinal dissection is indicated. The resorptional therapy is administered (pyrogenal, aloe, iodine preparations). In the next stage a patient needs an operative intervention which results in failure of erection. The latter may be possible afterwards with the help of an erector.

Gangrene of the penis

This disease can be spontaneous or idiopathic and may be a complication of balanoposthitis, lymphangitis, thrombophlebitis or paraphimosis. The clinical symptoms of the disease may resemble a gangrene of the scrotum — Fournier's disease.

The etiology of this disease is not clarified. The bacterial flora from the wounded surface is not homogeneous. The disease occurs all of a sudden, especially for young men. It is manifested in pain, hyperemia, edema, an infiltrate in the skin of glans penis.

The main *clinical symptoms* are intoxication, incompetence, nausea, vomiting, chills.

Treatment. Urgent hospitalization. Broad-spectrum antibiotics in large doses.

Surgical treatment: dissection of the necrotic tissue of the skin of glans penis. In the edemic outer surface paraphimosis is formed which should be dissected. Further on a granulation on the outer surface of the glans penis will occur.

In future these patients will need a plastic surgery.

Fournier's disease (gangrene of the scrotum)

This is a very severe disease which can be found in the urgent urinology.

Etiology: anaerobic infection *(Cl. perfingens, Cl. oedematuns, Cl. hystolyticum)*.

Nosotropic conditions for disease progressing:

— trauma;

— inflammation of the scrotum;

— wet eczema;

— thrombophlebitis, thrombosis of hypodermic veins of the scrotum.

Clinical symptoms: the beginning of the disease is very acute, scrotal edema intensively progresses, the skin of the scrotum is red at first, then acquires a cyanotic shade, vesicles with hemorrhagic contents are formed. During the first 12–14 hrs the skin necrosis is noted which increases with each hour.

General symptoms: symptoms of intoxication and bacteriemia. High temperature up to 39–40°C, chill, headache, palpitation, weakness. On the following day the size of the necrotic area reaches 5 cm. The scrotal oedema is increasing. In 24 h by palpation the crepitation will be felt — these are the signs of a gas gangrene. The testicles cannot be palpated, the edema is diffused around the penis and on the internal surface of the thigh, perineum and suprapubic area. On 7–8 days the necrotic tissues turn into purulent, with separation of necrotic masses with a strong odour, formation of granulations takes place. The patient's condition is improving, intoxication is decreasing.

Differential diagnosis: phlegmon of the scrotum, gangrene of the penis, a serous epididymitis, a wet eczema.

Blood test: high leucocytosis.

Bacteriological study: searching for a bacterial agent.

X-ray: at the survey X-ray film gases and flocks of pus are revealed.

Treatment: Urgent hospitalization and isolation. Intravenous polyvalence antigangrenous serum, 10 times (*antiperfingens serum* 10,000 U, *antioedimatious* 8,000 U, *antivibrion septic* 5,000 U). Antibacterial and disintoxicational therapy.

Surgical treatment: if the size of the necrotic area is less than 3–4 cm, the skin and hypodermic cellulose (necrosis) are dissected under intravenous anesthesia within the boundaries of unaffected

tissue up to 1 cm. The wound is rinsed with 3% peroxide of hydrogen or 0.1% of potassium permanganate. In 5–6 h the bandage is taken off. If the necrosis continues, the necrectomy is performed. In 10–12 h again a control bandage and if necessary — a repeated necrectomy 3–4 times. In 1 week the edges of the wound are dissected.

Antimicrobial therapy: broad-spectrum antibiotics (aminoglycosides).

Disintoxicational therapy: intravenously 5% glucose solution (NaCl), haemodesum, rheopolyglucin. Antipyretic therapy: aspirin. Proteolytic enzymes (Trypsin, Chemotrypsin), immune modulators (poly- and γ-globulins, staphylococcic γ-globulin, anatoxin).

Lecture 4

TUBERCULOSIS OF THE UROGENITAL ORGANS AND PARASITIC DISEASES

TUBERCULOSIS OF THE UROGENITAL SYSTEM

Tuberculosis is a social disease that reflects socioeconomic state of people, their welfare, as well as the level of the healthcare development with phthisiatric service included.

For the past three decades a great success was achieved in treatment of renal tuberculosis. Lethality has been reduced from 50% to 2–3%. Still, a wide introduction of specific chemotherapy of renal tuberculosis has not solved entirely all the problems of struggling against this disease. The rate of newly recorded cases of renal tuberculosis is not reducing greatly, but a relative rise of the rate of renal tuberculosis is noted.

In the late XX century the WHO experts (1993) predicted epidemic tuberculosis having defined it as a global threat which ran out of control in the majority of countries. The epidemiological situation in Ukraine has become worsen as well. Every year the amount of people who fall ill increases by 30% and makes up 65 per 100,000 of people. According to the statistic data, 82 new cases of tuberculosis are recorded in Ukraine and 20 ill persons die from tuberculosis. Within this period lethality increased by more than 1.5 times and accounts for 14.1 by 10,000, thus, in 1995 — 7,331 persons died.

So the problem of renal tuberculosis still remains actual. Tuberculosis requires further studying: in diagnosis, treatment and preventive aspects. For the past decade tuberculosis remains the most spread infectious disease with a critical course, high lethality and disability. Even in the most developed countries in the economical aspect, with a high living standard, there is a rise in disease incidence.

Etiology of the urinary system tuberculosis, as well as tuberculosis of other organs, nowadays is found clearly. The basic propagation path is hematogenous. During the primary generalization of the tubercular process when many organs are infected by tuberculous micobacteria penetrating to the blood circulation from the primary tuberculous complex in the lungs and bronchial lymph nodes, the both kidneys become affected. At first finest tuberculous loci are formed in the renal cortical layer.

In case of good resistance these loci will be healed and hereinafter they will not exhibit themselves for the whole life. But sometimes under unfavorable conditions (weakening of the body, special infectious virulence) there is no complete healing, the process is progressing or remains in the latent state. More often the process is developed in one kidney, whereas in the other one it calms down and in the beginning does not give clinical symptoms.

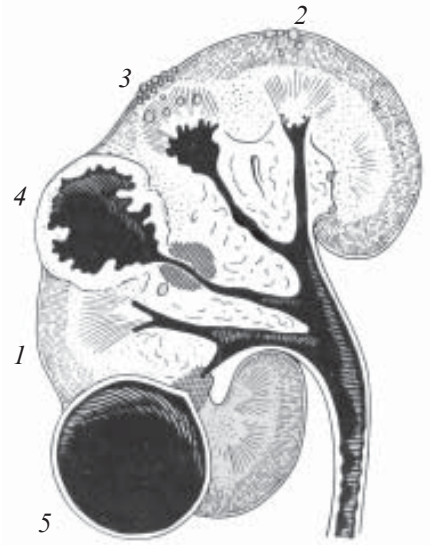


Fig. 27. Scheme of tuberculosis spreading in renal tissue (according to Chevassu): *1* — unchanged renal tissue; *2* — primary tuberculous tubercles; *3* — tuberculous infiltrate, necropapillitis; *4* — tuberculous cavern; *5* — separated tubercular cavern, abscess

The bilateral renal tuberculosis is found approximately in one third of ill persons. It has been established that local pathogenetic factors, particularly disorder in urine passage out of the kidneys, is of great importance in tuberculosis progressing.

Spreading of the tuberculous process within the kidney takes place in the direction from the renal cortical layer towards calyces and the renal pelvis, without leaving the parenchyma limits for a long time (Fig. 27). While progressing, the pathologic process reaches the apex of the pyramid, i.e. renal papilla. The papilla becomes ulcerated, then the mucous membrane of the calyces and the renal pelvis become affected. Further on the process is disseminated along the ureter and frequently affects the urinary bladder. The favourite

localization is the peribladder part of the ureter where at first specific inflammatory infiltration takes place and then on its background — cicatrical narrowing of the ureter. Further on a similar process is developed in the urinary bladder resulting in its cirrhosis.

So, the hematogenous way of tuberculous infection to reach the both kidneys is recognized as the basic one.

Resistance to tuberculosis is a result of complex reactions which to the present time are still not fully recognized and which do not give such a high level of protection as in case of diphtheria immunization. At primary infecting mycobacteria are caught by macrophages that make them produce antigens presented by specific T-lymphocytes receptors in combination with human leucocytic antigen — glycoprotein of the macrophage surfaces. Activated T-cells produce interleukin-1 and -2. Increase of the lymphokine number promotes to the following:

— stimulations and induction of hypersensitivity reactions;
— B-cell activations, which results in production of antibodies;
— cytotoxic cells;
— suppression of macrophage activity.

The suppression of T-cells can be boosted by increasing mycobacterial antigens.

Pathological anatomy. Initial pathomorphological changes in case of renal tuberculosis are localized in the renal cortical layer. They can be found only in thorough histological study of the renal cortical substance. Thereby you find typical tuberculous tubercles composed of epithelioid and giant Pirogov—Langerhans' cells. They are so called subclinical variations in the kidneys.

If tuberculosis transfers into a clinical stage, it will be manifested morphologically by formation of a specific inflammatory infiltrate passing from the renal cortical layer to the cerebral one. Renal tubules will be damaged and, as a consequence, first changes occur in the urine: erythrocytes, leucocytes, protein, often can be also found tuberculous mycobacteria.

At further progressing the process affects the papilla area (specific papillitis), and then occurs ulceration of the mucous membrane of calyces and renal pelvis. Progressing of destructive changes in the area of papillae and vault of calyces results in formation of a cavity — a cavern. In other cases cavern formation is conditioned by caseous degeneration of the locus of tubercular infiltration in

the renal cortical layer. The cavern can be coupled to the calyx by a narrow sinuous passage and consequently be emptied poorly or not at all.

At attenuation of the process there can be calcification of the caseous loci (petrificates). At cavern emptying and its cleaning the self-healing may occur.

In unfavorable cases of renal tuberculosis there is further damaging of parenchyma: the caverns are increasing, they are becoming closer to each other (polycavernous renal tuberculosis) and afterwards unite to an integral saccular cavity — tuberculous pyonephrosis.

Specific to a pathomorphologic pattern of renal tuberculosis is calcification of inflammatory loci — petrificates. They may be single, multiple, and occasionally the entire kidney is subjected to calcification. In the depth of the petrificate there may be a hidden process with alive tuberculous mycobacteria.

Another outcome of far going tuberculosis is so-called "autonephrectomy", i.e. disconnection of the kidney from the urinary system due to cicatrical obliteration of the ureter.

Thus, the basic meaning for the prognosis has duly identification of the renal tuberculosis.

Classification. The most reasonable and sufficiently satisfying for practicing physicians is the classification proposed by V. D. Grund (1969).

I. Clinical and X-ray forms of renal tuberculosis.

1. Tuberculosis of renal parenchyma (without visible X-ray changes.
2. Tuberculosis of renal papilla (papillitis).
3. Restrictedly cavernous renal tuberculosis.
4. Totally cavernous tuberculosis (pyonephrosis).

II. Phases of the tuberculous process.

1. Open tuberculous process.
2. Cutting-off.
3. Calcification:
   a) total;
   b) sectional.

III. Bacillarity (availability or absence of tubercular mycobacteria in the urine sediment).

IV. Functional state of the kidney.

1. The function is not disturbed.

2. The function is reduced.
3. The function is absent.

V. Complications: pyelonephritis, nephrolithiasis, hypertension, amyloidosis, etc.

Clinical features and course. The genitourinary tuberculosis is characterized by poor specificity and pathognomicity of symptoms. The nephrophthisis is taking for a long time as hidden behind other diseases or asymptomatically so long as the process is not spread to the urinary bladder (Fig. 28). But even in this case existing disorders in urination are estimated as ordinary cystitis.

The most often subjective exposure of renal tuberculosis is in pain in the lumbar area, more often dull, of aching nature.

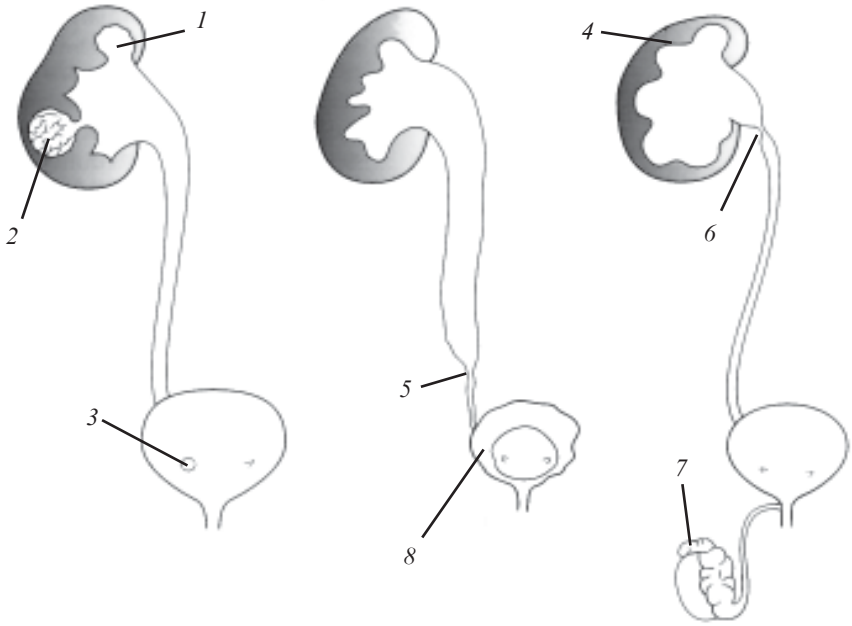


Fig. 28. Changes of the urogenital system caused by tuberculosis: *1* — erosion of renal papillae; *2* — tuberculous pyocalix as a result of fibrous obstruction of the neck of the calycle; *3* — aperture of the ureter orifice as a result of fibrosis; *4* — total replacement of renal tissue by caseous masses (autonephrectomy); *5* — stricture of the ureter; *6* — stricture of the pyeloureteral segment; *7* — tuberculosis epididymitis; *8* — fibrously-changed and shortened bladder

Another frequent early symptom of the tubercular process in the kidneys is failure in the act of urination. As a rule, they are not manifested sharply and arise after the instigating moments (overercooling, the disturbance of nutrition) and disappear very quickly.

Only many months later patients note a decrease of work capacity, higher fatigability. The increasing intoxication causes impairment of appetite and weight losing.

The most significant objective sign of tuberculosis of the kidneys an the urinary bladder is pyuria on the background of acidic urine reaction. This symptom in case of untreated tuberculosis of the kidneys can be found in 100% of cases. Pyuria has a resistant nature and does not yield to customary (nonspecific) therapy conducted against suspected pyelonephritis or cystitis. A less constant sign of tuberculosis of the urinary system is microhematuria. The availability of this symptom requires a thorough search for tuberculous mycobacteria in the urine, and that will affirm unconditionally the diagnosis of tuberculosis. It is necessary to keep in mind that an unstable symptom and even the most responsive bioassay (vaccination of urocheras to guinea-pigs) allow to make a diagnosis by sure in only 70% of cases.

It is necessary to pay attention to other true symptoms of renal tuberculosis.

They are specific changes on the part of the mucous membrane of the urinary bladder.

Thus, at cystoscopy of the patient with tuberculosis of the urinary system one can find tubercular tubercles in the shape of "millet" elevations above the mucous membrane, enclosed by the rim of hyperemia. The tubercles are usually located in groups and are localized around a vessel. At far-going changes of the mucous membrane of the urinary bladder one can find ulcerations, tumourous granulations near the ostium of the ureter. The ostium of the ureter can be expanded, widely open and hitched backwards.

The X-ray picture of renal and urinary bladder tuberculosis consists of a series of signs (Fig. 29, 30). At the initial stages of the process it is a deformation of calyces and renal pelvis by an infiltrate developing in the parenchyma of the kidney, ulceration of outlines of papillas (papillitis), formation of additional cavities going from calyces (arising cavern).

The most typical symptom of nephrophthisis is a clearly expressed cavern in the shape of a spherical cavity connecting with

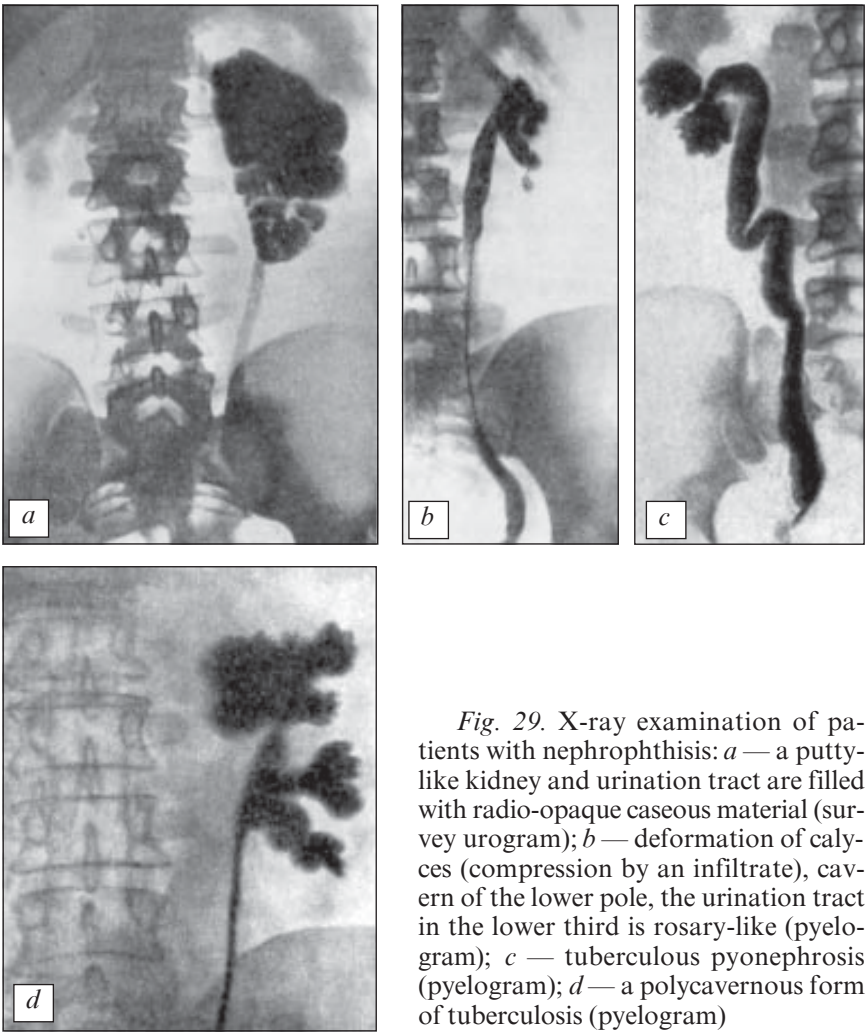


Fig. 29. X-ray examination of patients with nephrophthisis: *a* — a putty-like kidney and urination tract are filled with radio-opaque caseous material (survey urogram); *b* — deformation of calyces (compression by an infiltrate), cavern of the lower pole, the urination tract in the lower third is rosary-like (pyelogram); *c* — tuberculous pyonephrosis (pyelogram); *d* — a polycavernous form of tuberculosis (pyelogram)

calycle-renal pelvis system by a narrow sinuous passage. In case of polycavernous process several such cavities are defined.

Diagnosis. Duly recognition of tuberculosis of the urinary system is a guarantee for a successful struggle against it.

Patient's examination suspected for renal tuberculosis starts with clearing up area complaints and the history of disease. Any complaints for pain in the area of the kidneys and the urinary bladder

or dysuria of unclear genesis make the practicing physician suspect a renal tuberculosis. Rather pathognomonic for tuberculosis of the kidneys is availability in anamnesis of pulmonary tuberculosis, lymph nodes, the bone and articulation system, exudative pleurisy. Therefore it is necessary to carry out a thorough examination of the thoracic organs and bones. Finding of petrificates serves an essential reason for existing tuberculosis of the kidneys.

The physical methods of clinical examination give little to recognition of renal tuberculosis, especially in the initial stages.

Of great importance is palpation of external genitalia, prostate and seminal vesicles in men.

From laboratory tests the urine analysis is the most important: finding of pyuria, microhematuria and moderate proteinuria are typical for tuberculosis. Because of association between mycobacteria and ordinary flora the acid reaction of the urine and aseptic bacteriuria become less characteristic.

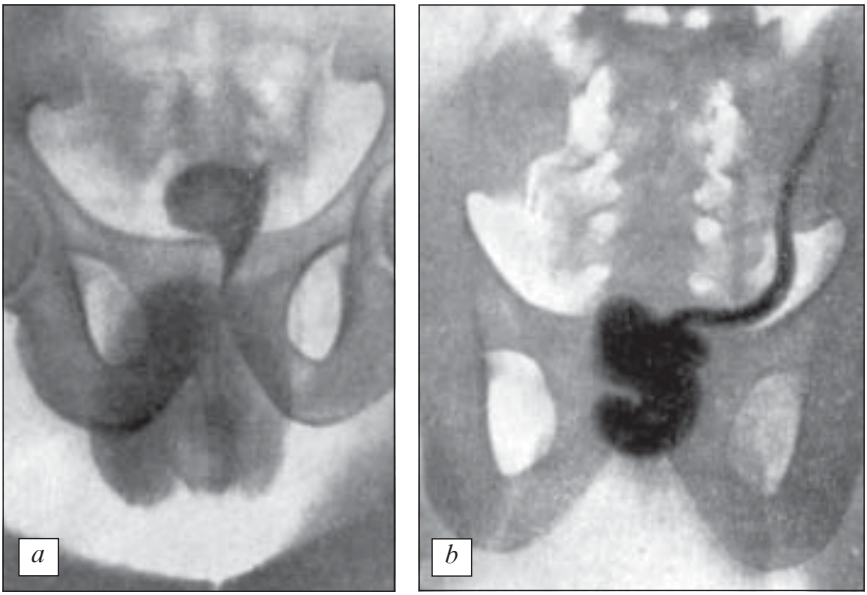


Fig. 30. X-ray-urologic examination of patients with tuberculosis of the urinary system: *a* — a contracted urinary bladder; *b* — a contracted urinary bladder, vesicoureteral reflux, a cavern of the prostate is overlapped to a shadow of the contracted urinary bladder

The most significant moment in the laboratory study of the patient with suspicion for tuberculosis of the kidneys is searching for mycobacteria of tuberculosis in the urine by bacterioscopy, inoculation to the potato-egg medium according to Levenstein or that to the blood one — according to Price—Shkolnikova and biological sample.

The former stipulates Ziehl—Neelson staining. For the test one collects a morning portion of urine to the boiled jar during 4–5 days. The results of the inoculation in the potato-egg medium will be received in 1–1.5 months, in the blood one — in 1–2 weeks. However, it is necessary to note that a diagnostic significance of the inoculation in the potato-egg medium and bloody medium is not equivalent to each other and reaches 70% and 40%, respectively. Therefore at present they use initial inoculation in the bloody medium for enriching the culture, with consequent reinoculation to the potato-egg medium. It is also recommended not to be confined by a single inoculation and to carry them out three-four times with an interval of 5–6 days.

The biological sample — infection of animals (guinea-pigs) sensitive to tuberculosis. If the guinea-pig has not perished within 2 months, it is subjected to euthanasia for studying its organs. Nowadays the biological sample is not used.

It is necessary to pay attention once again to the fact that with the help of the most sensitive techniques — bacteriological and biological — mycobacteria are found in 70% of cases.

The next stage in patient's examination is cystoscopy. It is not always easy to determine the nature of pathological changes in the bladder at cystoscopy, therefore biopsy is expedient.

The X-ray study (see fig. 27, 28) allows to detect an enlarged shadow in case of disorder of urine outflow from the kidney and reduction of the shadow in case of its contraction, as well as calcification in renal parenchyma typical for tuberculosis. Petrificates are not homogeneous, of irregular shape, and they are located in a projection of the parenchyma of the kidney, as distinct from concrements in the kidneys. The contrast studies of the kidneys allow to determine the shadow of the kidney, that of the pyelocaliceal system, the ureter and the urinary bladder.

The characteristic signs of renal tuberculosis on the contrast X-ray in different stages are as follows: stenosis, compression of calyces, ulceration of the papilla, irregularity of outlines of calyces, large additional cavities (caverns).

The tuberculous affection of the ureter and the renal pelvis are characterized by their stenosis, quite often multiple, especially in the renal pelvis-ureter segment and in the large pelvis.

The tuberculous affection of the urinary bladder is characterized by its deformation, obliquity and reduction of its volume.

Treatment. If the fact itself of diagnosing the renal tuberculosis in the era before Streptomycin required a nephrectomy, now the most cases of tuberculosis (up to 90%) are successfully treated with pharmaceuticals.

The main principles of treating tuberculosis are as follows:

— not to administer a single antituberculous medicament;

— doses of drugs should be high enough considering the patient's age, weight and functional state of the liver and kidneys;

— treatment should be long (for 4 months and more),

— the physician should convince the patient of necessity in regular reception of medicaments.

Standard preparations for treating tuberculosis, according to the recommendations of the International Antituberculosis Committee, are the following ones: Isoniazid, Rifampicin, Pyrazinamide and Ethambutol in day time dosages. Treatment is to be started with the first three preparations and lasted till establishing the results of response to them. After receiving some positive effect, treatment can be proceeded by two preparations, to which the body is responsive, preferably — Isoniazid and Rifampicin. If an organism exhibits stability to two and more standard drugs, treatment should be proceeded with Streptomycin and/or Ethambutol. The polyresistance is now rarely found and as a rule, there is no necessity in administering one of the drugs taken in before. These regimens have had a good reputation and give excellent results of treatment. The course of treatment should last at least 4 months or more in case of severe illness. The optimal period of treating tuberculosis of the kidneys is within 9 months — 1 year.

If tuberculosis is treated with a single preparation, resistance will develop quickly. Thus, for example after 3 months of treatment with Isoniazid only, there will be found resistance in 62% of patients and the growth of mycobacteria in them. If resistance to one of two drugs administered simultaneously is found, resistance to the second drug will develop quickly.

The conservative treatment includes administration of two or three drugs of the antituberculous nature:

— antibiotic (more often Rifampicin);
— Hydrazine of the isonicotinic acid (Isoniazid)
— Pyrazinamid.

Doses of drugs for traditional treatment are as follows:

Isoniazid 100–300 mg a day orally.

Rifampicin 600 mg a day orally.

Ethambutol 25 mg/kg a day orally for 2 months and 15 mg/kg a day afterwards.

Pyrazinamide 1.5–2.0 g a day orally.

Streptomycin 1.0 g per a day.

Treatment should be performed under thorough follow-up for the patient. In case of poor tolerance or poor efficiency of the drugs mentioned above (so-called drugs of the first line) they can be substituted with drugs of the second line — from antibiotics — Cycloserin; from hydrazines of the isonicotinic acid — Saluzid, Methazid. Nowadays the combined drug — Mycobutin — is used successfully that requires intake once a day.

In order to decrease negative moments of cicatrisation, the antituberculous therapy is to be combined with administration of glucocorticoids or adrenocorticotropic hormones. As a rule, Prednisolone is administered in a daily dose up to 25 mg.

The complex of treatment also includes a regimen, a diet, treatment at the sanatorium, climatotherapy. The patients are recommended to have a rest in the middle of the day.

Meal for patients should be high-caloric, include a lot of vitamins. The most convenient sanatoria for treatment of patients of this category are on the Southern coast of the Crimea. It is expedient to stay in coniferous forests.

The patients suffering from tuberculosis are on dispensary record which provides:

— analysis of urine once a month;
— bacteriological and X-ray examination of the urine system at least once a year.

The patients can be considered cured from tuberculosis if they do not have changes in the urine, and any progression in changes on urograms during 3 years.

Surgical treatment. Depending on the stage of the process, more organ-preserving operations are performed — cavernotomy, cavernectomy, resection of the kidney, more seldom — nephrectomy.

In cases of failures in urine outflow — plastic operations on urinary tracts: pyeloureteroanastomosis, ureterocalycoanastomosis, ureterocystoanastomosis, replacement of the distal part of the ureter with a segment of the ileal intestine, and in case of contraction of the urinary bladder — sigmoplasty of the urinary bladder (enlargement of its volume by a segment of the sigmoid intestine). After the basic course treatment is to be continued at the outpatient antituberculous dispensary or carried out at the sanatorium.

Prognosis. Practically it depends completely on the stage of the disease (in the initial stages — favourable, after nephrectomy — it is more doubtful, since the disease is bilateral).

GENITAL TUBERCULOSIS

The genital tuberculosis represents a local exposure of the total tuberculous infection (see fig. 28). There are three points of view concerning propagation of the process in these organs:

1. Epididymis, and then the deferent duct, prostate and seminal vesicles.

2. Primarily the prostate is affected by a hematogenous way, or seminal vesicles, from there retrogradely along the deferent duct to the epididymis and the testis.

3. The tuberculous mycobacteria reach the man's genital system from urine.

Apparently, all three ways have the right for existence.

The symptoms of the **tuberculous prostatitis** are more often poor and non-specific (pyo- and hemospermia, strangury, pollakiuria). Most frequently the diagnosis is made by the rectal digital examination of the prostate. In the prostate some tuberous or flat painless infiltrates can be found, alongside with them — softened areas. At abscess emptying — retractions.

At tuberculous epididymitis, in the epididymis one can usually find tuberous infiltrates. The disease has a chronic course, more often without essential signs of inflammation. The characteristic symptom of the epididymis with a tuberculous lesion is its rather early adhesion with the skin, and hereinafter formation of fistulas.

Discharge of "aseptic" pus and finding mycobacteria in it is significant for making a diagnosis.

Treatment: conservative and surgical.

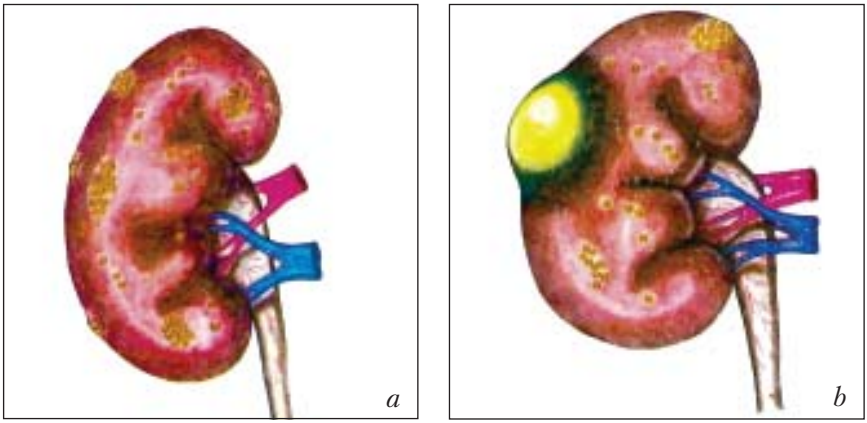


Fig. 21. Appearance of the kidney in apostematous pyelonephritis *(a)* and renal carbuncle *(b)*

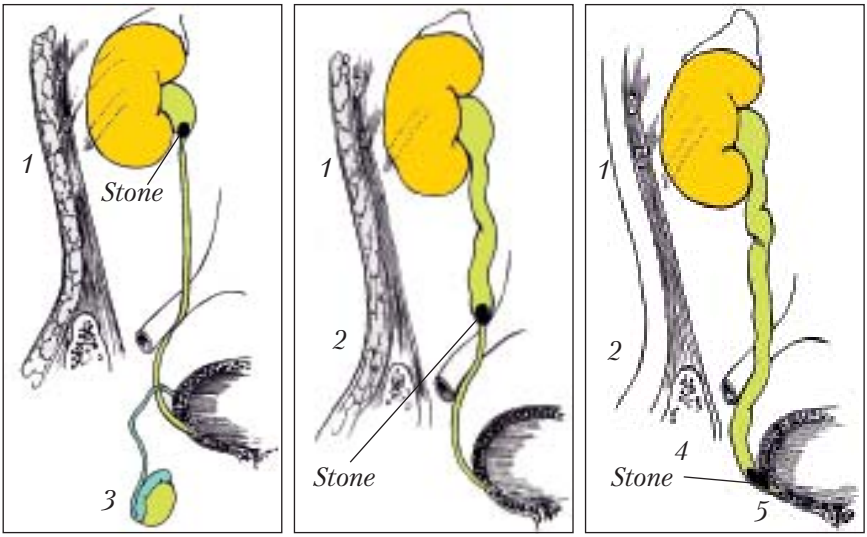


Fig. 31. Pain irradiation at the different level of the stone localization: *1* — to the lumbar area; *2* — to the sacral area; *3* — to the testicles; *4* — to the scrotum or the vulva; *5* — irritation of the urinary bladder

Fig. 41. Transitional cell carcinoma of the renal pelvis with invasion to the renal parenchyma. Macro-specimen

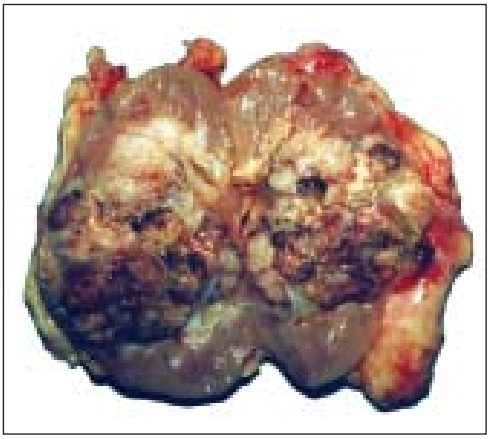


Fig. 42. Specimen of the kidney removed due to a tumor

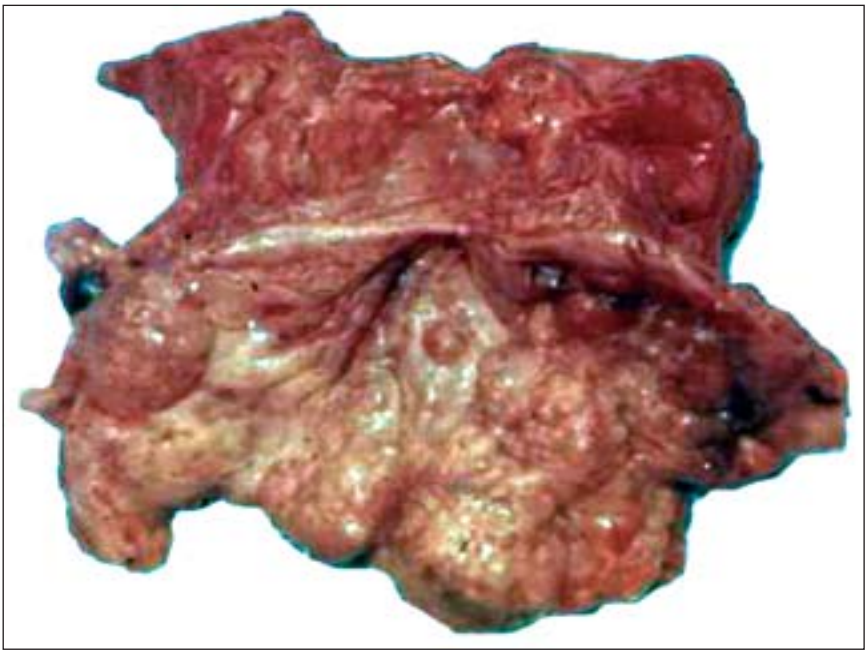


Fig. 45. The urinary bladder removed in case of a malignant tumor. Macro-specimen

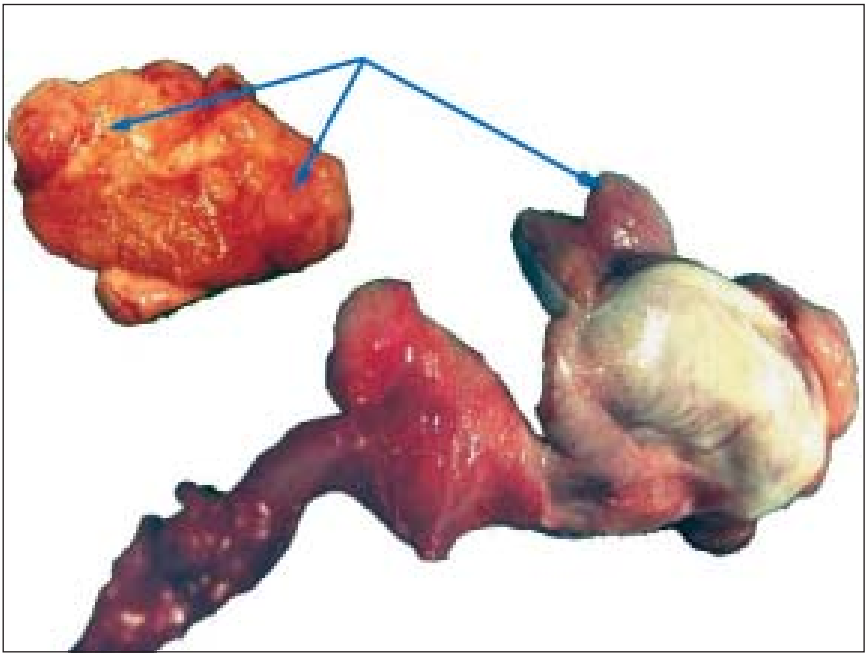


Fig. 47. Tumor of the tecticle. Macro-specimen

Fig. 49. Embryonal carcinoma of the testicle. Macro-specimen

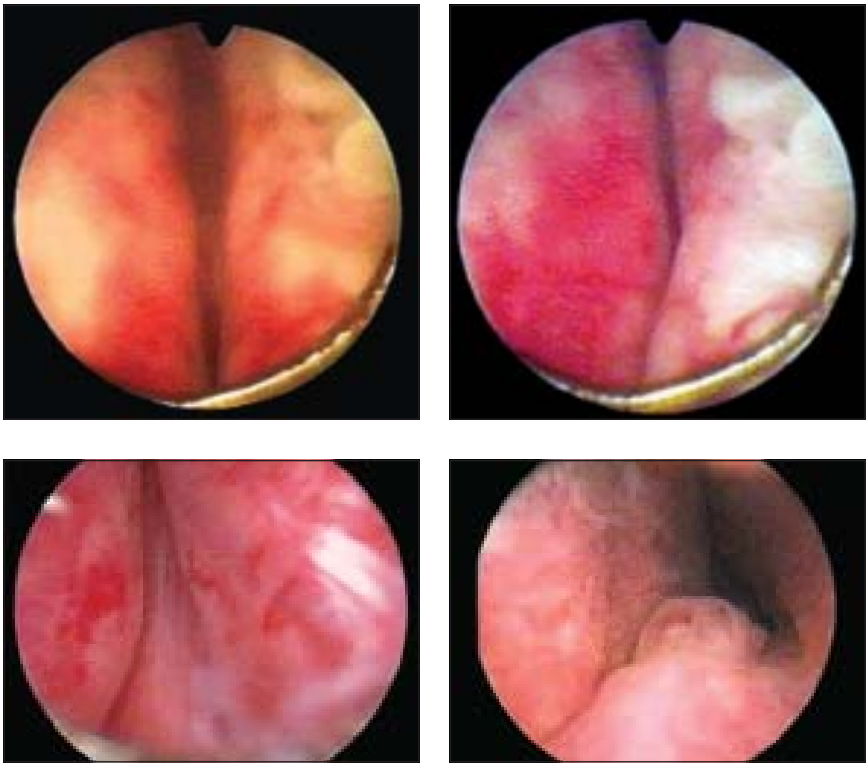
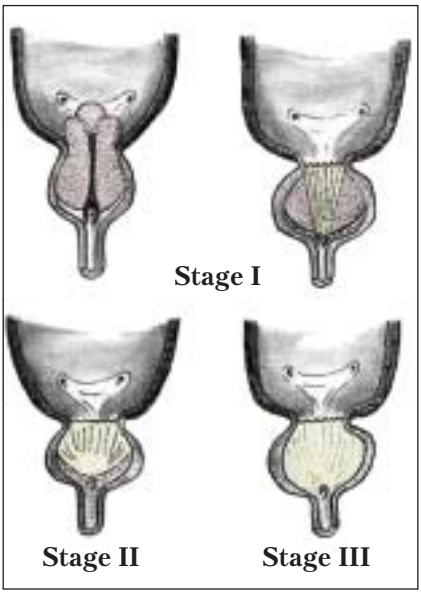


Fig. 54. Endoscopic picture in case of benign prostatic hypertrophy

Fig. 59. Adenomatous nodes removed in case of partial transvesical prostatectomy



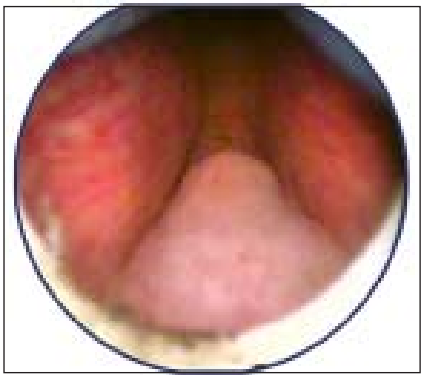


Fig. 60. Transurethral resection of the prostate. Stages of operation

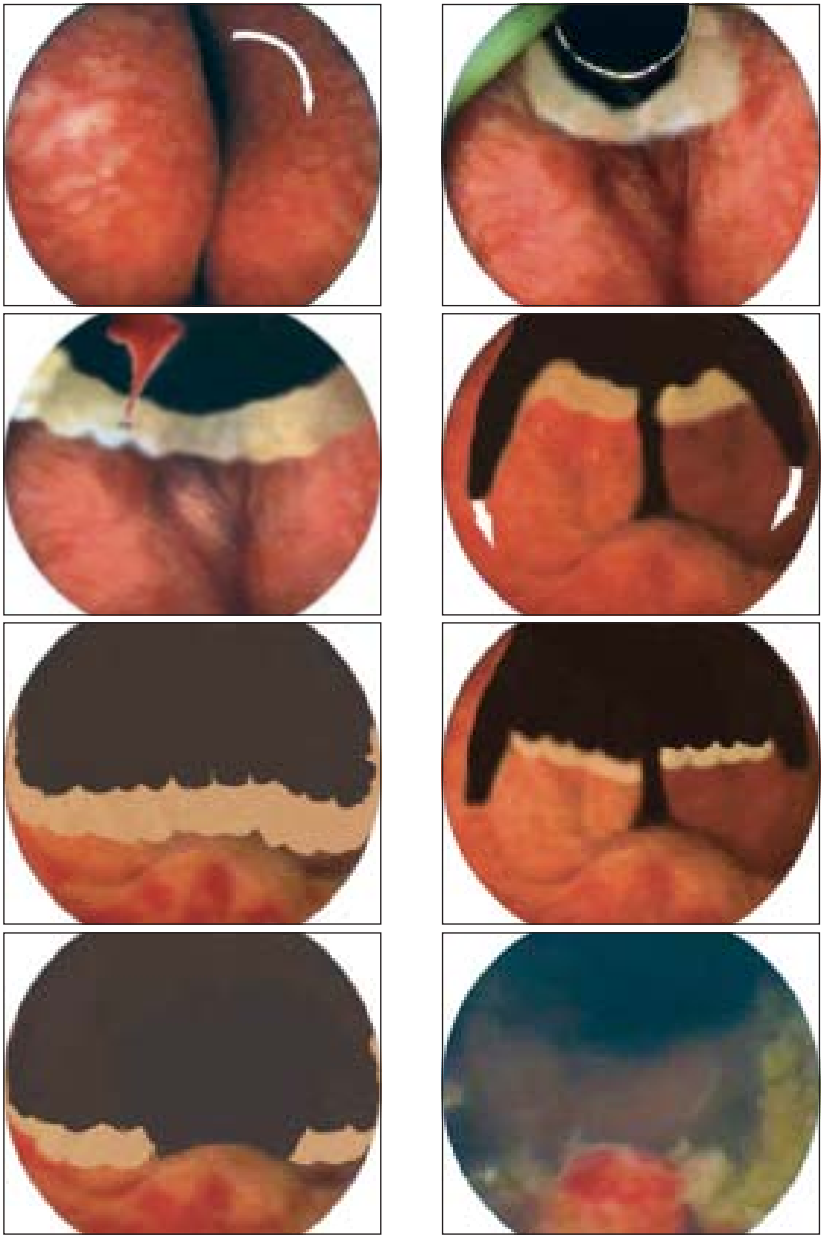


Fig. 62. Technique of performing transurethral resection according to Nesbit. Stages of operation

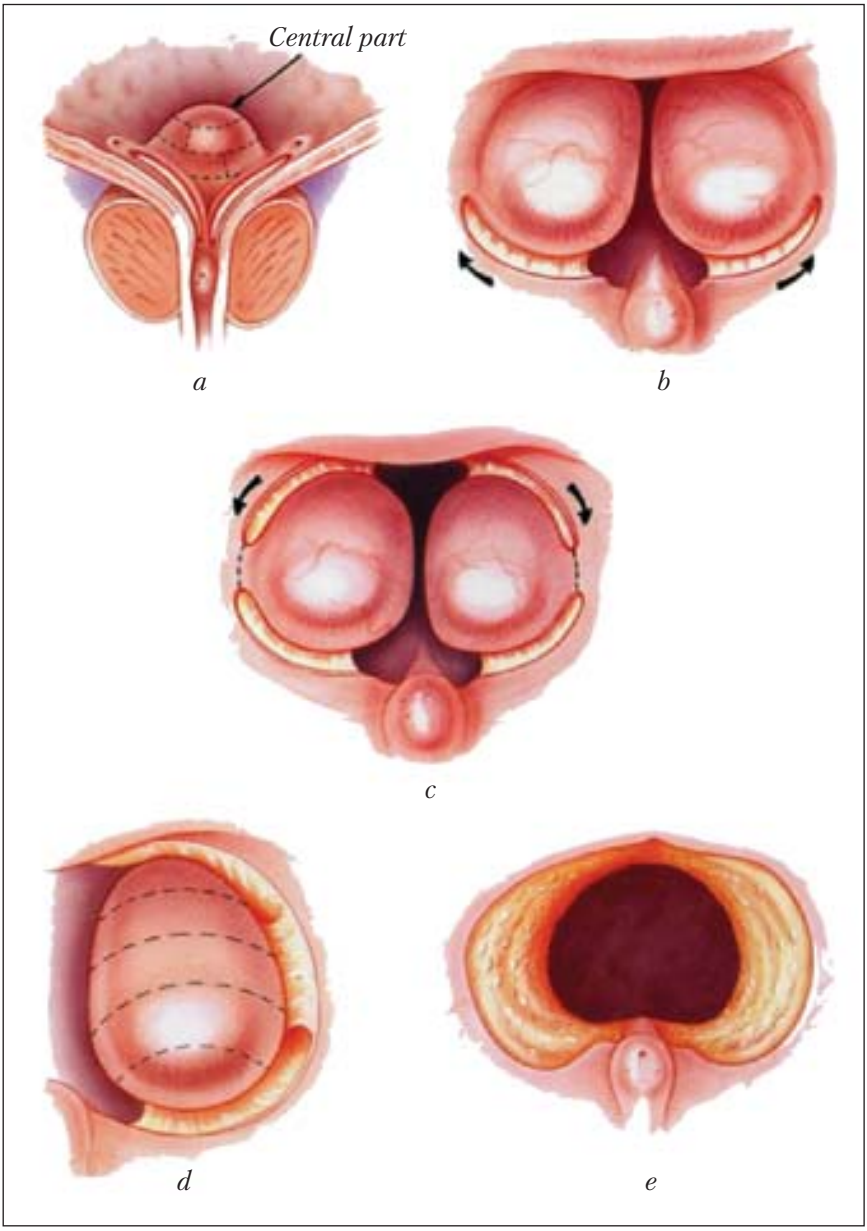


Fig. 64. Contact laser resection in case of benign prostatic hypertrophy: *a, b, c, d, e* — stages of operation

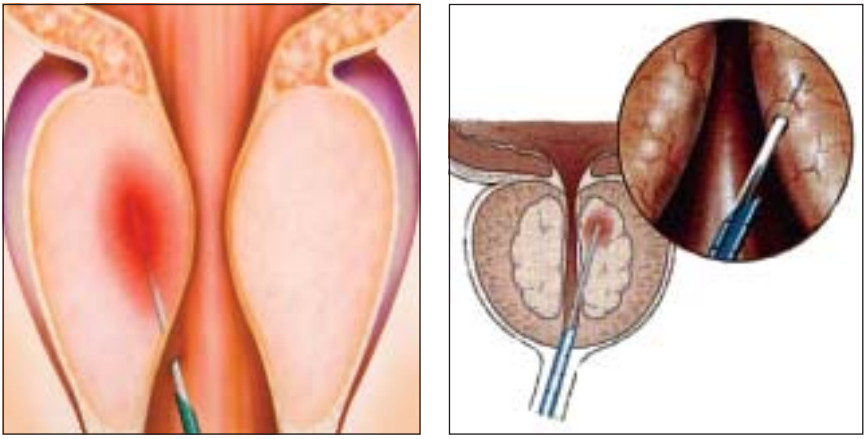


Fig. 65. Interstitial laser coagulation in benign prostatic hypertrophy

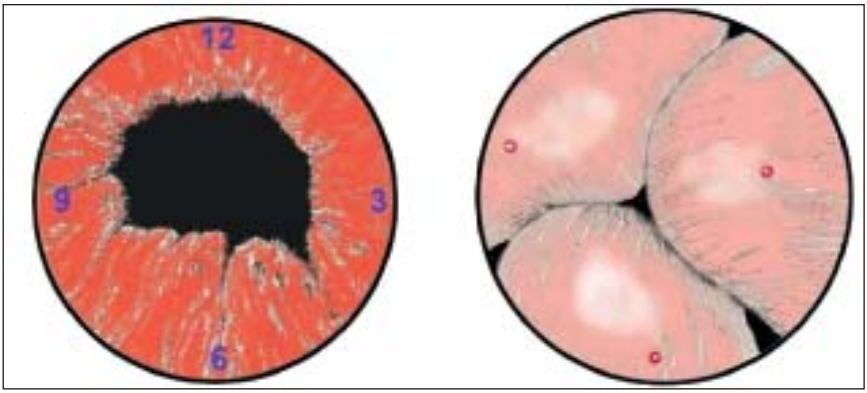


Fig. 75. Treatment of urine incontinence. Places for injections of collagen or Teflon paste

Conservative treatment: full-value food, work without physical or mental overwork, sufficient stay on fresh air.

Specific antibiotics (Streptomycin, Rifampicin), Isoniazid and Pyrazinamide in different combinations should find their use in treatment of genital tuberculosis.

Treatment is conducted with intervals for some years. In case of abscess and fistula formation, as a rule, it is added with a surgical technique.

PARASITOGENIC DISEASES OF THE UROGENITAL ORGANS

The most significant parasitogenic disease, from the urologist's point of view, unconditionally, is schistosomiasis. However, other parasites can cause changes in the urinary tracts: Wuchereria, Plasmodium, Echinococcuses, etc.

The lesion of the urogenital system under conditions of tropical countries can be subdivided into 2 types:

1. Primary diseases of the urogenital system.
2. Complications on the part of the urogenital system in case of tropical diseases.

Schistosomiasis

Schistosomiasis is referred to a group of helminths with a preferential affection of the urogenital system organs.

Historical reference. The first information about this disease was presented in the papyrus referring to 12–10 B.C. When studying Egyptian mummies, Rouffaur (1910) found calcified eggs of the parasite in the straight tubules of the kidneys. Larrey has noted hematuria in the commander in the times of Napoleone's campaign and called it "Egyptian hematuria". Bilhartz (1851) found heterosexual worms in mesenteric vessels of a corpse suffered from hematuria. Weinland (1858) referred these helminths to a Schistosoma class.

The biologic cycle of Schistosoma can be represented as follows: from ill persons the eggs of helminths fall in water. From water they fall in an organism of an intermediate host — shellfish, where they mature. Thousands of them — cercariae — fall in water. A human being becomes contaminated when using this water. In the

body of the infected person cercariae penetrate into venous plexuses of the portal vein, hemorrhoids. A life span of parasites lasts up to 30 years, and their number reaches 300.

Geography of schistosomiasis. The total number of patients accounts for about 270 mln of people. The disease is spread in countries with high average annual temperature which promotes all year round survival in pools of the intermediate host — shellfish. The endemic centers of schistosomiasis are Egypt, Eastern and Western Africa.

Hematuria in persons coming from these regions requires examination in order to exclude schistosomiasis. The first signs of the disease occur in 10–12 weeks after contamination, after infiltration of cercariae into the mucosa of the urinary bladder, rejection, egg laying and occurrence of hematuria.

Pathogenesis and pathological anatomy. At the site of egg implantation as a rule a "bilharzioma" infiltrate composed of hystiocytes, mononuclears, eosionocytes and plasma cells is formed. The urinary bladder affection at first is manifested as dysuria and a rise of the rate of imperative urination. Schistosomous ulcerations are usually accompanied by pains in the perineum and above the pubis. The most typical clinicopathologic signs are as follows:

— pseudopolyposis of the urinary bladder at the incipience of the disease;

— ulceration at the site of rejection of Schistosoma eggs.

In case of a prolonged disease course there will be fibrosis of the urinary bladder, its contraction and cicatrical lesion of distal parts of ureters. It is found that bilharzia eggs perishing in the mucosa of the urinary bladder are subjected to degenerative changes and calcification. Thus, a long-lasted disease is exhibited by formation of "sand" spots, polyposis, cystic ureters. Stenosing of ureters takes place as a result of stenosing of the part of the urinary bladder adjacent to the intramural part of the ureter.

Pyelonephritis and hydronephrosis are also developed as secondaries in result of schistosomic stenosings. The metaplasia of the urinary bladder epithelium in case of a prolonged disease course induces development of tumours. Cancer of the urinary bladder in such patients can be found 11 times as often.

The lithiasis in the urethra, urinary bladder, ureter and kidney at infections transmitted with blood can be found in 25% of infected persons. The core of these concrements consists of oxalate en-

closed by acid-urate envelope and it often contains Schistosoma eggs. In case of reasonable environmental factors for lithiasis, infection and stasis of the urine are rather promoting factors.

Clinical picture. The disease can be found more often in the age of 10–20 years. In the location of cercariae invasions toxicoallergic manifestations in the form of papules and pustules, urticaria and fever are seen. Sometimes liver enlargement can be found, and in peripheral blood the amount of leucocytes is increased. In 7–14 days these phenomena remit and the imaginary health occurs. In 2–6 months there occur dysuria, pollakiuria, weakness, hematuria, pain in the lumbar area, renal colic, hypochromic anemia.

The diagnosis is made after the urocheras having been studied and eggs been found. Cystoscopy allows to detect infiltrates, ulcer, "sand" spots. A biopsy of the wall of the urinary bladder allows to make a precise diagnosis for 90% of patients.

The X-ray examination allows to find linear and ring-shaped calcificates, stenoses of ureters, hydroureteronephrosis, defects in filling-up and outlines of the urinary bladder; to determine the functional state of the kidneys. The dynamic follow-up of the patient shows that after treatment and probably spontaneously some of these lesions are reversible.

Usage of the diuretic-renography method without load and with furacemide infusion allows to distinguish functional changes in urodynamics from organic ones.

Treatment. Before determining the necessity in surgical treatment, especially for young people, it is necessary to evaluate the results of medicamental therapy.

Drugs of choice for schistosomiasis treatment are Metriphonate (Clibarcyl) 7.5–10 mg/kg a day with enteral introduction for three days with an interval of 1–4 weeks, or Praziquantel (Biltracyde) 20–35 mg/kg a day orally for 5 days.

Filariasis

Tissue helminths (Wuchereria, Brugeria) affect the lymphatic system. Wuchereria are widely spread in tropics, while Brugeria are limited by South-East Asia. Both these helminths induce chiluria. Chiluria is specified by formation of the messages between the lymphatic and urinary systems.

Frequent symptoms of contamination by Filaria are in lesion of men's genitalia: hydro- and hematocele, epididymitis, orchitis,

funiculitis. The detection of Filaria in the urine allows to make a diagnosis. Signs of necropapillitis can be found by X-ray. The most effective drug for treatment of filariasis is Invermectin.

Echinococcosis of the kidneys

Echinococcosis of the kidneys takes the sixth place in incidence of parasitogenic lesions of the kidneys. The disease is widespread in countries of South America, less on the whole planet, UIS countries included. The main hosts of worms are dogs, wolves, foxes. A man is contaminated from intermediate hosts — pigs, cows, horses, sheep. A sheep is the best carrier.

The disease has the same course as in case of simple solitary cysts: compresion of the kidney, atrophy of the parenchyma, pressure on tissues and organs.

In case of open echinococcosis hydatites can be found in the urine looking like a grape peel. Indication to contact with animals is of great importance. Characteristic X-ray sign is in presence of crescent calcinates. The Casoni's test is responsive in 80–90% of cases. Serologic IFA assays have a high prognostic significance.

Albendasolum is an effective drug for monotherapy or as a complement to operation.

Malaria

Malaria is of less interest since the lesion of the urinary tract is bounded to a kidney, that is a competence of a nephrologist.

Tertian malaria

The acute renal failure (ARF) can cause a death of a patient suffering from a tertian malaria and in this case only peritoneal dialysis or haemodialysis can save the patient. If there is no obstruction of the urinary tracts, it is necessary to think of ARF with malaria, if within 24 h the diuresis goes down to 500 ml, and relative density of the urine does not exceed 1,016. The level of urea in the blood serum exceeds 30 mmol/L.

The pathological process induced by a malarial plasmodium results in a chain of reactions. Changes in blood circulation through many organs, as well as through kidneys, are the result of metabolic changes, disorders in the endocrine homeostasis. Pharmaco-

logically active substances including kinins and kininogens affect blood vessels and membranes, thus adherence of parasitogenic cells to endothelium is present. Arising physiologic reactions result in local or general lesions. These lesions are reversible, but in due course they can become irreversible.

Quartan malaria

Follow-up data accumulated by the present time are the evidence of relationship between the quartan malaria and a nephrotic syndrome in children. The recontamination by malarial plasmodia for untreated people can give incorrect immunological response as a consequence of the lesion and sensitization of the basal glomerular membrane by an antigen — antibodies complex. These immunological failures are very convincing.

Autoimmune reactions in the patient's body with malaria can induce secondary glomerulopathy with signs of renal insufficiency. Thus, it is necessary to consider the parasitogenic diseases of the urogenital system as potential ones in development of functional complications in the kidneys.

Lecture 5

UROLITHIASIS

The kidney stone disease (urolithiasis) is a wide spread pathology known to the mankind from the ancient times and it can be found throughout the world. In many regions the urolithiasis has an endemic nature, which is evidence of significance of exogenic factors in its development.

The concrements are formed in the urinary tract due to many reasons. Those of them which are formed repeatedly as a result of existing hyperparathyroidism, renal-tubular acidosis, cystinuria, failures in metabolism of purine compounds, hyperoxaluric states, as well as a latent urine infection cover only a small part of all cases of lithogenesis (10–20%). At the same time, the idiopathic calcium-rich stones found in 70–80% of cases, undoubtedly, are the dominating problem in industrially developed countries. The pathogenesis of calcium-rich stones has a multifactor nature, which determines the scope of medical measures, respectively.

The phenomenon of stone formation has stimulated appearance of a lot of theories that explain its genesis, nevertheless regardless to a stone, the fundamental process of lithogenesis is common to all concrements, and any hypothesis of lithogenesis should take into consideration availability of its three stages:

1) initiation and nucleation;
2) persistence or retention;
3) growth.

In this respect, the basic physicochemical principles controlling dissolubility of saline components of the aqueous solution common to the processes of urinary tract stones have been determined.

The lithogenesis occurs only when urine becomes supersaturated with salt compounds, in any other case the lithogenesis is impossible. In case of cystinuria, for example, increase of urine flow

rate up to 2 ml/min is sufficient to avoid supersaturation of urine with cystine, while urine alkalinization changes physical conditions of uric acid dissolubility so as to permit the dissolution of uric acid. The supersaturation, however, is not a synonym of lithogenesis, and in many normal individuals the urate crystals pass out together with urine proving that the urine is supersaturated, nevertheless there is no stone formation. And still this is supersaturation, that is a required condition for crystallization and lithogenesis.

The second acting agent which induces aggregation of crystals is still an unknown factor that determines the size of crystals and their accretion. The development of stone formation also requires the third condition — the entrapment of crystals in the tubular lumen with further "free" microlith growth or the adhesion of the crystal on the surface of urothelium, which allows its "fixed" growth.

IDIOPATHIC NEPHROLITHIASIS

Calcium-rich stones are typical for population of the developed countries of the contemporary world. This condition affects mainly men in the age within 40–60 years, with the peak of its incidence in the IV decade. In this connection it is very interesting to note that autopsy studies show a similar rate in finding renal concrements in men and women. The similar tendency concerning the urolithiasis takes place among male and female patients, from childhood and up to the age of 40 years. When even allowing for the effect of greater awareness and contrary to considerable geographic and climatic variability, there has been a higher rate of incidence of urolithiasis in Europe, Northern America, Japan and in many other regions in the 90's. Numerous studies of entire population groups, hospital admission rates and postmortal statistics have shown considerable progressing increase of urolithiasis incidence varying within 75–100% for the past decade. It is quite clear that its incidence among in the younger age patients now is 2–3 times as high as among the elderly people. For example, incidence of renal stones in 40 years old men was about 6%, while in the group of patients who were older than 20 years in the similar age the incidence of nephrolithiasis is only 2%. The rate of finding renal stones in children also increases, according to reports on their occurring in groups of patients under 10 years.

Recurrence after the first stone episode in the urinary tract is a well recognized feature of the disease and in the majority of patients the development of the disease is speeded up, the opposite tendency is marked only in the minority. The up-to-date results prove that the rate of stone recurrences in the kidneys for 8 years is 53%. In more distant period of follow-up the value of this index is more than 70%.

Epidemiology of urolithiasis, certainly, can continue the intriguing relationship between the incidence of this disease and such factors as economical status and social class, age, sex and occupation, race and ethnicity, geography and climate, and dietary excesses and limitations. These correlations, either alone or in combination, exert an influence on the metabolic abnormalities and risk factors that predispose to stone formation.

Thus, it is necessary to consider other versions of etiopathogenic mechanisms such as the intestinal absorption of stone salts, supersaturation of urine, inhibition and promotion of crystallization, microlith formation, endosymmetry of the urinary tracts, which are of identical or greater importance in etiology of urolithiasis. These indices, to a greater of less degree, determine the process of formation of most types of concrements that occur in the urinary tract.

Bladder stones

The composition of concrements can vary widely depending on the geographic conditions, but calcium stones or combined ones are the most common type.

The overwhelming majority among calcium stones belongs to calcium-oxalic stones and less — to calcium-phosphatic compounds. It is known that 70–85% of patients with stones suffer from **calcium-oxalic nephrolithiasis**. Thus, for example, the "infection" stones occur approximately in 3–15% of cases, uric and urate concrements occur at the rate of 2–18%, cystine stones — in 1–2% of patients in European countries. In addition to the crystalline component study it is necessary to identify a matrix fraction, which in calcium stones contains several macromolecular substances selectively influencing on the crystalline material of the stone.

Calcium stones. It is known that the initial steps in stone formation take place in a nephron, so nucleation of calcium-phosphates occurs in the distal tubule, while nucleation of calcium oc-

curs in the collecting duct. The both processes occur in the unstable supersaturation and are facilitated by "promoters", such as the fragments of cell membranes, phospholipids, other fragmentary components and macromolecules, which occur in the urine. The abnormally low concentration or insufficient functional activity of inhibitors of growth and aggregation in addition to a high supersaturation can be a reason for development of large crystalline aggregates of both calcium oxalates and calcium phosphates. The formation of large aggregated crystal masses is an important feature that distinguishes stone formers from practically healthy people.

The toxic effect of oxalate crystal, calcium oxalates, and other injurious agents, still not enough studied, that might disturb the function of tubular epithelium and cause both reduced production of inhibiting macromolecular compounds and increased excretion of cell degradation promoting factors. Probably, the partial or complete indissolubility of calcium phosphates crystals at low pH of urine in the collecting tubule might result in a heterogenic nucleation of calcium oxalates, nevertheless there are no convincing evidence obtained.

For development of a concrement, the crystal material should be retained somehow. In this respect an interaction between the epithelial cell of the tubule and the crystal is of great importance, thereby the crystal is either internalized by a tubular cell or migrates to the intercellular interstitial position. Further on, crystals often return to the basal-lateral part of the tubular cell. At the same time with existing growth and agglomeration, the cell-crystal interaction is neutralized by various agents, such as nephrocalcin, heparan sulphate, citrate and osteopontin which are adsorbed on the crystal surface as well as by the glycocalcial layer covering the tubular cells. Crystals internalized by a tubular cell may be degraded through intracellular mechanisms, the operating principles of which are not absolutely clear understood.

Under certain conditions, the crystal masses that were moving to the interstitial layer before, now can move towards the renal papilla base or its tip where they go out onto the surface of epithelium and appear under the conditions required for the stone formation.

Intratubular formation of crystal aggregates, usually calcium oxalates, may form obstruction in the lumen of the collecting tubule, particularly in its slit-like opening of the renal papillary tip.

It is worth mentioning a number of favourable factors related to a pathological calcium salt crystallization. Thus, a high excretion of calcium increases the risk of calcium phosphates precipitation, thereby in a greater degree than that of calcium oxalates. Further on formation of salt crystals is facilitated as a result of increase in oxalate concentration in the urine. Since high urine pH disintegrates calcium phosphates precipitation, low urine pH theoretically may induce calcium oxalates nucleation at calcium phosphates dissolubility. Reduction of urine pH also may result in transformation of Tamm—Horsfall protein from an aggregation inhibitor to its promotion at simultaneous involvement of calcium and citrate to this process. Its low excretion with urine later can reduce calcium oxalates and calcium phosphates dissolubility, reduce activity of inhibition of growth and aggregation of these salts and counteract the protective reactions of the tubular cell with respect to calcium oxalates crystals.

Brushite stones. According to their composition, these concrements are referred to calcium-pyrophosphate. Their crystalline phase is represented by calcium phosphate, the determining role of which is not quite well understood. The feature of these concrements is in their extremely high rate of recurrence in patients with urolithiasis.

Urate concrements. The precipitation of urine acid salts occurs in the urine in case of its hypersaturation. The process of lithogenesis is determined with high urate concentration (as a consequence of high excretion of these salts, as well as in connection with an abatement of diuresis) and decrease of urine pH.

Cystine stones. Cystine is a poorly soluble amino acid that is excreted in urine in patients with a defect in calcium reabsorption of such amino acids as cystine, lysine, arginine and ornithine. The concentration of cystine does not exceed its solubility except in homozygous cystinuria.

Infection stones. The dominant constituents of infection stones are magnesium ammonium phosphate and carbonate apatite. The most important prerequisite for precipitation of these salts is the presence of urease-producing microorganisms, the activity of which results in a high urine pH to create conditions for ammonium and carbonate depositing. The crystallization occurs in a matrix gel secreted by the urothelium as a result of the inflammatory reaction caused by the infection and the ammonium ions. It should be no-

ted that the risk of carbonate apatite precipitation increases in the presence of hypercalcuria.

Ammonium-urate stones. Infection of the urinary tract with urease-producing bacteria with a high concentration of urates may result in formation of ammonium urate stones. This stone type also has been observed in patients with laxative abuse.

Secondarily infected stones. These stones which most commonly are composed of calcium oxalates or calcium phosphates, have been secondarily infected, as a result of various manipulation or surgery in the urinary tract. The difficulties in eradicating the infection in the presence of stone material reflect the clinical problem of this type of stones.

Stones in ureters. According to their genesis, these concrements are practically always mixed stones of the kidneys. They are different in their shape and size. More often there are solitary stones, but there may be two, three and more in one ureter. The stone most often is retarded at the sites of physiological stricture of the ureter: in outlet from the renal pelvis, when crossing iliac vessels, in paravesical and intramural areas.

Pathologic anatomy. The morphologic changes in the kidney in case of the nephrolithiasis depend on the stone location, on its size and shape, on specific anatomy of the kidneys. The morphologic changes in the kidney are specified mainly by the inflammatory process in it. Rather often the stones appear on the background of the existing pyelonephritis which is aggravated with time as a disorder in the urine excretion caused by the stone.

Still even in case of "aceptic" stones the morphologic changes in the kidney parenchyma are sufficiently distinctive. Absence of infection in the urine under the bacteriologic study does not mean absence of inflammatory alterations in the kidney which have a nature of interstitial nephritis in these cases; dilatation of urinary tubules and glomerules, phenomena of endarteritis, proliferation of interstitial connective tissue, especially around the tubules. In case of a progress in the changes described, gradually the renal tissue becomes an atrophic one.

The recent histochemical studies and studies under electronic microscopes show that the renal tissues in case of nephrolithiasis, as well as the interstitial renal tissues and the basal membranes of the glomerular capillaries accumulate excessive amount of glycoproteids, mucopolysaccharides, with a hyaluronic acid included.

The sclerosis and the tissue atrophy, starting in the renal pelvis, pass to the interstitial renal tissue, thus resulting in a gradual destruction of the functional elements of the renal parenchyma and its simultaneous liporeplacement.

The essential components of the morphological changes in the kidney in case of an "aceptic" nephrolithiasis are an outcome of a disorder in urine outflow caused by a stone.

In case of "infected" stones, i.e. calculous pyelonephritis, the inflammatory process is spread from the cerebral to cortical layer. The focal inflammatory infiltrates and suppurations in the interstitial renal tissue result in further cicatrization followed by the atrophy of tubules and then that of glomerules.

A chronic calculous pyelonephritis may be a cause of a suppurative fusion of the renal tissue (pyonephrosis). The inflammatory process gradually involves papillae (necrotic papillitis), then — deeper areas of the renal pyramids. In the parenchyma the abscesses occur and fuse with each other, the capsule is suppurated and grows into the surrounding fatty tissue. Sometimes the renal parenchyma may be damaged, thus involving the paranephral fat into the inflammatory process.

The morphological changes in the renal pelvis and ureter in case of "aceptic" stones that obstruct urinary outflow involve loosening of the mucosa, submucosal hemorrhage and hypertrophy of the muscle wall. In the course of time, atrophy of muscular fibres of the pelvis and ureter, as well as that of their nervous elements will develop, the lymph and blood flow will be affected and the tonus will be reduced. The pelvis is dilatated, the ureter is transformed into a dilatated atonic connective tube, sometimes 2–4 cm in diameter (ureterohydronephrosis). In the presence of any infection, inflammation is developing in the renal pelvis and ureter walls. Gradually the process involves the surrounding adipose tissue; peripyelitis, periureteritis and pedunculitis develop, the ureter became sclerosed and of low motion. On the site of the ureter stone a stricture, decubitis may occur and they may result even in wall perforation.

Clinical picture. The most characteristic symptom of the renal stone disease is pain in the lumbar region, which has a spasmodic nature (renal colic). Hematuria, pyuria, dysuria are also observed, as well as self-passage of stones and (seldom) obstructive anuria.

Pain in case of the renal stone disease may be steady or intermittent, dull or acute. Localization and irradiation of pain depends

on the stone location (Fig. 31; see col. suppl. sheet). Large stones in pelvic and coral-like renal stones are stationary, they cause dull pain in the lumbar region. Absence of painful sensation in case of renal stones is rare. The renal stone disease is characterized with relationship between pain and motion, jolty journey and so on. Pain in the lumbar region often irradiates along the ureter, into the iliac region. While the stone moves down the ureter, the pain irradiation alters gradually, pain began spreading down to the inguinal region, to the femur, testicle and the glans penis in men and in the pudendal lips in women.

The most characteristic symptom of renal and ureteric stones is acute spasmodic pain — renal colic. The reason for the renal colic occurrence is abrupt occlusion in the urinary outflow caused by obstruction of the upper urinary tract with a stone. Abnormality in the urinary outflow results in overflow of the renal pelvis with urine, increase of the intrapelvic pressure; in its turn it results in irritation of sensitive nerve receptors in porta renis and the fibrous renal capsule. The pain grows due to disorder in microcirculation in the kidney and developing hypoxia of the renal tissue and nerve endings of the kidney innervating plexuses.

The attack of the renal colic caused by a stone occurs all of a sudden, more often during or after physical tension, walking, jolty journey or vast water intake. Acute pain appears in the lumbar region and in the hypochondrium and often irradiates to the respective part of the abdomen. Patients change their position all the time, rather often they groan and even scream. Such characteristic patient's behavior often allows to diagnose "at a distance". Sometimes the pain lasts for several hours and even for some days, with intermittent lessening. After acute pain, nausea, vomiting, sometimes more frequent painful urination occur. Some patients have a reflex enteroparesis, retarded defecation, tension of muscles in the anterior abdominal wall.

Dysfunction of the gastrointestinal tract in case of renal colic can be explained by irritation of the posterior parietal peritoneum, adjacent to the anterior surface of the adipose capsule of the kidney and connections between the nervous plexuses of the kidney and the abdominal organs.

In case of the renal colic oliguria may be found, which is related both to the reduced function of the kidney occluded with a stone and to the increased dehydration due to vomiting. The renal colic

is also accompanied with weakness, xerostomia, headache, fever and other general symptoms.

During the objective general clinical examination of a patient with the renal colic there may be found a pronounced painfulness in the respective hypochondrium, muscle tension in the anterior abdominal wall in this region, an extremely positive Pasternatsky's symptom. Palpation of the renal region and percussion in the lumbar region for revealing the Pasternatsky's symptom in case of the renal colic should be performed very carefully, so as not to cause the steady increase of painful sensation.

With a stone in the ureter, palpation sometimes reveals the greatest painfulness not in the renal region, but in the underlying areas of the abdomen in the projection of the ureter region where the stone is located.

The attack of the renal colic may be accompanied with elevated temperature and growth of the blood leucocytosis, which is stipulated with pyelovenous and pyelotubular refluxes.

The renal colic caused by a small stone, as a rule is ended with its self-passage out. If the stone is not excreted, the renal colic may be recurrent.

Stone passage can be considered to be a pathognomic feature of the nephroureterolithiasis; almost always it is accompanied with a renal colic. Ability of a stone for self-passage depends mainly on its size and site, on the state of the tonus and urodynamics of the upper urinary tracts. With decrease of the tonus and reduced dynamics of renal pelvis and ureter emptying, passage of concrements becomes difficult or impossible, and retardation of the stone in the urinary tracts leads to further disorder in urodynamics.

Hematuria in the urolithiasis is found very often. It may be microscopic when 20–30 erythrocytes (erythrocyturia) are found in the urinary sediment, as well as a macroscopic one. The macroscopic hematuria stimulated with a renal or ureteric stone is always total. It is a result of rhexis in the thin-wall veins of the fornical plexuses caused by a rapid recovery of the urinary passage after abrupt increase of the intrapelvic pressure. In case of large stones the hematuria occurs after long-time walking or physical load, as a result of a trauma in fornical veins or their rhexis after abrupt intrapelvic venous hypertension.

Pyuria. The course of the disease in majority of patients (60–70%) who have renal or ureteric stones is complicated with accompanying infection, that aggravates the disease and worsens the di-

agnosis. The infection stimulated mostly with collibacillus, staphylococcus, streptococcus, Proteus vulgaris, is manifested as an acute or chronic pyelonephritis, ureteritis, pyonephrosis, therefore pyuria is a frequent symptom of the renal stone disease.

Dysuria depends on the stone location: the lower the stone in the ureter, the more it is manifested. Feelings to urination become almost continuous, when the stone is located in the intramural region of the ureter, which is caused by irritation of the bladder wall interoreceptors.

When examining a patient suffering from the unilateral nephroureterolithiasis, there may be found asymmetry in the lumbar region due to scoliosis and atrophy of muscles in the lumbar region of the opposite side. One can seldom palpate an affected kidney, but painfulness in palpation in the renal region and the Pasternatsky's symptom are often reported about. The ureteric stone is featured with painfulness in its projected area — in the iliac or inguinal region. Very rarely one can palpate a large stone in the perivesical region of the ureter in women through the anterior wall of the vagina.

Complications in nephrolithiasis

The most frequent complication in nephrolithiasis is an inflammatory process in the kidney, that may have an acute or chronic form. The favourable conditions for development of this complication in case of the renal stone disease are created as a result of a disorder in the urinary outflow caused by renal stones and especially by ureteric stones, increase of the intrapelvic and intracalical pressure, pelvic-renal reflux and disorders in the renal hemodynamics.

Acute pyelonephritis is found in almost half of the patients suffering from nephroureterolithiasis. Its clinical manifestation corresponds to acute secondary pyelonephritis. If the stone that occludes the urinary tracts is not removed and the antibacterial therapy under these conditions is not effective, the serous acute pyelonephritis will develop into a pustular (apostematous) form or into a renal carbuncle. The vast apostematous pyelonephritis or multiple renal carbuncles may result in a complete destruction of the renal parenchyma and in necessity of renal extirpation. Thus, the primary significance for favourable result of the organ-preserving

therapy is in in-time remedy of the urinary outflow from the kidney by this or that means.

Chronic calculous pyelonephritis represents a typical example of a chronic secondary pyelonephritis. If the stone that occludes urodynamics is not removed in time, the antibacterial therapy will not able to remove infection and to stop progressive inflammatory process in the renal parenchyma. Gradually the kidney becomes shrunken (nephrosclerosis) and its function will be reduced.

The chronic calculous pyelonephritis may also result in **calculous pyelonephrosis** — a suppurative fusion of the renal parenchyma, its transformation into a sac filled with stones, pus and products of tissue decay that is a source of acute intoxication of an organism. In case of pyonephrosis the renal function in practice is completely and irreversibly lost, and in this light the only possible method of treatment is nephrectomy. With stones that occlude the pelvic-ureteric segment or ureter, **calculous hydronephrosis** often develops as a complication — a typical example of the secondary hydronephrosis.

The chronic pyelonephritis, pyonephrosis and hydronephrosis on the base of the nephroureterolithiasis, in their turn, may result in one more complication — **nephrogenic arterial hypertension.**

The most severe complication of the nephroureterolithiasis is acute or chronic renal insufficiency. It develops in case of lesion of the both kidneys or one kidney (congenital or nephrectomy aftereffect).

Acute renal insufficiency (ARI) develops as a result of abrupt stone occlusion of the both ureters or the ureter of the only one kidney. The first symptoms of this complication are in acute pain in the region of both kidneys or the only one kidney, anuria or well manifested oliguria, then xerostomia occurs, nausea and vomiting, diarrhea and other symptoms of the acute renal insufficiency. If a proper treatment is not performed in time (removal of stones, drainage of the kidney), the patient's condition will be worsened, a symptomocomplex of uremia will develop (confused consciousness, dermal itching, uncontrolled vomiting, gastroenterocolitis, polyserositis, etc.) and fatal outcome happens.

Chronic renal insufficiency on the backgrounds of the nephroureterolithiasis develops in case of partial and gradually rising disorder in the urinary outflow from both kidneys or from the one left, thus, it is most often found in case of coral calculus or multiple renal stones. The disorder in urodynamics caused by stones re-

sults in progressive chronic pyelonephritis, shrinkage of the renal parenchyma, gradual still persistent reduction of its function. In its turn, it specifies alterations in homeostasis that are characteristic for chronic renal insufficiency: hyperazotemia, disorder in the electrolyte balance and acid-base balance. The only possible measure to prevent from development of the final stage of the chronic renal insufficiency in case of nephroureterolithiasis is in-time organ-preserving surgery.

Diagnosis. Nephroureterolithiasis is diagnosed mainly on the base of the patient's history and complaints. The most important of them are attacks of renal colic, especially recurrent ones, with dull pain in the lumbar region in the periods between the attacks, stone passage, haematuria, especially that one which occurs after the physical tension. Blood in the voided urine after the renal colic is a pathognomonic symptom of nephrolithiasis.

The general clinical methods of examination allow to reveal symptoms of lesion in the kidneys and urinary tracts (positive Pasternatsky's symptom, painfulness at palpation in the renal region or along the ureter, palpated kidney). The objective clinical signs of nephroureterolithiasis are not always pathognomic.

Blood test for patients with urolithiasis in the remission period shows few changes, but as for the time of the renal colic or the attack of pyelonephritis it shows leucocytosis, left leucocytes shift, toxic neutrophiles and raised ESR.

Urinalysis shows a small quantity of protein (0.3–0.3 g/L), single casts and salts. leucocyturia occurs in complication of nephrolithiasis with pyelonephritis.

Chromocytoscopy is of great significance in diagnosis of the renal stone disease. It allows to see a stone if it is "born" from the ureter into the bladder or to see the signs of its close location to the ostium (edema, hyperemia and loosen ostium ureteris). Rather often on the background of the normal bladder — mucosa salt deposits can be seen, as well as hemorrhage and inflammatory lesions in the circumference of the ostium ureteris of the affected kidney in case of persistent calculous pyelonephritis. Often cloudy urine is excreted from the ostium ureteris, and in pyelonephrosis thick pus is excreted as tooth paste from the tube. Chromocytoscopy allows (to some extent) to evaluate the renal function, as well as to establish partial or complete ureteric occlusion, that being especially important in differential recognition of the renal colic. In the latter case as a rule, urination marked with indigo-carmine is

not observed for 10–12 min from the ostium ureteris of the affected kidney. Absence of indigo-carmine excretion for the time between the pain attacks may show considerable destructive or atrophic alterations in the renal parenchyma that affect severely its function (hydronephrosis, pyonehrosis, purulent pyelonephritis). With coral-like renal stones that affect its function, indigo-carmine is excreted poorly and with delay in the majority of cases.

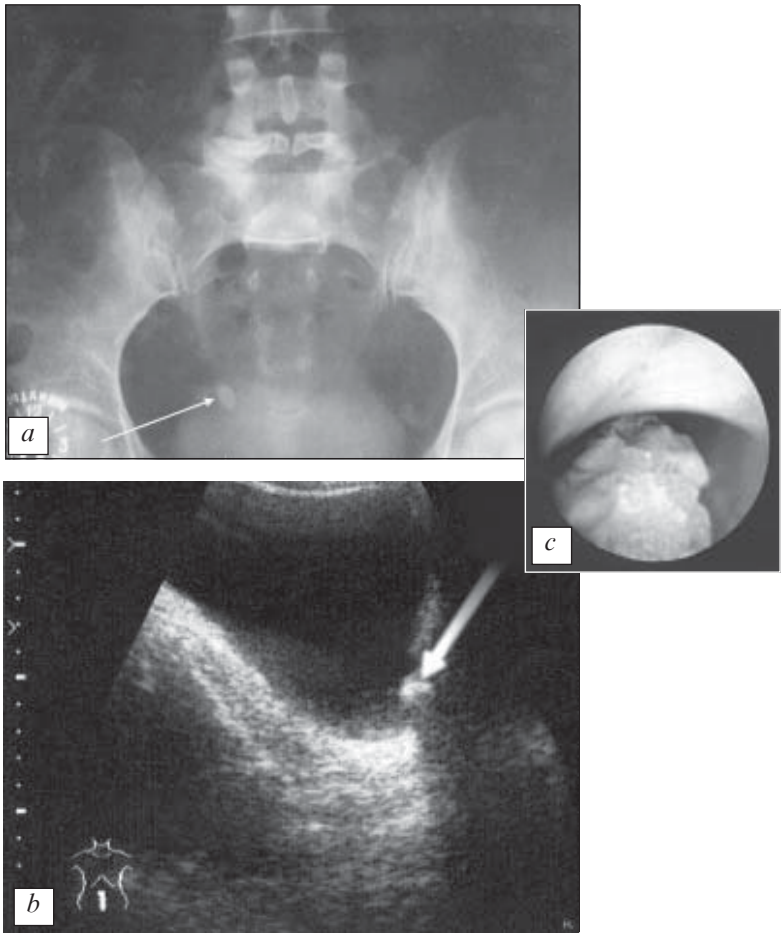


Fig. 32. Stones in the urinary tracts: *a* — X-ray contrast concrement in the lower third part of the urethra (survey urogram); *b* — echo-positive stone of the ureter ostium (US); *c* — endoscopic picture of the same stone (ureteroscopy)

X-ray-examination (Fig. 32) takes the leading position in recognition of renal and ureteric stones. The method practiced on a large scale is a surveying urography. It allows to determine the size and shape of a stone, as well as its approximate localization (Fig. 32–34).

The survey urogram should cover the whole region of the kidneys and urinary tracts from the both sides. Not all the stones cast a shadow on the picture. The chemical composition of the stones, their size and localization are extremely variable. Oxalates and phosphates contain elements with a high atomic mass and cast an intensive shadow. In 10% of cases the stones on the survey radiogram are not seen (urates, cystines and xanthines), since their density with respect to the X-rays is close to density of soft tissues (X-ray negative stones). With abnormality in development of the urinary tracts the shadow of a stone in the survey picture may be found beyond common localization of the kidneys and ureters.

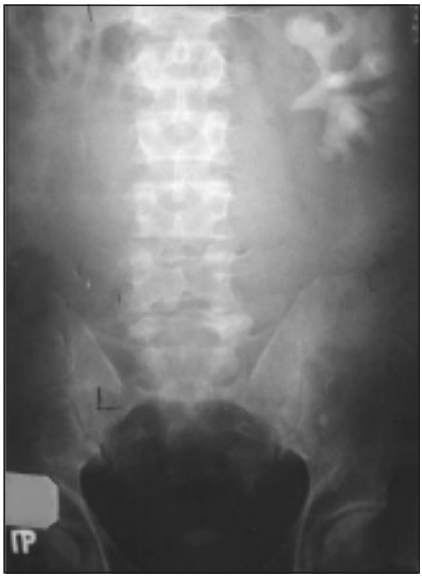


Fig. 33. Coral-like stone in the left kidney

Fig. 34. Stones of the urinary bladder

One should keep in mind that the shadow suspected for a renal or ureteric stone may belong to a foreign body, a petrified lymph node, a stone in the gallbladder and so on. In the small pelvis projection some rounded shadows are often seen — phlebolites that look like a stone. Their feature is true round clear contours and lightening in the centre. Basing on the surveying urography, one may diagnose coral-like renal stones (see fig. 31), which are a copy of the calyx-pelvis system and they give a dense shadow in

the region of kidney projection, except X-ray negative stones.

After performing the radioscopy of the urinary tracts the excretory urography should be performed. According to its results, one can say whether the shadow seen in the picture is referred to the urinary tracts. The excretory urography allows to clarify the anatomic and functional state of the kidneys, to determinate the type of the pelvis (intrarenal or extrarenal) and localization of the stone (in the pelvis, calyx or ureter). In those cases when the stone affects the urine outflow, the excretory urograms show changes in the calyx-pelvis system (hydrocalicosis, pyeloectasis). Usually a shadow of the stone is seen in the pictures on the background of the X-ray contrast substance. If the stone occludes the ureter, the contrast substance is located above the stone in the dilatated ureter as if it "points" to the stone. With an X-ray negative stone, on the background of the radiographic contrast substance a filling defect is seen that corresponds to the stone. As a rule, the excretory urography gives a complete presentation on a functional ability of the kidney, still after the attack of the renal colic the kidney is in the state of a blockade and it does not function for some time. When examining the functional ability of such a kidney, the isotopic methods of examination render a great assistance. They allow to establish that in majority of cases the blocked "blind" kidney retains its functional ability and the irreversible changes in the tubule mechanism are absent.

The retrograde pyelography with a liquid X-ray contrast substance or with oxygen (pneumopyelography) is performed only in cases when there are some doubts in the diagnosis or the shadow of the stone is not seen (in case of X-ray negative stone). Such a stone on the retrograde pyelogram with liquid X-ray contrast substance is revealed as a filling defect. Rather often after the retrograde pyelography a stone is impregnated with X-ray contrast substance and becomes clearly seen in the survey picture.

In retrograde pyelography with gas substances (oxygen or carbonate gas) the X-ray negative stone in the pelvis or calyx is revealed on the gas background as a clear shadow.

Differential diagnosis. Differentiation of the renal colic usually does not present any difficulty. Still in 25% of patients it is atypical (pain is spread along the whole abdomen, irradiates to the epigastric region, shoulder blade, shoulder, etc.). In these cases it is necessary to know the main symptoms of a number of acute oper-

ative diseases in the abdominal organs for correct differentiation between them and the renal colic.

In acute appendicitis the disease develops gradually, it starts with temperature raising and with pain in the epigastrial, then in iliac regions, with nausea and vomiting. Its feature is in quiet patient's behaviour and position on the right side or on the back. Motion aggravates pain. The pulse is frequent, Rovsing's and Shchetkin—Blumberg's symptoms are revealed. The blood leucocytosis is usually high, with left leucocytes shift.

The acute cholecystitis causes violent pain in the right-side hypochondrium, the pain occurs abruptly, irradiates into the right-side supraclavicular fossa (phrenicus-symptom), to the right-side shoulder blade and back. The pain as a rule occurs as a result of unprotecting diet. The temperature is raised, sclera and skin often become yellow. There is tension in muscles of the anterior abdominal wall, mostly from the right side. The gallbladder is increased, its palpation is painful. There is leucocytosis in the blood.

Perforating gastric or duodenal ulcer is manifested in violent "piercing" pain in the epigastric region, that occurs all of a sudden at the moment of perforation. Gastric and intestinal content delivery to the abdomen results in peritonitis. The patient lies motionless, the abdominal wall is under tension like a board. When percussing the abdomen, thympanitis is to be differentiated in the region of the renal dullness. When X-ray the abdomen, gas is to be differentiated under the dome of the diaphragm, as a sickle.

The acute small intestinal obstruction (ileus) occurs abruptly with violent spasmodic pain in the abdomen, retardation of defecation and gases, abdominal distention and vomiting. A probability of the reflectory enteroparesis in renal colic makes the differential diagnosis difficult and for it special methods of examination are required: chromocystoscopy, excretory urography.

Large intestine obstruction develops more gradually, pain in the abdomen is not so violent, and it makes differential diagnosis not so difficult.

Acute pancreatitis is manifested with violent pain in the epigastric region, it irradiates into the back, shoulder, hypochondrium and rapidly becomes girdle pain. Peritoneal phenomena and vomiting are often found. The total condition of the patient is critical but the temperature is normal. Content of diastase in the blood and urine is raised.

The ectopic pregnancy is characterized with persistent pain in the lower part of the abdomen, position on the back with legs bended, symptoms of irritation of the peritoneum and a picture of internal hemorrhage.

Treatment. Since many problems of etiology and pathogenesis of the renal stone disease up to the present time are not solved, surgial removal of the stone from the kidney does not mean patient's recovery. In this connection the conservative treatment is widely used, since it is directed towards eradication of painful sensation and the inflammatory process, prevention from recurrence and complications of the disease. There exist many drugs that stimulate spontaneous passage of stones. For the recent years the drugs are practiced that stimulate stone dissolution.

The conservative treatment can be used mainly in cases when a stone does not affect urinary outflow, does not cause hydronephrotic transformation or shrinkage of the kidney as a result of the inflammatory process, for instance, with presence of small stones in the renal calices. The conservative treatment is also performed in case of contraindications to the operative treatment of nephroureterolithiasis.

The conservative treatment consists of general health-strengthening measures, diet, medical treatment and sanitation measures. The rational diet renders assistance in recovery of normal metabolism and retaining homeostasis. It is prescribed in dependence on the type of the electrolytic misbalance. With uraturia and formation of urates, it is necessary to limit intake of products that stimulate formation of uric acid (brains, kidneys, liver, meat broth, etc.) With phosphaturia and phosphates the urine has an alkaline reaction. These patients need a diet with a less intake of calcium with food, to stimulate oxidation of urine. Mainly meat is prescribed, with no milk, vegetables and fruits. In addition to meat, it is recommended to eat fish, lard, starchy foods, vegetable oil. With oxalates, intake of oxalic acid should be limited, lettuce, spinach and sorrel should be excluded, consumption of potatoes, carrots and milk should be diminished.

Sanatorium treatment is of not less importance in the combined treatment of patients with urolithiasis. Still, it is necessary to be careful in prescription of mineral waters, since their excessive intake may worsen the course of the disease. Mineral waters may give a rise to diuresis, they may change urinary pH, its electrolytic balance and acid-base balance. The sanatorium treatment is

worth to be recommended after stone passage out or after its surgial removal in case of satisfactory renal function and sufficient dynamics in emptying of the pelvis and ureter.

For patients with uric acid diathesis it is recommended to go to health resorts with alkaline mineral water (Essentuki N4, N17, Smirnovskaya, Slavyanovskaya, Borzhomi). Patients with oxaluria are prescribed with lightly mineralized water (Essentuki N20, Naphtusya, Sairme). With phosphaturia it is worth to intake mineral water that stimulates oxidation of urine (dolomite Narzan, Naphtusya, Arzni).

Medicamental treatment for patients with the renal stone disease is directed towards activation of urodynamics in case of small pelvic or ureteric stones, so as to achieve their self-passage out, towards struggle against infection and towards dissolution of stones. With stones that have a tendency to self-passage, one should prescribe drugs from the terpene group (Cystenal, Artemizole, Enatin, Avisan, etc.), that have bacteriostatic, spasmolytic and sedative effect.

A special position in treatment of nephroureterolithiasis belongs to measures on stopping the renal colic. It is pertinent to start them with thermal procedures (hot water bag, hot water bath) in combination with analgetic or spasmolytic injections.

In those cases when the renal colic is accompanied with acute pyelonephritis, catheterization of the ureter should be performed in order to recover urinary passage. If it is managed to guide the catheter above the stone, the urine collected in the kidney will drop frequently along it and pain relief will be achieved.

The medicamentous agents used for a struggle against urinary infection play an important role in treatment of patients with nephroureterolithiasis. They are administered with the result of urinal inoculation and sensitivity of its microflora to antibiotics and other antibacterial agents taken into consideration.

Surgical treatment. The operation is the leading method for removing stones from the urinary tracts. Removal of the stone does not save the patient from urolithiasis, but at the same time it prevents from destruction of the renal parenchyma. In this connection, the surgical treatment has certain indications. The surgery is required in case if the stone causes pain that deprives the patient of working ability; in case of the urinary outflow that results in reduction of the renal function and in hydronephrotic transformation; in case of severe attacks of acute pyelonephritis; in case of haematuria.

Surgery on a patient's kidney with nephrolithiasis can be an organ-removing (nephrectomy) or organ-preserving (pyelolithotomy, nephrolithotomy, nephrectomy). Before the operation it is necessary to clarify presence of the second kidney and its functioning. On the day of the surgery it is necessary to take a test survey picture in two-three projections since stones often change their position. It is most pertinent to take a test picture just before the surgery on the operating table with the patient being placed into position for surgery on the kidney (position on the side, on a bolster, with lowered ends of the table for the head and legs).

The main stages in the pre-surgery preparation are active treatment of pyelonephritis and disintoxicational therapy — in case of renal insufficiency.

Achievements in surgery and anesthesiology allowed to use organ-preserving operations. The stones can be removed through an incision of the pelvis (pyelolithotomy), that of the calyx wall (calicothotomy) and renal parenchyma (nephrolithotomy).

The most widely spread is pyelolithotomy. Depending on which pelvic wall is incised, pyelolithotomy may be anterior, lower, posterior and upper one. Mostly the posterior pyelolithotomy is performed since the trunk renal vessels pass along the anterior surface.

Fig. 35. Electrohydraulic lithotripsy of the calyx of the kidney through a fibronephroscope

The size and localization of the renal stones are extremely variable. Each stone needs a special individual approach, and not all the stones may be removed by means of pyelolithotomy and caliolithotomy. The stones that are located deeply in the calices arid in the intrarenal pelvis sometimes may be removed by means of nephrolithotomy or electrohydraulic lythotripsy through a fibronephroscope (Fig. 35). In case of large coral-like stones with multiple processes in the calices and with a

thin parenchyma in some cases a "sectional" incision of the kidney is performed.

It is advisable to remove multiple stones from the calices by nephrotomy which is to be performed just above the stone. Rather often nephrolithotomy is combined with pyelolithotomy (pyelonephrolithotomy). Pyelolithotomy and nephrolithotomy are to be ended with renal drainage (pyelo- or nephropyelostomy) in those cases when there are doubts in removal of all small stones, when the operation was accompanied with hemorrhage and when it was performed in case of active inflammatory renal process. The multiple stones in calices that caused hydrocalicosis are to be removed by means of nephrectomy since urine is congested in the dilatated calyx in case of its poor drainage and it retains the inflammatory process.

In case of patient's poor condition, when stone obstruction in urinary outflow causes raised temperature up to 39–40°C, intoxication, septic condition, the ureteric catheter does not provide sufficient passage of pyuria from the kidney, and the critical condition of a patient does not allow to carry out operation on removal of a stone or stones in the full volume, a light operative intervention is recommended nephropyelostomy or pyelostomy aimed to saving of patient's life. The main aim of this surgery is to get the urine out of the kidney, its decapsulation and opening of abscesses; as for stone removal — it is admitted only in case when they are accessible and it does not affect duration and gravity of surgery.

At present the organ-preserving tendency is the leading one in the operations for treating patients with nephrolithiasis since nephrectomy does not eradicate the main disease and the stone often can be formed in the single kidney left. It is advisable to refuse from nephrectomy in young patients even in cases when the renal function is reduced greatly. A calculous pyonephrosis, hydronephrosis in the final stage, nephrogenic arterial hypertension may be indications to nephrectomy. The nephrectomy is indicated in case of a severe suppurative process in the kidney in older people since the postoperative period in weak patients after nephrectomy has much more favorable course than after the organ-preserving operation.

The percentage of stone formation recurrence after removal of aseptic stones is lower than that in calculous pyelonephritis.

Treatment of patients with ureteric stones

Treatment of patients with ureteric stones may be conservative, instrumental or surgical.

Conservative treatment is indicated in case with stones in the ureter, that do not cause violent pain, do not obstruct urinary outflow, do not result in hydroureteronephritis and have a tendency to pass out by themselves.

In 75–80% of cases the ureteric stones pass out themselves after conservative measures. Treatment is directed towards potentiation of the ureteric motility and eradication of its spasmodic contraction. Water loads, active regimen, intake of spasmolytic agents are recommended, in renal colic — the above said measures.

For *instrumental stone removal* from the ureter many various tools are provided — extractors where Zeiss' loop, Pashkovsky' loop and Dormia basket are the most popular (Fig. 36).

Zeiss loop is a ureteral catheter with a capronic thread passed through the lumen and going out from the end of the catheter and again entering into the lumen via a hole at a distance of 2–3 cm from the end of the catheter. With the thread being stretched, the tip of the catheter bends and forms a loop.

The Dormia extractor is a ureteral catheter with a rod in the lumen, that has a movable basket which straightens when going out of the catheter and contracts when entering back.

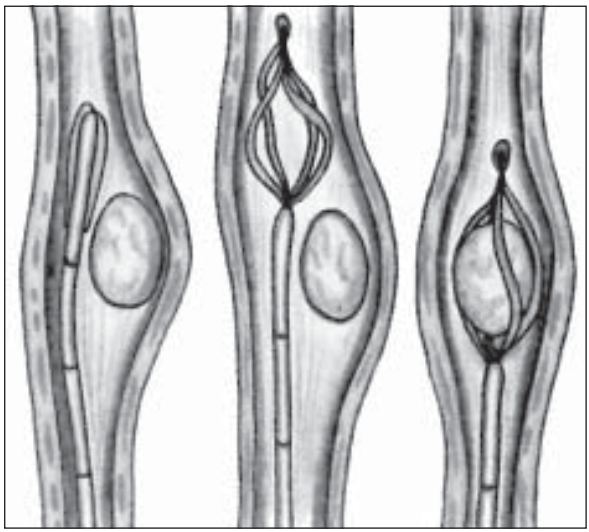


Fig. 36. Removal of a stone from the ureter by means of the universal Pashkovsky's extractor (a loop)

It is recommended to let the small stones located in the pelvic region of the ureter pass down. Before the manipulation a survey picture should be taken in order to localize the stone. A catheterization cystoscope is led into the bladder after injection of spasmolytic agents to the patient. The extractor is passed above the stone, the latter is caught and carefully is passed down under visual control. It is recommended to bring the stone down slowly since in contrary the ureter may be perforated or even torn away. If there is some difficulty in stone removal, the extractor should be left in the ureter for 3–4 days, with some small load (no more than 200 g) suspended to it. The extractor may be torn away and stay in the ureter and should be removed surgically.

Surgical treatment. The stone that locates in the intramural region of the ureter or in the ureterocele may be removed by endovesical incision (endovesicotomy) or by electrical incision of the *ostium ureteris*. If the stone protrudes from the ostium, it should be removed by means of the forceps of the operative cystoscope.

When the size of the stone does not allow to think of its self-passage, as well as in occurrence of symptoms of ureteric occlusion with a stone and development of acute pyelonephritis, surgical treatment is recommended — *ureterolythotomy*.

The surgery is also recommended in cases when the conservative therapy of ureteric stones is delayed, renal function is reduced and hydroureteronephrosis develops. In case of occlusive ureteric stones of the only kidney or that of the both ureters, the emergency operation is required, since stoppage in urinary outflow rapidly results in development of acute renal insufficiency. Stone removal operation on both ureters in case of satisfactory patient's condition may be carried out simultaneously from the both sides. It is expedient to carry out nephro- or pyelostomy instead of ureterolythotomy in critical patients with durable attack of pyelonephritis. In case of apostematous pyelonephritis it is necessary to perform a renal decapsulation and abscess opening. This policy improves the condition of the kidney and promotes a quick calming down of the inflammatory process. After eradication of the acute inflammatory process and improving the patient's condition and if the stone has not passed out by itself, the ureterolithotomy is to be carried out.

Modern methods, such as extracorporal shock-waved lithotripsy, percutaneous ultrasound lithotripsy, mechanic and electropneumatic cystolithotripsy (Fig. 37) are widely used nowadays.

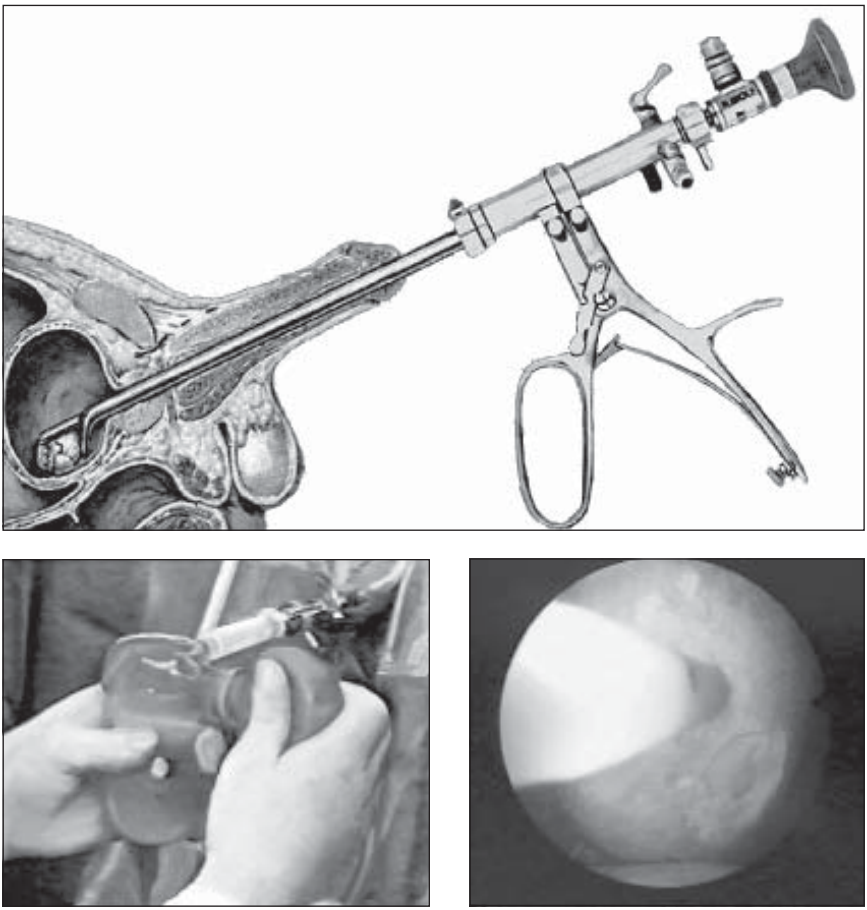


Fig. 37. Mechanical and electropneumatic transurethral cystolithotripsy

Prophylaxis and metaphylaxis (recurrence prevention) of urolithiasis are based on treatment of metabolic disorders that lead to stone formation, in-time treatment of chronic pyelonephritis and recovery of the abnormal passage of urine.

Dietotherapy is in limitation of intake of total amount of food consumed, fat and common salt. It is pertinent to exclude completely broths, chocolate, coffee, cocoa, fried and piquant food. In case of normal glomerular filtration it is recommended to intake liquid at least 1.5 L a day.

Treatment of hyperuricemia should be performed by suppressing formation of uric acid in an organism by means of enzymatic inhibitors (milurit, allopurinol). Reduction of uric acid level in blood may be achieved by administration of uricuretics (butadionbenzobromaron). In all cases it is necessary to maintain urinary pH at the level of 6.2–6.8 by intake of citrate mixtures (magurlit, blemaren, etc.) and sodium hydrocarbonate (cooking soda). The basic method used to reduce oxaluria is peroral intake of magnesium salts and pyridoxin, that reduce formation of oxalic acid and increase solubility of the calcium oxalate. In treatment of hypercalciuria it is often enough to limit calcium intake by excluding milk products from food. As for drugs, hypothiazid 0.015–0.025 g twice a day may be recommended. When treating with hypothiazid, it is necessary to increase potassium content in food by intaking dried fruits (dried apricots, raisins) 200 g a day or in addition of potassium chloride 2 g a day. Treatment should be performed under strict control of the electrolytic composition of plasma. Reduction of hypercalcemia in case of primary hyperparathyroidism is achieved by administration of thyrocalcitonin.

Prognosis in case of conservative treatment of nephrolythiasis is unfavourable, as a rule. The renal stone is gradually increased in size, it creates conditions for obstruction in urinary outflow, development and progression of pyelonephritis. In case of in-time surgical treatment the prognosis is favourable, still recurrence in stone formation always remains a certain threat, since nephrolythiasis is a disease of not only the kidney, but of the entire organism, so stone removal does not mean eradication of the disease. In order to prevent from recurrent stone formation it is recommended to carry out complex treatment described above (anti-inflammatory, dietary, etc.). In cases when it is managed to eradicate metabolic abnormalities, inflammatory process in the kidney, to maintain urinary pH at the required level, with a good passage of urine, no recurrence occurs for many years. The active pyelonephritis sustained by stable microorganisms (Proteus, blue pus bacillus), urinary obstruction, overcooling, gastrointestinal, gynecologic and some other diseases rapidly result in recurrence of stone formation in the kidney operated. Patients need long-time dispensary follow-up.

Lecture 6

TUMOURS OF THE KIDNEYS, URINARY TRACT AND TESTICLE

RENAL CELL CARCINOMA

The renal cell carcinoma (RCC) is a widespread oncologic disease, it accounts for 3% of all malignant neoplasms in adults. RCC accounts for 85% of all primary malignant tumours of the kidneys.

The etiology of RCC is not studied completely, the only evident risk factor is smoking. There is a higher risk of disease occurrence for patients with Von Hippel—Lindau disease, horseshoe kidneys, polycystic disease and acquired cysts of the kidneys accompanied with uremia.

The clinical symptoms of the disease at the early stages are very poor. The classic triad of the symptoms which are typical for RCC (pain, hematuria, palpated tumour) is the sign of a neglected illness and it may be found in 10–15% of patients. The most significant symptom is a monosymptomatic hematuria. This implies that every patient who wants to take a medical advice concerning a monosymptomatic hematuria, should be examined thoroughly in order to exclude a tumour of the kidneys and the urinary tract.

Patients with a metastatic lesion complain of ostealgia, dyspnea and hemoptysis. The disease may be manifested as paraneoplastic syndromes — erythrocytosis, hypercalcemia and hypertension. Sometimes the first symptom of the disease that causes a patient to see a doctor is a symptomatic varicocele on the affected side, which is connected with a tumoural invasion of vessels or a disorder in the venous blood circulation as a result of regional lymphadenitis.

The occurrence of varicocele, especially on the right side, in middle-aged persons also gives a suspicion to a tumour of the kidney. In this case varicocele in the majority of patients practically does not disappear with the patient's being in the horizontal position.

At pathological rupture of the kidney affected with cancer a retroperitoneal hematoma also can be estimated as a local symptom.

The special place in the clinical picture of the renal cell carcinoma is taken by symptoms of its metastatic spreading. It is explained by two moments: 1) a part of patients by the time of the diagnosis establishment have already had distant metastasing, and for the other part of patients the symptoms of metastasing are the first symptoms of the disease; 2) a feature of renal-cell carcinoma metastasing is their probable solitarity. The letter circumstance is especially important, for in many respects it determines surgical treatment policy, considerably expanding its possibilities.

The first manifestation of renal cell carcinoma metastasing to the lungs are usually cough and hemoptysis. In X-ray they have a spherical shape. Multiple metastases resemble a picture of inflammation of the lungs or tuberculosis.

The metastases of the renal cell carcinoma to bones are usually manifested with pain, often intensive one, which quite frequently is considered as a manifestation of radiculitis. As a result of metastases to the vertebral column, there may be developed a lower paraplegia with affection of the pelvic organs functioning. Some cases of pathological fractures at the site of renal-cell carcinoma metastasing to the shoulder, femoral bones, ribs are known.

The metastases to the liver are found quite often in case of the renal cell carcinoma. They do not manifest themselves usually as a clinical picture, the function of the liver may be not disturbed. In far-going stages of the renal-cell carcinoma the multiple metastases to the liver are manifested with jaundice.

The metastases to the brain are found rather seldom. One of the earliest symptoms is a persistent headache. The metastasis of the renal cell carcinoma to the brain can result in hemiplegia. The spreading to the spinal cord also may be found, but it occurs very seldom and, as a rule, is accompanied with pain, paresis and plegia of extremities.

Knowledge of symptomatology and clinical picture of renal cell carcinoma metastases is important, as quite often their solitary nature in each particular observation makes possible to carry out the surgical treatment.

Diagnosis. The examination of a patient with suspicion to RCC starts with ultrasonic investigation as the most informative (diagnostic significance reaches 95–100%) and low-invasive method of testing.

In case of the patient's appeal concerning a monosymptomatic hematuria the first thing to do is an endoscopic study in order to verify the source of bleeding.

The outbursts of blood from one ureteral orifice are a valuable symptom designating at once "an area of concern".

At ultrasonic investigation RCC has its own clear symptoms — it is a sizable formation bound with the kidney and frequently changing the structure of the pyelocaliceal system. Usually the inner structure is heterogeneous, the outlines are not distinct. The formation can be isoechogenic, hyperechogenic or hypoechogenic depending on the histological structure of the tumour. The up-to-date diagnostic instrumentation allows to diagnose a tumour with up to 1 cm in diameter, to make a differential diagnosis between a tumour and a simple cyst of the kidney. The possibilities of the ultrasonic diagnosis allow to determine RCC at the pre-clinical stage. Up to 50% of treated patients with RCC are found at the ultrasonic screening in the pre-clinical stage.

When revealing RCC, it is necessary to perform examination in order to determine a clinical stage of the disease and to prepare for a surgical method of treatment. The examination includes data acquisition on the history of the disease, physical study, clinical blood tests, renal and liver functioning tests, urine analysis, chest X-ray.

The most significant role for determination of the clinical stage of the disease is played by a computed tomography (CT) or nuclear magnetic resonance imaging (NMR) (Fig. 38).

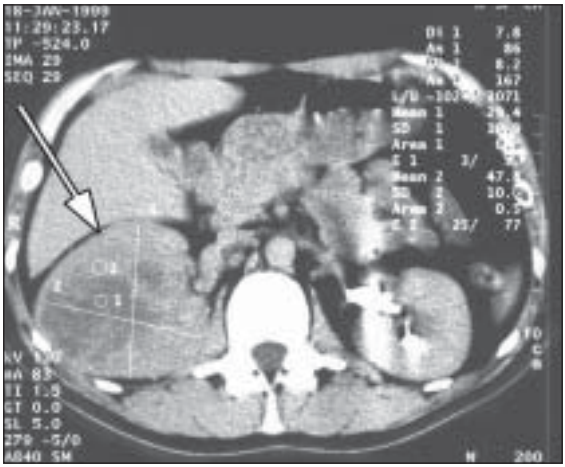


Fig. 38. Computed tomography of the tumour of the right kidney

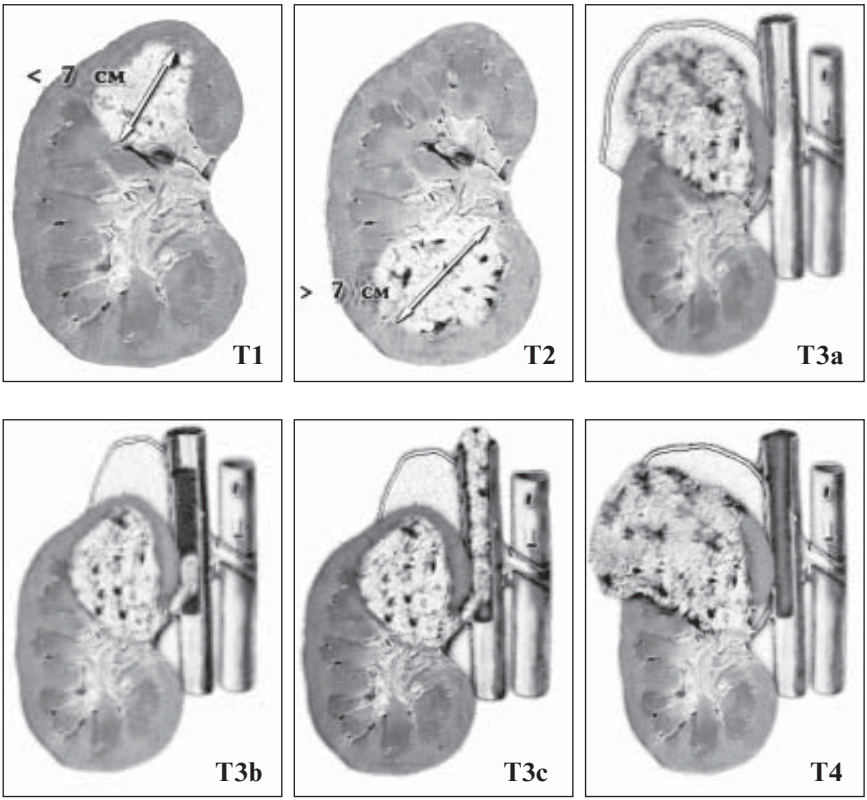
The CT or NMR are aimed to clarify the spread of the RCC within the organ and surrounding tissues, adjacent organs, availability or absence of the regional lymphadenitis, availability of a tumoural invasion into the renal vein or vena cava. In those cases when according to the CT data one suggests that there should be an invasion to the vena cava, it is necessary to carry out a lower contrast venocavography.

The renal angiography is required for the patients with a tumoural invasion to the vena cava or in case of necessity to perform nephrectomy at the NMR of the single kidney, as well as in case of expressed deficiency in functioning of the opposite kidney.

Stages of the renal cell carcinoma in TNM system
(Fig. 39)

T1 — a small tumour, a minimal change in the renal outlines;
T2 — a large tumour, changes in the renal outlines;
T3a— tumor spreading into the fatty tissue around the kidney;
T3b— Affection of the vena cava with a tumour;
T3c — subphrenic affection of the vena cava;
T4a— spreading to the adjoining structures;
T4b— affection of the vane cava superior;
N0 — lymph nodes are not affected;
N1 — one lymph node is affected;
N2 — lesion of many lymph nodes;
N3 — fixed lymph nodes;
M1 — distant metastases.

Treatment. A unique radical method to treat the RCC is surgical treatment. A radical nephrectomy is an operation of choice for patients with a localized unilateral RCC and a normally functioning kidney in the opposite side (Fig. 40 in the text and Fig. 41; 42 — see col. suppl. sheet). The radical nephrectomy includes removal of the entire kidney within the limits of the Gerota's fascia; the adrenal gland is to be removed too if the upper pole of the kidney is affected. The opinions on advantages of the regional lymphadenectomy are contradictory, the latter is performed more often in order to carry out intraoperative clarification of the stage of the disease. The radical nephrectomy should be performed with strict observance of the rules of oncology — ligation of main renal vessels



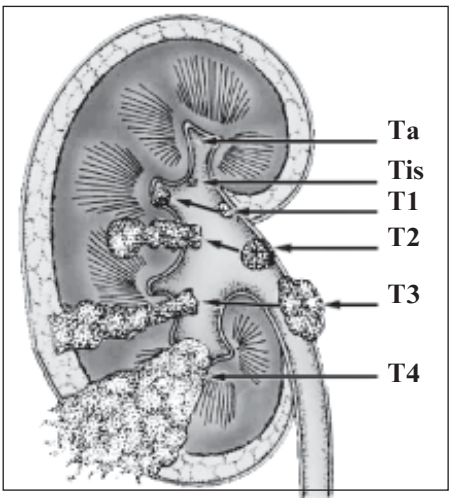


Fig. 39. Renal carcinoma. Tumor characteristics (category T)

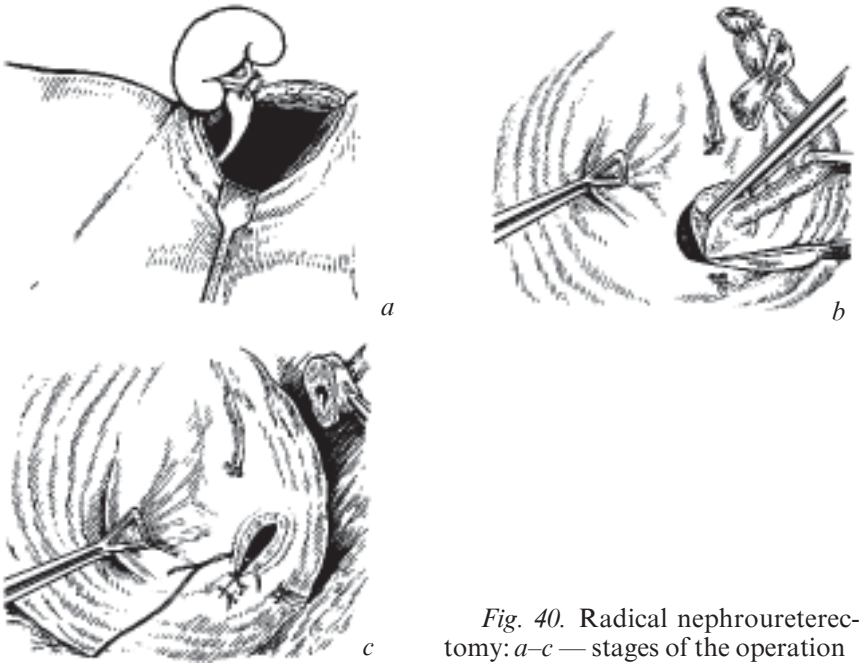


Fig. 40. Radical nephroureterectomy: *a–c* — stages of the operation

before separation of the tumour. With this purpose the most used approaches to the kidney are thoracoabdominal and transperitoneal ones, which allow to observe this most important rule.

Five years' survival rate for patients with T1, T2 accounts for 70–80%. With the pararenal fatty tissue involved to the process it is 60–70%, the renal vein — 50–60%, the vena cava — 40–50%, the regional lymph nodes — 5–20%, the adjoining organs — 0–5%, in case of distant metastases — 0–5%.

In patients with RCC metastases, the nephrectomy is a palliative treatment and it is applied in case of severe complications related to local manifestations. In some cases the alternative is embolization of the renal vessels.

At present, many urologists think that in case of considerably increased capabilities of anesthesiology and techniques of operations it is possible to have one opinion — in any case, when there is a chance to remove a tumour, it is necessary to operate. Removal of large tumours in patients with metastases is expedient due to the following reasons:

1. The nephrectomy eliminates aggravating symptoms of the disease and improves greatly the quality of life. As a rule, the pain and wasting chills cease, appetite appears.

2. The operation eliminates complications, related to the tumour lysis (bleeding, intoxication).

3. Removal of the basic mass of the tumour provides more favourable possibilities for consequent chemical and radiation therapy.

During the past decades in connection with a wide introduction of ultrasonic methods of testing into practice, there became possible a diagnosis of renal tumours in the early stages and a problem on applying the organ-preserving operations occurs. Among the organ-preserving operations the advantage is given to nephrectomy. Tumour enucleation is inadmissible from the oncologic point of view as it does not guarantee radicalization of operation.

At present while discussing this problem at the European congresses of urologists they came to the following agreement: a resection is possible in case of cancer of one kidney and the other one being healthy if the tumour is up to 3 cm in diameter. In case of a tumour within 3 to 5 cm in diameter, the operation is possible for patients with one kidney. If the diameter of the tumour exceeds 5 cm, the nephrectomy is not expedient.

In patients with single operable metastases the surgical treatment with removal of the primary and metastatic loci is justified. In these cases the 5-year survival rate makes up 30–35%. According to many existing techniques of treating metastatic RCC, removal of the primary tumour is required, still advantage of nephrectomy is not proved. Metastases are found approximately in one-third of patients during the primary diagnosis. Use of different hormonal and cytotoxic chemiopreparations as monotherapy and in different combinations gives a positive effect less than in 15% of cases. RCC is not responsive to radiation therapy, however this method can be applied as palliative one if there is a severe symptomatology conditioned by availability of metastases (for instance, metastases into the bones).

The hopeful results are obtained at applying an immunotherapy — with interferon and interleukin-2. The responsiveness in found in 30–40% of cases.

NEPHROBLASTOMA (WILMS' TUMOUR)

A nephroblastoma can be found predominantly in children's age within 2–5 years. At the same time a nephroblastoma affects both the newborns and elderly people (over 70 years). In occurrence of this tumour the great role is played by genetic factors. A nephroblastoma usually is unilateral, but in 5–8% of cases there may be found a bilateral affection.

In incipient states the clinical picture of the nephroblastoma is poor in symptoms. According to A. A. Durnov et al.'s data (1981), the change in behavior is found in 80% of patients, in disposition — in 76%, paleness of dermal integument — in 90%, raised temperature — in 60%, vomiting — in 12%, lost appetite — in 75%, losing of weight — in 76%, abdominal pain — in 46% of patients. Clinical symptoms of the disease grow in future. A tumour can be palpated in a child, which is the first sign of the disease manifestation. There is an extension of the hypodermic venous network of the belly. The patients begin feeling a troubling pain, the arterial pressure increases. The hematuria is found in 8–25 % of cases. The occurrence of metastases worsens the patient's condition and results in formation of new symptoms.

The most informative methods of diagnosing a nephroblastoma are ultrasonic and X-ray tests.

The anamnesis collected in the correct way, the results of objective study should attract physician's attention to the necessity of the kidneys to be tested.

The ultrasonic tomography in addition to its high informational contents, has also another essential advantage — this method is not invasive and it is harmless, which is especially important at examination of children. On echograms a tumour represents a heterogeneous formation with cyst-like areas.

The further clarification of the nature of the disease, estimation of the functional state of the both kidneys is related to an X-ray examination — an excretory urography. On the urogram one can see well the outlines of the kidneys, changes in the shape, availability of calyx-renal pelvis system deformation and defects in its filling, up to full absence of kidney functions, as well as one can estimate the condition of the opposite lying kidney.

X-ray computed tomography and especially nuclear magnetic resonance possess large diagnostic possibilities.

Treatment of patients with a nephroblastoma should be in complex and include in itself a combination of operative, radiation and medicinal methods. At first preoperative polychemotherapy is administered (Vincristin, Cyclophosphan, Adriamycin). The combination of these preparations allows to receive a positive outcome in 80% of patients. The main purpose of the preoperative chemotherapy is reduction of tumour and metastases sizes. The neoplasm is decreased by more than 50% and conditions for performing operations are considerably improved. The surgical intervention is the second stage of treatment. The nephrectomy is executed by a transperitoneal access. The kidney is removed as an integrated unit, together with pararenal and retroperitoneal tissues and affected lymph nodes.

The postoperative treatment depends on the finally established stage of the disease. In stage II four courses of chemotherapy are carried out. In stages II-b, III and IV they perform a radiation therapy on the bed of the removed kidney and metastases, as well as chemotherapy for 1.5–2.0 years.

The prognosis depends on diagnosing in time, on patient's age, the degree of differentiation of the nephroblastoma.

TRANSITIONAL CELL CARCINOMA OF THE RENAL PELVIS

The disease is found in 5–7% of all malignant neoplasms of the kidneys. Bilateral lesions are found seldom.

The transitional cell carcinoma (TCC) accounts for 3–4% of all oncourologic diseases. Approximately in 30–50% of patients with TCC of the renal pelvis a transitional cell carcinoma of the urinary bladder (Schmincke's tumour) develops.

The most frequent symptom of TCC is a monosymptomatic hematuria in 70–90% of cases. The pain in the lumbar area occurs in those patients for whom TCC is a reason of subrenal or intrarenal obstruction. For a part of patients TCC is manifested with hydronephrotic transformation of the kidney, and with addition of infection — with clinical symptoms of obstructive pyelonephritis.

In 5–10% of patients the disease is manifested as an irritating symptoms.

The algorithm of patients' examination with suspicion for TCC of the renal pelvis includes an intravenous urography, retrograde pyelography, selective cytological study of the upper urinary tracts.

When the excretory or retrograde pyelogram shows a defect in filling up, ultrasonography allows to distinguish between a tumour and a X-ray-negative concrement. The computed tomography by means of "thin sections", with introduction of the contrast substance or without it, is of great significance in the diagnosis.

If the studies performed leave some doubts in the diagnosis, the problem is to be solved finally when carrying out ureterorenoscopy with a biopsy.

Allocation of TCC of the renal pelvis in stages (TNM system)

TaTis — the tumour is circumscribed with a mucous membrane;
T1 — vegetation into the mucosal proper lamina *(Lamina propria)*;
T2 — vegetation to the muscle layer;
T3 — invasion into the renal parenchyma;
T4 — invasion into the neighboring organs;
N1 — invasion into the lymph nodes;
M1 — distant metastases.

For patients with a localized TCC of the renal pelvis and normal function of the other, opposite lying kidney, nephrureterectomy is a method of choice for treatment.

For patients with highly differentiated non-invasive TCC of the renal pelvis the five years' survival after nephrureterectomy accounts for 75–90%.

Patients need a long-term follow-up, with control endoscopic studies included, related to a probability of metastases implantation to the urinary bladder.

Patients with a metastatic widely-spread process receive chemotherapy, the radiation therapy is not usually effective.

BENIGN TUMOURS OF THE KIDNEYS

The benign tumours of the kidneys are found rarely, and they account for less than two percent of all renal tumours.

The renal adenomas first described by Bell represent small, less than 3 cm, dense tumours of the renal cortex, they are always

asymptomatic and are found occasionally. To distinguish an adenoma of the kidney and a nephrocellular carcinoma is clinically impossible.

Diagnosis. The differential diagnosis is possible only at a histological study.

Oncocytomas are benign tumours which are indistinguishable from nephrocellular carcinomas of a small size according to clinical and radiological results. They can manifest themselves by hematuria. Verification of the diagnosis is only histological.

Treatment of the disease is surgical — resection of the kidney, or nephrectomy.

The angiomyolipomas are benign tumours which may be solitary formations, and they are a symptom of a systemic disease — tuberous sclerosis. It is manifested by a characteristic triad: by lesion of the brain (retardation of mental development, epilepsy), affection of the skin — sebaceous adenoma, renal hamartomas.

The angiomyolipomas can be diagnosed by ultrasonic examination and computed tomography. As the tumours are multiple or solitary and they contain fatty tissue, at CT they are estimated according to Hounstield's scale in 40 points and less.

Treatment depends on the size of a tumour. The tumours under 4 cm do not need treatment. Patients should pass annual examination by sonography or CT. The tumours with the size more than 4 cm, with tendency to grow, are subject to embolization or surgical treatment. Methods of treatment should be nephrosaving.

There exist **renin-secreting tumours** of juxtaglomerular cells. They cannot be found by radiographic methods. Patients are subject to surgical treatment.

Among other benign tumours of the kidneys there are fibromas, myomas, lipomas, lymphangiomas, hemangiomas. They can be found by radiographic methods as sizable formations. Their differentiation from RCC in diagnosing by clinical and radiographic methods is impossible. In this connection they will be recognized by histological study after surgical removal.

TUMOURS OF THE URETER

Tumours of ureter are rather rare neoplasms of the urinary tract, they manifest themselves by hematuria and signs of subrenal obstruction, more often chronic, in an aspect of slow growth. The overwhelming majority of tumours are malignant and more often they

represent the transitional cell carcinoma (TCC). The squamous cell carcinoma can be found extremely rarely in case of chronic inflammation and infection.

Specific risk factors are analgetic abusing, papillary necrosis and "Balkan" nephropathy. Smoking is a risk factor for TCC progressing in all organs coated with urothelium.

The *diagnosis* is made by means of radiographic methods. On the excretory urography there may be seen a defect in filling up and signs of urodynamics disorders (hydronephrosis, ureterohydronephrosis) of different degree of manifestation. The retrograde ureteropyelography confirms persistence of the defect of filling. In doubtful cases the diagnosis is clarified by ureteropyeloscopy, biopsy.

The essential assistance in making a differential diagnosis of the X-ray-negative concrement and TCC of the ureter can be rendered by sonography and computed tomography "by thin sections" with "an area of concern" defined beforehand.

The standard method of ureter TCC treatment in case of a functionally valuable opposite kidney is nephrureterectomy, since TCC represents an urethelial disease of "field variations", characterized by the tendency towards polychronotropism (multiple recurrences in time and space).

In case of metastatic and locally spread forms of the disease a combined treatment (polychemotherapy, radiation therapy) is indicated.

CANCER OF THE URINARY BLADDER

The urinary bladder cancer (UDC) covered 50–70% of all urogenital malignancy and 4% of all oncologic pathology. It is common after the age of 50 years. Mails are affected more often than females. The tumour can be located in any part of the urinary bladder, but lateral walls of the bladder and the triangle zone are affected more often. Almost 97% of all tumours of the urinary bladder are papillary tumours and cancer. Different morphological structure stipulates different clinical course of this disease. Some epithelial tumours of the urinary bladder develops slowly and do not affect the general helth condition, others are aggressive and are characterized by fast growing, frequent recurrence and early occurrence of regional and distant metastases. The patients have intoxication, anemia, cachexia, pyelonephritis, renal failure, repeated secondary bladder bleeding.

TRANSITIONAL CELL CARCINOMA OF THE URINARY BLADDER

The transitional cell carcinoma of the urinary bladder is an often an oncourological disease, which takes the fourth place among all malignant neoplasms in men and the eighth one in women.

Among the risk factors there are evidently proved ones: age (the incidence is increased in the 7th decade of life), occupational contact with aniline dyes and aromatic amines, smoking (increases the risk of the disease occurrence twice as much), phenacetin abusing, treatment with cyclophosphamide. The transitional cell carcinoma is found in 90% of cases of all malignant neoplasms of the urinary bladder.

Bladder TCCs are subdivided into noninvasive (superficial) and invasive forms.

The noninvasive forms can be exophytic — they are papillary tumours that protrude into the lumen of the bladder, and squamous — usually carcinoma *in situ* which looks like a hyperemic velvety area composed of a low-differentiated TCC. The invasive tumours are characterized with a vegetation into the muscular layer, they are usually dense, with a solid area of growth.

Up-to-date international classification of bladder carcinomas

The classification is related only to cancer and it does not include papillomas. There should be a hystologic or cytologic confirmation of the diagnosis. T category is assigned on the basis of results of physical examination, X-ray and endoscopy; N category — according to results of physical examination; M category — according to results of physical examination and X-ray.

Regional lymph nodes are lymph nodes of the pelvis itself located beneath bifurcation of the common femoral arteries. Spreading of the tumour does not influence on assignment of categories.

TNM Clinical Staging

T — a primary tumour (Fig. 43).

Subscript *m* indicates multiplicity of the lesion; *is* may be added to category T in order to indicate a single tumour *in situ*.

Tx — a primary tumour which cannot be estimated;
T0 — there are no data on the primary tumour;
Ta — noninvasive papillary tumour;
Tis — a carcinoma *in situ*;
T1 — the tumour is spread to the subepithelial connective tissue;
T2 — invasion of the tumour to the muscular layer;
T2a — invasion to the upper layers of muscles (the internal half);
T2b — invasion into deep muscular layers;
T3 — the tumour is invaded to the paravesical fat;
T3a — the tumour is determined under the microscope;
T3b — the tumour is determined macroscopically (extravesical conglomerate);

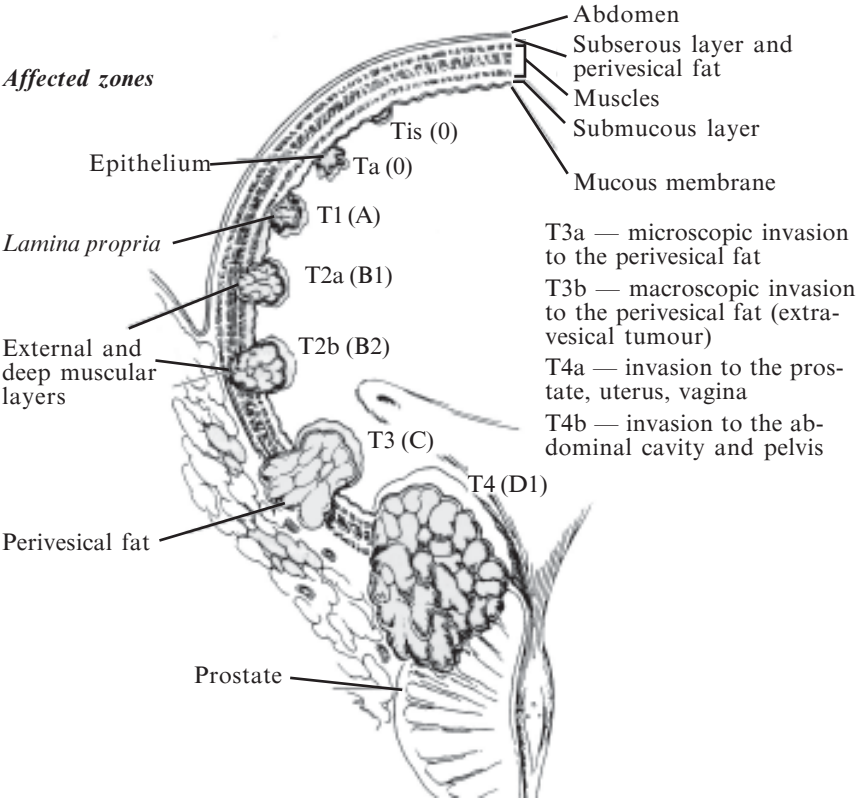


Fig. 43. Stages of bladder cancer

T4 — the tumour is invaded to any of the following organs: the prostate, the uterus, the vagina, the wall of the pelvis, the abdominal wall;
T4a — tumoural invasion to the prostate or uterus, or the vagina;
T4b — to the wall of the pelvis or to the abdominal wall;

N — *regional lymph nodes*
Nx — the regional lymph nodes which cannot be estimated;
N0 — there are no metastases in the regional lymph nodes;
N1 — there is a metastasis in one regional lymph node not exceeding 2 cm in size;
N2 — there is a metastasis in one regional lymph node ranging within 2–5 cm or there are multiple lymph nodes each not exceeding 5 cm
N3 — there are metastases to the regional lymph nodes exceeding 5 cm in size.

M — *distal metastases*
Mx — distal metastases which cannot be estimated;
M0 — there are no distal metastases;
M1 — distal metastases.

Pathoanatomic Staging by pTNM

Categories pT, pN, pM correspond to categories T, N and M.

G — *histopathologic gradation*
Gx — a degree of differentiation which cannot be estimated;
G1 — highly differentiated tumour;
G2 — moderately differentiated tumour;
G3–4 — poorly differentiated (nondifferentiated) tumour.

Grouping in Stages

Stage 0a	Ta	N0	M0
Stage 0is	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2a	N0	M0
	T2b	N0	M0
Stage III	T3a	N0	M0
Stage IV	T3b	N0	M0
Stage V	T4a	N0	M0
	T4b	N0	M0
	Any T	N1, 2, 3	M0
	Any T	Any N	M1

The most frequent *clinical symptom* of TCC is a monosymptomatic hematuria, especially in noninvasive tumours. Irritative symptoms are more characteristic for a diffuse carcinoma *in situ* and invasive cancer. At availability of the invasive growth with failure of urine outflow from the upper urinary tract the symptoms of obstructive nephropathy are added, and in case of infection added — those of the obstructive pyelonephritis and chronic renal insufficiency.

If there are distal metastases, the clinical picture corresponds to localization of metastases (ostealgia, radiculalgia, dyspnea, pneumorrhagia).

Approximately 70–75% of TCC are superficial noninvasive tumours when being diagnosed for the first time. Most highly differentiated tumours remain unchanged. However, many patients are inclined with the course of time to appearance of multiple recurrent tumours located in other areas of the urinary bladder. About 10–15% of noninvasive tumours, usually poorly differentiated ones, invade into the proper lamina of the mucous membrane and progress to muscle invasion.

Most invasive tumours are invasive by the moment of making a diagnosis, and about a half of them have concealed metastases.

Diagnosis. The basic method to diagnose TCC of the urinary bladder is an endoscopic study (cystoscopy with biopsy).

The excretory urography allows to estimate the condition of the upper urinary tract and functional state of the kidneys. The ultrasonic examination and computed tomography are indicated for clarification of the stage of the process in case of invasive forms of cancer.

Treatment. When determining the method of treatment for patients with bladder cancer, it is necessary to orient to the up-to-date conceptions which consider the urinary bladder cancer as a disease of the entire mucous wall, and to consider that the most part of patients with invasive cancer have already had micrometastases by the beginning of treatment. That dictates a necessity to effect onto the entire mucous membrane of the urinary bladder. Moreover, it is expedient to take problems of treatment in dependence on the stage of the disease.

"The golden standard" in treatment of the urinary bladder tumours in stage T0 and T1 (superficial cancer) is a transurethral electroresection (Fig. 44). Depending on the histological conclusion after operation the problem on necessity to apply local chemotherapy

Fig. 44. Resection of the urinary bladder tumour

or immunotherapy is to be solved.

The surgical treatment of invasive (T2–T4) forms of cancer requires the other approach. The same is referred to multifocal superficial affections, and also to cases when the tumour is located in the area of the neck of the urinary bladder or invades the prostate. (Fig. 45; see col. suppl. sheet)

At present the open cystectomy of the urinary bladder in case of large tumours practically is not applied in connection with low efficiency of cystectomy and high rate of recurrent tumours.

The cystectomy can be applied to the transitional cell carcinoma and it should be combined with pre- and postoperative radiation therapy. For the last years most specialists prefer cystectomies (Fig. 46) in treatment of the invasive forms of the urinary bladder cancer — T2–T4.

After cystectomy some problems arise with urine derivation. The least traumatic method of discharging the urine is ureterosigmoidostomy at which there is no necessity in draining.

However, at this method of urine discharging there often occur attacks of a pyelonephritis in connection with a higher pressure in the intestine as compared to the urinary tracts and with absence of effective antireflux protection. Another frequent complication of the ureterosigmoanastomosis is hyperchloremic acidosis. It is served as the basis in searching for other methods of urine derivation. Such a technique is in the Bricker's operation — application of ureters to the isolated part of the colon and leading out the stoma to the skin. The disadvantage of this operation is in availability of the stoma, which does not provide patients with a high quality of life.

During the last years techniques for performing a radical cystectomy with formation of an intestinal urinary bladder and recovery of arbitrary urination were elaborated.

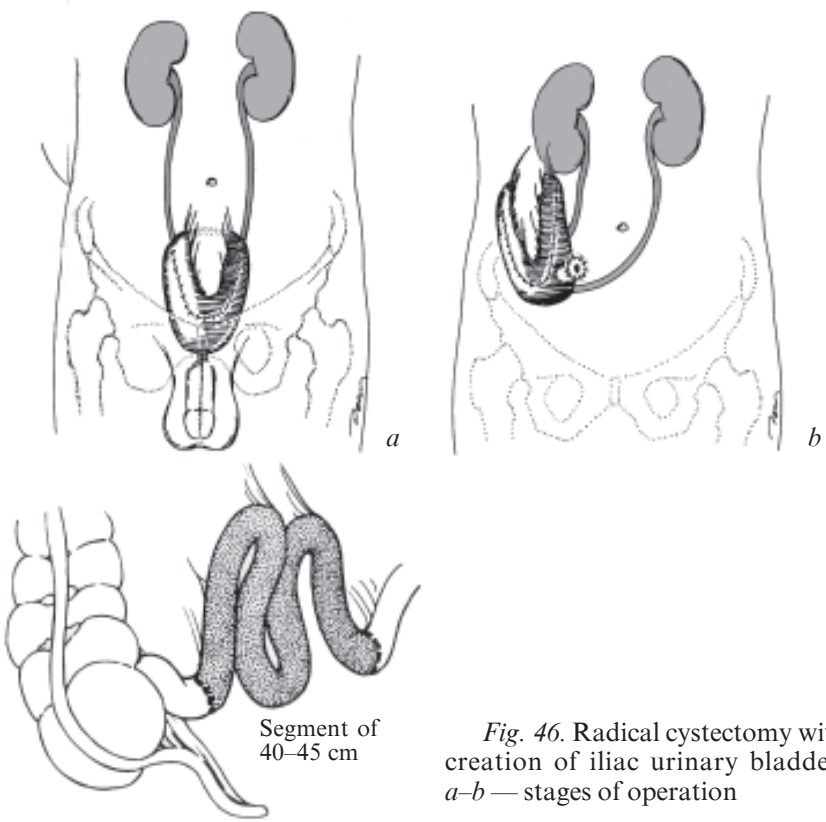


Fig. 46. Radical cystectomy with creation of iliac urinary bladder: *a–b* — stages of operation

There are many modifications directed to provision of a reliable mechanism for urine retention and creation of an intestinal reservoir (made of a thin or a thick one) with a low pressure.

Nowadays some interesting works appeared on usage of the ileocecal department of the intestine for creation of a retaining catheterized reservoir for the urine (Mainz pouch operation)

In the neglected stages of the urinary bladder cancer with massive bleedings and total lesions, a ligation of internal ileal arteries and supervesical urine derivation with the ureters being blocked, is a forced operation.

Treatment of the urinary bladder cancer is a combined one (operation, chemotherapy, immunotherapy, radial therapy).

In case of superficial cancer of the urinary bladder, instillation of Tio TEF, adriamycin, mitomycin are carried out after TUR.

For the past 10–15 years the intravesical immunotherapy with BCG vaccine has been widely used for treatment of superficial cancer of the urinary bladder. Nowadays it is considered a drug of choice.

The preventive application of BCG therapy after TUR allows to reduce considerably a number of relapses of this disease.

The best results have been obtained at administration of 120 mg of the vaccine into the bladder once a week for 6–8 weeks.

The BCG vaccine in case of intravesical administration has an expressed local and systemic toxicity, which is exhibited in appearance of dysuric phenomena, raised temperature, arthralgia, fluelike syndrome, etc.

Contraindications to usage of the BCG vaccine is tuberculosis in the past, a highly positive tuberculin test, allergic diseases, vesicoureteral reflux, ulcerous surfaces of the mucous membrane of the urinary bladder, high-gravity concomitant diseases.

In case of the superficial cancer of the urinary bladder, the radiation therapy is usually applied at T1 with the total dose of 50–70 Gy.

Cysplatin and Methotrexate are the most active drugs in case of the invasive cancer of the urinary bladder. Their efficiency in monochemotherapy reaches 30–37%.

Chemotherapy in case of the invasive cancer of the urinary bladder can be applied in several versions:

— preoperative;

— adjuvant (after operation);

— as a part of the integral strategy in combination with the radiation therapy;

— independent treatment.

Most authors who carry out a preoperative chemotherapy, report of its high effectiveness, a positive result in 35–70% of observations. As a result of the chemotherapy carried out, there are created possibilities of operative help of a smaller scope compared to cystectomy.

According to data obtained from the Oncologic Center of the Russian Medical Academy of Science, at present the following policy is conducted with respect to patients with a locally spread cancer of the urinary bladder. Treatment is started with 2 courses of

preoperative chemotherapy. If there is reduction of the tumour size for more than by 50%, two courses of chemotherapy more are to be conducted. If efficiency of 2 courses is less than 50%, further application of chemotherapy is inexpedient.

The postoperative chemotherapy is administered if there is a possibility to predict a high probability of recurrence after histological study of the removed material.

The radiation therapy of the invasive cancer of the urinary bladder is applied as an independent method of treatment, as well as in combination with an operation or chemotherapy.

The indication to a radical course of the radiation therapy as a rule is impossibility to perform a radical operative intervention due to localization of the process, severe concomitant diseases.

A complete regression of the tumour is reached in a part of patients, for others conditions for cystectomy are formed.

For the last 4–5 years a lot of papers have been published which informed about positive results of combined usage of chemo- and radiation therapy. The complete tumour regression rate amounts to 70%.

Regardless of the methods used in patients' treatment cystoscopy should be made every 3 months for 2 years, then once in half a year for 2 years and then once a year.

The main method of treatment is surgical intervention though we can't utilize only the surgical method. Resection of the bladder is not a radical operation and should be performed only with preoperative radiation with large fractions.

The preoperative radiation is used for deviation of the tumour cells and according to the Russian Oncologic Research Centre named after M. M. Blokhin (RORC) causes twice decreased rate of recurrences (18% vs 36%). In cancer of the bladder (CB) indications for surgery are absolute. Various surgical interventions are applied. As a rule, according to the principles of oncological radicalism the whole organ should be resected. The stages of the disease and CB localization are significant for choosing a method and scope of the surgical intervention.

In I stage when the tumour does not involve muscular layers of the bladder wall the *bladder TUR* is successfully performed. It is obligatory to give large fraction radiation therapy before the operation — distance telegammatherapy (TGT) with total radiation focal dose (TRFD) of 20 Gy.

Lately TUR has been performed in different modifications:
— under photodynamic control;
— with laser destruction of the tumour;
— with electrovaporization.

It allows to enhance TUR radicalism. However, according to the materials of the 14th Congress of EAU (1999) the number of indications for TUR has decreased. In presence of low differentiated superficial CB T1N0M0G3 early cystectomy is a method of choice and effects directly the life duration.

The wide application of the *bladder resection* in our country is unjustified. We distinguish segmental resection, hemiresection with ureterocystoneostomy or without it. There is no need to stop on the bladder resection in detail as this operation is palliative and does not meet the requirements of oncological radicalism. For treatment of patients with CB in the leading clinics in France, Germany, Italy and Spain TUR of the bladder is used in I stage and radical cystectomy — in II–III stages.

Such oncological radicalism is well proved by the results of studies made in RORC: it is established that CB exerts marked inductive influence on the bladder mucous membrane left after surgery, and areas of epithelial dysplasia develop at quite remote distance from the removed focus of tumour up to IV stage, i.e. obligate precancer. There are foci in the mucous membrane that may give rise to CB even under the conditions of applying the most radical organ-saving techniques of surgery.

Cystectomy is the only radical operation in treatment of patients with CB, however, many urologists in our country show restraint to it, considering it unsafe to patients' life as even in good performance it has severe consequences and shortens life duration of the patient.

Cystectomy (see fig. 46) is an ideal surgery from the oncological point of view but it causes disapproval as to the methods of urine derivation. Cystectomy is performed in one or two stages. In the two-staged operation urine is first taken out of the kidney onto the skin, intestines or artificial bladder formed from small or large intestines. Cystectomy is performed only in 1–1.5 months afterwards.

To take urine out onto the skin the following operations are suggested: ureterocutaneostomy, ureteroiliocutaneostomy (Bricker's operation, etc.) and ureterocolocutaneostomy (Blokhin's operation, etc).

The artificial bladder from the small intestine is formed by two ways: 1) isolated intestinal transplant is connected with ureter and urethra (ureteroilioureterostomy); 2) the proximal end of the transplant is connected with ureter and distal one is taken out through the rectum sphincter on the perineum.

There are three variants of artificial bladder made of the large intestine: ureterocoloureterostomy, intrasphincter perineum ureterocolocutaneostomy and rectal bladder.

Nowadays the main criteria of treatment efficacy of patients with oncological diseases are not only their survival rate but also life quality.

Unfortunately, consequences of some ways of urine derivation (ureterocutaneostomy, operations of Bricker's, Blokhin's type, formation of rectal bladder) result in very low life quality, therefore the patients agree to them reluctantly. High traumatism of the operation due to formation of intestinal reservouirs that replace the bladder as well as impossibility of weakened patients to survive such an intervention are often the reason of giving it up.

Lately the most popular operations for urine derivation have been the following:

1. Formation of the reservoir from the terminal part of the small intestine and caecum with appendix. The ureter is transplanted in the small intestine part of the reservoir. The ileocaecal valve that works as antireflux mechanism protects ureterointestinal anastomoses.

The reservoir with volume of 400–500 ml is formed at the expense of the caecum and ascending colon which is connected with the skin in the umbilical area. The proximal part of the appendix (4 cm) is used for anastomosis. Patients empty the reservoir by self-catheterization. The catheterization is simple and safe for the patient. In accordance with materials of XIV Congress of EAU this operation is quite popular in Italy, France, Spain and Israel.

2. Ileocystoplasty (ureteroileoureterostomy) by "W" technique is detubulization of the transplant along the antimesentary edge with simultaneous performance of radical cystectomy is popular in our country and is widely utilized in the Kiev Institute of Urology and Nephrology. The duration of the operation is 5–10 h.

3. Ureterosigmostomy is widely used in the urological clinic of the Odessa Medical University and the Odessa Oncological Clinic.

Urine derivation by ureterosigmostomy that had a lot of followers earlier and was forgotten is gaining popularity nowadays. The analysis of all known kinds of urine derivation taking into account all possible complications as well as the patients' wish not to be "wet" give grounds to consider ureterosigmostomy to be the most expedient operation. It was earlier considered that the ureter transplantation into the intestine had some latent danger of ascending infection into the kidney. Nowadays it is proved that endogenic infection is less dangerous and is easier treated than hospital strain of urine infection which is observed in patients with external urine fistula.

The surgical intervention is preceded by preoperative preparation of patients, which includes: treatment of latent pyelonephritis; application of hepatotropic remedies that improve the liver function; preparation of the large intestine with the help of the drugs that suppress pathogenic intestinal flora. The operation is performed in two stages.

The first stage — retroperitoneal left-hand ureterosigmostomy with glomerular lymphadenectomy. The operation is well tolerated by the patients; its duration is 45–60 min. For 3–4 weeks the patients get adapted to urination through the urinal, sigmoid-like intestine — till constant urine entry and left kidney — till functioning in new conditions. Thus, the patient is well adapted to new conditions of urination before the main stage of the operation.

The second stage consists of lower-median laparotomy and right-hand sided glomerular lymphadenectomy, right-hand sided ureterosygmostomy with radical cystectomy (cystoprostatovesiculoectomy). The duration of the operation does not exceed 3 h. The analysis of literature data and our own observations prove that the patient who suffered from CB and had undergone radical cystectomy with staged bilateral ureterosigmostomy by our technique has a chance to live for 3–5 years and more. The life quality is high. The patients are "dry", they are tolerantly treated in the society and they often preserve work ability. Taking into consideration that the risk of this operation is the least compared with other methods of urine derivation, this operation deserves attention of oncourologists, moreover it allows to improve completion of the radical treatment of CB.

It is known that surgical treatment of patients with CB can't be always performed due to diffusion of the process, elderly age and

concomitant diseases. In such cases the main method of treatment is radiation therapy. Besides, it is used as a component of combined or complex therapy.

The advantage of the radiation therapy is in possibility to exert influence on the tumour and route of regional metastases. Distance TGT may be rotary, static and through the grid. The single dose varies within 1.5–2 Gy; total dose is 60–70 Gy. To abate patient's response to radiation the total dose is given by two stages with 2–3-week interval. During treatment of patients with CB the method of accelerated hyperfraction in static radiation regimen is widely used at the oncological clinics. The treatment is given by two stages from the four fields with a single focal dose of 1.8 Gy with a 4-hour interval. The total focal dose is 60 Gy for two stages. The interval between stages is 14–15 days. The treatment of patients with CB by the method of accelerated hyperfraction has the following advantages as compared to the classical method: rapid attainability of symptomatic effect of the action, absence of marked responses to radiation, reduction of hospital stay by 40–50%.

Without doubt, all patients with CB who have undergone an organ-saving operation require anti-recurrent treatment. The necessity of drug and immune therapy for treatment is conditioned by peculiarities of CB course. Only in 25–40% of cases patients with invasive CB survive for 5 years, the rest die of recurrences and metastases. Such unsatisfactory results are associated with late reference to treatment when they are in the stage where there are latent "subclinical" metastases due to absence of macroscopic metastases. It is the only reason of high mortality rate (40%) in patients during the first year after the diagnosis made and application of the standard schemes of treatment. As a rule, high rate of recurrences in patients with CB is associated with late diagnosis and underestimation of the range of the tumourous process.

Therefore, using only local methods including surgery and radiation cannot solve the problem completely; it is obligatory to give cytostatic therapy.

Drug therapy of patients with CB is used as polychemotherapy. The scheme M-VAK (metatrexate, vinblastin, adriamycin, cystaplatin) is effective but cost of the drugs restrict the possibility of wide application of polychemotherapy.

Immunotherapy takes an important place among numerous methods of treatment of patients with CB. It is known that devel-

opment of cancer tumour in a human organism always takes place against the background of immune deficiency. Correction of the immune system is an obligatory component of the combined or complex treatment of patients with CB.

The *vaccine BCG* became widely used in the world. The best results were attained in case of intravesical introduction of the vaccine both with therapeutic and preventive purpose (120 mg of the preparation in 50 ml of the isotonic solution of sodium chloride once per two weeks) as well as *laferon* (recombinant alpha-2b human interferon).

Laferon like natural leucocytic interferon has three main biological activities: immunomodulating, antiviral and anti-tumorous. It is used intravesically by 3 mln IU three times a week for a month, following by once a week for 6 months.

Palliative methods are of importance in treatment of patients with neglected CB. They are applied for relieving unbearable pains, persistent hematuria, and blockage of the upper urinary tract.

For example, in presence of marked dysuria, low capacity of the bladder, compression of the ureters cystostomy, puncture nephrostomy and ureterocutaneostomy are performed. When the tumour has grown into the adjacent organs and pressed on the nerve trunks causing unbearable pain novocaine blockade is made besides analgesics and narcotics. Bone pain in case of metastatic affection is relieved by means of short courses of local radiation. A separate problem is hemorrhages from the tumour that threaten the patient's life in case of its disintegration that cannot be controlled by conservative methods (the bladder lavage with hot isotonic solution of sodium chloride, hemotransfusion, injections of hemostatic remedies, transurethral electrocoagulation). In such cases the following procedures are performed: ligation of the inner glomerular arteries, their embolization, 4 or 10% formalin solution (Brown's method) is introduced intravesically, treatment with hyperthermic pressure (Helmstein's method), hyperthermic irrigation (Hall's method), electrocoagulation or suturing of the vessels that bleed after destruction of the bladder, palliative cystectomy.

The scheme proposed for radical surgical treatment of patients with CB is not a dogma. Its realization depends on specific conditions: general state and age of the patient, presence of concomitant diseases, the state of the upper urinary tract, localization of the process, share and degree of its malignancy, and of course professional skills of the urologist.

Having used different methods of radiation, the newest chemo- and immunodrugs the patients with CB may be expected to reduce number of recurrences and increase life quality.

TESTIS TUMOURS

Testis tumours are observed quite rare. According to different authors they constitute 0.5–3.0% of all malignant neoplasms. The prevalent age of patients with testis tumour is from 20 to 40 years old. Testis tumour quite often develops in children under 3. Irrespective of accessibility of the testes for examination 30–50% of patients who were revealed to have testis tumour had already had metastases.

The right testis is affected more frequently — 60% of cases. 1.5–2.0% of patients have bilateral tumours.

Testis tumours vary in the morphological structure. Of all neoplasms developing in the testis 95% are germinal tumours that have mainly heterogeneous structure and look like different combinations of three and more kinds of tumours (Fig. 47, see col. suppl. sheet). The neoplasms developed from the stroma of the Hunter's gubernaculum constitute 3–4% of testis tumours, and 1% is composed of tumours of rare structures.

Up-to-date international classification of testis tumours

The classification is used only for germinal tumours of the testis. There should be histological confirmation of the diagnosis and division by histological types. Presence of the tumour is often determined by increased level of serum markers: α-fetoprotein (AFP), chorionic gonadotropin (CG), and lactatedehydrogenase (LDH). Determination of the disease stage is based on detection of anatomical spreading of the disease and estimation of the serum tumourous markers.

To detect the category N physical examination and X-ray methods of diagnosis are utilized; for M category — physical examination, X-ray methods and biochemical tests; for S category — serum tumourous markers.

The stages are subdivided on the basis of presence and degree of increased level of serum tumourous markers, that are determined

at once after orchiectomy. When their level is increased, it is necessary to make series study for its estimation after orchiectomy according to normal disintegration of AFP (half-life is 7 days) and CG (half-life is 3 days). The classification of S category is based on presence of the lowest indices of CG and AFP determined after orchiectomy. The level of serum LDH (but not its half-life) is of a prognostic value in treatment of patients with metastasis affection and is included into stage classification.

The regional lymph nodes include abdominal paraaortal (periaortal), preaortal, interoaorto-, peri-, paracaval inferior, retroaortal. The lymph nodes located along the testicular vein are considered to be regional. The affection diffusion does not influence determination of the category N. The intrapelvic and inguinal lymph nodes are considered regional after performing the operation in the inguinal area and on the scrotum.

Clinical classification TNM

T — primary tumour

Spreading of the primary tumour is classified after radical orchidectomy (see pT). When radical orchidectomy is not performed the symbol Tx is used.

N — regional lymph nodes

Nx — regional lymph nodes that cannot be estimated;

N0 — no metastases in regional lymph nodes;

N1 — metastasis with the lymph node size of 2 cm and smaller in its biggest measurement or multiple lymph nodes with the size no more than 2 cm;

N2 — metastasis with the size of conglomerate of lymph nodes over 2 cm but smaller than 5 cm in its biggest measurement or multiple lymph nodes with the size over 2 cm but smaller than 5 cm;

N3 — metastatic conglomerates with the size over 5 cm in its biggest measurement.

M — remote metastases;

Mx — remote metastases that cannot be estimated;

M0 — no remote metastases;

M1 — remote metastases;

M1a — lymphatic glands that do not belong to regional ones or pulmonary metastases;

M1b — remote metastases different from M1a.

Patho-anatomical classification pTNM

pT — primary tumour

pTx — primary tumour that can't be estimated (when radical orchidectomy is not performed, the symbol Tx is used);

pT0 — no data that confirm presence of primary tumour (determined histologically as a cicatrix on the testis);

pTis — intratubular herminocellular neoplasia (carcinoma in situ);

pT1 — tumour is restricted by the testis and epididymis without vascular (lymphatic) invasion; there may be tumourous invasion of the protein membrane but not of the vagina;

pT2 — tumour is restricted by the testis and epididymis with vascular (lymphatic) invasion or spreads beyond the protein membrane and involves the vagina;

pT3 — tumour infiltrates the spermatic cord with vascular (lymphatic) invasion or without it;

pT4 — tumour grows into the scrotum with vascular (lymphatic) invasion or without it;

pN — regional lymph nodes;

pN — regional lymph nodes that cannot be estimated;

pN0 — no metastases in regional lymph nodes;

pN1 — metastasis with the lymph node size of 2 cm and smaller in its biggest measurement and 5 or less positive lymph nodes sized of no more than 2 cm in its biggest measurement;

pN2 — metastasis over 2 cm in size but smaller than 5 cm in its biggest measurement or over 5 positive lymph nodes sized no more than 5 cm, or confirmation of extranodal spreading of the tumour.

pM — remote metastases

The category pM corresponds to the category M.

S — serum tumour markers

Sx — the study of serum markers is impossible or was not made;

S0 — serum markers within the range of normal values.

LDH	CG mU/ml	HAFP, ng/ml
S1>1.5 × N	<5000	<1000
S2 1.5–10 × N	5000–50,000	1000–10,000
S3 > 10 × N	<50,000	<10,000

Note: N is an index of the upper bound of the norm in the study of LDH.

Stage grouping

Stage 0	pTis	N0	M0	S0, Sx
Stage I	pT1–4	N0	M0	Sx
Stage IA	pT1	N0	M0	S0
Stage IB	pT2	N0	M0	S0
	PT3	N0	M0	S0
	PT4	N0	M0	S0
Stage IS	any pT/Tx	N0	M0	S1–3
Stage II	any pT/Tx	N1–3	M0	Sx
Stage IIA	any pT/Tx	N1	M0	S0
	any pT/Tx	N1	M0	S1
Stage IIB	any pT/Tx	N2	M0	S0
	any pT/Tx	N2	M0	S1
Stage IIC	any pT/Tx	N3	M0	S0
	any pT/Tx	N3	M0	S1
Stage III	any pT/Tx	any N	M1, M1a	Sx
Stage IIIA	any pT/Tx	any N	M1, M1a	S0
	any pT/Tx	any N	M1, M1a	S1
Stage IIIB	any pT/Tx	T1–3	M0	S2
	any pT/Tx	any N	M1, M1a	S2
Stage IIIC	any pT/Tx	N1–3	M0	S3
	any pT/Tx	any N	M1, M1a	S3
	any pT/Tx	any N	M1b	any S

Like a prostate cancer this disease has a symptomless course in the initial stage, therefore the physicians of medical institutions should examine the external genitalia of all male patients referring to polyclinic for medical consultation. Any consolidation in the testis, unpleasant feeling or moderate tenderness, its enlargement is the cause for sending a patient to the urologist. It should be remembered that gynecomasty is observed in 5–50% of patients with testis tumour. Patients with cryptorchidism have a tumour and pains at the location of the testis. The patients who have undergone orchiopexy require dynamic follow-up for the removed testis as it is quite often affected by a tumour, mainly by seminoma.

The patients with extragonadal tumours of the testicular tissue belong to an individual group. There is still no unified thought as to the origin of these tumours. Some authors believe the cause of their formation to be the impairment in the embryonic development; others consider that it is presence of small tumours in the testicu-

lar parenchyma unrevealed during the examination and tumourous formations in the mediastinum testis and retroperitonium are their metastases. Extragonadal tumours are mostly located in the retroperitonium and mediastinum. The tumour can't be revealed even during thorough postoperative examination. Histologically it resembles herminogenic tumours. The clinical manifestations of the disease depend on the size and localization of the neoplasm. The tumourous node located retroperitoneally is manifested by pain in the abdomen and lumbar region. As the tumour grows the pain becomes constant and the node can be grasped. When the tumourous node is located in the mediastinum, the patient feels pain and heavy sensation behind the breastbone, dyspnoea, cough and general weakness.

The secondary testis tumours are observed rarely. Tumours of any localization may give metastases in the testis but they are more frequently seen in patients with CB.

In practical oncological urology the tumours are divided into seminomas and nonseminomic formations, as there are principal differences in policy of their treatment. Pathological and anatomical diagnosis of testis tumours is complex and very important. All doubts of the urologist and pathological anatomist should be in favour of nonseminomic tumours as wrong choice of treatment worsens considerably the remote results of treatment and disease outcome.

We should emphasize once more the importance of diagnostic value of tumourous markers (TM), the study of which can significantly extend the diagnostic abilities of the urologist. While studying TM we can make the diagnosis at the early stages of the disease, detect the metastases before their clinical manifestations, control efficacy of the given treatment and obtain more specific information about the histological structure of the tumour.

Diagnosis in accordance with tumourous markers:

— increased level of one or two TM (CG and HAFP) before orchifuniculectomy (OFE) is evidence of presence of nonseminomic tumour;

— increased level of one of two TM (CG and AFP) after orchiectomy is evidence of III stage of the process;

— increased level of TM after lymphadenectomy (LAE) is evidence of the remote metastases;

— permanent increase of TM after OFE and/or LAE indicates the presence of residual tumour and requires further treatment;

— application of TM in the staging process reduces the percentage of mistakes and helps in choosing adequate treatment;

To diagnose testis tumours we suggest the following algorithm of examination:

— visual examination and palpation of the testis and all peripheral lymph nodes;

— US examination of the scrotum, retroperitoneal and inguinal lymph nodes and the liver;

— study of the TM level (CG, HAFP, LDH);

X-ray examination of the chest organs (XECO).

To define more precisely the range of tumour diffusion, CT and MR are the ideal methods of the investigation that allows to assess the state of retroperitoneal lymph nodes with high precision.

Treatment of testis tumour must be combined and complex and it is given only in a specialized medical establishment — oncological clinic.

At the first stage of treatment *orchifuniculectomy* is performed (Fig. 48) which is diagnostic in fact. Orchiectomy through the scrotum is impermissible as it is contrary to principles of oncological radicalism, it worsens significantly the disease outcome, stimulates metastases and results in reoperation — funiculectomy with wide excision of the postoperative cicatrix.

Orchifuniculectomy has got some peculiarities. From the oncological point of view it should be called funiculoorchiectomy; this name is more precise.

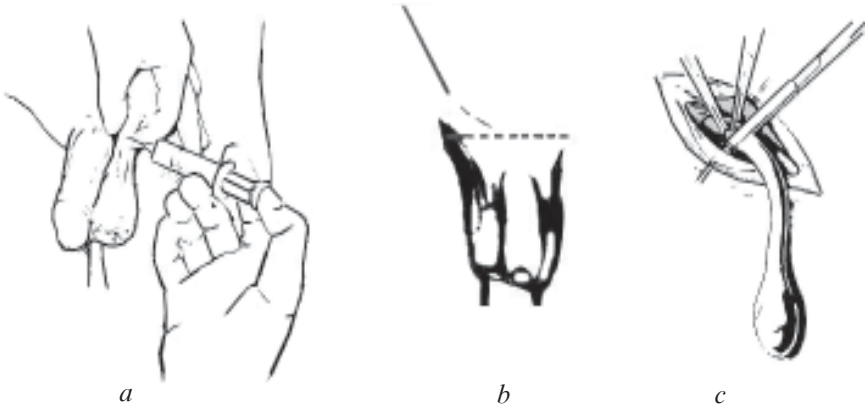


Fig. 48. Orchyfuniculectomy in case of testis neoplasms: *a–c* — stages of operation

The operation is performed regardless of histological structure of the tumour, its size and diffusion from the inguinal approach, in case of need involving the scrotum with obligatory incision of aponeurosis over the inguinal canal. The vascular clamp is applied to the spermatic cord near the inner outlet. The spermatic cord is mobilized only after this and the testis is delivered in the wound. Testis express-biopsy is made and in case of confirmation of the diagnosis of malignant tumour the spermatic cord is ligated at the level of the inner ring of the inguinal canal. The spermatic cord and testis are excised with all their membranes. In presence of adhesions to the scrotum skin, the scrotum skin is widely excised. The inguinal canal anterior wall plasty is performed by Martunov or Kimbarovsky technique.

It is expedient to make diagnostic puncture of testis tumour for there is danger of its dissemination. Besides, puncture biopsy does not give complete overview of morphological peculiarities of the tumour and the negative result of cytological study does not exclude the presence of neoplasm.

The plan of further treatment depends on morphological structure of the testis tumour and its diffusion (Fig. 49, see col. suppl. sheet).

V. S. Sakalo (the Research Institute of Urology and Nephrology of the Academy of Medical Sciences of Ukraine) developed the schemes of treatment of patients with testis tumour that included the world experience of treatment of this disease.

Treatment of testis seminoma

I stage. The OFE operations with further radiation therapy of the retroperitoneal and glomerular lymph nodes on the affected side.

The radiation therapy involves the inguinal lymph nodes in patients with invasion of the scrotum skin or after the operation on the scrotum; radiation therapy is carried out as distance TGT. The total focal dose of radiation of 25–30 Gy (5 fractions by 2 Gy a week) is sufficient. 5 years' survival rate of the patients is about 98% (91–100%). The recurrent rate is 2.5%.

II stage. It is divided into moderate and massive. Massive cases are cases when CT reveals metastases over 5 cm.

The OFE operation is performed with further radiation of the retroperitoneal and glomerular lymph nodes on either side with TFD up to 36 Gy (5 fractions by 2 Gy a week).

Radiation of the supradiaphragm lymph nodes is not recommended as only 8% of cases have affections of the mediastinum

lymph nodes which are treated with the help of polychemotherapy (PCT). 5-years' survival rate without recurrences is 90%.

II stage (massive). The OFE operation is performed with further PCT (using the preparations of platinum).

The results of PCT are worse in patients who have had radiation therapy (Pizzocaro, 1986; Loehrer, 1997). Metastases of seminoma may contain nonseminoma components (Mostafi, 1977).

III stage. The OFE operation is performed with further PCT.

The residual tumour after PCT is, as a rule, in the state of fibrosis. Residual tumours of over 3 cm in size may contain tumourous cells and require additional treatment (radiation therapy or excision).

Treatment of nonseminomic testis tumours

I stage. The OFE operation is performed with further retroperitoneal LAE. The LAE operation is performed by sparing neurosaving technique to preserve ejaculation ability.

Thorough weekly control is required during the first year with every two months' control during the second year. Tumour growing in into the lymphatic and/or blood vessels increases the risk of remote metastases from 6 to 19%. 27% of patients with I stage of the disease are revealed to have metastases in the distant retroperitoneal lymph nodes. In the first signs of progressive development of the disease it is necessary to administer PCT. 15% of patients who have no metastases in the retroperitoneal lymph nodes are revealed to develop metastases in the lungs during 18 months (Kiepp, 1990). Development of the tumour in the retroperitoneal area is observed in 2.4% of cases (Weibbach, 1988). The application of PCT allows to attain remission in 90% of patients.

I stage (modification of the method). The OFE operation without retroperitoneal LAE has been used for the last 10 years.

This policy may be used under the following conditions:

— negative data of CT and TM studies;

— the patient's comprehension of necessity to perform regular CN of the retroperitoneal lymph nodes;

— monthly control for 2 years.

Risk factors of metastasis:

— invasion into the lymphatic vessels;

— invasion into the blood vessels;

— presence of embryonic cancer;

— absence of the yolk sac tumourous elements.

Presence of three of the four above enumerated signs form a threat of metastasis in 58% of patients (Friedman, 1987).

PCT given by the scheme with cysplatin, etoposide and bleomycin (PEB, 2 courses) decreases metastasis risk from 50 to 5% (Pont, 1996).

II stage. The OFE operation is performed with further retroperitoneal LAE and weekly control.

Such treatment when there is PCT in reserve is recommended to patients with metastases into the lymph nodes if the number of metastases reaches 6 and each of them does not exceed 2 cm as well as there no extracapsular invasion. The rate of progressive development does not exceed 10%. PCT is used only in progressive development of the disease, and it is effective in this case (Richie, 1991). The patients in whom indices of TM did not get normal are recommended to make PCT. When vascular invasion of the primary tumour after LAE is confirmed microscopically the progressive course is observed in 64% of the patients. The progressive course is observed in 24% of the patients without vascular invasion.

The patients with vascular invasion of the primary tumour are recommended to take two courses of adjuvant PCT (Sesternhenn, 1992).

II stage. The policy of treatment of the patients with regional metastases sized over 5 cm and who cannot be cured completely is only PCT.

The OFE operation is recommended with further PCT and excision of the residual tumour in the retroperitoneal region (if found) and control follow-up.

The necessity in excision of the residual tumour often arises after 3–4 courses of PCT and normalization of TM.

In 33% of patients the operation material is revealed to have fibrosis, necrosis; in 33% — mature teratoma; in 33% — living tumourous cells (V. S. Sakalo, 1992). The presence of living tumourous cells is an indication for giving additional PCT (Fox, 1993).

III stage. The OFE operation and PCT are performed.

Patients with metastases into the brain are recommended PCT and radiation therapy.

Chemotherapy for the diffused testis tumours (the 1st line) should be given.

The most effective schemes are PCT with PVB and PEB.

PVB

Cysplatin 20 mg/m2 per 24 hrs from the 1st to the 5th day intravenously.

Vinblastin 0.2 mg/kg per 24 hrs, the 1st and 2nd day intravenously.

Bleomycin 30 mg, on the 2nd, 9th and 16th day intravenously.

The course is repeated with an interval of 21 days.

PEB

Cysplatin 20 mg/m^2 per 24 hrs from the 1st to the 5th day intravenously.

Etoposide 100 mg/m^2 per 24 hrs, from the 1st to the 5th day intravenously.

Bleomycin 30 mg, on the 2nd, 9th and 16th day intravenously.

The course is repeated with an interval of 21 day.

Results of treatment (Droz, 1996)

The progressive course of the disease is observed in 10% of patients with a good prognosis and in 30–50% — with a bad one.

For the last years the drug "Iphosphamid" is widely used in the treatment scheme of patients with diffuse testis cancer with bad prognosis. It is used together with uroprotector "Uromitexan" ("Mesna").

Only application of iphosphamid and etoposid can result in complete remission in patients who have been given PCT with cysplatin.

The treatment scheme of primary patients with bad prognosis

Caboplatin 400 mg/m^2 intravenously on the 1st day

Iphosphamid 1.5 g/m^2 intravenously on the 2nd, 3rd, 4th and 5th day

Mesna 0.9 g/m^2 intravenously on the 2nd, 3rd, 4th and 5th day

The interval between cycles is 28 days (4 cycles).

Results of treatment of primary patients with bad prognosis (Amato, 1995)

Complete remission is observed in 71% of patients. Absence of recurrence after resection of the residual tumour is observed in 24%

of patients. The progressive course of the tumour is in 5 patients. No recurrence for 3 years is observed in 91% of patients.

Saivage therapy (Pizzocaro, 1992)

The scheme VIP

Iphosphamid 2.5 g/m^2 on the 1st and 2nd day.
Mesna 2.4 g/m^2 on the 1st and 2nd day.
Cysplatin 100 mg/m^2 on the 3rd day and 40 mg/m2 on the 5th day.
Vinblastin 6.0 mg/m^2 on the 3rd day.
The interval between cycles is 28 days (4 cycles).

The disease *prognosis* in patients with testis tumours depends on the disease stage and histological structure of the tumour. It is favourable in case of seminoma when the 5 years' survival rate is nearly 100%.

The increased level of CG is an unfavourable prognostic factor. It is proved that decreased level of CG during radiation therapy or PCT is evidence of treatment efficacy and vice versa its increased level during therapy and during the follow-up is unfavourable prognosis. The cases are known when the patients with seminoma with increased level of CG were found to have retroperitoneal metastases of other histological structure (embryonic cancer and choreonepithelioma), despite the fact that primary tumour was studied with the help of series sections.

Prognosis is worse in nonseminomic tumours although the utilization of active surgery (retroperitoneal lymphadenectomy) and up-to-date PCT allows to improve results of treatment.

Thus, active detection of the disease, early diagnosis, adequate surgical intervention and radiation or drug therapy with modern chemical drugs help to obtain good results in treatment of patients with testis tumours.

Lecture 7

BENIGN PROSTATIC HYPERTROPHY AND PROSTATE CANCER

Anatomy. The prostate gland, or prostate (originating from *Greek* — to stand ahead, to protrude ahead) is one of the glands of the male body's genital system.

Being located in the low anterior third of the small pelvis, under the urinary bladder, between the pubic joint and rectum, by its anatomy it represents an unpaired formation with a chestnut shape. The prostatic part of the urethra passes through its thickness. The prostate has two surfaces — front and back ones, as well as two lobes — left and right, between which on the back gland surface there passes a feebly marked groove.

The size of the prostate varies in rather significant limits depending on the age and individual features of the body. Its length in an adult man reaches 2.5–4.2 cm, its width — 2.2–5 cm and thickness — 1.7–2.3 cm, its weight is 17–28 g.

The prostate gland is composed of a glandular body for 1/2–3/4 of its volume and a prostatic muscle. The glandular body includes 20–50 separate tubular-alveolary glandules of a pear or wedge shape, each of them having its own duct. These ducts merge and further on open on the back wall of the prostatic part of the urethra. The glandular lobules are connected to each other with a connective tissue containing elastic fibres and powerful smooth muscle bunches, forming a circular muscle of the prostate, the reduction of which stipulates its secretion.

Outside the prostate is covered with a capsule, which consists of a dense connective tissue with elements of smooth muscle fibres.

The main function of the prostate is in production of a specific secretion, which contains various products that have different functional properties: proteins, immunoglobulins, enzymes, vitamins, ions of metals, etc. Such a set of substances provides energetic needs of spermatozoa, it participates in processes of ejaculate dilution and has a protective function.

The initial function that provides incretion of secretion is a motor contracting function. It is provided with smooth muscle fibres in the glandular capsule and in the prostatic part of the urethra.

The structure and function of the prostate is controlled by androgens, estrogens, pituitary hormones and steroid hormones. Its various parts have unequal sensitivity; androgens stimulate a back part of the gland, estrogens — its front area. As a hormone-dependent organ, the prostate is the main target of testis androgens: dihydrotestosterone is the most active in it. The existence of functional relationship between the prostate and testes has been proved convincingly. In case of a bilateral castration its function is reduced greatly, the volume of the gland decreases at the expense of destruction of glandular epithelium cells. On the contrary, at various pathological processes, on the background of the reduced function of the prostate, the function of testes fails as well, and this is reflected in sexual activity of the male.

Thus, the anatomic-functional features of the prostate give a conception about complex regulation of functional activity of the gland, about its close interrelation with other organs, and not only with the small pelvis.

BENIGN PROSTATIC HYPERTROPHY

Liquidation of many infectious diseases and improvement of results of treating cardiovascular diseases promote elongation of human life and increases the number of elderly men. Benign prostatic hypertrophy (BPH) is a frequent disease of elderly men. Until recently the term "adenoma of prostate" was widely used, however, today specialists prefer to use the term BPH, since it correlates most fully with the morphogenetic nature of the disease.

In addition to the change in opinions with respect to the sources of adenoma occurrence, the concept of the prostatic anatomy has been radically reviewed. According to studies of Gil Vernet (1953) and McNeal (1988), the prostate has 3 functional areas with the following correlation:

— *the central area* (25% of total volume of the prostate) has a conical shape with the apex located on the verumontanum, it forms the base of the prostate; the central area covers the deferent ducts

for the whole length and very seldom it is involved to the pathologic process both at adenoma and the cancer of prostate;

— *the peripheral area* (70% of volume); it forms the back and low parts of the prostate; in 85% of cases the cancer of prostate develops from this area;

— *the transitional area* (5% of volume); it is formed by two small lobules and the proximal part of the urethra, it gives origin to adenoma of the prostate.

At the age of 40–49 years, BPH can be found in 11–12% of cases, at the age of 80 years — in 81–82%.

It has been established that nearly 30% of men at the age of 40 years who survive till 80 have been subjected to operation on BPH.

The social significance and actuality of the problem are emphasized by demographic studies of WHO, that evidence a great growth of population of the planet at the age under 60, and this rate goes ahead of the growth of population as a whole.

The epidemiologic studies showed that in spite of a number of peculiarities and deviations found, at present it is considered as generally adopted that a race, nationality, specificity of food, sexual activity and smoking do not have a principal significance in BPH etiology.

Etiology and pathogenesis. The up-to-date concept of the theory of BPH development is based on the embryological and morphological difference in response of separate areas of the prostate to endocrine stimuli. Thus, the peripheral area, represented mainly by prostatic acini, is developing and controlled by androgens while the central area in the experiment is more responsive to effect of estrogens. Nowadays the significance of androgens for growth and support of normal function of the prostate, as well as participation of these hormones in BPH development is well known. According to contemporary conceptions, the main circulating androgen is testosterone produced in testes and adrenal glands, it reaches directly the cells of the prostate and is transformed into a more active form — dehydrotestosteron (DHT) under the effect of 5α-reductase enzyme located mainly in the membrane of the nucleus. The DHT activity is evidenced as a result of its strong binding to the androgenic protein receptors, which are in the nucleus of the cell. It results in synthesis of DHT with specific metabolic and proliferative responses (transitional area and periurethral region). Thus, BPH is a DHT-dependent condition.

BPH nodi are localized first in the peri- and paraurethral areas, more proximal than the verumontanum (Fig. 50). Further direction of their growth, configuration and sizes depend on resistance of the surrounding tissue of the proper gland and the neck of the urinary bladder. The acquired shape and position of hyperplastic nodi define specificity of the disease course, its symptomatology and pathogenesis, which is closely related both to a failure in urine outflow and development of chronic renal insufficiency in the kidneys and urinary tracts and to the irritative symptomatology that leads to hypertension, stenocardia, infarction and stroke.

Clinical symptoms. Failures in urination take the first place in the clinical picture of BPH. Occurrence and development of the intravesical obstruction in case of BPH are determined by 2 components: a static one — as a result of mechanical compression of the urethra with hyperplastic tissue of the prostate and a dynamical one — specified by hyperactivity of adrenoreceptors of the urethra zone and prostate (constriction). In this connection one can distinguish 2 groups of symptoms while analyzing patient's complaints.

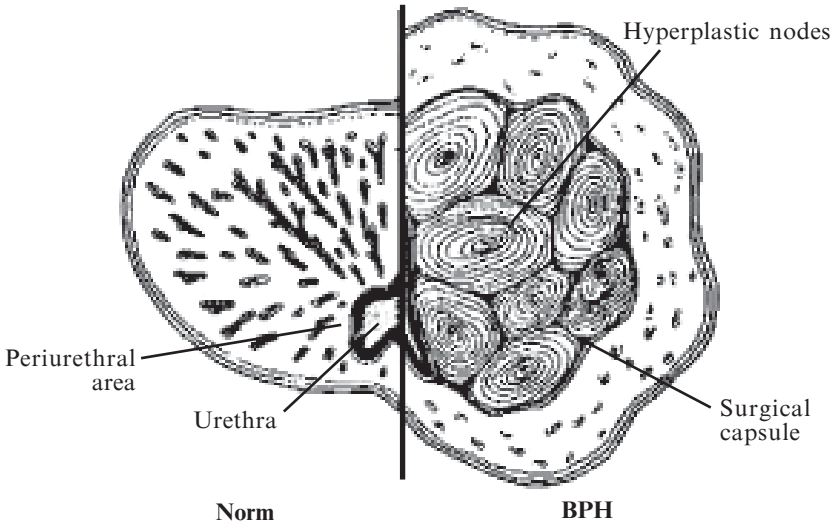


Fig. 50. A change in anatomic relationship in development of benign prostatic hypertrophy

1. Irritative symptoms — as day and night pollakiuria, imperative feeling to urination and urinary incontinence (i.e. symptoms of irritation), estimated by a degree of functional failures of the neuromuscular apparatus of the urinary bladder.

2. Obstructive symptoms — retention of urine, a weak stream, a feeling of incomplete emptying of the urinary bladder, tension of muscles of the *prelum abdominale* while urinating, intermittent urination and urine dripping which is connected with progressing difficulty in urine outflow as a result of hypertrophy.

The most early symptoms of the disease are more frequent urination, usually at night, as well as a thinner stream of urine and lessening of the pressure. Later on, with increase in the intravesical obstruction there occur complaints to incomplete emptying of the urinary bladder, drop-like urination, necessity to make efforts while urinating, etc.

In later stages the symptoms are added that are specified by secondary changes of the bladder and the upper urinary tract (pyelonephritis, stones in the bladder, hydronephrosis and chronic renal insufficiency) (Fig. 51, 52).

A frequent complication of the BPH clinical picture is acute urinary retention (AUR) (Fig. 53) which is observed in any stage of the disease. Very often quite a sudden AUR is the first clinical manifestation of BPH. According to data from reports, this complication is observed in 10–50% of patients, more often occurring in the second stage of the disease. The provoking factors of development of this complication may be: nonobservance of the diet, alcohol or

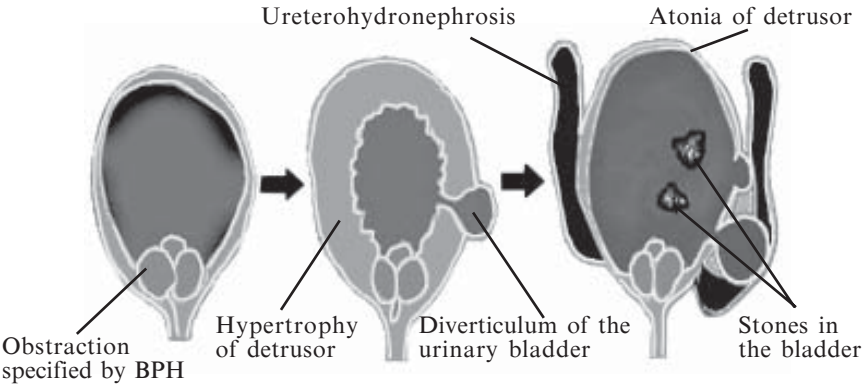


Fig. 51. Development of BPH complications. Principal scheme

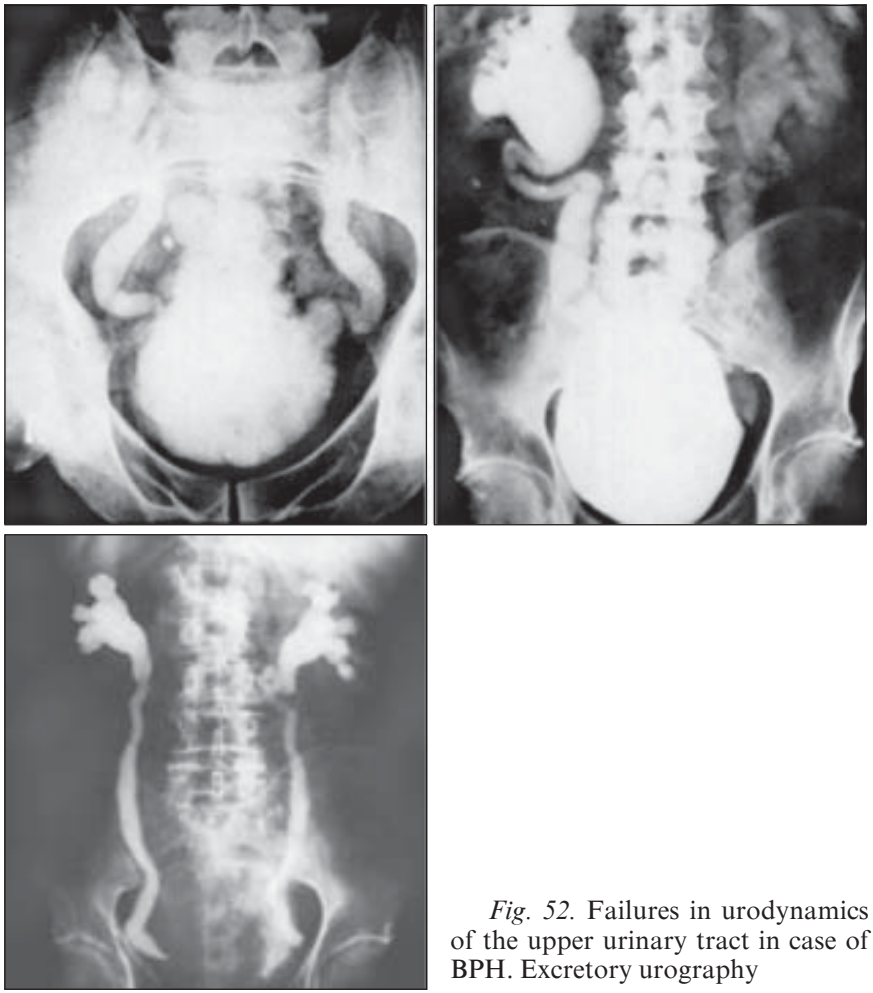


Fig. 52. Failures in urodynamics of the upper urinary tract in case of BPH. Excretory urography

products with a plenty of spices, overcooling, constipations, delayed bladder emptying, stresses, etc.

A concomitant inflammatory process in the prostate plays a great role in formation of the clinical picture at BPH. The rate of chronic prostatitis at BPH accounts for 70%. Preconditions for development of chronic inflammation are as follows: venous stagnation, compression of excretory ducts of acini with hyperplastic tissue, congestion.

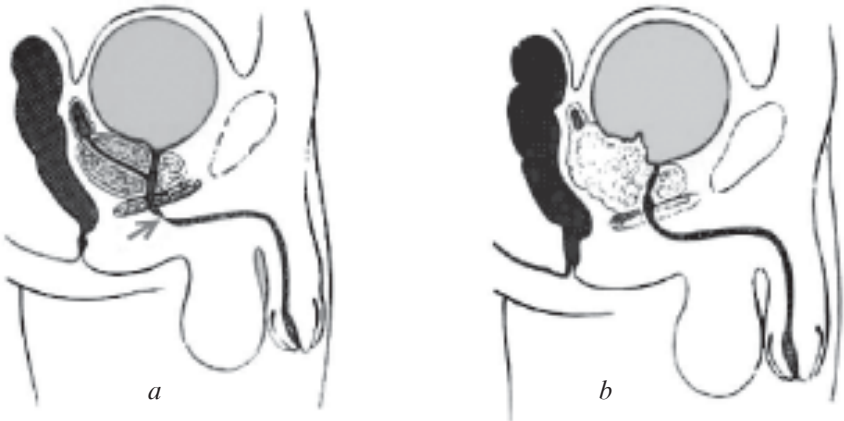


Fig. 53. Acute urine retention in case of urethra stricture *(a)* and cancer of prostate *(b)*. Scheme of occurrence

Classification. The modern clinical classification of BPH is based on the characteristics of functional condition of the bladder, the upper urinary tract and the kidneys.

The first stage of BPH is characterized with a compensated function of the urinary bladder, absence of functional changes in the kidneys and upper urinary tract, moderate increase of the prostate size, smoothness of the intralobule groove and it is manifested in more frequent urination, especially at night; difficulty in urination, more often in the morning; a longer time for urination, a weak stream of urine. All these symptoms are increased after cooling, alcohol intakes, etc.

The second stage is characterized with a subcompensated function of the bladder, sometimes that of the kidneys and the upper urinary tract, trabecularity of the bladder; occurrence of false diverticula, a great increase of the prostate size (Fig. 54, see col. suppl. sheet), absence of the intralobule groove. The main feature of this stage is presence of residual urine. As a result, the detrusor tonus is decreased, and chronic urine retention develops. In the beginning of this stage the amount of urine remained in the bladder is less than in the outflow. Gradually the amount of the residual urine increases. The second stage, as a result of infection in the urinary tract, is characterized with significant disuria, frequent, imperative, sometimes painful feelings to urination; a feeling of incomplete emptying of the bladder; sometimes pain in the lumbar area from one or both sides, some patients have hematuria; final-

ly, there may be hemotamponade of the urinary bladder or acute urine retention.

The third stage is characterized with a decompensation of the bladder function and further increase of functional and anatomic changes of the upper urinary tract and kidneys. The amount of the urine flowing out of the bladder is less than the amount of the residual urine.

The chronic voiding insufficiency of the urinary bladder with availability of a great amount of the residual urine, a complete atony of the urinary bladder in some patients is not accompanied with a feeling of full emptying, urine drips all the time from the urethra; a paradoxical ischuria occurs, polyuria, in the later stages there may be uremia. In the second and third stages of the benign hyperplasia there may be found complications as acute urine retention, cystitis, stones in the bladder, hematuria, pyelonephritis and others. This subdivision into stages is close to the Guyon's classification.

Diagnosis. This is a benign disease and it does not threaten the patient's life. The rate of BPH is rather high. There exists a large choice of methods of treatment, therefore it is desirable for the patient to take part in working out the procedure of examination and a regime of treatment.

One of the urgent methodological problems at the stage of diagnosing BPH is standardization of methods applied for study and elaboration of the optimum diagnostic algorithm. According to recommendations of the 4th meeting of the International Consulting Committee on BPH (Paris, 1997) compulsory, advised and optional methods of research were determined.

The compulsory studies include:

— collection of the case history;

— determination of total estimation of symptoms according to the International scale (IPSS);

— estimation of the quality of life according to a 6-grade scale (QOL);

— digital rectal examination;

— general urine analysis;

— estimation of the level of urine and creatinine in the blood serum;

— estimation of the morphological and functional condition of the kidneys and the upper urinary tract by means of X-ray or radioisotopic method of testing;

— ultrasonic testing of the prostate;
— definition of availability and amount of the residual urine;
— urodynamic testing (uroflowmetry);
— estimation of the level of prostate-specific antigen (PSA).

One of the first steps in solution of the problem of relationship between a patient suffering from benign prostatic hypertrophy and a physician is the International System of summary estimation of symptoms in prostatic diseases and estimation of patients' life quality.

The questionnaire of 7 items with clear and intelligible questions is to be filled in by a patient himself. Each reply corresponds to numeric designation from 0 to 5. The patient has to choose one of six replies in dependence on the degree of each symptom manifestation. According to the results of questioning, patients are subdivided into the following groups:
— score 0–7 — light symptomatology;
— score 8–19 — moderate symptomatology;
— score 20–35 — severe symptomatology.

The most comprehension methods for BPH diagnosis are: digital rectal examination; transurethral ultrasonic scanning (Fig. 55), which allows to define exactly the size and shape of BPH growth, presence of accompanying disease of the prostate. Thereby it is necessary to note that availability of morphological symptoms of BPH, as well as its increase determined with the help of palpation or ultrasonography (USG), not always correlates with the degree of clinical symptoms of the disease and intravesical obstruction.

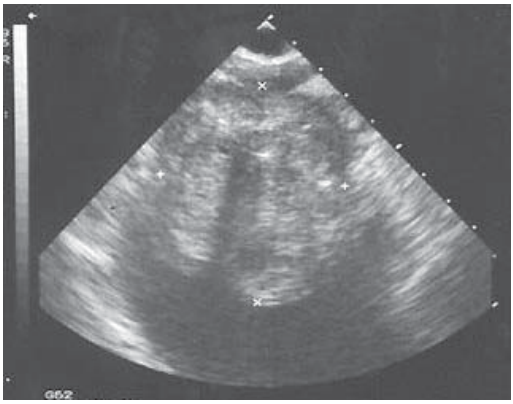


Fig. 55. Transurethral ultrasonic tomography of a patient suffering from BPH

A preferable method to define the degree of intravesical obstruction is uroflowmetry (Fig. 56), which represents an important information about the character of failure in urination and in some cases allows to allocate a group of patients for further urodynamic testing. Values of maximum speed of flow exceeding 15 ml/s are usually considered as normal, 15–10 ml/s — a

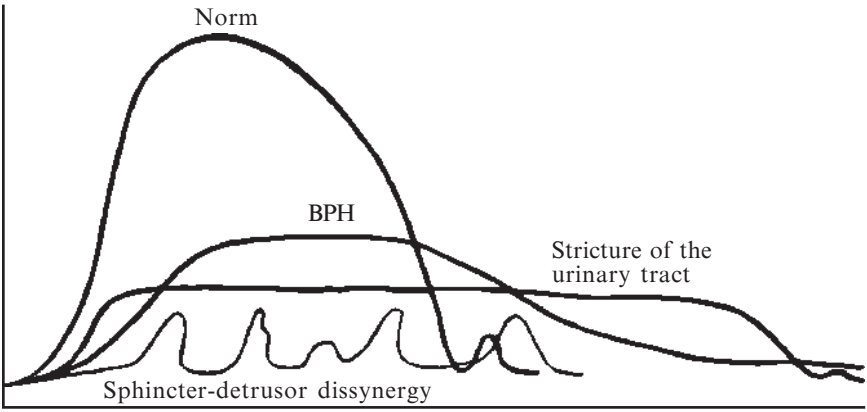


Fig. 56. Typical shapes of uroflowmetric curves

light degree of failure in urodynamics; in case of 10–5 ml/s — clearly expressed disorders in urodynamics and at speed of less than 5 ml/s — severe disorders.

The basic stage of the diagnostic program is the definition of the level of prostate-specific antigen (PSA) in the blood serum with the purpose of revealing a latent prostate cancer.

For BPH diagnosis roentgenurologic methods are also used — excretory urography with descending cystography in two projections and ascending urethrocystography (Fig. 57).

Treatment. Lately opinions on BPH treatment have been changed greatly. Only 10 years ago specialists unanimously insisted on active surgical technique, nowadays they admit an opportuni-

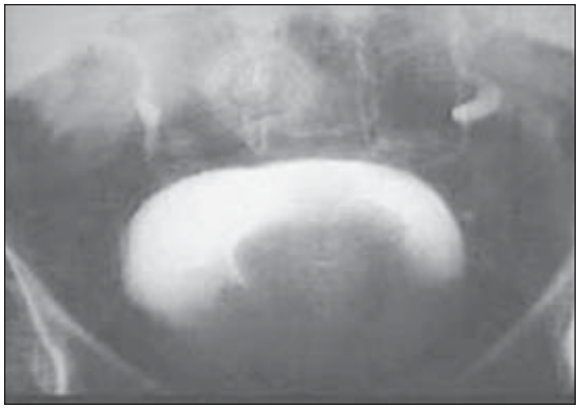


Fig. 57. X-ray diagnosis of the BPH. Cystogram. A defect in filling up due to internal bladder component

ty of alternative approaches in dependence on the stage and availability of complications. In the beginning of the disease when symptoms do not bring any essential discomfort and there are no complications, there may be possible a thorough examination. The patient should be examined once a year and no treatment is administered. Rather often the pathologic process progresses very slowly. Active dispensary observation is the only method of medical influence on such patients. Moreover, the disease often may progress quickly or it may have complications by the time of examination. It is necessary to advise an active treatment to these patients.

Surgical treatment. The maximal radicalism in BPH treatment is provided with open prostatectomy (Fig. 58 in the text, Fig. 59 — see col. suppl. sheet). But in connection with a considerable invasion of the method, a long stay in the hospital and a high level of postoperative complications the specialists consider performance of prostatectomy to be expedient for patients with a large size of the prostate (more than 100 cm^3).

The absolute indication to surgical treatment is acute ischuria (impossibility to empty the urinary bladder), repeated massive hematuria specified by BPH, stones in the urinary bladder, relapses of infection in the urinary tract, large diverticula of the urinary bladder which were formed as a result of BPH.

The *transurethral resection of the prostate* (TURP) is recognized as the "golden standard" in BPH treatment (Fig. 60, 62 — see col. suppl. sheet, Fig. 61, 63 in the text). It promotes liquidation of symptoms and improvement of urination. After performance of TURP there also may be complications. Intraoperative and postoperative bleedings, that require hemotransfusion occur in 5–15% of patients, urinary incontinence — in 0.8%, erectile impotency — in 15.7%, retrograde ejaculation — in 68%. The necessity in surgical treatment of complications arises in 3.3% of patients who underwent TURP. The three-year observation demonstrates that in 2% of patients there is a necessity in performing repeated intervention due to BPH relapse. In this connection, and also because of a rather high cost of TURP, alternative instrumental methods of treatment of this disease have been searching for.

The transurethral incision of the prostate (TUIP) is close to TURP. It is in incision of the neck of the urinary bladder and prostate. The incision is started under the orifice of the ureter towards the point distant from the verumontanum by 0.1 cm. The opera-

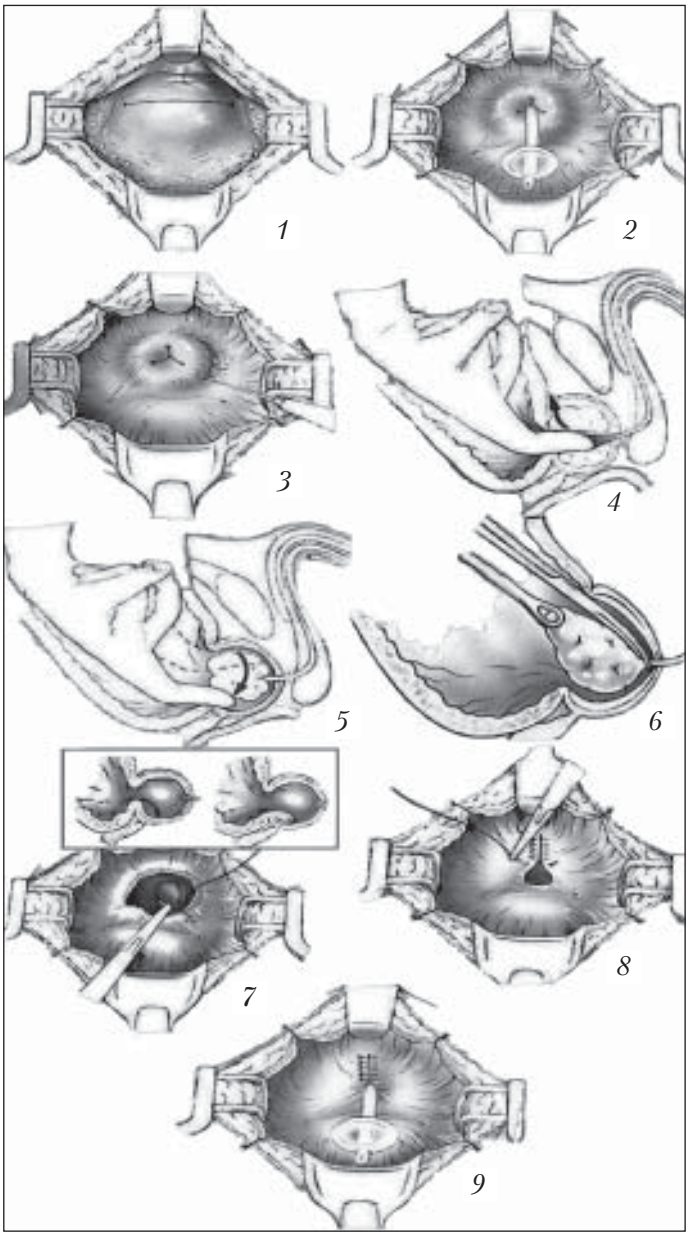


Fig. 58. Transvesical prostatectomy (according to Kirby, Connel). Stages of operation

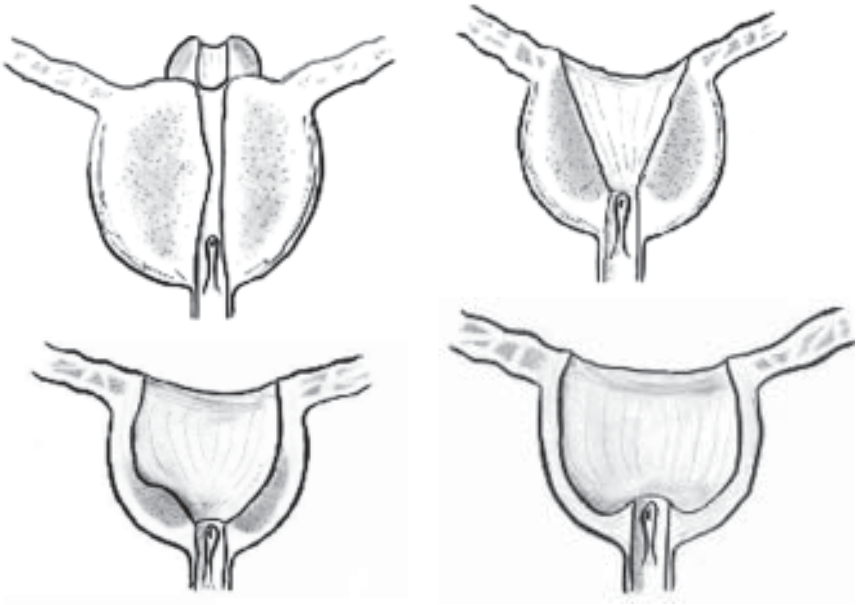


Fig. 61. Restoring of the urethral lumen while performing the transurethral resection

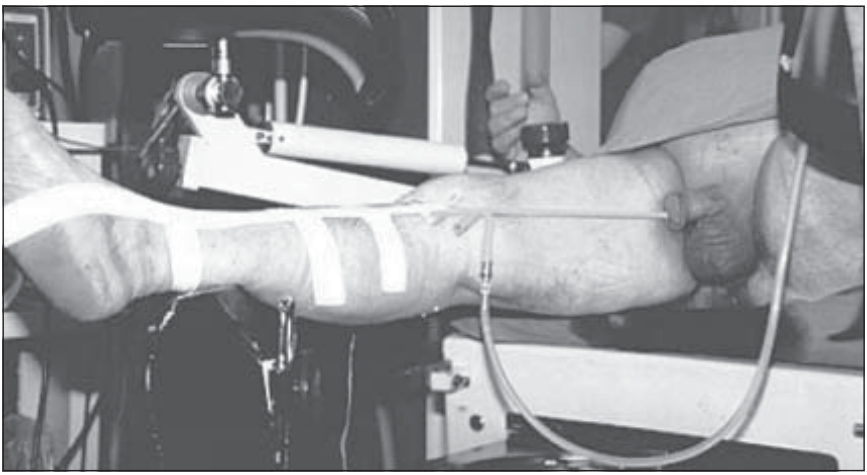


Fig. 63. The urinary bladder draining after transurethral resection of the prostate

tion may by unilateral and bilateral. The main indication to TUIP is a small volume of the prostate (under 30 cm^3) without enlargement of the central part, as well as a high risk for the disease.

Modification of a standard TUIP is a transurethral electrovaporization (TUEV), or vaporization of prostatic tissues by means of a special electrode — vaportrode which generates electric current of high density. The electrovaporization provides three effects of "vaporization out" of unwanted tissue, hemostasis, prevents from reabsorption of liquid due to creation of "drying" under the vaporized tissue. The previous observations demonstrated a high efficiency of this method. If there occurs a necessity in a histological test of tissues, a vaportrode is replaced by a standard hot snare. High temperature at the contact between the electrode and prostatic tissue creates a fast and complete vaporization of the intracellular liquid with further damage of the cells. For "cutting" 200–250 V voltage is applied. The close contact between the electrode and tissue and its adequate advancing provide a zone of vaporization within 3–4 mm with coagulation of the underlying zone within 1–3 mm, whereas at TUEV this zone reaches 0.1–0.5 mm. Simultaneously TURP provides results comparable with TURP. Another advantage is in the minimum bleeding and shortening of the time for the postoperative catheterization (catheter can be removed during the first day after the operation). Thus, the period of stay in the hospital is less. The transurethral vaporization of the tumour is indicated for patients with BPH who require low invasion for the time of operation because of their age and the general state. Compared to other alternate methods of BPH treatment, TURP advantage is in low cost and absence of necessity in other equipment in addition to a vaportrode.

Application of prostatic stents for some patients with BPH is justified. The stents may be used for temporary liquidation of obstruction as the preparatory stage for a radical surgical operation or as a terminating method of treatment. The main indication to their application is prevention of acute ischuria after the laser prostatectomy, thermotherapy, transurethral needle ablation of the prostate, effect of the focused ultrasound of a high frequency.

The low-invasive methods of treatment include transurethral balloon dilatation of the prostate. Balloons of different designs are used for dilatation of the prostatic part of the urethra. The mechanism of dilatation effect is likely to be related to the gland compression and forcing out of the tissue fluid and consequent dehy-

dration and atrophy. The mechanical dilatation of the urethra, stretching out of the fibrous capsule make an effect on α-receptors of the neck of the urinary bladder and the prostatic part of the urethra.

Laser technologies are widely used in BHP treatment. The laser technology provides laser irradiation (direct and indirect) of the prostatic part of the prostate (Fig. 64, 65, see col. suppl. sheet). Laser with a 1,064 nm wavelength and power of 60 W is used to perform coagulative necrosis. The edema of the prostate after irradiation needs the urinary bladder to be catheterized for a longer time than that after TURP and TUIP. The laser effect on the prostate is based on transformation of light energy to the heat of tissue. The zone of the coagulative necrosis is replaced by fibrosis and atrophy. This process lasts for 8–12 weeks.

The thermal effect of the prostate takes a significant place among alternate methods of the BPH therapy. The hyperthermal thermotherapy is indicated to patients with the moderate and expressed obstruction and a large volume of the prostate (more than 40 $см^3$). Still, the amount of complications after treatment by this method is also increased, irritative symptoms occur and there is a need in catheterization of the urinary bladder for a long time. This method provides a thermoablation of the prostate.

The *focused extracorporal* method of therapy is under development, it is based on the thermal and cavitation influence onto the prostatic tissue. The attempts of treating BPH by the extracorporal shock — wave therapy is made, with usage of devices for a remote lithotripsy.

The medicamental treatment of patients with BPH for the past years has acquired a wide application. It is necessary to note, that the extent of symptom removal by applying these methods of treatment does not achieve the results of surgical treatment. Thus, the smaller result is chosen, but with a smaller risk for a patient.

It is generally recognized that BPH development requires a combination of influence of testicular hormones and age. The main intraprostatic androgen is dehydrotestosteron (DHT), which is derivated from testosteron under the effect of enzyme 5 α-reductase. In the early 80s of the XX century there was synthesized a drug that inhibited activity of the enzyme, — finasteride (proscar). The purpose of administration of this drug is reduction of the hyperplastic prostate volume, speeding up the urine flow, decrease of symptoms and prevention from disease progressing. The clinical

studies have shown that treatment with finasteride for 2 years decreases the risk of acute urine retention by 57% and by 34% — surgical intervention. Patients with a prostatic volume more than 40 $см^3$ and the level of prostatic specific antigen of 2.5 ng/ml have the best results of treatment.

Two components form an obstacle for urine outflow from the bladder caused by BPH: a static one related to the anatomic obstruction as a result of prostate enlargement, and a dynamic one, related to the nervous control of the tonus of the smooth muscles of the prostatic part of the urethra and the neck of the urinary bladder. If finasteride first makes an effect on the sizes of the prostate, then preparations that block the receptors control the tonus of smooth muscles of the prostate and the neck of the urinary bladder. Administration of a α-adrenoblockers moderates the tonus of smooth muscles in the prostate and the lower urinary tract, protects α-adrenoreceptors against sympatomimetic stimulation, the result of which is increase of the urine flow and reduction of symptoms of the disease. In most cases patients are administered α-adrenoblockers of prolonged action: terazosin, doxazosin (cardura) and prostate-specific α1a-adrenoblocker tamsulosin (omnic). Their basic negative affect is connected with vasorelaxant action and, as a consequence — a decrease of arterial blood pressure.

For decreasing the BPH symptoms, some phytotherapeutic drugs are prescribed: an extract of the African plum-tree (tadenam), that of nettle (urtiron), etc. For more detailed study and confirmation of their efficiency, it is necessary to perform (compared to placebo) additional randomized studies. One can prescribe these drugs to patients after having provided them with the information that the abatement of symptoms may not necessarily be accompanied with a reduction of the extent of infravesical obstruction.

Nowadays there is a large arsenal of methods to treat BPH, which requires profound understanding of both pathogenesis of the disease and of mechanisms of these methods acting on the prostate.

According to recommendations of the 3rd Meeting of the International Consultation Committee on BPH by results of the randomized studies, the balloon dilatation and hyperthermia (T 45°C) are not considered perspective. Other forms of the hyperthermal action remain under development. The laser exposure continues developing. However, numerous methods of applications and restricted time of observation do not allow to estimate its effect and ad-

vantages compared to TURP. Therefore TURP, TUIP and open prostatectomy remain the most effective ones. Among methods of medicamental therapy the efficiency of the antagonists to α-adrenoreceptors and inhibitors of 5α-reductase is recognized. However, medicamental therapy is effective only in case of uncomplicated course of the disease. Besides, administration of medicines should be preceded by fundamental examination by a qualified urologist.

PROSTATE CANCER

The prostate cancer (PS) is one of most frequently found malignant neoplasms in men of the middle and old age. In the structure of oncologic male diseases it is in the second place, and in some countries — the first one (10 years ago this disease in the USA was in the first place as a reason of death resulting from malignant tumours in males older than 50 years and nowadays in this country PC is the most spread male tumour: its incidence accounts for 317 thousand new cases a year, mortality is 41 thousand). At the age of 50 years the risk of PC reaches nearly 42%.

Every year in the world about 300,000 new cases of prostate cancer are diagnosed. Still, a disproportion between the level of incidence in the highly developed countries in Europe and North America (100.2 per 100,000 males) and the level in Asian countries (1.0–6.6 per 100,000 males) remains constant.

According to B. P. Matveyev et al.'s data (1999), PC in Russia by its increment takes the second place after skin melanoma (35%) and it exceeds considerably malignant lung diseases (5%) and stomach diseases (10.2%). Thus, if in Russia in 1989 index of PC incidence was 8.4 cases / 100,000 of population, then according to reports of 1996 it reached 11.3. The highest mortality due to prostate cancer is in West India and the Bermudas — 28–29 per 100,000 males. Among Japanese males emigrated to San Francisco incidence is 16.5 per 100,000 males, and among their relatives who remained in Osaka — 6.1 per 100,000 males. Every year in Europe they register at least 80 thousand of new cases of the disease. For the past years there is a stable growth of PC incidence in Ukraine and Russia. It is worth noting that incidence and mortality from prostate cancer in Ukraine does not exceed these data from the USA and Great Britain.

Very seldom PC occurs in males under 40 years old. Above 40 years the disease incidence among the males begins to rise and this tendency is on up to 80 years. The average age of patients is within 62–70 years old. Nearly 50% of patients with prostate cancer at the moment of making the diagnosis have already metastases.

Etiology and pathogenesis. At present etiology of prostate cancer remains one of the most urgent problems. Some studies proved a direct relation of prostate cancer occurrence to disorders in the endocrine regulation of sex hormone balance at the level of the hypothalamic-pituitary-adrenal axis and gonads (testosterone).

The study of the rate of morbidity among the Japanese and black emigrants in the USA shows that factors of the environment play an important role in cancerogenesis of the prostate.

It was found that factors of risk for PC development are age, race (Negroids), family (inherited) history.

It is supposed that it may be caused by fat meal, contact with cadmium, vasectomy, BPH, decrease of ultraviolet radiation. The prostate cancer in 85% of cases develops from the peripheric zone of the prostate, to which there is a good access for digital rectal examination and only in 25% — from the transient zone which is inaccessible for digital and ultrasonic examination.

Staging. The prostate cancer is classified according to the International staging system TNM (tumor, node, metastasis) (Fig. 66). In stages T1 and T2 the tumour does not invade beyond the limits of the prostate; T3 — the tumour occupies the prostate, invades outside its capsule, there are expressed metastases in regional lymph nodes; T4 — the tumour invades into the adjacent tissues and organs, it gives formation for numerous metastases.

Up-to-date international classification of prostate cancer

The staging relates only to prostatic adenocarcinoma (hyperplastic prostate). The transitional cell carcinoma of the prostate is classified as an urethral tumour. There should be a histological verification of the diagnosis. Stage T is assigned on the base of a physical examination, radiation diagnostic methods, endoscopy, biopsy, biochemical assays; stage N — according to results of the physical examination and radiation methods; study of the skeleton and biochemical assays.

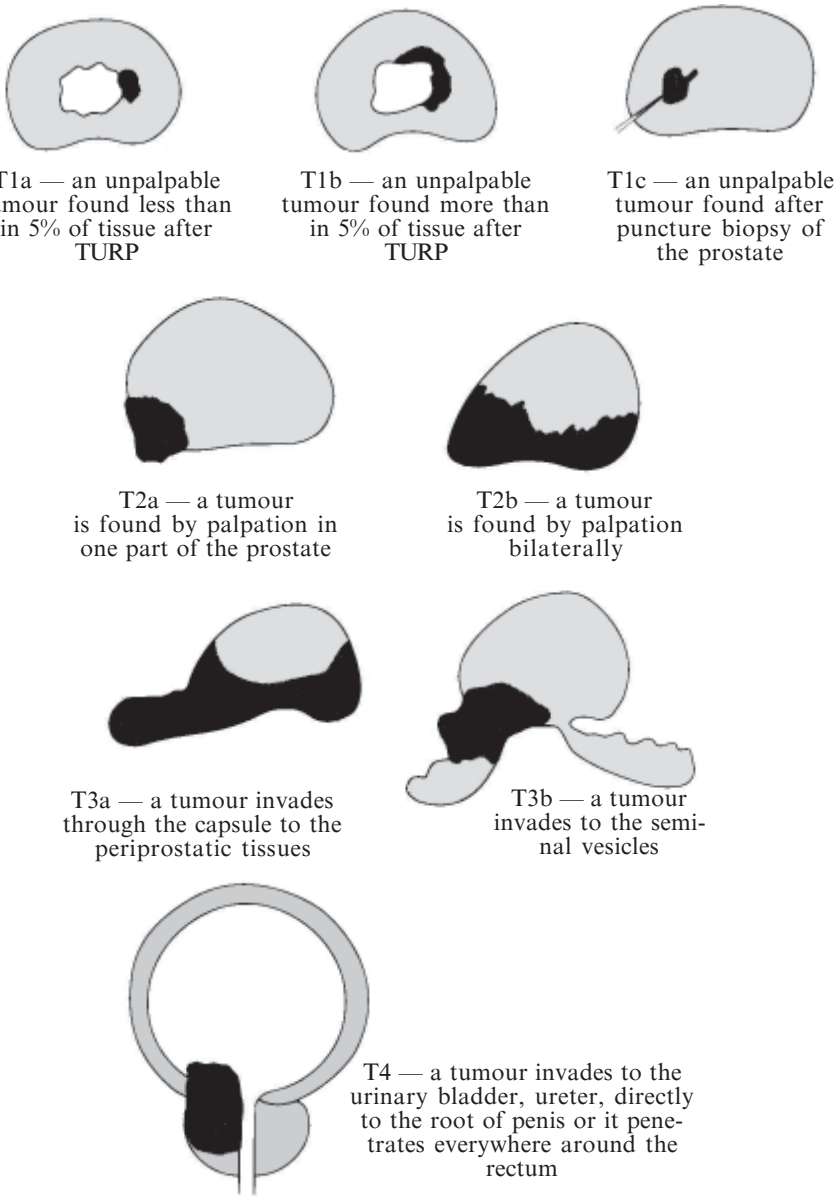


Fig. 66. Prostate cancer. Criteria of distribution according to T stages (TNM staging)

Regional lymph nodes are lymph nodes of the proper pelvis located below bifurcation of common femoral arteries. Extension of the tumour does not effect on assignment of stage N.

Clinical staging TNM

T — primary tumour (see fig. 66)

Tx — primary tumour that cannot be estimated

T0 — there are no data on the primary tumour

T1 — a tumour that is not manifested clinically, cannot be found by palpation and radiation diagnostic methods

T1a — a tumour has been found by chance, no more than in 5% of the tissues taken out

T1b — a tumour has been found by histological examination, accidentally, more than in 5% of the tissues taken out

T1c — a tumour has been found by means of biopsy (i.e. in connection with availability of a higher PA level

T2 — a tumour is limited with the prostate

T2a — a tumour encompasses one part

T2b — a tumour encompasses two parts

T3 — a tumour invades beyond the limits of the prostatic capsule

T3a — extracapsular invasion (unilateral or bilateral)

T3b — a tumour invasion to seminal vesicles

T4 — a tumour is fixed or it invades to adjacent structures, others than seminal vesicles: the neck of the urinary bladder, external sphincter, rectum, levators and/or the pelvic wall

Notes: 1. A tumour found in one or the both parts by biopsy but not palpable and not found by radiation methods is staged as T1c. 2. Invasion to the top of the prostate or invasion to the prostatic capsule (but not beyond) is staged as T2 and not as T3

N — regional lymph nodes

Nx — regional lymph nodes which cannot be estimated

N0 — there are no metastases in the regional lymph nodes

N1 — there are metastases in the regional lymph nodes

M — distal metastases

Mx — distal metastases which cannot be estimated

M0 — there are no distal metastases

M1 — availability of distal metastases

M1a — lymph nodes which are not referred to regional ones

M1b — bones
M1c — other localizations

Notes: With more than one localization of metastases it is necessary to assign a category which corresponds to a wide spreading of the tumour.

Pathoanatomic classification pTNM

Categories pT, pN, pM correspond to categories T, N, M. Still, category pT1 is absent because availability of tissues is insufficient for assignment of the highest category pT.

G — histopathological gradation
Gx — a stage of differentiation which cannot be estimated
G1 — a highly differentiated tumour
G2 — moderately differentiated tumour
G3–4 — low differentiated (undifferentiated) tumour

The histomorphological characteristic PC according to classification of the International Union Contra Cancrum (IUCC) includes 3 types of the histological gradation:
1 — a high degree of differentiation
2 — a moderate degree of differentiation
3 — a low degree of differentiation
According to location of the primary development — in the acini or tubules — the adenocarcinoma is in nearly 90% of all histological forms.

The sarcoma of the prostate is found in 0.5–1% of patients, more often in the young age.

Grouping in stages

Stage 1	T1a	N0	M0	G1
Stage 2	T1a	N0	M0	G 2-3-4
	T1b	N0	M0	Any G
	T1c	N0	M0	Any G
	T1	N0	M0	Any G
	T2	N0	M0	Any G
Stage 3	T3	N0	M0	Any G
Stage 4	T4	N0	M0	Any G
	Any T	N1	M0	Any G
	Any T	Any N	M1	Any G

Diagnosis. According to recommendations of the European Association of Urologists, issued in February, 2002, the main methods for diagnosing PC are as follows: digital rectal examination, determination of PSA level in the blood serum and transurethral ultrasound (TUUS).

Many patients have an asymptomatic disease course in the initial stages, therefore it is necessary to detect it actively. Thereby the digital rectal examination (DRE) of the prostate is of great significance. If there are no examination rooms for men in polyclinics, not only urologists and oncologists should perform DRE, but other practitioners as well, for all men older than 45 years, who admit to the polyclinic for medical care due to any reason. With the slight suspicion on PC, the practitioner should refer the patient to be tested for PSA.

The PSA test (no more than 4.0 ng/ml in norm) has a high sensitivity and specificity, a low rate of false-positive and false-negative results and a high prognostic significance. The American Association of Urologists recommends to perform this test for all healthy men in age above 50 who expect to live more at least for 10 years.

In case of raised PSA level, it is necessary to perform ultrasonography with use of a transrectal sensor and a thin-needle perineal (or transrectal) biopsy of the prostate. These methods for making an effective early diagnosis accessible for every physician help to find more than 90% of patients with PC in the clinically localized stage. In case of a positive result of the biopsy, the further step in the diagnostic algorithm is determination of incidence of the malignant process: survey and excretory urography, radio-isotope bone scanning, computer tomography, magnetic resonance imaging procedure.

Making the final diagnosis will require a pathohistological confirmation of the prostatic adenocarcinoma, taken by biopsy or by aspiration needle cytodiagnosis. The diagnosis in the early stages of the disease will require carrying out numerous so called systematic or sextant sampling of tissue from the organ under the transrectal ultrasound guidance which provides a more precise diagnosis as compared to the digital and even rectal ultrasound control.

For the PC to be found in the early stage, we advise such an algorithm for patients' examination:

— rectal digital examination of the prostate;
— PSA level testing;
— ultrasound examination of the prostate (better with use of a transrectal sensor);
— thin-needle perineal (or transrectal) puncture biopsy of the prostate; if it does not give enough information — transurethral resection is performed.

Additional methods of examination for clarification of limits of the spread-out process:
— ultrasonography of femoral arteries;
— radioisotopic lymphoscintigraphy;
— X-ray of pelvic bones and the lumbosacral area of the spinal column (if necessary, other areas);
— computer tomography, magnetic resonance imaging procedure.

Nowadays nobody doubts in the fact that early diagnosis is the most perspective way of struggle against cancer. According to the reports of studies carried out in the USA (1998), the cost of treatment for patients with a local prostate cancer is 3–5 times as low as that for the spread-out cancer.

In early diagnosis the main role is referred to physicians of the general treatment network, but additional examination and treatment of patients with prostate cancer should be carried out only in specialized medical institution — an oncologic dispensary.

Clinical picture. In the early stages of its development prostate cancer runs asymptomatically, the diagnosis is often made after the digital rectal examination in connection with another disease.

In stages T3 and T4 the tumour is invading into surrounding tissues of the prostate. With further tumour growing, there occur symptoms of the disease which differ little from clinical manifestation of benign prostatic hyperplasia (due to absence of metastases). They are: dysuria as more frequent feeling to urination, difficulty in urination, up to complete retention, pain in the anus, sacral bone, lumbar, legs, a sense of heaviness in the perineum. A later manifestation of cancer are symptoms of the disease of the upper urinary tract, which is related to enlargement of the tumour to the ureter zone and their mechanical compression.

The prostate cancer treatment remains a complicated and contradictory problem which is conditioned by specificity of the clinical course of the disease and a different nature of tumour response to a certain medical effect. In case of early diagnosis of the pros-

tate cancer recovery is achieved in the majority of cases. The rate of 5-year survival is 90%. In case of metastasic lesion of distal organs or skeleton, even if the best up-to-date methods of treatment are used, survival does not exceed 3 years.

Treatment should be combinatory or complex and it depends on the stage of the disease, tumour response to different types of therapy, general state of the patient and some other factors.

A wide usage of early diagnostic methods for the prostate cancer and radical methods of treatment (surgical and radiation ones) is the most perspective. Unfortunately, the reality contradicts with it: over 60% of patients with the prostate cancer found for the first time have already metastases.

A selection of therapeutical technique and procedure of its performance depends on the stage of the disease and the degree of differentiation of the prostate cancer. When planning the operation, one should better always prefer a radical method.

In stages I–II when the tumour is not yet widespread beyond the limits of the prostate tumour, radical methods of treatment are to be used.

Radical methods of treatment of patients with localized prostate cancer

1. Radical retropubic prostatectomy (RRP).

In most urological clinics of the world as well as in our country RRP is performed by the P. Welch technique.

Criteria of patients' choice are as follows:

a) I–II stage of prostate cancer (T1–2-N0M0), absence of regional metastases;

b) age under 70, absence of serious concomitant pathology;

c) verified diagnosis.

Due to difficulties of early PC diagnosis, a great scope of surgery as well as advanced age of majority of patients who also have several concomitant diseases RRP can be performed only in 5–10% of cases. Pelvic lymphodenectomy with histological identification of the removed lymph nodes is obligatory performed in RRP. When metastases or micrometastases are revealed in them, treatment is supplemented by radiation or hormone therapy.

2. Distance telegammatherapy (TGT) according to radical programme of total focal dose of radiation (TFD) is 60–70 Gy.

Treatment is given by two stages: I stage of TFD — 40–45 Gy, 4 fields (2 anterior and 2 posterior).

The regimen is static. The single focal dose is 1.8–2.0 Gy It is given daily, 5 times a week.

After a 3-week interval the 2nd stage of TFD is made by up to 60–70 Gy. The regimen is rotational with deviation angle of 120–240°.

Taking into consideration that initially there are populations of cells in the RRP tumour tissue which are insensitive to hormone therapy, it is necessary to choose as many patients as possible to apply distance TGT. The criteria of patients' choice are based on the study of regional metastatic ways of RRP. The state of the regional lymph nodes is the basic condition for giving TGT. The bilateral retroperitoneal glomerular lymphadenectomy (BRGL) is performed with express-cytological tests of the removed lymph nodes.

Literature data and our own observations convinced us that due to histological identifications of the removed lymph nodes metastases are revealed in them more frequently than in case of applying other nonsurgical methods of investigation. According to different authors all noninvasive methods of the regional lymph node investigation give error from 15 to 68%. 42% of patients with the regional lymph nodes are affected by micrometastases sized to 2 mm that are revealed only by the morphological method. While performing BRGL it is necessary to remove completely the regional lymph nodes. When the regional lymph nodes are subject to removal and there are no distant ones, combined treatment is used: maximal androgen blockade (MAB) and TGT-NAD of 60–70 Gy.

During BRTL paravasal cellular fat with lymph nodes are removed (dissected) from the posterior wall of the inguinal canal up to the bifurcation of the glomerular vessels, and if necessary, more cranially. The removed lymph nodes are subject to express-cytological tests.

In absence of regional metastases the operation is completed. The patients are administered the course of TGT of the radical programme after the operative wound healing.

Treatment of patients with diffuse prostate cancer

Due to peculiarities of the clinical course and diagnosis imperfection, 60–80% of patients with PC who first referred to a physician have metastases. PC is the most sensitive to hormone effect among all hormone-dependent tumours. There was a conviction

earlier that testes are responsible for production of 95% of all androgens though the latest results give evidence that both testes and adrenal glands produce up to 50% of total amount of androgens located in the adult prostate. In fact, the prostate like other endocrine tissues transforms nonactive precursors of the adrenal nature — dehydroepiandrosterone (DHEA) and DHEA-sulfate into active androgen (DHT). The therapeutic measures used for diffuse RRP reduce maximally the production of endogenic testosterone (the so-called MAB).

For a long time the leading place in PC hormone therapy was taken by synthetic analogues of female sex hormones — estrogens. According to different statistical data general 5-years' survival rate of patients with PC who have been treated by estrogens is from 18 to 62% of cases including patients with disseminated cancer — 8–22%. However, estrogen therapy has quite significant drawbacks: complications in the cardiovascular system, gastrointestinal tract, coagulation blood system, and suppression of immunity. The patients die from the complications associated with estrogen usage but not because of the disease progress. Therefore routine estrogenotherapy as the first line of treatment of diffuse PC is not widely used though its significance as the other line of treatment is not denied.

During the last years new hormonal remedies are successfully used for treatment of patients with diffuse PC, among them antiandrogens and analogues of gonadotropic releasing hormone (AGRH) draw special attention of clinicians. The application of androgens in MAD regimen proved to be popular and effective, simultaneously blocking androgens both of testicular and adrenal origin.

Maximal combined androgenic blockage includes a) medication castration (AGRH — zoladex, decapeptil, etc.) or surgery; b) antiandrogenotherapy (flucinol, anandron, androcur, etc). The results of numerous studies confirmed significant advantages of using combined hormone therapy in MAB regimen by objective and subjective parameters. According to the Russian Oncological Research Centre named after M. M. Blokhin, partial regression of the process was determined in 48.7% of cases and the disease progress — only in 7.9%. Improvement of life quality, i.e. decreased intensity of pain syndrome, reduction of dysuria, increased appetite, etc. were determined in 97% of patients. MAB application promoted prolongation of patients' life, and this result was obtained in treat-

ment of the patients both with localized and diffuse stages of PC. On the basis of these data we can make a conclusion that MAB should be used not only for treatment of diffuse but also as a constituent of therapy at the early stages of this disease.

Fernand Labry from the Laval University (Quebec, Canada) has made large scale investigations and come to the following conclusions: neoadjuvant MAB (flucinor + AGRH) having been made for 3 months improves results of surgical and radiation treatment of patients suffering from localized PC. Continuation of combined hormone therapy after radiation therapy allows to improve remote results of treatment. Adjuvant combined hormone therapy having been made for 5 years results in maximally marked destruction of the tumour cells and improves remote results of treatment in patients with the disease of T2 and T3 stages.

When it is impossible to make radical treatment or expected patient's life duration does not exceed 10 years (at the age of 70 and over) MAB usage is a highly effective therapeutic method of localized PC. Combination of long-term MAB (probably for 5 years) with surgery or radiation therapy is the best management for patients of younger age.

It should be noted that the study of PSA level not only for diagnosis but also for controlling efficacy of treatment of patients both with localized and diffuse PSA play a great role. The study of PSA level is recommended every 3–4 months. Normalization of the PSA level is considered to be a sign of treatment efficacy and its elevation is an indication for changing the therapy plan.

However, during treatment of patients with diffuse RRP sooner or later the tumour process advances against the background of hormone therapy, so their condition becomes worse. It is explained by the fact that as a rule, PC consists of three populations of cells:

— androgen-dependent ones which need androgenic stimulation for development;

— androgen-sensitive ones that are not killed because of androgen absence but their growth gets slow due to this;

— androgen-independent ones whose growth do not need androgens.

Aggravation of patients' condition may be explained by growth of androgen-independent PC cells. The tumour transforms into insensitive to androgens the same as to estrogens if they were used before. According to B. P. Matveev, the Russian Oncologic Sci-

entific Center (ROSC) named after M. M. Blokhin, it is necessary to withdraw all hormonal remedies used, and it may improve the patients' state in time (a so-called withdrawal syndrome). Such paradoxical response is noticed in all hormonal remedies of nowadays. The withdrawal effect may last for 4 months, and it is confirmed by objective data. For example, the PSA level decreased in 47% of patients and 22% of them had decreased size of the tumour after withdrawal of flucinol. Most responses of such kind take place in MAB application. The mechanism of the paradoxical response to withdrawal of the hormone therapy is incompletely clear yet. In case of development of therapeutic hormone resistance a question will be raised about the second line of therapy. In this case there may be used the preparation estramycin both as monotherapy and in different combinations: estramycin + hydrocortisone; estramycin + vinblastin; estramycin + vinblastin + hydrocortisone.

Traditional polychemotherapy is still important (doxirubicin, ethiposide, vinblastin, carboplatin, taxol, etc).

In presence of diffuse PC with bone metastases when there is hormone resistance a good effect is observed in using intravenous infusions of honvan up to 1,200 mg daily for at least 10 days. Introduction of high doses (1,200 mg/day) of honvan influences directly on the synthesis of DNA and protein, inhibits them and causes antimitotic effect.

According to the data of the ROSC named after M. M. Blokhin there was found the antitumour effect of suramin in combination with hydrocortisone. The mechanism of suramin action is binding of the PC growth receptors.

In the last years immunotherapy with laferone (recombinant alfa-2b-interferon) is widely used for treatment of patients with PC, especially hormone resistant ones.

Thus, early diagnosis and application of radical methods of treatment is the most perspective trend in PC therapy and allows to cure of patients complitely. Treatment of patients with diffuse and hormone-resistant PC requires creative improvisation of the physician, that should be based on knowledge of all modern therapeutic methods. Properly chosen combination of different methods of treatment and up-to-date drugs improve remote results of treatment of PC patients.

Lecture 8

UROGENITAL INJURY

The urogenital tract (except external male genitalia) is well protected from external violence and a penetrating injury owing to its inherent mobility, surrounding viscera and musculoskeletal structures. Patients with urogenital injuries may be directly subdivided into two groups:

1) those suffering from penetrating injuries who need examination;

2) those suffering from blunt external injuries who need urgent surgery.

GENERAL ASSESSMENT OF THE PATIENT SUSPECTED OF UROGENITAL INJURY

History of the injury (disease history). It is extremely necessary to know the etiology of the injury for providing care, as well as for exam so as to verify the integrity of some parts of the urinary outflow tract and to differentiate a penetrating injury from a direct external effect. If the patient is conscious, he will be able to explain in details occurrence of the injury (whether it is a fall from a height, a car accident, a stab or bullet wound or a sudden deceleration). It is necessary to pay a special attention to a shock (systolic pressure < 80 mmHg) or macrohematuria in the history as factors at which there is a need in X-ray studies, in order to estimate the severity of the injury. If the patient is conscious, he will be able to provide a urine sample himself to have a general uroanalysis (as minimum), except for the male patient with a known straddle injury (a jockey pose) in which case urethrography should be carried our prior to catherization or self-urination. If the patient is unconscious, the cause of the injury may be provided by the persons

who have brought the patient to the emergency care hospital. Relying upon this information, inspection is carried out in seeking for intra-abdominal and intrapelvic hematomas; fall in hematocrit; enlargement of the scrotum or swelling in the flanks of abdomen projections; discoloring of the external genitalia which may serve as symptoms of the urogenital injury. The retrograde urethrography should be carried out in case of the blood available in the outer opening of the urethra or in case of a hematoma in the perineum or in case of fracture of the pelvic bones, for instance, in case of Molchalin fracture, these phenomena give the basis to suspect an injury of the urethra. If the information is not sufficient, at first urethrography with a sterile water-soluble, contrast substance is to be performed. If the retrograde urethrography cannot be carried out, a small bladder catheter (16–18 Ch) should be introduced with the patient being unconscious. Introduction of the catheter provides information on availability of hematuria or rupture of the urethra, urinary bladder and it helps to carry out cystography, to measure the amount of urine; it gives a possibility to estimate blood-substituting therapy and therapy that replenishes intracellular and extracellular volume of fluid.

When carrying out inspection and observation, one must follow certain rules. Although urologists first concentrate on the urogenital system, they should be certain that:

1) an adequate possability of the upper airways has been established;

2) an access to the vascular system for fluid replacement is accomplished;

3) bleeding sites have been controlled;

4) safe drainage is provided for the urinary tract;

5) nasogastric intubation, especially in the unconscious patient, has been carried out.

Diagnosis. In order to have a more exact estimation of the injury of the urinary bladder and urinary tract, a retrograde cystography and ureterography are to be carried out, with taking pictures after urination or drainage. Damages of the upper part of the urinary tract are evaluated by means of computed tomography (CT) if possible.

The presence of a distended abdomen, absence of bowel sounds, a history of deceleration injury; presence of palpated formations in the abdominal bottom or flank projections; suspicion for injury to the pancreas, liver, or spleen, high blood leucocyte count

(>20,000) or injury to the bowel are indications to CT examinationof the abdomen. Renal and other abdominal visceral outlines are more clearly seen on CT. Minimal urinary extravasation not seen on an excretory urography (EUG) may be found by CT with contrast material.

All patients with a penetrating trauma to the abdomen (stab or gunshot wounds) should undergo complete radiographic studying except for those cases with severely injured who have unstable hemodynamics after having been subjected to laparoscopic exploration.

Some authors have suggested limiting intravenous contrast material to patients with a shock in the history (systolic blood pressure <80 mm Hg) and/or macrohematuria.

Such a limitation would eliminate a large group of patients with microhematuria (<500 erythrocytes in the field of vision) with normal arterial pressure and no shock. The differential diagnoses of acute torsion from a testicular trauma or tumour can be made by US. However, they are often not available, and this should not prevent from alternatives in making a diagnosis and in treatment.

Examination of the injury. For the urologist who, for varying reasons, has no access to CT scanning, the examination of the injury by means of excretory urography and cystography gives valuable information for localization of the wound and for planning treatment. The examination of the injury is done by studying a kidney, ureter and bladder on the survey abdomen X-ray, and then injecting (after obtaining a negative response to iodine or contrast material) 40 or 60 ml of 30% iodine-containing contrast material. In 5 min after having injected the contrast material to the vein and performing the abdominal X-ray, the urinary tract is filled with contrast material and a film is taken. Films are made at the 10th, 15th and 30th min. The bladder is then to be emptied, and postevacuation films are made. In this manner, preoperative integrity of the urinary tract can be established, as well as necessity in operative intervention determined. In diagnosis of urinary tract injuries at least 5% of blunt trauma cases were classified as a severe renal injury.

RENAL INJURIES

Classification. Renal injures (wounding) may be classified as penetrating or blunt (Fig. 67). Penetrating injuries should be examined. Only a stab wound with does not enter the pleural or peri-

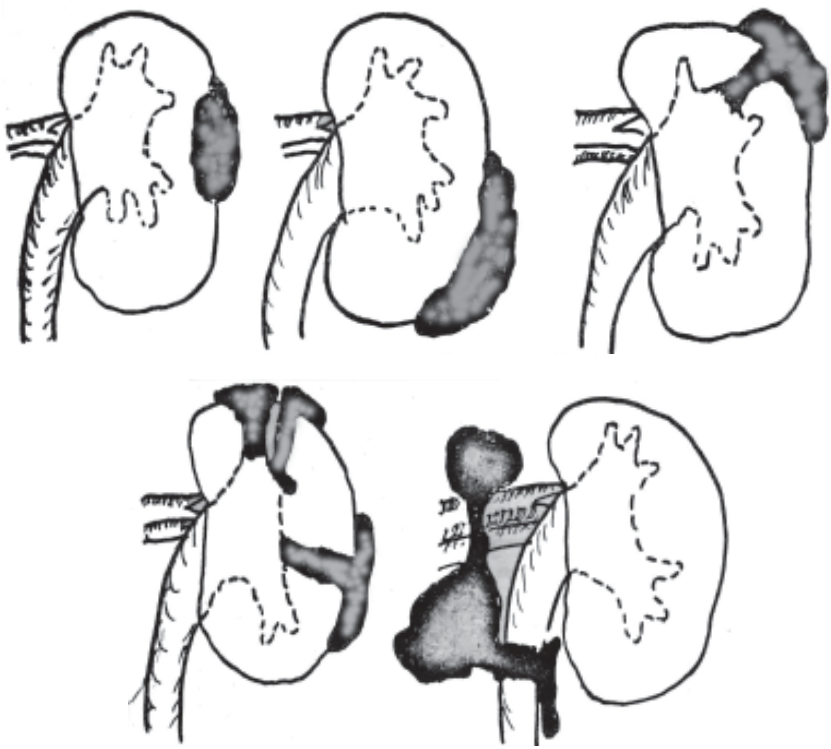


Fig. 67. Classification of renal injuries

toneal cavity may be observed as an exception. Patients with blunt renal injures do well in 96% of cases. Renal injuries may be classified as major or minor. A major renal injury includes a renal pedicle avulsion, polar avulsions or lacerations extending through the parenchyma into the collecting system associated with gross hematuria.

Minor renal injuries:

— a simple laceration;
— subcapsular hematoma;
— renal contusion.

Major renal injuries:

— renal rupture;
— laceration of the renal artery or vein;
— perirenal hematoma;
— laceration through the collecting system.

Diagnosis. A renal lesion may be suspected in an individual with gross or microscopic hematuria, a history of injury to the abdomen or its flanks, bruises over the flank, and fractured ribs near the spinal column clearly seen on the abdominal radiography (usually ribs X, XI, XII), as well as in an individual with a penetrating bullet injuries accompanied with gross or microscopic hematuria. In these cases CT scan is preferred. It defines associated visceral organ injuries more precisely than excretory urography; it shows a minute extravasation of contrast material from the urinary tract or bowel that might be missed by excretion urography.

In these cases in large traumatologic centres the patients are subjected to radiologic examination, except for the cases when a patient has gross hematuria with a shock or without it (systolic pressure is lower than 80 mmHg) or microhematuria with a shock.

The abdominal CT gives the same or more precise information on blood circulation through the renal parenchyma than that by means of intravenous urography (both methods do not provide full information on injury of the renal artery). CT provides more complete information on position of the ectopic kidney or on absence of the kidney than other methods of exam. It defines loci of infarction with the size less than 1.5 cm. The pelvic CT defines precisely injuries of the pelvic organs, their anatomy.

Arteriography in diagnosing artery injuries is a valuable method. The injuries that cannot be seen on the excretory urography are distinguished by CT at the level of the intima of artery.

Arteriography as compared to CT provides more information on presence of congenial stenosis of the renal pelvis-ureter segment or its combination with a neoplasm. This combination is possible in case of hematuria being present. In this case an injury is excluded. When a disproportional hematuria or proteinuria are found in case of an injury, one should think of a previous disease.

Some physicians compare blunt and penetrating injuries and renal wounding. In penetrating injuries one can find, often and in large quantities, combined wounds, especially in those cases where the gunshot wounds are the reason. The blunt injuries are characterized by an abrupt beginning, which is often diagnosed after occurrence of hematuria. There are two injuries that are characterized by a sudden beginning, both in children and in adults. They are a rupture of the arterial intima and injuries of the renal pelvis-ureter segment. The injury of the renal pelvis-ureter segment can be found in case of extansive traumas in children.

In penetrating injuries there is also a laceration of the intima of the renal artery.

Closed injuries to the kidneys

Damages of the kidney are of two types: open and closed (subcutaneous). Closed injuries are found more often in men than in women. The right kidney can be damaged more often than the left one, due to its lower position. The renal injury may combine with injuries of other organs (mostly organs of the abdominal cavity).

Closed injuries of the kidneys take the first place among injuries of the visceral abdominal and retroperitoneal organs. Mainly renal injuries are found in boys of school age. The main reason of the injury is a domestic and sport traumatism, as well as a strong contusion of the body or a kick over the kidney. A strong direct kick on to the kidney or over it, the anatomic location of the kidney and its physical properties, development of muscles, availability of subcutaneous fat and perirenal tissues, intraabdominal pressure at the moment of the injury, — all that has a great significance for the mechanism of renal injury occurrence. In addition, there are other mechanisms of renal injuries — a hydrodynamic effect, resulting in a rupture of the kidney, since the kidney is an organ composed of vessels of different gauges filled with fluid.

Classificaton. Closed injuries can be subdivided into 6 groups according to the nature and traumatic changes in the kidney and surrounding paranephric tissues (see fig. 67).

1. Contusion of the kidney: multiple hemorrhages into the renal parenchyma with the absence of macroscopic rupture of the parenchyma and subcapsular hematoma.

2. Subcapsular hematoma and subcapsular rupture of the parenchyma which does not penetrate the renal pelvis and calyces.

3. Injury to the capsule: small lacerations of the cortical layer of the parenchyma and injuries of fatty paranephric tissues with a hematoma in it.

4. Urohematoma — ruptures of the fibrous capsule and parenchyma with spreading to the renal pelvis or calyx.

5. Crushing of the kidney: multiple injuries of the parenchyma, capsule and renal pelvis-ureter segment.

6. Avulsion of the renal crus: injury to the renal vessels, rather often without renal injury.

Clinical symptoms. The main symptoms of the renal injury are pain in the lumbar region, hematuria, swelling in this anatomic region, paranephral tissues, strain of the fibrous capsule of the kidney, pressure of retroabdominal hematomas onto the parietal peritoneal leaf, ureter obturation with clots of blood.

Swelling in the lumbar region can be explained by 2 reasons: 1 — hematoma appearing in the subcutaneous fat, muscles and interfascial spaces of the lumbar region; 2 — urohematoma, i.e. urine from the renal pelvis and kidney is added to the blood flown out. The most typical symptoms of the renal injury may be hematuria, the nature and duration of which depends on the degree and localization of the renal injury. Hematuria may be late (secondary) which occurs in relation with hematoma suppuration. Usually hematoma exists for 4–5 days after the injury, in some cases — 2–3 weeks and more.

In case of a slight renal injury (a wound, subcapsular hematoma, laceration of the fibrous capsule) the general patient's condition is satisfactory. The diagnosis is made on the basis of the history of the case, availability of pain in the lumbar region, its irradiation, subcutaneous hemorrhage and micro- and macrohematuria.

In subcapsular renal injury *clinical symptoms* will be less expressed. The patients complaints of persistent or violent pain. In case of massive hematuria there may be tachycardia and falling of the arterial pressure. In this case of renal injury there may be symptoms of peritoneal irritation, specified by urohematoma adjacent to the parietal peritoneum.

Symptoms of deep lesion of the renal parenchyma with involvement of the urinary tract to the pathologic process in the pelvic area appears as a severe general condition of a patient, pain in the affected side with irradiation into the lower part of the abdomen, falling of AP, thread-like pulse, growth of urohematoma, which may be spread to the pelvic region, stretching anterior abdominal wall muscles. Presence of hematuria with formation of blood clots is one of the basic signs of involving the kidneys to the pathologic process. Formation of fine clots of blood takes place in the ureter.

Among lesions of the kidneys there may be iatrogenic injury, which occurs as a result of diagnostic and medical manipulations. The signs of lesion during paranephral blockade or biopsy of the kidney appears as growth of paranephral hematoma in the lumbar region and hematuria.

Treatment. A patient with the kidney injury must be admitted to the hospital immediately.

Conservative treatment of the isolated closed injury of the kidney is carried out in cases when patient's general condition is satisfactory, there is no profused hematuria, no symptoms of internal bleeding, no signs of hematoma growth and urinary infiltration.

Conservative cure includes taking care of a patient, strict bed rest for 10–15 days, administration of analgetic and hemostatic drugs, antibacterial therapy.

Indications to operative intervention in case of renal injury are combination of lesion of abdominal organs, increase of signs of internal bleeding, increase in hematoma growth, intensive and long hematuria accompanied with aggravation of patient's general condition, appearance of signs of acute inflammatory processes in the affected kidney and paranephry and occurrence of hyperazotemia. The patient is to be operated after being taken out of shock and if it does not work, then operation must be done with active usage of antishock therapy.

If the upper or lower renal segment is affected, it is possible to perform its resection (Fig. 68, 69). The defect is closed with sutures, while sewing the edges of the wound are made close to each other and hemorrhage stops.

Open injuries to the kidneys

These injuries include mainly gunshot wounds, under peaceful circumstances — stab and cut wounds.

Gunshot wounds are subdivided into isolated and combined ones (lesion of organs in the abdominal cavity, chest or wounds of the lumbar column, renal cortex or medulla, large vessels).

Clinical symptoms. The patient's general condition in case of an open injury of the kidney in most cases is critical, with clinical symptoms of shock. With the injury of organs of the abdomen, chest, symptoms on the part of these organs (peritoneal symptoms, hemothorax, paralysis) may mask the renal injury.

The main symptoms of renal injury are hematuria and presence of urine in the wound, hematuria occurs in 80–90% cases.

Presence of urine in the wound is the main symptom of the renal injury, but this symptom is seen less than hematuria and it comes

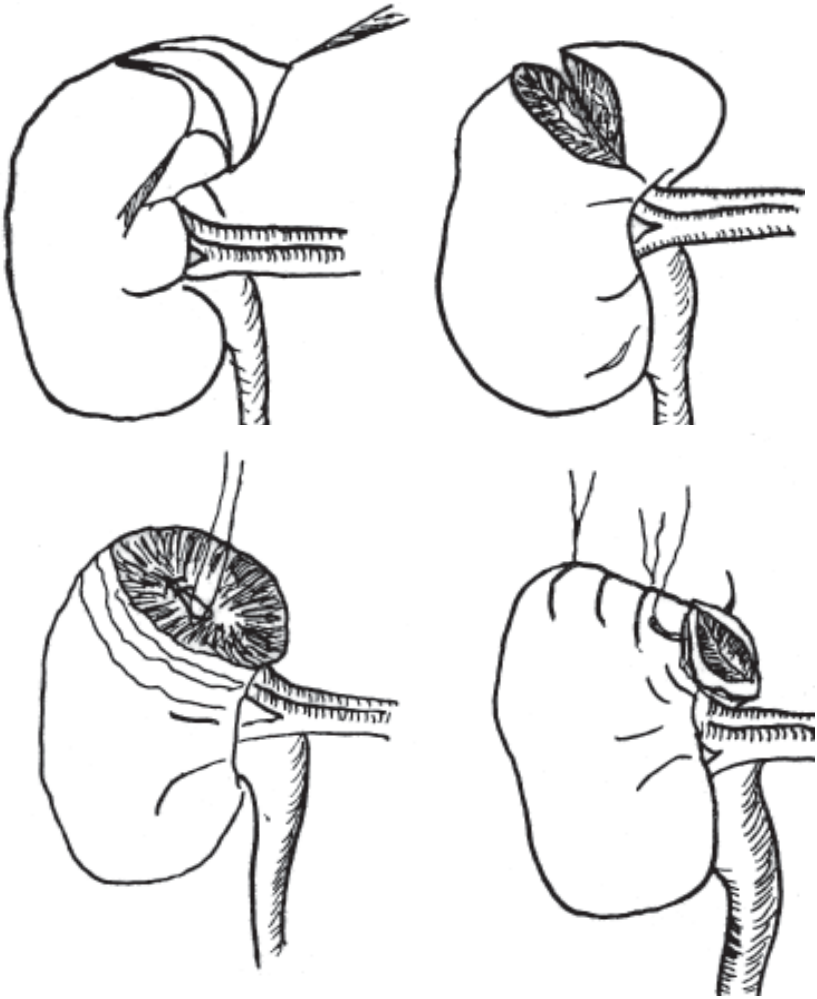


Fig. 68. Resection of the upper pole of the kidney. A scheme

later. The presence of urine in the wound in case of an open renal injury may be confirmed by means of the indigo-carmine method. If the affected kidney functions normally, the earlier urine portions will be blue, but the absence of staining does not say that the kidney is not damaged.

Diagnosis. A wound in the lumbar region, location of the wound canal, hematuria, appearance of urine in the wound are signs of

an open injury of the kidney. The diagnosis is made on the basis of special techniques of testing, such as excretory urography and ultrasound scanning of the kidney, retrograde ureteropyelography and renal arterio- and venography.

Treatment. Any open injury of the kidney requires an urgent operative intervention, which starts with basic treatment of the wound. If the vessels are affected, then the kidney is removed — nephrectomy. In cases of isolated injury of a renal segment, resection of the respective segment of the corresponding kidney is performed (see fig. 68).

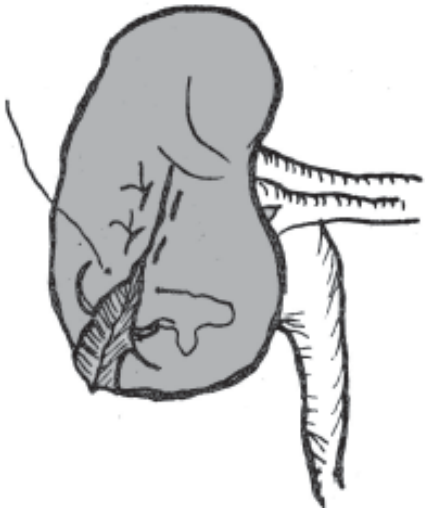


Fig. 69. Suturing of the kidney rupture. A scheme

INJURY TO THE ADRENAL GLAND

Isolated injuries of the adrenal gland occur very rarely. For the past 7 years among over 16,100 injuries registered in Ukraine there was not a single isolated injury of the adrenal gland. In 1990 an iatrogenic injury was studied by Skinner et al. As a result of injury, hemorrhage occurs in the renal medulla, the same can be seen during renal transplantation and in obstetrics during delivery while extracting a fetus out. Still more than 28,000 women in labour with pelvic presentation of the fetus did not have any hemorrhage. A bilateral adrenal injury in these cases is a rare phenomenon, because lately in obstetrics there is a tendency to perform a cesarean section in pregnant women with a persistent pelvic presentation.

URETHRA INJURIES

Urethra injuries take the first place in incidence of injuries of the urogenital organs and they are often combined with fractures of the pelvic bones. They take place more often in men than in

women. From the anatomic point of view, urethra injuries are subdivided into open and closed ones.

Closed injuries to the urethra

In case of these injuries other tissues are not destroyed. In occurrence of these injuries the main role is played by external pressure onto the urethra and a result of fracture of the pelvic bones.

When the pelvic bones are fractured, *pars prostatica* and *pars membranacea* are affected. Basing upon the nature of the injury, there may be distinguished 2 types of injuries — penetrating and non-penetrating ones, when not all layers of the urethra are affected.

In cases of wounds accompanied with fractures of the pelvic bones, the surrounding tissues and the urinary bladder are affected. The urine may penetrate to tissues of the small pelvis, retroperitoneal and prevesical spaces (Fig. 70). Fast joining of infection under these circumstances promotes formation of acute states: phlegmons of the small pelvic tissues and urosepsis.

A special group of urethra injuries are endourethral tool injuries caused by dirty metallic catheters, dilatators of the cystoscope and such peculiarities as formation of a false channel, which has been formed at mechanical damage of the urethra walls with formation of the urinary fistula in the paraurethral space.

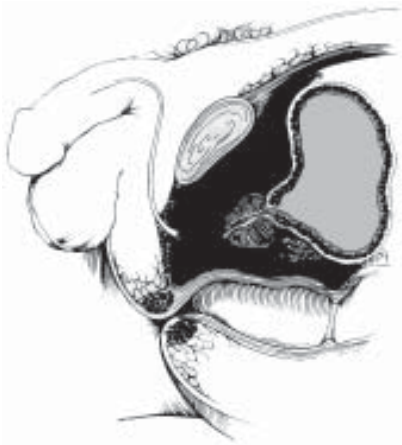


Fig. 70. A lesion of the posterior (membranous) part of the urethra

With the urethra being damaged, when trying to catheterize the urinary bladder, the infection may be introduced together with extravasation (urinary leakage) which leads to formation of a paraurethral abscess and a pustule.

Clinical picture. The earliest and most typical symptoms of the urethra injury are urethrorrhagia, stoppage of urine excretion and hematoma. Difficulty in urine excretion, close to acute

urine retention, depends mainly on the nature of the urethra injury.

Urine retention may be complete and partial. Difficulty in urine excretion, close to acute urine retention, may occur in case of nonpenetrating injury of the urethra, when urine outflow is not affected.

Diagnosis. Presence of injury in the case history, its specific nature and mechanism of urine excretion, urethrorrhagia, formation of hematomas in the paraurethral tissues help in making a diagnosis.

In rectal digital examination revealing of an edema of the paraprostatic tissues, irregularity in prostatic edges, pain at this procedure, bleeding from the outlet of the urethra after examination all those are typical symptoms of the lesion of the prostatic section of the urethra.

The main method in diagnosing lesions in the urethra is a retrograde urethrography showing outflow of contrast substance to the paraurethral tissues.

Treatment. In case of a complex injury and ruptures of the urethra with the edges of the wound diverged from each other, there should be performed a plastic operation aimed to recovery of the urethra integrity (Fig. 71). In case of closed injuries of the urethra there may be used a conservative method that

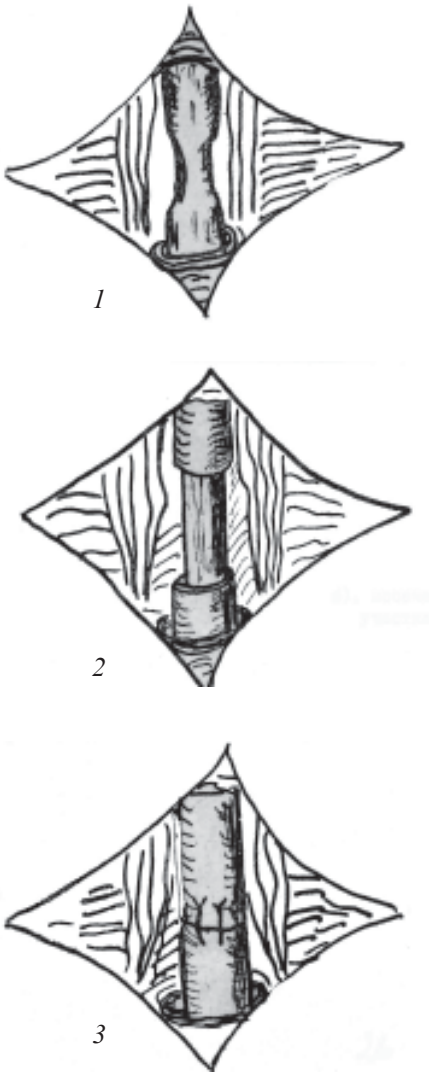


Fig. 71. Urethroplasty according to Kholtsov. The scheme of operation: *1* — isolation of the urethra; *2* — dissection of the narrowed part of the urethra; *3* — sewing of urethra edges "edge to edge"

includes a strict bed rest, local hypotermia of the affected area, antibacterial therapy and continuous drainage of the urinary bladder by means of a catheter in case of difficulty in urine excretion.

URETER INJURIES

Diagnosis. The ureteral injury should be suspected in each patient with an abdominal injury. Iatrogenic injuries not found in time lead to pain in the side, which lasts within 4–9 days, raised temperature up to 38°C. When palpating the kidney, its area almost always is soft. Presence or absence of hematuria cannot be the main reason in making a diagnosis. 11% of surgical patients with an injury of the ureter had an external, clearly expressed hematuria.

The ureter is injured rarely. It is protected well with surrounding organs and soft tissues (owning to its anatomic location and mobility).

With the ureter being injured, four main factors are significant:

1. Place of injury, i.e. which of the parts (upper, middle or lower one) is damaged.

2. Nature of injury, i.e. a blunt wound with laceration or a penetrating wound with the surrounding organs being damaged.

3. Time of recognition during which stenting may be used for just recognized damages.

4. Concomitant damages change standard treatment, nephrectomy becomes an operation of choice.

Damages will be secondary in case of gynecological, urological and vascular surgical interventions and they are rarely found in orthopedic or neurosurgical operations during laminectomy. Study of these cases indicates an interesting fact that a part of the ureter adjoining to the pelvic edge is injured much more often than the lower part which passes near the uterine artery, urinary bladder, hypogastric vessels, external iliac vein, a wide ligament of the uterus, etc. The ureter wounds were found in 16 cases of 1,093 extensive abdominal gynecological operations (Daly, Higgins, 1988). Thereby, 12 of 16 wounds were found in wounds of the ureter adjoining to the small pelvis edge, 10 — in the right ureter, 8 patients of that group underwent uterine extirpation before. No one of those patients had an injury of the ureter during vaginal manipulations. The rate of ureter damages in the gynecological surgery remains

at the level of 10 cases in abdominal surgery per 1 case in the vaginal one.

Due to high rate of complications in other forms of manipulations with the middle third part of the ureter, uretero-ureterostomy is a preferable method to close the damaged ureter in its upper and middle third part. If intramural or lower parts of the ureter are damaged, an ureter reimplantation is applied together with a tunnel technique (Politano—Leadbetter).

RUPTURE OF THE URINARY BLADDER

It is convenient to subdivide these injuries into two groups: extraperitoneal and intraperitoneal ones (Fig. 72).

The intraperitoneal rupture is often found when there is a direct external influence on the urinary bladder. The common reason is an accident, fall from the height, a penetrating wound. Alcohol abusing often leads to a road accident and a patient might have a full bladder. The intraperitoneal rupture, as well as an extraperitoneal one, may be connected with a fracture of pelvic bones with a divergence of the broken pelvic bone (usually a pubic arc) or without it. The intraperitoneal rupture should be suspected in

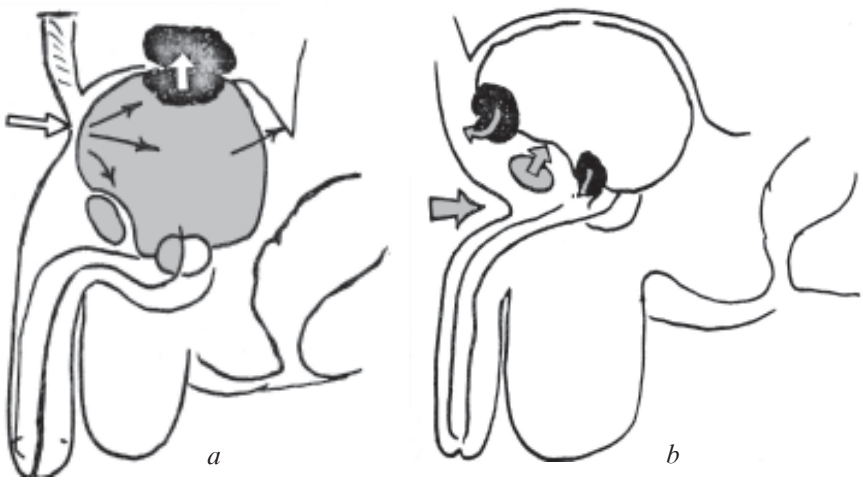


Fig. 72. A scheme of injuring the urinary bladder: *a* — intraperitoneal; *b* — extraperitoneal

patients who underwent an abrupt braking, who have malacia in the lower part of the belly, hematuria and impossibility to urinate. A voiding cystogram usually helps to make a correct diagnosis. In order to perform it correctly, it is necessary to fill the urinary bladder at least with 250 ml of sterile contrast material. Otherwise there would be seen a small urinary bladder which would appear to be intact because its wall would screen a place of injury. And it would be a case of hypodiagnosis.

Intraperitoneal ruptures of the urinary bladder are often combined with other intraperitoneal damages. Diagnostic laparotomy for the time of suprapubic cystotomy is a valuable method to reveal these damages. If the laparotomic result is negative, the wall of the urinary bladder should be sutured with chromic catgut or vicryl threads, there should be installed a suprapubic drainage and added with an extraperitoneal drainage (Fig. 73). 10–14 days after that a cystogram should be done through the suprapubic fistula with a postevacuation picture. If there is no visible extravasation and it is determined that the patient can urinate without residual urine, the suprapubic fistula is to be removed. In case of necessity it may stay there longer, i.e. when there is a concomittant rupture of the urethra, necessity for patient's immobilisation and necessity to make nursing for the bladder easier and to avoid such complications as urethritis, epididymitis and stricture of the urethra in men in case of long presence of the urethral drainage. Re-

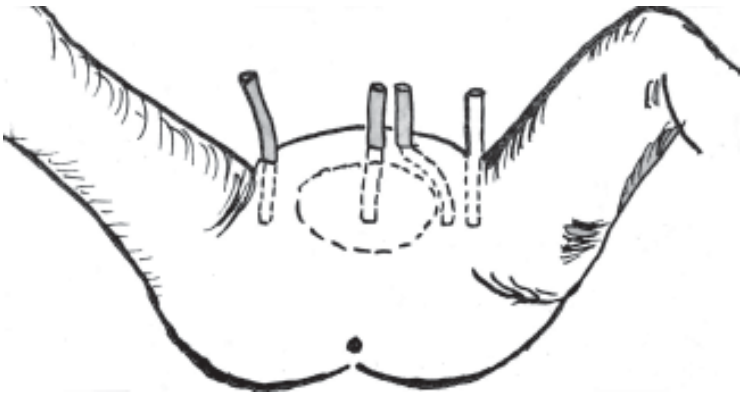


Fig. 73. Types of drainage for paravesical space through the anterior abdominal wall

covery in men with intraperitoneal rupture take place quickly when the suprapubic cannula is removed under the condition of normal urine evacuation through the urethra.

The extraperitoneal rupture is related most closely to the fracture of the pelvic bones, which can be found by an urologist while examining the patient. When the patient with a pelvic fracture is examined by an orthopedist, only 5–6% of physicians can find the existing urine extravasation. For instance, Herzog in the Parkland Memorial Hospital studied 512 fractures of the pelvic bones and found 25 ruptures of the urinary bladder (4.8%) and those of the urethra — 12 (1.3%).

A surgeon-orthopedist is less useful for a patient with the pelvic fracture, except cases with the Malgaigne fracture.

INJURIES TO THE SCROTUM

When treating the complete loss of the scrotal skin, only a few principles of actions should be observed. Implantation of the testis is to be performed under the nearest area of the thigh skin which is preferable over the subcutaneous abdominal placement, as the temperature on the surface of the thigh is 10°C lower and that is significant for protection of spermatogenesis. When only a small amount of the scrotal skin remains, flaps may be united by employing the perineal skin to cover testes. Patients with multiple injuries, particularly with fear of wound contamination, will need a repeated surgical treatment of testes in order to avoid suppuration. This place may be left for treatment: to apply tampons with saline every day or 25% solution of acetic acid until scrotal granulations are adequate to permit application of a thin flap of the skin or perform full grafting. Orchiectomy is not usually needed in such cases. When a laceration through the tunica albuginea of the testis occurs and contamination of the testis parenchyma is obvious, as with a penetrating close-range gunshot wound or a violent external injury, the testis parenchyma should be treated with fine foreign debris (dirt, bullet). Then it is necessary to irrigate the affected area with warm saline and to accomplish primary closure of the tunica albuginea with synthetic sutures.

Wide-spectrum antibiotics are indicated. Orchiectomy is rarely needed. The possibility of reimplantation of the amputated testis

and cord must be performed within 8 h of injury. Microvascular techniques exist today for successful revascularization.

INJURIES TO THE PENIS

The Buck's fascia encloses the cavernous body with the urethra spongy body included. Injury of the cavernous body may result in bleeding which may be spread up to the Buck's fascia. Such loci occur as a result of penetrating wounds as by a gunshot or puncture wound or may be a result of a blunt wound, for instance at the moment of coitus when the cavernous body may be injured by a partner's pubic bone. Lacerations of the tunica albuginea (Buck's fascia) result in blood or urine flow-in. Defects of the cavernous body usually can be palpated.

Treatment. Local and total anesthesia is applied when accomplishing hemostatic unresolved suture. Treatment in time can avoid penis bending resulting from scar formation which cause some problems, especially in erection. The scars look like deformation that occurs at the Peyronie's disease. Strangulation loci of the penis are formed when different objects are used in order to stimulate the sexual function or in masturbation. The penis edema will be decreased if soft soap is used or a thread to be wound onto the penis beginning from the external opening of the urethra so as to apply compression to the organ and to decrease its diameter with respect to the compressing object, as well as the edema.

Penis amputation

A complete or incomplete penis amputation may occur as a result of self-injury or injury by another person. There may be distinguished several main principles significant for saving the injured person:

1. The amputated part should be disinfected with a saline, placed into a vacuum flask with ice or into sterile saline, with ice being placed around and it should be transported to the centre of microvascular surgery. A compressing bandage is applied onto the proximal part in order to stop bleeding.

2. The patient should be transported to the centre where micro surgical operations are performed frequently, operation should be performed within 8 hrs after the injury.

3. If microsurgeons cannot recover dorsal arteries, superficial

veins of the penis and cavernous arteries of the urethra with the help of 10–11 nonresolving sutures, then the minimum assistance to be provided is recovery of the venous anastomosis with 8-10 nonresolving sutures. Confrontation of the proximal and distal parts of the body is possible when providing a venous drainage for reservation of the distal part of the penis.

4. The urethra may be saved by application of continuous or interrupted suture 5–0 or 6–0 (chromic catgut or vicryl). It is an important factor for further vital activity of the amputated tissue.

Damage of the tunica albuginea

This type of penis injury is often met when clothes together with the penis get into some mechanism, e.g. to a gardening or agricultural implements. For the proximal part of the penis skin not to be injured, the damaged part should be thoroughly fixed after the injury to the place of laceration. If the skin is damaged up to the root, it should be removed. Sometimes flaps of the skin of 0.15 mm thick taken from other parts of patient's body for a plastic operation do not provide normal stretching of the penis body in erection and become a source of discomfort for the patient.

TRAUMA IN PREGNANCY

With suspicion for the urinary bladder to be injured, the health of the mother takes precedence over the health of the fetus. In penetrating wounds of the abdomen, observation is indicated when perforation of the peritoneal cavity or the uterus has been determined. Doppler ultrasound is used to inspect the fetus, US helps to determine any anatomic changes that may be present. The location of the placenta, the status of the fetus, including monitoring of the fetal heart beats, can be seen by US. It is especially important in early pregnancy when radiation exposure is to be minimized.

Sakala and Kort (1988) have suggested an algorithm for grading the patients suffering from an abdominal stab wound in pregnancy, including the indications for immediate cesarean section. Measures undertaken in the pregnant females with abdominal injury differ from those in males. It is stipulated by a desire to minimize irradiation exposure, particularly in early pregnancy. Fortunately, ultrasound will allow painless assessment of the integrity

of the renal parenchyma, the states of the fetus and uterus, as well as suggesting the possibility of displacement of the kidneys and extravasation following penetrating injuries.

Renal parenchymal laceration in the pregnant female should be managed with adequate methods of treatment. Angioinfarction may be considered for branched lesion of the renal artery, which is diagnosed by arteriography. Open surgery is indicated for the majority of penetrating renal injuries and renal artery lacerations. Location of the placenta and evidence of placental injury may be determined by ultrasound, and fetal survey may be done as well.

Conservative management is most commonly indicated for the patient with no history of macro- or microhematuria and shock. An upper abdominal penetrating trauma is especially serious in the pregnant female, as the gravid uterus has a pressure mostly on the upper abdominal organs, making them more vulnerable to injury. In the absence of placental injury, there may be vaginal delivery of the fetus. The indication for cesarean section would be a fetus demonstrated to be alive by utrasonography, having a gestational age of 26 to 35 weeks, as well as a threat to mother's life by prolongation of pregnancy.

Usually, no problem occurs in operating pregnant women, even within a few days of term, if there is an injury to the kidney, renal pelvis-calyx system, or bladder. Nephrectomy and/or urinary drainage may be performed following the usual indication similar to a nonpregnant female.

Lecture 9

ACUTE AND CHRONIC RENAL INSUFFICIENCY

The kidney is an organ that regulates a balance of the inner medium.

Renal insufficiency is the condition at which all renal functions are disturbed, namely: excretion of nitrogen metabolism products from the body, water-electrolytic balance, acid-base balance, erythrogenesis and control of blood pressure and red erythrocyte hematosis, as well as other processes that take place in the kidneys.

Functional (transitional) failure of the kidneys is a transient disorder of their function.

Organic renal insufficiency can be acute and chronic. The both failures are based on the pronounced changes of the renal tissue structures which are accompanied with resistant failures of homeostasis.

ACUTE RENAL INSUFFICIENCY

The acute renal insufficiency (ARI) is a potentially reversible, fast developing (within several hrs or days) failure of all functions of the kidneys (a global one), more often of ischemic or toxic genesis.

Characteristic development of ARI first of all is an abrupt decrease of urine excretion (down to a complete anuria) as a result of which the body accumulates nitrous remainders, water-electrolytic balance and acid-base balance will be disturbed. In uncomplicated cases these processes are reversible. The extent and recovery time of the disturbed functions depend on duration of etiological factor affecting.

ARI occurrence is promoted with prerenal, renal and postrenal factors.

Classification. According to Ye. M. Tareyev and V. M. Yermolenko's classification (1983), ARI is devided into prerenal, renal and postrenal.

The basic reasons for development of the ***prerenal ARI*** are the following ones:

1. The conditions accompanied with a decrease in heart output (cardiogenic, hemorrhagic and traumatic shock, cardiac tamponade, arrhythmia, heart failure, embolism of the pulmonary artery), vasodilation (sepsis, anaphylaxis).

2. Reduction of extracelullar volume (burns, hemorrhage, dehydration, diarrhea, hepatic cirrhosis, nephrotic syndrome, peritonitis).

The ***renal ARI*** is caused by:

1. Acute tubular and cortical necrosis (shock, hemolysis, myolysis, affect of nephrotoxic products — poisons, salts of heavy metals, aminoglycosides).

2. Blockade of nephron tubules (by urates, sulfanilamides).

Reasons for the ***postrenal ARI*** development can be subdivided in the following way:

1. Mechanical ones (stones of kidneys and ureters, tumours of pelvic organs, surgical operations with damage or ligation of ureters, retroperitoneal fibrosis, etc.).

2. Functional ones (disease of the spinal cord, diabetic nephropathy, intake of ganglionic blockers for a long time, etc.)

Some authors distinguish one more form of ARI — an ***arenal*** one. It is developed in case of an injury, as well as in case of removing due to biotic observations or incidentally a sole (anatomically or functionally) kidney.

The basic nosotropic mechanism of ARI progressing is ischemia of the kidneys. In case of a shock of any genesis the disorder of the general hemodynamics is accompanied with a drop of renal perfusion pressure, spasm of postglomerular arterioles with a failure in blood supply to the renal cortex, a drop in glomerular filtering. In the beginning these changes have a functional nature, further on structural changes develop in the kidneys, mainly in tubules.

Patients with a sudden obstruction in the upper urinary tract have a raise of intrapelvic and intrarenal pressure, swelling of the interstitial tissue. It stipulates fast occurrence of necrotic and destructive changes of nephronic tubules. The early removal of obstacles to urine outflow promotes immediate recovery of the renal function.

Macroscopically the kidneys are enlarged in size, soft to touching, the capsule separates easily, the surface is pale.

In histology in case of a postischemic ARI dilatation of proximal tubules is found, their lumen is filled with rejected epithelium, granulated and hyaline casts. In the interstitial tissue an edema and inflammatory infiltrates are found. The most significant morphological marker of ARI with a nephrotoxic genesis is acute tubular necrosis. The distal parts of the proximal tubules suffer most, while the glomerules remain rather saved.

Traditionally, the ARI course is divided into 4 stages: original, initial stage, oligoanuria, restoration of diuresis and recovery.

Symptoms in the *initial stage* depend on the etiological cause of ARI occurrence. The general clinical symptom of this period is a circulatory collapse, which in some cases is so short that remains unnoticed, in other cases it lasts for a day and more.

This stage is characterized by a gradual reduction of diuresis, as well as by increase of azotemia, though there are no symptoms of uremia and failures of electrolytic blood composition are not expressed yet. The patients' state is conditioned by severity of the main disease resulting in ARI.

The *stage of oligoanuria* is the main one in the ARI course. The basic symptoms are conditioned by failures in water-electrolytic balance and by azotemia. Some patients have symptoms of hyperhydratation, which is manifested in edemas of different intensity in the area of eyelids, face or the whole body. Subsequently edemas extend to internal organs, brain included, or they are confined with serous cavities.

In connection with protein catabolism the contents of potassium is increased. This is promoted with hyponatremia, hypocalcemia and acidosis. The potassium is shifted from the endocellular to extracellular space. Hyperkalemia may result in patient's death. Clinically, it is manifested in hyperexcitability of muscles and hyperreflexia. There may be found changes in the myocardium as well, which is well expressed on the ECG: lowering of P and S waves, widening of QRS, T wave becomes sharp, high, ST interval is lower than the isoelectric line. Moreover, there may be extrasystoles, short-time arrhythmia, in high-severity cases — heart arrest.

The toxicity of hyperkalemia is aggravated with a metabolic acidosis and hypocalcemia.

In case of pernicious vomiting and diarrhea, hypokalemia may arise manifesting in general weakness, adynamia, diminition of reflexes and muscle weakness. Thereby there may occur reduction

of electrical activity of the myocardium and paralysis of the respiratory muscles.

ARI is almost always accompanied with hypocalcemia, hypochloremia, hypophosphatemia.

Hypochloremia is manifested specifically in case of frequent vomiting. Despite of hypocalcemia, tetany is observed rarely, as in ARI the level of an ionized fraction of this electrolyte is raised.

The acidosis is developed, resulting in more frequent breathing, later — in the Kussmaul's respiration.

Due to all the reasons mentioned above, dystrophic changes of the myocardium develop. In the incipient stage of ARI cardiac sounds are muffled, there is tachycardia, systolic noise of the functional nature (anemia, dehydration). The arterial pressure is raised, but the diastolic pressure sometimes drops down to zero.

In case of hyperhydratation, a pulmonary edema developes, which can be recognized in time with the help of breast X-radiography (symptoms like "butterfly").

The growth of azotemia in this stage is promoted with a protein catabolism, which is expressed specifically in acute sepsis, long squashing of tissues, nontraumatic rhabdomyolisis, hemolysis, severe infectious complications. The lethality in catabolic ARI is higher. The catabolism is less advanced in case of prerenal ARI: the increment of urea a day is 6–10 mmol/l. The rapid growth of urea (14–17 mmol/l a day and more) may be conditioned by generalization of the infection.

Duration of the oliguria stage varies over a wide range, accounting for 5–11 days on the average, more seldom — 2–3 weeks. If the cause for a renal ischemia is in failure of blood circulation through it, the oligoanuric stage lasts not for a long time and has a favourable cause. In case of a long ischemia ARI has a severe nature and it takes more time for regeneration of the renal epithelium. The cases have been reported when the oligoanuric stage lasted for almost 90 days.

The early stage of diuresis recovery usually lasts for 5–10 days. More often diuresis is recovered step by step, in some cases there is a fast growth of diuresis, the latter may reach 8–10 l.

It is necessary to note that in spite of excretion of a great amount of urine and tendency to normalization of the nitrogen level, the patient's state is still serious, as losses of electrolytes and water are considerable, the relative density of urine is low and the amount of nitrogen residues is small. Hyperkalemia is quickly replaced with

hypokalemia, the level of sodium in blood goes high even more. The loss of a fair quantity of fluid is accompanied with exicosis, hypotonia, mental confusion.

The inadequate correction of biochemical failures within this period may invoke aggravation of the patient's condition, even death.

Changes in blood and urine (anemia, hypoalbuminemia, erythrocyturia) may also remain for a long period of time.

The *stage of recovery* lasts from 6 months to 1–2 years, depending on the severity of ARI.

In all ARI stages due to inhibition of protective responses of the body there may be different complications of the infectious nature (pneumonia, pyelonephritis, hematosepsis, bacteriemia).

The *course and outcome* of the disease depend on the cause of ARI occurrence, the degree of renal parenchyma damage, as well as on adequate and in-time treatment.

There may be several versions of the disease:

1. Cyclical course with recovery.

2. Irreversible progressing (bilateral cortical necrosis, a true sclerodermic kidney, hemolytic-uremic syndrome in children, etc.).

3. There may be a recurrent course (obstructive ARI, analgetic nephropathy, thromboembolism of renal vessels in elderly people, the Berger's disease, lumbodynic-uremic syndrome, hemolytic heritable hematurias, etc.).

4. Transfer to chronic disease (pyelonephritis, glomerulosclerosis with arterial hypertension, etc.).

The diagnosis of ARI is not difficult. The carefully collected anamnesis allows to reveal the reasons that resulted in ARI development. Among them are: injury, burn, sepsis, poisoning, surgical interventions, hemotransfusion, urolithiasis.

In determination of the ARI form (prerenal, renal and postrenal) a radionuclide renography renders some help, since each form of ARI has a certain type of the curve, and ultrasonography of the kidneys. In the postrenal ARI form there is a necessity for X-ray study. The diagnosis should be directed towards revealing of probable occlusion of the urinary tract with concrements, urosepsis (bacteriemic shock), etc.; in gynecological practice — ligation and damage of ureters. For determination of the state of the upper urinary tract, catheterization of ureters with a retrograde ureteropyelography is used.

The biochemical shifts in the ARI patient's organism are of the same type, as a rule, irrespective to their reasons.

The study of "mean molecules" concentration in the blood plasma is a sufficiently informative test for early revealing of failure in renal functioning, estimation of the pathological process dynamics in patients.

It is very important to differentiate ARI from chronic renal insufficiency (CRI).

1. In case of CRI the diuresis is preserved, quite often there is polyuria, there are minimal changes in urine, and in case of ARI — oliguria, there is much protein in the urine, cylindrosis.

2. Arterial hypertension, hypertrophy of the left ventricle, a change in the eye fundus are the CRI characteristic.

3. The edemas are more characteristic for ARI.

4. The sizes of the kidneys are diminished in CRI, and in ARI they are normal or enlarged.

5. The rate of azotemia increase in ARI is higher.

6. The anamnesis helps to make a diagnosis.

Treatment of patients with ARI depends on the stage of disease and its etiology. In the initial stage of the ARI ischemic form therapy directed towards the struggle against shock and arterial hypotension is indicated. It includes administration of drugs recovering volume of circulating blood, facilities to strengthen the tension of the vascular wall (dopamine, noradrenaline), introduction of blood and blood substitutes, as well as anticoagulants (heparin, fragmin, fraxiparin), etc. If the failure in renal blood circulation is conditioned by dehydration and hypovolemia (vomiting, diarrhea), it is necessary to replenish waste of water and electrolytes.

In the *early stage* of ARI it is expedient to administrate manitol. Together with it or instead of it there should be administered furosemide (200–1,200 mg i/v). It is recommended to combine furosemide (30–50 mg/(kg·min) with dopamine (3 mg/(kg·min)) within 6–24 h, which diminishes a renal vasoconstriction.

In order to replenish volume of the circulating blood, plasma is used, as well as protein solutions, refortan, rheopolyglucine which should be introduced under the control of central venous pressure (raising to 10 cm H_2O is dangerous because of probability of pulmonary edema development).

In the incipient stage of ARI of a toxic genesis it is recommended to perform antidotal and disintoxicational therapy as early as possible.

In case of availability of a symptom of a peripheral spasm (high systolic and low pulse pressure) it is recommended to introduce pentamin, euphylline, analgin, nitrates.

In the *stage of oligo-anuria* a special attention should be paid to observance of a water intake schedule. The daily water intake should replenish all the losses with urine, vomiting, diarrhea plus 400 ml of fluid i/v or per oral. The water balance is to be checked by patient' weighing every day. Simultaneously it is necessary to determine concentration of sodium in blood. Its reduction is a sign of hyperhydratation, that dictates a more strict limitation of liquid.

Imbalance of electrolytes is to be controlled in accordance to biochemical indications and clinical manifestations. At hyperkalemia glucose with insulin and calcium gluconate are to be introduced, intake of potassium with food is limited. For acid-base balance to be restored, 3–5% solution of sodium bicarbonate is introduced. If the patient can drink, he is advised to drink mineral water: "Borzhomi", "Essentuki N14, 17", "Luzhanskaya", "Polyana Kvasova", etc.

In case of ARI, a considerable proportion of nitrous residues is excreted through the gastrointestinal tract. Therefore frequent gastric lavage and cleansing enemas promote excretion of nitrous matters from the body. Moreover, in this case nausea and vomiting become less.

Reduction of protein catabolism is promoted with administration of anabolic hormones (retabolilum 1 ml, 1 time each three days or testosteron-propionate — 100 mg a day or methandrostenolone — 0.05 3 times a day).

The diet should be protein-free, but provide at least 1,500–2,000 kcal/day. If food intake is impossible, there should be administered i/v glucose, mixtures of amino acids, intralipid.

ARI is always accompanied with reduction of body resistance to infection; therefore in all stages of ARI the antibacterial therapy is indicated. It is necessary to consider drugs from a penicillin group less toxic — especially semi-synthetic ones, erythromycin, as well as synthomycin, levomycetin, cefazolin. Nephro- and oto-

toxic antibiotics are contraindicated: streptomycin, kanamycin, gentamycin), sulfanilamides, nitrofurans.

In stage of *diuresis recovery*, especially in the first days, treatment which was started in the stage of oligoanuria, is to be continued, because hyperkalemia and hyperazotemia are still revealing (sometimes even are increased).

Most patients with ARI perish in this stage because of water-electrolytic disorders and infectious complications.

In the stage of diuresis recovery bronchopneumonia is frequently developed, pyelonephritis develops or becomes acute. Because of inadequate treatment the process may have a recurrent (reverse) nature: again the stage of oligo-anuria develops with respective changes in organs and systems.

In course of time, because of pathological process fading and regeneration of epithelium in nephrons' tubules, the function of the kidneys is recovered step by step, the water-electrolytic balance is normalized, as well as concentration of nitrous residues and other indices of homeostasis.

If the conservative therapy does not give desirable results and anuria remains present, extracorporal detoxification methods should be applied.

The method of extracorporal hemodialysis method by means of the artificial kidney apparatus is mostly applied. The indication to it are pronounced failures of water-electrolytic balance (hyperkalemia more than 7 mmol/l, signs of augmenting pulmonary edema) and acid-base balance, hyperazotemia (urea more than 30 mmol/l, creatinine — 700 mmol/l), provided that urea increment a day is 9 mmol/l, appearance of uremia symptoms.

Depending on the patient's condition, hemodialysis is carried out every day or in a day.

At present in ARI treatment early and even preventive hemodialysis is carried out even more frequently, to prevent from progressing of severe metabolic failures. Patients with unstable hemodynamics are recommended to carry out hemodialysis with usage of bicarbonate dialyzing solution.

The dialyzing solution is selected individually. Its composition depends on the level of electrolyte concentration in the patient's blood plasma. A process of different substance diffusion from blood to the dialyzing solution takes place in the hemodialyzer.

The alternative to the hemodialysis is a peritoneal dialysis which does not require heparin introduction and undesable for patients with a posttraumatic and postoperative ARI.

Recently hemofiltration has been successfully used for treatment of patients suffering from ARI during which urea is discharged from the body together with excess of fluid at the rate of its formation in the body. As a result, the level of urea in the blood remains stable.

The peritoneal dialysis may be of 2 types: continuous and fractional. For continuous dialysis two tubes are required: one for supplying the dialyzing solution to the abdominal cavity and the other one — for its discharging. During the fractional dialysis one tube is used for supplying the solution (1–2 l), after that the tube is closed for 15–20 min, and then the solution is discharged through it. The procedure is repeated for 4–6 times, sometimes even more often.

The positive aspect of peritoneal dialysis is in its good tolerance for patients, and the negative one — necessity in laparotomy and probability of abdominal infection.

In some cases hemosorption is added to hemodialysis.

This method is based on the principle of removing toxic substances from blood when it is passed through the apparatus with activated charcoal. The hemosorption is less effective than hemodialysis.

Prognosis for ARI depends on severity of the disease course, the degree of internal organs damage, availability of infectious complications and the prognosis for the main disease which resulted in development of renal insufficiency. Among outcomes: complete recovery takes place in 35–40% of patients, partial recovery — in 10–15%, lethal outcome — in 40–45%. Lately unusually high per cent of chronization has been reported (15–18%) after ARI caused by X-ray contrast investigations.

CHRONIC RENAL INSUFFICIENCY

Chronic renal insufficiency is a complex of symptoms developing as a result of progressing reduction of the amount of functioning nephrons, which results in the expressed homeostatic shift: azotemia, dyselectrolytemia, metabolic acidosis, anemia. The chronic renal insufficiency may be partial when one or two functions of

the kidneys are affected, or a global one when all functions of the kidneys are affected.

Factors of development and pathogenesis. CRI is developed at a different pathology of the kidneys. The most frequent reason is chronic glomerulonephritis, chronic pyelonephritis, polycystosis of the kidneys, glomerulosclerosis on the background of diabetes mellitus and other systemic diseases, congenital and acquired failures of tubule functioning, bilateral anomalies, etc.

A special group is composed of urological diseases, which are accompanied with obstruction of the urinary tract, in case of chronic pyelonephritis added.

In spite of variety of etiological factors during CRI progressing, some more or less stereotyped changes can be found in the kidneys, at which the morphological originality is lost and sclerotic processes start to dominate resulting in a reduction of the amount of acting nephrons. With a decrease of their amount down to 30%, a clinically expressed CRI pattern is developing, and in the terminal stage — to 10% and less, but their saved nephrons are not viable in a structural and functional respect.

At CRI, in the initial stage polyuria develops, which in course of time is replaced by an oliguria, and then anuria. The consequences of polyuria are hypokalemia, hyponatremia and acidosis. Further on, hypocalcemia and reduction of phosphates are added. Gradually the symptoms of failure in functions of all organs and systems (anemia, arterial hypertension, heart failure, etc.) occur.

In the course of CRI 4 stages are distinguished (N. A. Lopatkin, I. M. Kuchinsky, 1973):

Latent CRI is characterized with minor subjective and objective symptoms. Glomerular filtration is reduced down to 50–60 ml/min, glucose excretion is raised, periodically proteinuria is revealed. On the isotope renogram there can be seen a decrease of the secretory function. Dysaminuria, periodical proteinuria may be observed.

Compensated CRI occurs in case of a great reduction of the renal function, still the urea and creatinine levels are not increased. The daily diuresis reached 2–2.5 l as a result of reduction of the tubular reabsorption. Glomerular filtration is reduced down to 30–40 ml/min. Osmolarity of urine is low. Periodically dyselectrolytemia may be revealed. Urea and creatinine are in the norm.

Intermittant CRI is characterized by further decrease of glomerular filtration down to 15–25 ml/min and tubular reabsorption. Periodically hyperazotemia (urea — 8.0–20.0 mmol/l, creatinine — 350–400 mmol/l) occurs. It is characterized with a change of periods of improvement and aggravation. Aggravation of the state is related to recurrences of the main disease. If the patient is not treated, the disease may transfer to the severe form.

Terminal CRI — decrease of glomerular filtration down to 10 ml/min and less, permanently high azotemia. On the isotope renogram straight lines are seen. This stage is irreversible, if treatment is not started (hemodialysis and renal transplantation). The terminal CRI is divided into four periods:

I — the water-excretory function is kept (diuresis of 1 l and more, glomerular filtration — 10–15 ml/min, urea up to 35 mmol/l), moderate acidosis.

IIA — oligoanuria (diuresis up to 300 ml), fluid retention, dyselectrolytemia, hyperazotemia (urea is above 35 mmol/l, acidosis). A resistant arterial hypertension, blood circulatory insufficiency of stage II.

IIB — severe blood circulatory insufficiency through the greater and lesser circulations.

III — a severe uremic intoxication (urea of 66 mmol/l), decompensated acidosis, dyselectrolytemia. Decompensation of heart activity, dystrophic changes of internal organs.

Depending on the clinical course and kidney functions, it is possible to distinguish some stages of CRI (M. D. Javad-zade et al., 1984).

In the initial period the renal disease occurs with normal kidneys functioning (CRI-0).

CRI-1 — the general patient's condition is satisfactory, but the unmanifested adynamia, undue fatiguability, tendency to a nocturia, isosthenuria are found. Glomerular filtration is reduced to 50–70 ml/min, tubular reabsorption — to 98%, creatinine is raised to 0.150 mmol/l. Vascular and secretory segments on renograms are lowered.

In case of CRI-2 symptoms of the main disease and renal function insufficiency are revealed. General weakness, hypodynamia, anorexia, polydipsia, polyuria (up to 2 l), nocturia, hypoisosthenuria are manifested. Functions of other organs as a whole are not disturbed, except for the arterial hypertension and slight anemia. The creatinine level is raised up to 0.354 mmol/l, glomerular fil-

tration is reduced to 30 ml/min, tubular reabsorption — up to 96%. Failure in water-electrolytic balance and acid-base balance are slight yet. The metabolic acidosis can be manifested at chronic pyelonephritis and congenital tubulopathies, at addition of intercurrent diseases.

In this stage patients loose weight, have a dry mouth, get thirsty, the skin becomes pale yellow, dry, with reduced elasticity.

The symptoms of suburemia are characteristic for clinical presentation of CRI-IIA. Patients complain of headache, lack of appetite, nausea, vomiting. In this stage functions of the kidneys and homeostasis are affected greatly. Thereby arterial blood pressure is frequently lowered, there are changes in the eyefundus as papilledema, retinal hemorrhage. Anemia, azotemia (creatinine is more than 0.355 mmol/l). Glomerular filtration is reduced to 15 ml/min, tubular reabsorption — to 95%. Acidosis, hypokalemia, hypocalcemia, hyponatremia, hypermagnesemia are present.

In stage CRI-IIB the clinical syndrome of chronic uremia is observed. In this case there is a failure not only in renal function but in other organs and systems as well, on the background of aggravated azotemia (creatinine is above 0.500 mmol/l) and dyselectrolytemia, further decrease of glomerular filtration and reabsorption. All this causes an extremely severe patient's condition. Patients continue loosing their weight, become weak, contactless. The apathy is sometimes replaced by excitation, alert, euphoria. Convulsions occur. Breathing is frequent, difficult; tracheobronchitis and pneumonia develop. The boundaries of the heart are expanded, the tones are muffled, a systolic noise is noticed. On the ECG the signs of failure in myocardial contractility are seen. The arterial blood pressure reaches high values. Anemia and blood circulatory insufficiency aggravate the patient's condition.

The diagnosis of CRI in the initial stages may become difficult because of unclear symptoms. It may be often difficult to set an etiology of CRI in connection with slurring of the main disease pattern. In general, the clinical picture for all patients with CRI is of the same type. In making a diagnosis there may be help from anamnesis, urine analyses, biochemical blood assays. The CRI diagnosis is confirmed by results of X-ray study, ultrasonic and radionuclide methods of examination, as well as echography and angiography.

Treatment of patients with CRI should be directed towards both treatment of the main disease and correction of homeostasis.

In case of CRI-I treatment of the basic disease ensures conservation of the renal function during a long period. The diet therapy is also indicated with the following included:

— limitation of protein to 40–60 g/day, and with reduction of glomerular filtration to 10 ml/min — to 20 g/day;

— a diet containing 20 g of protein per a day is followed for 25–30 days, then about 40 g to be introduced to the ration;

— control of sodium intake: its considerable limitation at the expressed hypertension to 3–5 g/day. In case of pyelonephritis the dose of salt is a little bit higher — 5–8 g/day;

— the use of a sufficient amount of fluid (up to 1.8–2 l) with control over the daily diuresis.

In case of CRI-III treatment first of all is directed to treatment of the main disease and normalization of homeostasis, improvement of the renal function, that of the liver and other organs; disintoxicational therapy is used, hypotensive, cardiovascular drugs, hemotransfusion. In order to decrease the uremic intoxication a gastric lavage with a soda solution is carried out, intestinal dialysis and administration of enterosorbents, anabolic hormones.

By applying antihypertensive medicine, the arterial pressure is to be lowered gradually, because with its rapid decreasing there will be degradation of blood circulation in the kidneys, the glomerular filtering will be reduced, azotemia will arise.

The basic method of treating patients with CRI is hemodialysis, which is applied both with the purpose to prolongate patients' life and to prepare for transplantation.

The hemodialysis is contraindicated with severe lesions of the cardiovascular system (myocardial infarction), CNS, failures of mentality, for oncopatients, etc.

Preparation for hemodialysis starts with installation of the arteriovenous shunt or fistula, which provides a constant access to the vascular system. Lately preference has been given to the latter one. For elderly people preference is given to a peritoneal dialysis. For detoxication — hemofiltration, plasmapheresis and hemosorption are used. Still one should keep in mind that hemodialysis and peritoneal dialysis for CRI are only an auxiliary and preparatory period.

The basic method of treatment for the case of chronic renal insufficiency is kidney transplantation — replacement of the affected organ be a healthy one, taken from a donor. The indication to it is a terminal stage of CRI, developed as a result of chronic glomerulonephritis and pyelonephritis, polycystosis and other congenital disorders, traumatic damage of a single kidney, etc.

In the postoperative period, since the first day an immunosuppressive therapy is administered directed to inhibition of the transplantation immunity (cyclosporine, azathioprine, prednisolone).

When transplanting a cadaveric kidney, the graft function will be resumed only in some days (about 2–3 weeks) due to its ischemic damage.

The recipient's life time for 5 years is reported in 40–79% of cases and exceeds periods of survival for patients being under a programmed hemodialysis (40–43%).

Prognosis for CRI depends on the nature of the disease, specificity of the clinical course, as well as on making a diagnosis in time and the adequate treatment (in case of pyelonephritis the prognosis is more favourable than in case of glomerulonephritis). In case of added arterial hypertension the prognosis is worse.

In the terminal stage of CRI treatment in time allows to prolong patents' life by 10 years and more. A kidney transplantation also prolongs patients' life for a long period.

Prophylaxis of CRI is in its revealing in time and in complex treatment of the renal pathology, as well as in prevention from complications.

Lecture 10

ENURESIS (URINARY INCONTINENCE)

The disease takes a significant place among all the reasons of involuntary urination. It is thought that 5–10% of children in the age above 5 years have not acquired habits to remain dry. However enuresis is not a disease, but a syndrome, which always has a temporary nature. It is necessary to give a clear definition to enuresis: it is an active, complete, involuntary and not realized act of urination which is not conditioned by failures in the anatomy of urinary organs and more often it takes place when children at the age above 5 years are sleeping. For the boys this phenomenon occurs more often than for the girls.

Two following types of enuresis are distinguished:

The ***primary*** one: starting from the birth, the child never remained dry at night, except for rare short periods of time with duration up to several weeks.

The ***secondary*** one: enuresis occurs after the child has learned to remain dry at the age under 5 years old at day and night time for 1–2 years. In case of the secondary enuresis one should search for the starting factors and psychosocial reasons. The enuresis sometimes is nothing more as an element of neuropsychologic disorders which are combined with other symptoms: with a failure in behavior, slow psychomotor progressing, etc.

The disease can be combined with encopresis (involuntary defecation), that is an evidence of availability of deeper disorders in the emotional sphere.

ENURESIS IN CHILDREN

A habit to remain dry at night normally is formed in children by 5 years' age, and faster in girls than in boys. It is confirmed with numerous epidemiological studies.

If the night urinary incontinence is considered as an abnormal phenomenon, its rate in the population is as follows: as a whole — 6%, among the boys — 7.2%, among the girls — 3.4%.

Classification. Many classifications of the enuresis have been proposed. Let's consider G. Lenoir's classification.

Isolated night enuresis — enuresis which is accompanied with daily disorders of urination.

Typical primary form in boys — enuresis with disorders in daily urination (in case of immaturity of the urinary bladder).

A form with a night polyuria — enuresis in case of irritative perineum (a reflex enuresis).

The primary-secondary psychogenic form — enuresis with emotional disorders (neurogenic or psychogenic enuresis).

Pathophysiology. It has been thought before that the primary isolated enuresis has a psychogenic genesis. Now the majority of pediatrists assert that there is no essential link between enuresis and psychogenic disorders, which might predetermine a definite day-time hyperactivity of the urinary bladder (Fig. 74).

In case of enuresis there are clear functional disorders of the urinary bladder: instability or hyperactivity. Their essence is in contractions of the urinary bladder detrusor which are not inhibited by overlying nervous centers. Muscles are controlled by the sacral center without any control from the side of the cerebral cortex and subcortical structures. This is normal for the child at the age from 18 months to 3 years. However, in the older age this phenomenon is referred as "immaturity of the urinary bladder". Uncontrolled contractions of the detrusor may be provoked by constipation, that in its turn may be a reason of involuntary night urination. Now a question arises: how often immaturity of the urinary bladder is the reason of enuresis.

When studying pathophysiology of enuresis it has been found that the primary enuresis is often combined with extensive urine production, which the bladder cannot hold. In 50–70% of children a positive effect has been observed in treatment by analogues of vasopressin.

In patients for whom treatment gave a positive effect, concentration of arginine-vasopressin in blood serum was lower than 2.5 pkg/ml, which was accompanied with increased diuresis with low osmolarity of urine. Intake of vasopressin analogues by these children compensated a night deficit of arginine-vasopressin. Moreover, the drug has a light tonic central action on the mechanism

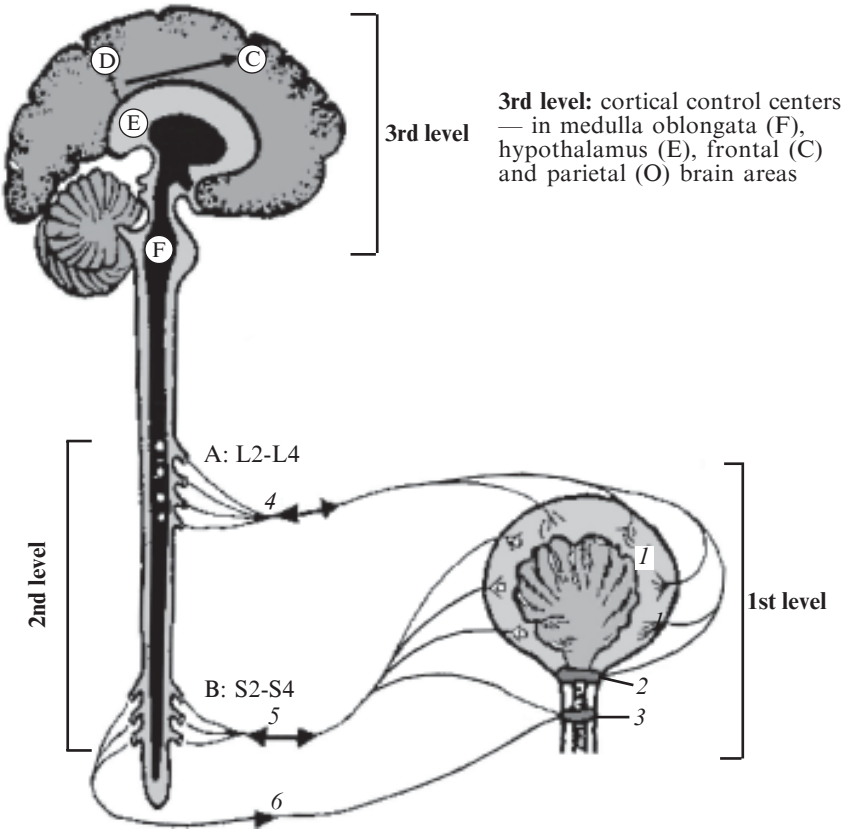


Fig. 74. Control of urination. A scheme

of awakening. When this preparation was injected to rats intracerebrally or peripherically, the growth of dopamine production in the brain was observed, which was accompanied with animal's superactivity. In patients for whom treatment by vasopressin analogues was ineffective, the level of arginine-vasopressin in blood serum exceeded 2.5 pkg/ml, and the functional capacity of the urinary bladder was much lower as compared to the control group.

Those patients responded positively to the treatment in whom enuresis had a family nature and was conditioned generically. In several families studied in Europe, at least one gene localized in the 13th chromosome which was responsive for this state was found.

Studying the depth of sleeping in children, they came to the deduction that in patients who suffered from enuresis sleeping was deeper.

The family nature of enuresis is found rather frequently: parents of 2/3 patients with enuresis had the same illness.

Diagnosis. Involuntary child's urination cannot be always considered as enuresis.

In girls involuntary urination may be conditioned by ectopic extravesical entrance of ureters. In these cases the child always has urine outflow and its amount depends on the functional capacity of the parehcnyma of the kidney that drains through this ureter.

The urinary incontinence is involuntary urination which takes place irrespective of the necessity to empty the urinary bladder. This phenomenon may be permanent or temporary, arise under definite circumstances, predominantly under an exercise stress. Simultaneously to urinary incontinence there may be found normal urination (pathological intermittent function of the sphincter may be observed) or episodes of absence of urination (the child cannot urinate with having an overflowed urinary bladder).

Polyuria conditioned by a definite reason (renal insufficiency, diabetes insipidus) may be accompanied with involuntary urination like in enuresis.

The diagnosis of the primary or secondary enuresis and finding its connection with other pathology mainly consists of careful collecting information on history. It is necessary to clarify the nature of enuresis: whether it is intermittent or permanent; whether it arises every day or after certain periods of time; whether it is isolated or is connected with other disorders. More often enuresis in boys is not accompanied with any other problems and has an isolated nature. During clinical examination the pathology is not found: the child has normal indices of weight and growth, normal development of genitalia, there is no pathological thirst or polyuria, the arterial blood pressure is normal, the urinary bladder after urination is not palpated, the results of palpation of the lumbar region and abdomen are normal (including palpation of the kidneys). The

additional studies are not necessary, at the utmost it is possible to carry out a bacteriological urinary test for elimination of infection in the urinary tract.

It is expedient to carry out additional examination (ultrasonic examination, intravenous urography) in order to study morphology of the kidney and urinary tract. Urodynamic examination of the urinary bladder is necessary only if there is infection of the urinary tract, functional disorders of the urinary bladder (dysuria, pollakiuria, imperative feeling of urination, difficulty for emptying the urinary bladder), in case of accompanying neurologic disorders, atonic urinary bladder, arterial hypertension, renal insufficiency.

The aim of these examinations is not to miss an organic pathology: neurogenic urinary bladder, supravesical obstacles for urine to flow out which cause its chronic retention, ectopic fall of the ureter.

Treatment. The choice of treatment management is rather complicated, physicians often give standard advices:

— to train sphincters of the urinary bladder. It means that a child should urinate at a certain moment of time and urination should be checked 2–3 times;

— sometimes the advise is to wake up the child at 11 p. m., if involuntary urination takes place soon after getting asleep;

— to try to lay the child to sleep on a hard bed, keeping only a thin matress under the bed-sheet;

— to keep a diary and put down the result of each night there.

Actually these simple pieces of advice are seldom effective, therefore pediatrists are predominantly forced to apply more intensive methods of treatment.

Forming of a conditional reflex of waking-up, or an alarm clock method, was adopted in English-speaking countries. However, in Ukraine it is much less popular, as many families consider it to be too cruel. Despite of it, effectiveness of this method of treatment has no doubts.

The purpose is to obtain waking up with outflow of the first drops of urine so that the child could complete urination in the water closet. There is a wide choice of alarm clocks, the most known among them is "Pipi-Stop".

For the past years some devices have been designed to be placed into the bed, linen, pyjamas, as well as many miniature alarm systems. The main trends in perfection are removals of such disad-

vantages as not-in-time waking up of other members of family except for the interested one, false alarm, no ringing of the bell in spite of child's urination to the bed.

Reviews issued in European countries inform on effectiveness of this method within 65–100% depending on child's age and the type of enuresis.

Data about percentage of relapses are different. Some studies show that it reaches 45%, in others this rate is much lower. The course of treatment should last for 3–6 months.

Most authors prove that successiveness of this method of treatment does not depend on child's age, gender, social status and standard of living. However, it is conditioned by a level of motivation on the part of the child and the members of the family.

Medicamental treatment. The treatment of enuresis with vasopressin analogues (desmopressin) is based on the multicenter international study, according to its results, the effect of treatment is estimated as positive in 2/3 of cases with a regress of signs during 2 weeks and considerable improvement in 38% of cases. The majority of children tolerated well this drug.

Volunteers were proposed to introduce this drug in the dose of 0.4 ml intranasally with the help of a sprayer before sleeping during 2 months, with a gradual cessation of the drug. Advantages of this method are quickness and ease of introduction, even outside. It is worth of especial significance for enuresis with a night polyuria.

The antidepressants (such as tofranil or anafranil) are applied widely enough. A risk of side effects (irritability, stimulation) with the doses that are usually administered is low. A drug is administered as a single dose (1 mg/kg of imipramine) before sleeping. The tests have affirmed a positive effect of drugs in treatment of enuresis in 2/3 of patients.

Oxybutynine in 5 mg/day dose (2 tablets) is often very efficient in case of immaturity of the urinary bladder, so-called uninhibited innervation. It is interesting to note that this drug is efficient in enuresis which is related to daily pollakiuria, sometimes to urinary incontinence and infection of the lower areas of the urinary tract. In other cases efficiency of oxybutinine is low.

Indometacin is administered as 7-day's course of treatment in a 1–2 mg/kg dose per day for one intake. The results of children's treatment show a noticeable improvement on the second day and vanishing of enuresis — on the third one. For a complete recovery it is recommended to continue treatment for about two weeks.

Most children who have taken the drug in have recovered. It is admitted that the effect of indometacin is mediated by influencing on metabolism of prostaglandins, which promotes reduction of urine production and influences on the motor activity of the urinary bladder.

Among other drugs amitriptyline and benzodiazepine are widely used for treatment of enuresis.

Thus, the variety of methods of treatment is evidence to heterogeneity of enuresis and impossibility for existence of its single form. In each case a separate regime of treatment is proposed. To our minds, it is necessary to start with advice to conduct a diary, and in case of failure to proceed (quickly to another method. Usage of alarm clocks is seldom practiced in Ukraine. The vasopressin analogues are easy in intake, are tolerated well and ensure a good result. The important achievement is therapy with antidepressants and oxybutinine (in case of immaturity of the urinary bladder).

It is necessary to listen to the child attentively, to conquer his/her confidence, to convince of absence of his/her guilt to the family (family motivation). In these cases, particularly in case of the primary enuresis in boys without a family anamnesis, the good results reach 70–80% depending on the method of treatment. However, sometimes the primary enuresis is resistant to therapy. In such cases it is necessary to study urodynamic indices in order to reveal functional disorders and to modify treatment. In case of resistant enuresis it is possible to apply psychotherapy.

URINARY INCONTINENCE IN WOMEN

More than 20 mln inhabitants of USA suffer from involuntary urination, and this amount of patients grows respectively to the age of persons. The studies carried out recently have shown that more than 30% of women in the age above 60 years suffer from urinary incontinence. Pampers for adults are produced for the sum of 1 bln dollars per annum. The family doctors should not only make a correct diagnosis in this state, but apply respective medical measures as well.

The urinary incontinence is an involuntary loss of urine through the exterior opening of the urethra. However, this definition does not explain other reasons of involuntary loss of urine, such as vesicovaginal fistula and ectopy of the exterior opening of the urethra.

Classification. Application of the schematic symptomatic classification instead of anatomic terms allows to give the most precise definition to urinary incontinence in women. There are three basic types of urinary incontinence which can be distinguished if the history of the case is collected thoroughly: stress, total (general) and urgent ones.

Stress incontinence. Sudden urination is connected with activities as a result of which the intra-abdominal pressure increases. Cough, weight lifting, breathing and laughter are typical situations which are capable to induce a stress urinary incontinence. According to contemporary representations, it is considered that intra-abdominal pressure which is transferred to the urinary bladder, is not balanced with the same pressure that is transferred to the urethra, as the neck of the urinary bladder and urethra is pouched out (like a herniation) as a result of weakening (loss of the tonus) of the tissue that is located in the small pelvis.

Urgent urinary incontinence is referred as a sudden imperative feeling of urination which is terminated with urine outflow; such type of urinary incontinence is accompanied with a different measure of success in controlling its expressiveness. The amount of the urine flown out may vary ranging from a tea spoon to the full volume of the urinary bladder. The volume of the urine in the urinary bladder is not the factor that designates urgency of the feeling, and patients note, that small amounts of urine can frequently induce an immediate (imperative) feeling. If the woman is capable to retain urine, she is puzzled by a small amount of outflow and appearance of a new feeling of urination after a short period of time.

Total urinary incontinence is an absolute inability for the patient to retain urine in the bladder, she is permanently wet, though she makes all her effort to escape this state. Patients continuously (in day and night) should use sanitary towels. The non-functioning urethra, as a rule, can be found when carrying out a simple study.

Anamnesis and physical examination. Acquisition of anamnesis data and physical examination are the most relevant components in diagnosing the urinary incontinence. Acquisition of anamnesis data starts with interrogating the patient about duration and extent of expressiveness of the urinary incontinence, as well as whether there were already attempts to eliminate incontinence by a surgical way. The purpose of interrogation is to reveal factors in patient's behavior or in her environment, which can be elimi-

nated, and to clarify availability of any neurologic diseases or those of the internal organs, that cause urinary incontinence or promote it. There are reports that about 50% of cases of urinary incontinence in hospitalized elderly patients are temporary, and after patients' recovery and discharge from hospitals they fade. A special attention physicians should pay to such factors as the beginning and type of urinary incontinence (for example, a stress, pressing, total, mixed one); patient's position in which urination takes place; significant symptoms; rate of urination at the night and the measures taken (for example, placing filtering paper, napkins and so on).

The mixed symptoms of forced and stress urinary incontinence are found in nearly 60% of women and the isolated form of the forced incontinence — approximately in 30%. Feeling of the full urinary bladder, pelvic prolapse ("pressure feeling" in the vagina or extrusion), outflow from the vagina or symptoms of deficiency of estrogen production (dryness and itching) are important symptoms, it is necessary to pay attention to them when acquiring data for anamnesis. Detailed gynecological history should include data on operative interventions, labor, infections, injuries, radiation therapy. It is also necessary to ask the patient about injuries she had in the pelvic area, operations on the spinal column, drugs administered, as well as about habits concerning sex life and so forth.

The diary of urination is relevant for a quantitative estimation and recording the amount of urine outflow. In the diary there should be recorded the amount of fluid taken per os and excretion of urine; imperativeness of feelings; time of urination and any physical activity related to the episodes of urinary incontinence. The diary of urination is a very relevant means of attracting the patient to treatment, as well as finding of exaggerations, when the clinical information does not respond to the data of objective examination.

Physical examination should be careful and focused not only at the urinary bladder and the urethra. When examining, it is necessary to evaluate mental and physical active capacity of the patient. The functional status of the patient can play a significant role in physical capacity of the elderly person to take advantage of the toilet in time to prevent urinary incontinence. When examining the abdomen, it is necessary to pay attention to postoperative sutures, pathological formations and traces of injuries, as well as to determine the degree of the urinary bladder fullness (palpatory). At the general neurologic examination it is necessary to pay attention to

responsive and motor innervation of the lower areas of the body and perineum. The locomotive and responsive branches run to the urinary bladder and urethral sphincter from the sacral segment of the spinal cord (from S_2 to S_4). Physical examination is aimed to estimation of responses of the perineal skin, motor function of the anal sphincter during arbitrary contraction and bulbocavernous reflex which is absent in 20% of healthy women. It is necessary to examine the area of the back and spinal column for revealing scars and asymmetry, as well as to estimate reflexes and response on the lower extremities.

It is necessary to carry out a step by step examination of the small pelvic organs. Before that the patient should empty her urinary bladder. It is necessary to estimate the state of the vaginal epithelium which evidences the hormonal background (for example, the surface is bright, dry, smooth and thin), as in some cases elderly women with a stress urinary incontinence are recommended to have only the estrogen-replacement therapy. It is necessary to clarify localization and appearance of the external opening of the urethra. The opened external aperture can evidence of availability of a non-functioning urethra.

One of halves of the Grave's urinary speculum is introduced along the posterior vaginal wall and investigate its anterior wall in rest state, during coughing and making Valsalva's test. Then the plate of the speculum is reverted and the posterior vaginal wall is examined in the rest state and in strain. The uterine cervix is examined as well as the state of adjoining tissues and position of the uterus. If the uterus is removed, it is necessary to study the state and strength of the vaginal "cuff", again in the rest state and in strain. During thorough examination one can reveal ptosis of the anterior wall of the vagina (cystocele — hernia of the urinary bladder), increased mobility of the proximal area of the urethra, prolapse of the uterus, closure of the vagina after uterectomy, extrusion of the perineum between utero-sacral ligaments (enterocele) or at of the rectum into the vagina (rectocele). The minor troubles can be revealed during repetitive examination in the patient's erect position.

Catheter N14 by Charriere's scale made of red rubber, is entered into the urinary bladder to measure the amount of the residual urine. A syringe for 60 ml without a piston is attached to the catheter, and the urinary bladder is to be slowly filled up with sterile water. By means of this procedure urodynamics is determined *ad oculus*. There should be recorded volume of fluid at which the

first feeling of the urinary bladder fullness and imperativeness of the feeling to urination occurs.

After filling up of the urinary bladder the catheter is removed out and the stress tests (coughing, a straining effort) are repeated in order to find the overmobility of the urethra and prolapse of the bladder into the vagina (cystocele).

Classification. The generally adopted classification is used by urologists to give a characteristic to types of stress incontinence revealed during physical examination. It is important to determine availability of urine outflow immediately after an incidental increase of the intra-abdominal pressure. Coughing may provoke a spasm (instability) of the urinary bladder, if there is a short period of time between coughing and urination. It may result in a faulty diagnosis of the available stress urinary incontinence. If slight urine outflow does not take place in the patient's recumbent position, it is necessary to repeat the test in the erect position. In case of patient's complaints of stress urinary incontinence and with the absence of their objective confirmation it is necessary to carry out a more profound examination.

Classification of stress urinary incontinence

Type	*Feature*
0	Raised mobility of the urethra which is found in the process of physical examination when making a stress test, but without a documentary affirmed incontinence, despite of implementation of the test with a straining effort
I	Raised mobility of the urethra during physical examination with documentary confirmation of urinary incontinence, but without cystocele formation
II	The same as in type I but with formation of cystocele
IIA	Stress urinary incontinence with cystocele in the vagina
IIB	Stress urinary incontinence with cystocele outside the vagina
III	Insufficiency of the proximal sphincter (internal urethral insufficiency). The state of tissues adjacent to the urethra is of no importance; as a rule, the expressed urinary incontinence is found.

Laboratory tests. The general urinary test, bacteriological tests and determination of separated bacteria response to antibiotics, as well as cytologic test of urine are performed with the purpose to exclude availability of infection or malignant process (for example, *carcinoma in situ*) as the causes for urinary incontinence.

Infection in the urinary tract should be treated before conducting tool manipulations on the urinary bladder or urethra (cystoscopy or study of urodynamics).

Creatinine in blood serum is an index of the state of renal functioning. Its concentration should be determined in patients with large volume of the residual urine or with expressed cystocele.

Cystoscopy is made for diagnosis of pain appearing in the urinary bladder as a result of filling up, availability of its increased movability in case of a straining effort, as well as for locating the site of obstruction. If the patient has hematuria in her anamnesis or erythrocytes are found in her urine, cystoscopy should be performed for exception of availability of a tumour in the urinary bladder, a stone or a foreign body in it.

The X-ray examination is performed in order to diagnose a stress urinary incontinence, type III (the opened neck of the urinary bladder in the rest or a slight outflow of urine as a result of minimum raising of the intra-abdominal pressure that is transferred to the bladder) or prolapse of the small pelvic organs (moderate severety or clinically apparent). X-ray methods are also used to acquire information about obstruction of the urethra which occurred as a result of the operation on urinary incontinence held before.

The voiding cystourethrography (the radiogram is taken during the act of urination) is used to study the urinary bladder filled with radio-opaque substance under the condition when the patient is standing, making a straining effort, coughing and urinating. The voiding cystourethrography also gives information on availability of the vesicoureteral reflux, diverticulum, and also about volume of the residual urine. The neck of the urinary bladder is open out as a result of its sudden spasm, and since it is impossible to reveal differences between anatomic incapacity of the proximal part of the urethra (the neck of the bladder) and a sudden spasm of the urinary bladder during X-ray, then in order to measure pressure in the urinary bladder a small catheter is introduced into it during examination.

Recording of pressure in the urinary bladder and the voiding cystourethrography are made simultaneously. A simple urodynam-

ic study is carried out for more precise diagnosis and a choice of rational treatment of the urinary incontinnce. In case of diagnosing the urinary incontinence with the help of the urodynamic test it is necessary for the phenomenon of the incontinence to be reproduced at the time of study. On the cystometrogram the pressure in the urinary bladder is registered at the time when the bladder is filling up at a constant speed, as a rule, 40–60 ml/min. The volume of fluid at the moment when the first feeling of a full urinary bladder appears in the patient, the first feeling to urinate and the total volume of the bladder are recorded on the cystometrogram. The sudden spasm of the urinary bladder, for the time when the patient is trying to hold the urine is clearly visible and is estimated as involuntary contraction of the urinary bladder if there is a sudden feeling to urinate or incontinence or without it.

When the sudden imperative feeling is connected with an involuntary spasm, which is recorded on the cystogram, and the incontinence is documented, the patient's forced urinary incontinence is secondary relatively to the involuntary spasm of the urinary bladder (instability of the detrusor). Washing, a sound of a water jet, bouncings on heels can provoke a forced urinary incontinence during examination.

In the adult's urinary bladder there may be retained 400–600 ml of urine, and thus the pressure will be less than 12 cm H_2O. A slow gradual raise of the intra-abdominal pressure during filling up the bladder indicates a weak response of its wall (fibrosis), which occurs, as a rule, after radiation therapy of the pelvic organs if there are malignant tumours in female genitalia or a failure of the peripheral innervation of the urinary bladder. Anatomically a normal urethra (with healthy adjacent tissues) is closed as a result of a raised intra-abdominal pressure. If the urethra has been injured as a result of radiotherapy, trauma, numerous operations or its innervation has been disturbed, it will not be closed in case of a change in the intra-abdominal pressure.

Treatment of stress urinary incontinence

Physical exercises and procedures for pelvic organs, medical therapy, training manipulations on the urinary bladder, vaginal pessaries, electric stimulation, surgical intervention — all this is applied if there is a diagnosis of stress urinary incontinence.

The exercises for muscles of the pelvic floor if they are done correctly strengthen muscles-elevators of the anus and are effective, according to reports, in 70% of cases. These muscles will create a maintaining "hammock", which elevates organs of the small pelvis, with the urinary bladder and urethra included. Teaching the patient to do exercises for muscles of the pelvic floor correctly is a guarantee of a successful treatment. The patient should precisely know what muscle should be strained, and also learn diligently to keep the duration and rate of straining efforts according to the optimal scheme (by the way, a small sheet of paper with an operating instruction about doing exercises is not an adequate form for correct teaching the patient with urinary incontinence). The practitioner enters two fingers of one hand into the patient's vagina and places the other hand on its belly and asks to strain her muscles like she does in order to avoid urination. Thereby the practitioner feels availability of the isolated contraction of the pelvic floor muscles in the patient without a strain in abdominal muscles.

The exercise for contraction-relaxation of the pelvic floor muscles is executed in "four strokes" with each contraction for 5 min 2 times a day at least.

The application of the biological feedback method and other tool methods with measuring of pressure while contracting muscles allows to strengthen visually the efficiency of this technique. Cones of different weight introduced into the vagina help the patient to learn how to tense definite muscles for holding the cone. The cones should be retained in the vagina for 15 min, twice a day during walking or in the vertical position of the body. For selective training of muscles an electric stimulation of the pelvic floor muscles is used by means of an electrode introduced into the vagina. The idea, parameters of the electrical stimulation and duration of therapy are still considered.

For medical check of the stress urinary incontinence estrogens and α-adrenomimetics are used. The smooth muscles of the base of the urinary bladder and the proximal part of the urethra are stimulated with α-adrenomimetics. The stimulated contraction of muscles should help to close the urethra for the time of the stress effects. More often phenylpropanolamin is administered, which is contained in many medicinal preparations for treatment of cold.

The replacement therapy administered to patients after beginning the menopause promotes increase of thickness of the mucous membrane of the urethra and vagina. It is thought that estrogens

increase hermeticity, which is formed by the mucous membrane in the urethra at the moment when its walls are closing as a result of raise of the intra-abdominal pressure. Traditionally training of the urinary bladder is used for controlling suddenness of urination and forced incontinence of urine. Studying the diary of urination, the practitioner assigns an approximate fixed interval of time to urinate for the patient; as a rule, these recommendations are associated with the schedule of urination, which has been formed in reality. If the patient urinates every hour, she should have a 45-minute interval between urinations and urinate only at a definite time. Every week the time interval is increasing by 15 min; finally the forced urination is controlled by a strengthening cortical effect on the bladder mechanism of feelings. The bladder training combined with exercises for the pelvic floor is a good starting treatment for 40-year old patients who began to have again a stress urinary incontinence in combination with previously experienced elements of the forced incontinence.

For medical control of the stress urinary incontinence some vaginal pessaries and diaphragms are used, which support the base of the urinary bladder and prevent from increase of movability of its neck and urethra in case of a sudden raise of the intra-abdominal pressure. However, difficulties in introducing and the state of discomfort which they cause in patients, are confined with usage of the above mentioned facilities. The first attempt to apply the Hodge pessary has given a positive result, but they did not manage to state for how long this effect had been maintained.

The surgical methods of treatment are subject to discussion if it becames clear that a patient has a clearly manifested stress urinary incontinence and application of conservative methods of therapy is not effective. There are 6 basic versions, which contain about 100 surgical methods of applications proposed for treatment of patients with a stress urinary incontinence. The choice of the therapeutic method is an urologist's competency and it is based on the patient's desire to diminish expressiveness of the urinary incontinence, thus, the accompanying diseases and pathological states are considered, as well as the fact that the operative measure can be single or repeated.

The method of narrowing the frontal part of the vagina is used in order to decrease the extent of expressiveness and to prevent from cystocele, which penetrates through its anterior wall. Such technique gives unreliable result in future in treatment of patients

with the stress urinary incontinence if the surgical intervention directed to resumption of the normal maintaining effect of the adjacent tissues onto the neck of the urinary bladder is not done in time. The best remote result of treatment was found in case of performing the abdominal retropubic urethropexy. It is recommended to perform retropubic alternatives of surgeric operation if there is availability of raised mobility of the urethra with the functioning proximal sphincter or absence of expressed cystocele (for example, type I of the stress urinary incontinence).

Methods of surgical treatment of patients with the stress urinary incontinence

1. Narrowing of the anterior part of the vagina with Kelly plication or without it.
2. Abdominal retropubic urethropexy:
— according to Marshall—Marketti—Krantz;
— operation according to Burch;
— paravaginal plastics;
— Lapidus' technique.
3. Transvaginal suturing according to:
— Pereyra;
— Stamey;
— Gittes;
— Ratz.
4. Pubic-vaginal loop.
5. Prosthetic urinary sphincter.
6. Collagen implant of the urethra.

Pereyra published results of treatment by using his technique (transvaginal method of suturing) in 1959. Later a lot of its modifications (Stamey, Gittes, Ratz) were proposed, though the major principles of this method remained the same. Tissues to the sides of the neck of the urinary bladder are sutured blindly or through exposure of the wall of the vagina to tissues disposed in the suprapubic space. There sutures are fixed to the fascia of the rectal muscle or to the periosteum of the pubic bone. As compared to abdominal retropubic operations, the duration of time of surgical intervention by this method and postoperative period are shorter. At some medical centers such an operation is performed on out-patients.

Information on the remote results of this operation is still accumulating. If there is a type III stress urinary incontinence and un-

functioning of the proximal part of the urethra, treatment is in applying a collagen implant, introduction of a pubic-vaginal loop or a prosthetic urinary sphincter. Suspended surgical interventions have no success in more than 50% of cases if a weak sphincter mechanism is simply fixed in another situ. For treatment of patients with the type III stress urinary incontinence there may be performed some injections of collagen under the mucous membrane of the neck of the urinary bladder (Fig. 75, see col. suppl. sheet), to perform an operation on creation of a fold, to apply a mechanical cuff around the proximal area (a proshtetic urinary sphincter). The surgeon should discuss all advantages and disadvantages of each alternative of interference with a patient.

For treatment of patients with the stress urinary incontinence many techniques are proposed. The thorough acquisition of information about the case, conducting a physical examination together with simple diagnostic routines promote in making a precise diagnosis. A practitioner should explain conservative methods of therapy to the patient and apply them before applying surgeric methods — a morbid state and deterioration of the quality of life remain in patients more often even after operation.

If the therapy by peroral drug intake has no success, but there is an indication to the operative treatment, it is possible to offer the method of catheter introduction. If the catheter is changed every month, it is possible to prevent progressing of infection. The other factor that prevents from the ascending infection is a hermetically closed system.

The family doctors should know how to prove documentary the diagnosis of the stress urinary incontinence, to choose recommendations for patients concerning exercises for muscles of the pelvic floor, as well as to administer medical therapy *per os*. If the data of the anamnesis evidences availability of the forced urinary incontinence in the patient, and she has no symptoms of incontinence while taking stress samples, the family doctor should think of exception of infection or carcinoma *in situ*. Permanent availability of symptoms of the disease with absence of the signs of infection, as well as unsuccessful attempt in treatment of the stress urinary incontinence with the help of exercises or with pharmacotherapy require to refer the patient to see an urologist to be examined and to solve the problem of expediency of surgical treatment.

Treatment of pressing urinary incontinence

Inability to delay urination after a sudden feeling is referred to as a pressing urinary incontinence. The pressing incontinence can arise due to different reasons, neurologic disorders (dissiminated sclerosis, infection of the urinary tracts) included. Generally a significant neurologic etiology cannot be found in patients with the pressing urinary incontinence and instability of the detrusor. With age the muscles of women's urinary bladder acquire a tendency to development of instability or weakly controlled contractive activity. To prevent from a sudden contraction of the bladder or in order to delay it, anticholinergic and antispastic drugs are administered. In treatment of patients with the forced urine incontinence more often peroral drugs (oxybutinine, propantelin, bromide) are administered.

Urological aspects of urinary incontinence in menopause

In the second half of the XX century there appeared a clear tendency to increase a human being's life duration, in this connection the contemporary population of women stays for one-third of their life in the state of postmenopause — a transitional and gerontic age. With elongation of life different aspects acquired some medical and social significance, which determine both quality of life for women and essential increase of the significance of problems of this age group of population for the society as a whole.

For the years before the menopause and after it 42% of women have climacteric symptoms which are caused by reduction of estrogen production.

Numerous scientific studies dedicated to the role of estrogenic deficiency and hormone replacement therapy, preventive measures and treatment of cardiovascular diseases and osteoporosis have been carried out recently. However, in clinical practice there is not a less actual problem — urogenital disorders, which development is connected to an age reduction of estrogen level in women.

The organs of the urogenital tract (vagina, urethra, urine bladder and the lower third part of the ureter) have a common embryological genesis and they are developed from the urogenital sinus. All these patterns are characterized by a high response to estrogens. The estrogen receptors have been found in muscle strata of

the vagina; basal, parabasal, intermediate and surface cells of vaginal epithelium; epithelial, muscular, connective tissue and vascular structures of the urethra; mucous membranes and detrusor of the urinary bladder; ligament mechanism and muscles of the pelvic floor; a round ligament of the uterus, as well as in the collagen connective tissue, which is included into their composition.

The urogenital disorders (UGD) in menopause include a complex of complications, related to development of atrophic changes in estrogen-dependent structures.

The rate of urogenital disorders is high enough and reaches approximately 30%. However, if UGD in perimenopause are determined in 10% of women, in women in the age under 55 years they are already found in 50% of cases. These disorders arise 3–5 years after the menopause. The rate of their development is increased with age and after 75 years it exceeds 80%, which is likely to be connected with advance of age atrophic changes. Patients with UGD come to see a medical practitioner more rarely than all other women with climacteric disorders. Treatment of such patients is carried out by urologists and as a rule, it is unsuccessful. The hormone replacement therapy in this group practically is not administered. The urogenital failures are considered as average climacteric disorders by their nature and time of their development. They are: atrophic vaginitis (itching, burning and dryness in the vagina), cystalgia, urinary incontinence, resistant recurrent urinary infections, cystitis and pyelonephritis.

In UGD progressing the etiopathogenetic significance acquire changes which take place in organs of the small pelvis in postmenopause.

On the background of the age estrogen deficiency there are atrophic alterations in the vagina, its mucous membrane becomes thinner (the basal and parabasal cells dominate), blood circulation and blood supply become less, there appears fragmentation of elastic and hyalo-collagen fibers, the glycogen concentration in epithelial cells is reduced, lactobacterial colonization is reduced, pH increases (up to 5.5–6.8), as a result of which there are changes in the vaginal microflora, which is exhibited by dissimination of potentially pathogenic micro-organisms (especially by colon bacillus) to the mucous membrane.

The atrophic alterations in female genitalia as a source of infection play a role in the pathogenesis of infectious-inflammatory diseases of the urinary tracts. The availability of canalicular, lympho- and hematogenous links between the sexual and urinary sys-

tems in women create favourable conditions for propagation of infection.

The similar alterations take place and in the epithelium of the urethra, urinary bladder (especially the Lieutaud's triangle), the lower third of ureters and in vascularization of the submucous membrane of these organs, which creates favourable conditions for adhesion of pathogenic bacterias to the urothelium with their further invasion (a full-valuable mucous membrane is considered as an effective antiadhesive and germicidal factor) and promotes development of frequently recurrent, resistant urinary infection.

Chronic cystitis can become a cause for development of inflammatory process in the kidneys because of insufficiency of the closing apparatus of ureters and occurrence of vesicoureteral, and ureter-pelvic refluxes (small pelvic areas of ureters also contain a great number of estrogenic receptors, and trophic failures in postmenopause can also develop in them).

The occurrence and progressing of pyelonephritis is promoted by disorders in urodynamics — a failure of contractile ability of cystoids in the upper urinary tracts, which results in urostasis, weakening and fading of urodynamics, and they are conditioned by hormonal dyscoordination in women.

A chronic course of inflammatory diseases of the genitourinary organs are favourable for stagnation in the venous network of the small pelvis and hypotonia of the muscular-ligament apparatus of the pelvic floor.

One of the most frequent symptoms in postmenopause which reduces the quality of women's life results in disability and is the cause of development of the ascending urological infection, is the urinary incontinence at the moment of a physical tension.

In connection with the beginning of menopause, women complain mostly of frequent and painful urination; a nocturia which disturbs sleeping; a frequent feeling of urination with a slight filling up of the urinary bladder (hyperreflexia); the atonic urinary bladder (weakness, instability of the detrusor which ia accompanied with incomplete emptying of the urinary bladder); imperativeness of the feeling with urinary incontinence or without it; urinary incontinence at the moment of a physical tension (coughing, sneezing, laughter, sharp movements and weight lifting).

The reason for urinary incontinence at a physical tension is a failure in the sphincter apparatus of the urinary bladder and urethra, which results from changes in the normal uretero-vesical re-

lationships — disorders in the ligament apparatus of the urinary bladder and a shift of the neck of the urinary bladder from the area of maximal hydrostatic pressure. It results in failure of an adequate transmission of the intra-abdominal pressure onto the proximal area of the urethra and causes the urinary incontinence. The decrease in estrogen synthesis results in oligotrophy of the epithelium of the urethra and Lieutaud's triangle, decrease of response of adrenoreceptors of the neck of the urinary bladder and turgor of tissues at the expense of decreases of the amount of water in them, and as the consequence, — to failure of closing mechanisms.

All structures and mechanisms that participate in the process of urine holding are estrogen-dependent. For the urine to be hold inside, the pressure in the urethra should permanently exceed pressure in the urinary bladder. It is ensured with four functional membranes of the urethra: by epithelium, connective tissue, vascular net and musculation.

The process of urine holding also depends on the tonus of muscles of the pelvic floor, the state of collagen fibres in the ligament apparatus of the small pelvis and the state of the detrusor of the urinary bladder. Till now the dominating solution of this problem was in performance of different modifications of surgical interventions, the number of which accounted for about 200. However, the effect of operative measures, as a rule, was very small, therefore there exists a search for other types of therapy.

The factors mentioned above not only maintain a high urethral pressure but also participate in prevention from development of ascending urological infection. It is considered that the ascending urological infection is prevented by means of the following mechanisms:

1. The zone of the higher pressure in the middle part of the urethra, that operates as a mechanical barrier.

2. Secretion of immunoglobulins by paraurethral glands and mucus — urethral epithelium, in this connection the proximal part of the urethra (1 cm) remains sterile so long as the urethral pressure exceeds pressure in the urinary bladder and there is a sufficient amount of mucus in the lumen of the urethra. These mechanisms are considered a protective ecological barrier of the urethra.

The urethra function is closely connected with other structures of the urethra: suburethral wall of the vagina, the ligament apparatus and muscles of the pelvic floor. The state of collagen in these structures is very important. In conditions of estrogen deficiency

the atrophic changes in all strata of the urethra are developed, and dystrophic alterations occur in the muscles of the pelvic floor, the urine bladder and in the ligament apparatus of the small pelvis, which results in different versions of failures in the urodynamics and urinary incontinence, ptosis of walls of the vagina.

Examination of women with disorders of urination and urinary incontinence at a physical tension

1. Patient's complaints — disorders in urination, even to urinary incontinence, which are related to beginning of the menopause.

2. Padding test — to determine the weight of the padding for 1 h before and after the physical exercises. If the weight of the padding exceeds 1 g — there is urinary incontinence.

3. Bacterial inoculation of urine with an antibioticogram.

4. Urodynamic studies:

— uroflowmetry (an objective estimation of urination that gives a representation about the rate of emptying the urinary bladder);

— urethrocystometry (estimation of local changes in the intraurethral pressure if there is a change in the bladder pressure);

— profilometry (graphics image of pressure in the urethra along all its length in the state of rest and with the full urinary bladder);

— coughing sample taken in patient's horizontal and vertical positions gives an idea of remained transmission of the intra-abdominal pressure on the proximal part of the urethra;

— electromyography (estimation of the pelvic floor muscles, their contractile activity which helps to determine mechanisms of holding urine).

Treatment of women with urogenital disorders in the menopausal period

Treatment of patients with urogenital disorders related to age deficiency of estrogens and improvement of the quality of life is impossible without hormone replacement therapy. Estrogens have a positive effect on all structures of the urogenital tract due to availability of estrogenic receptors in them.

Any kind of therapy by estrogens (both systemic and local) acts positively onto urogenitalia in the following way:

1. It results in a proliferation of the vaginal epithelium, which is manifested in increase of the karyopyknotic index and maturing index.

2. The amount of lactobacillae, glycogen and pH level in the vaginal contents is lowered, which prevents from development of vaginal infections.

3. The blood supply to all strata of the vaginal walls is improved, the transsudation is augmented, sex activity of women is improved.

4. The blood supply to all strata of the urethra is improved, its muscular tonus is recovered, there is a proliferation of the urethral epithelium and the amount of the urethral mucus (musclular, vascular and epithelial effects of estrogens' action) is increased.

5. Pressure in the middle part of the urethra is increasing to the values that exceed that of the pressure in the urinary bladder, which prevents from progressing of the stress urinary incontinence.

6. Trophicity and contractability of the detrusor are improved.

7. Trophicity, blood circulation and contractability of the pelvic floor, collagen fibres, are improved, thus promoting to holding of urine and preventing from optosis of vaginal walls.

8. Estrogens stimulate a secretion of immunoglobulins by paraurethral glands, which, together with increase of the amount of urethral mucus, forms a barrier to progressing of the ascending infection.

9. α-Andrenergic action onto the urinary bladder, the neck of the urinary bladder, urethra (Fig. 76) stimulates.

The systemic therapy by drugs which contains estradiol-valerate or conjugated estrogens is recommended for women whose urogenital disorders are related to emotional-mental and vegetovascular disorders, as well as in order to prevent from cardiovascular pathology and osteoporosis. In case of contraindications to the use of the drugs which have a systemic action (disease of the liver, blood, availability of thromboembolism, oncologic diseases, etc.), or if patient's age is above 65 years, drugs of local action are administered: estriol as suppositories, creams, vaginal tablets, micronized 17-β-estradiol as estradiol-replacement silicone rings, conjugated estrogens as creams. It is necessary to remember that 3–5 weeks after cessation of therapy by estrogens the atrophic processes can recur, therefore therapy of urogenital disorders by estrogens practically is permament (for the whole life).

Hormonetherapy is contraindicated with of the following diseases:

— tumors of the uterus and breasts;

— uterine bleeding of unknown genesis;

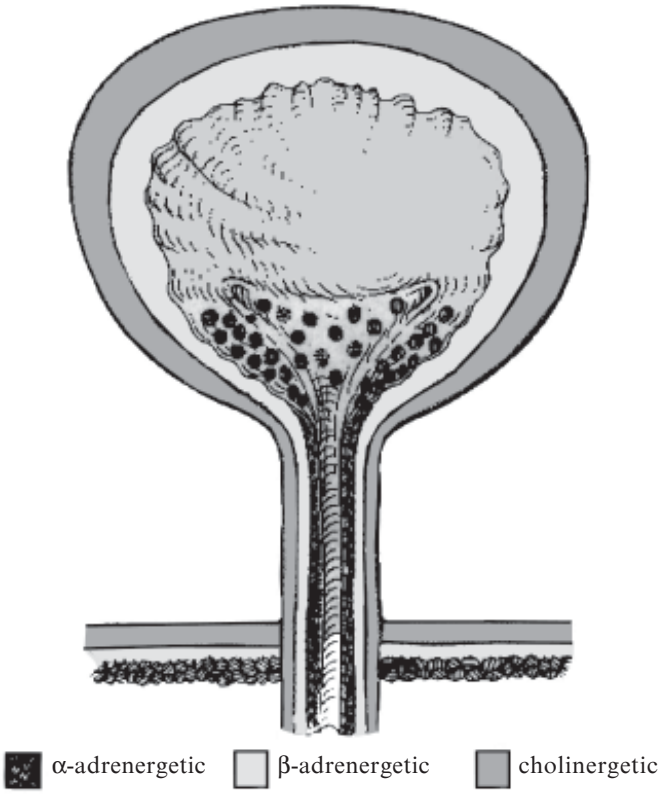


Fig. 76. A scheme of α-, β-adrenoreceptors and cholinereceptors in the urinary bladder

— acute thrombophlebitis;
— acute thromboembolism;
— renal and liver insufficiency;
— severe forms of diabetes mellitus;
—melanoma, meningioma.

Estrogen-therapy should be stopped in case of occurrence of jaundice, uterine enlargement, if there is acyclic bloody discharge. In such cases it is recommended to carry out ultrasonic examination and diagnostic curettage.

Before administration of the hormone therapy it is necessary to conduct the following examinations:

— ultrasonic examination of genitalia;
— study of breasts, lymphography;
— oncocytologic study;
— measuring of the arterial pressure, height, weight of the body, coagulation factors, level of cholesterole in the blood.

Patients with hormone therapy should check their arterial pressure every 3 months and should have their genitalia tested ultrasonographically once a year, as well as mammography.

The diagnostic and medical algorithms for urological diseases are shown in the supplment (Fig. D1–D41).

DIAGNOSTIC AND TREATMENT ALGORITHMS

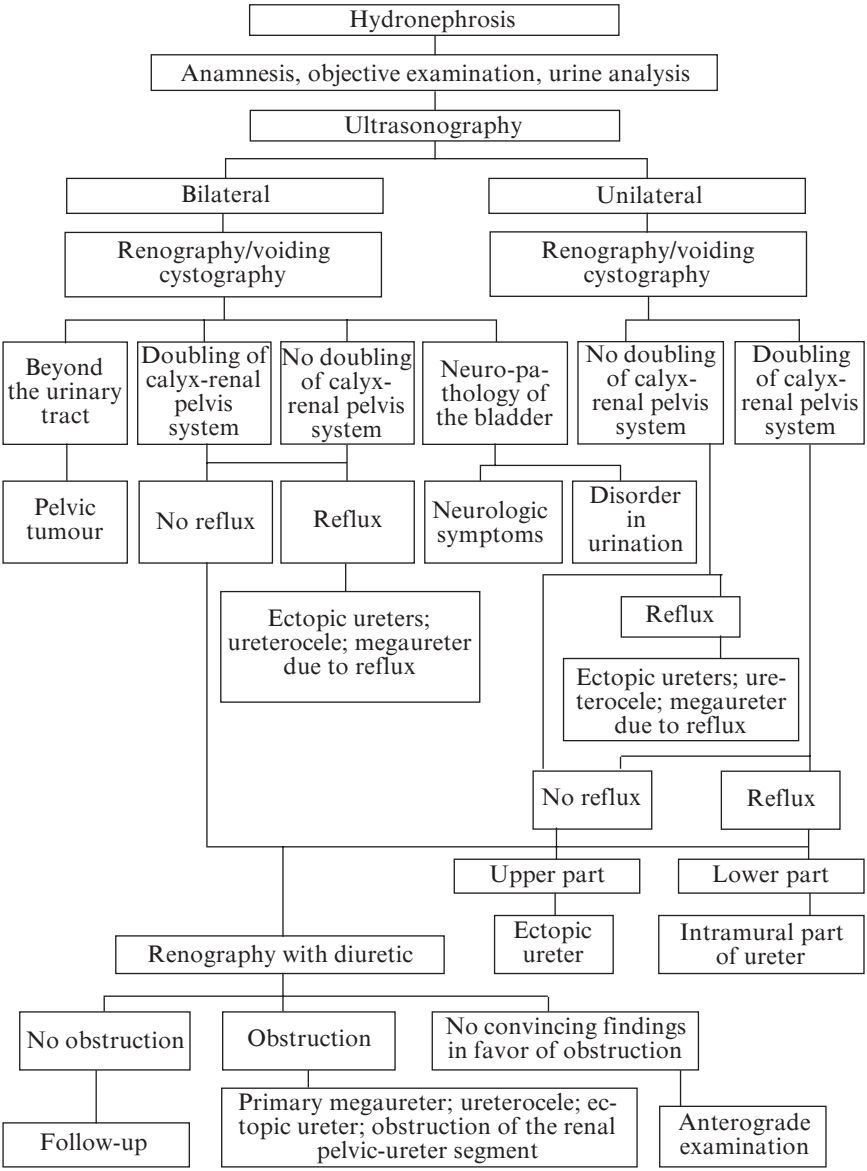


Fig. D1. Hydronephrosis in girls

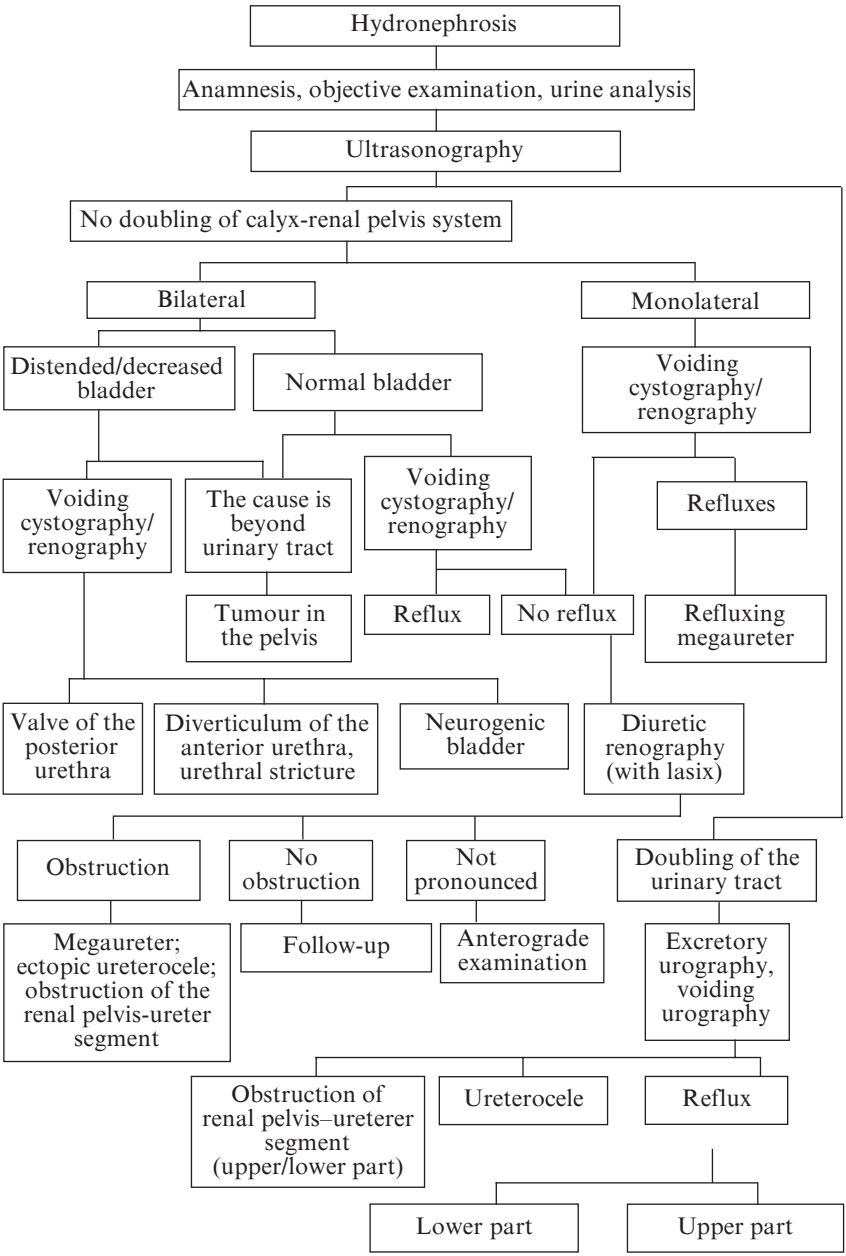


Fig. D2. Primary hydronephrosis

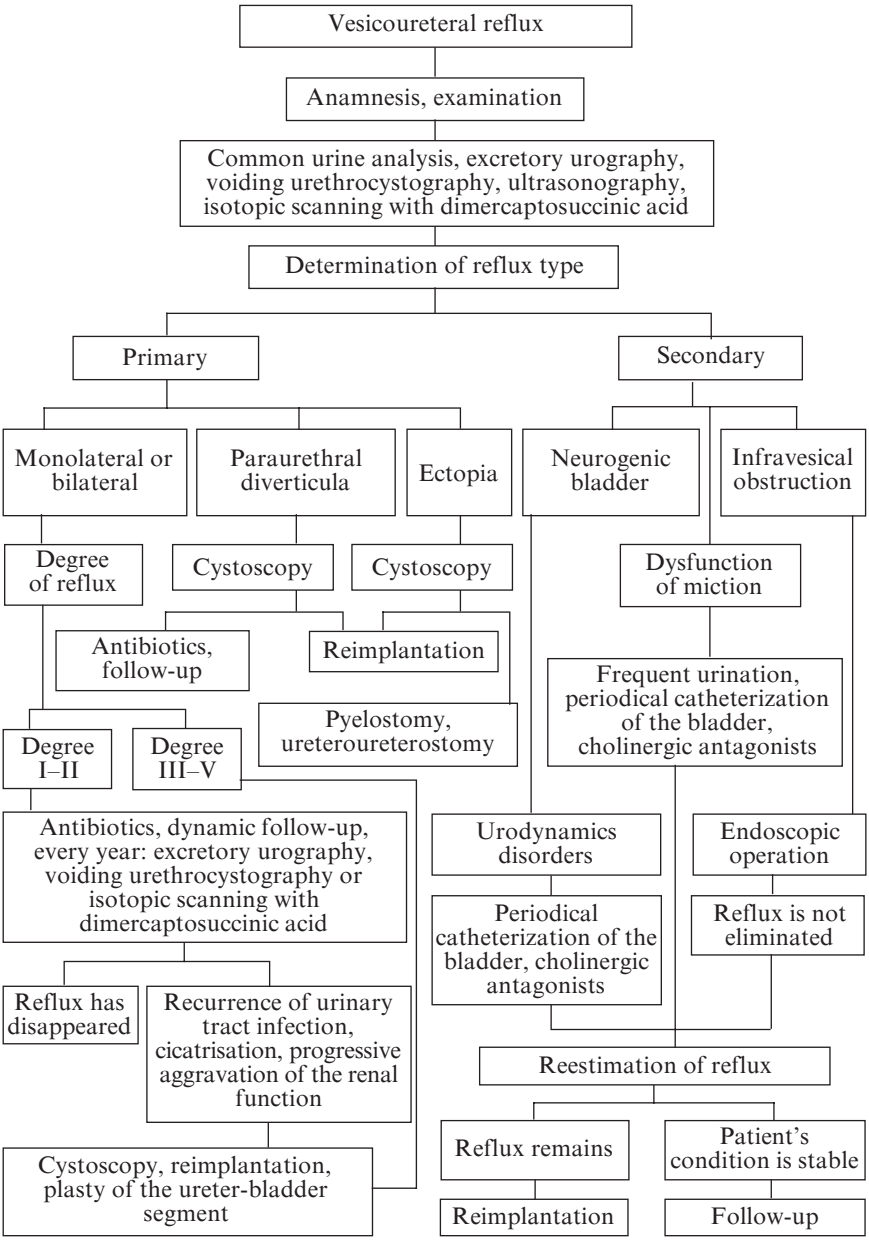


Fig. D3. Suspicion for bladder-ureter reflux

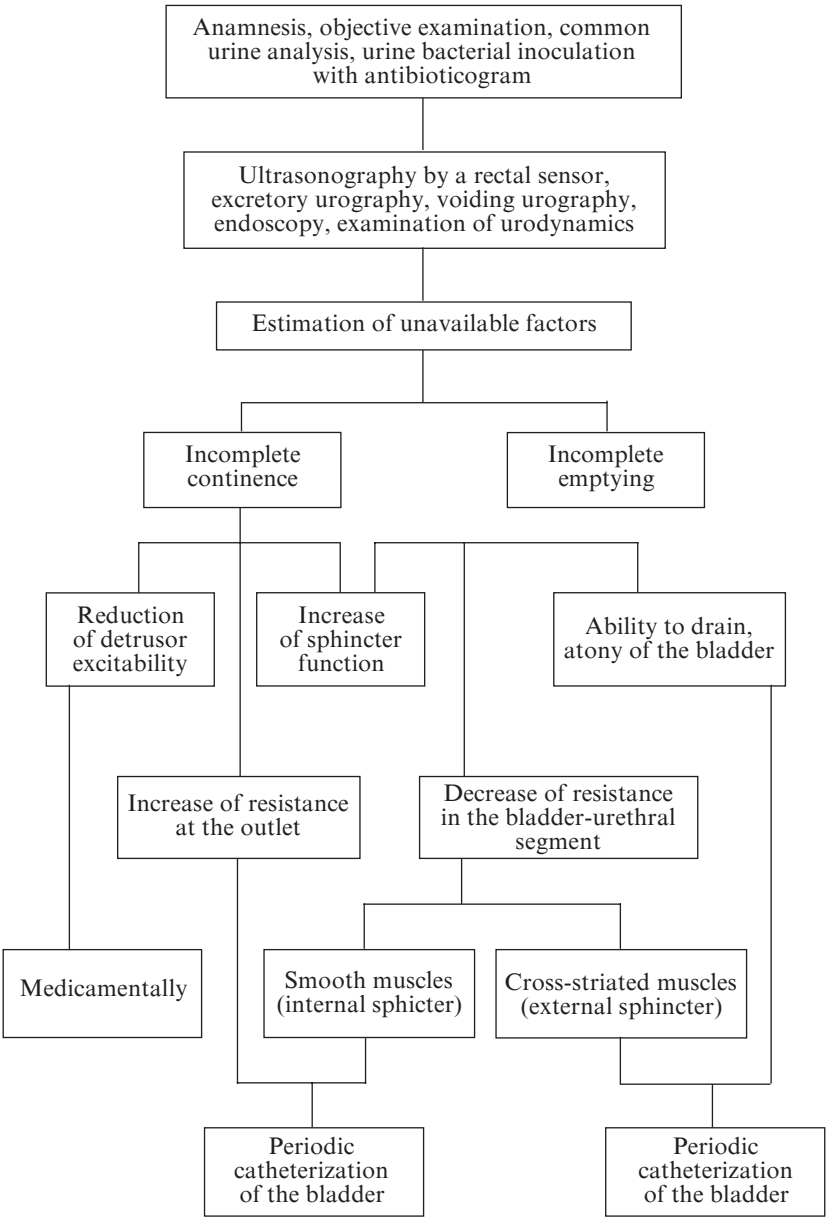


Fig. D4. Disorder of urination

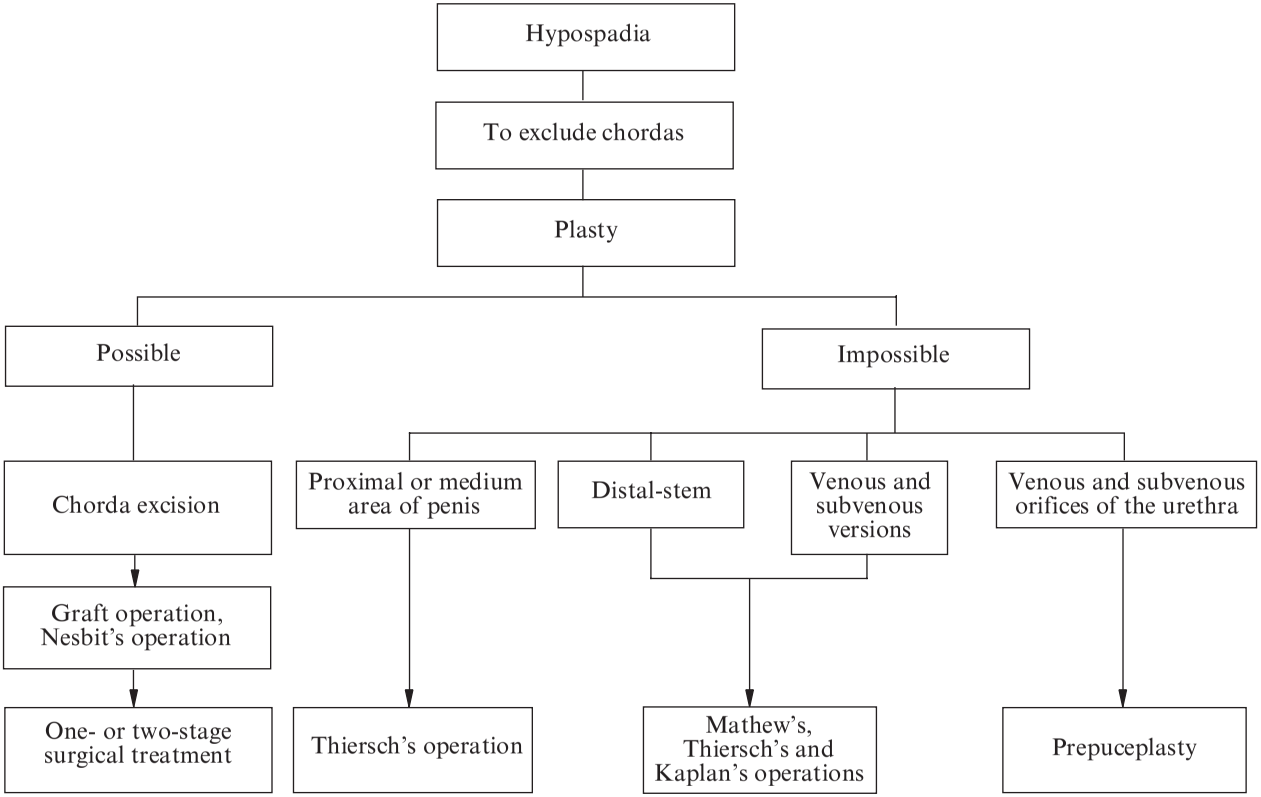


Fig. D5. Hypospadia

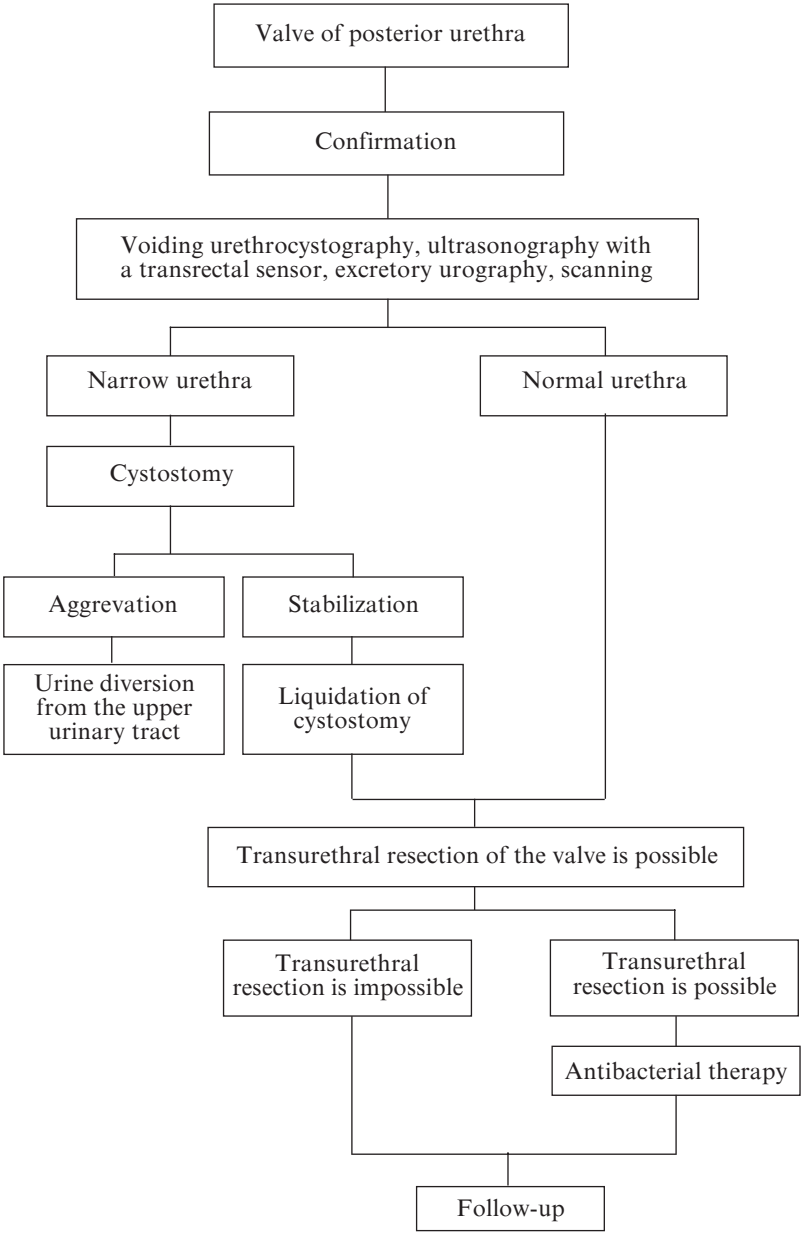


Fig. D6. Valve of the posterior urethra

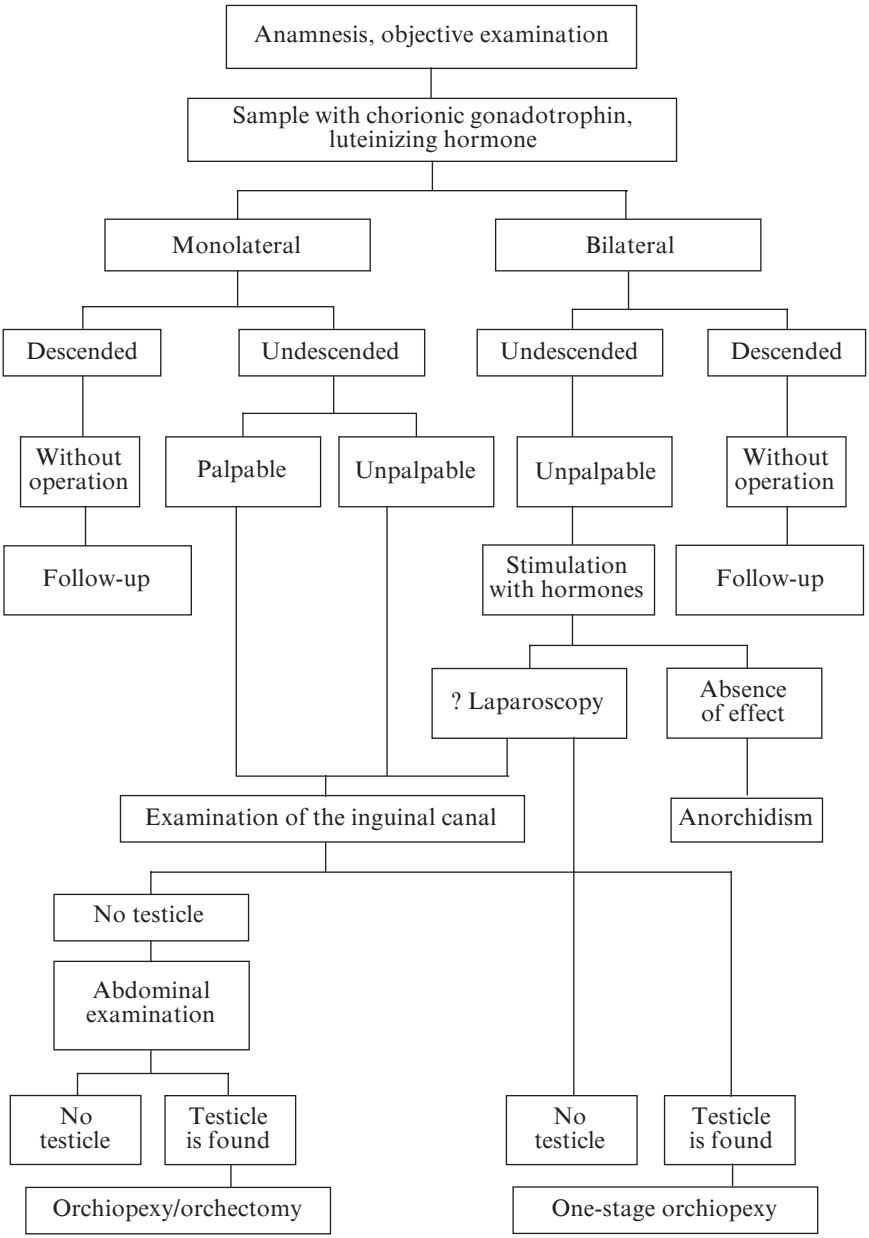


Fig. D7. Cryptorchidism

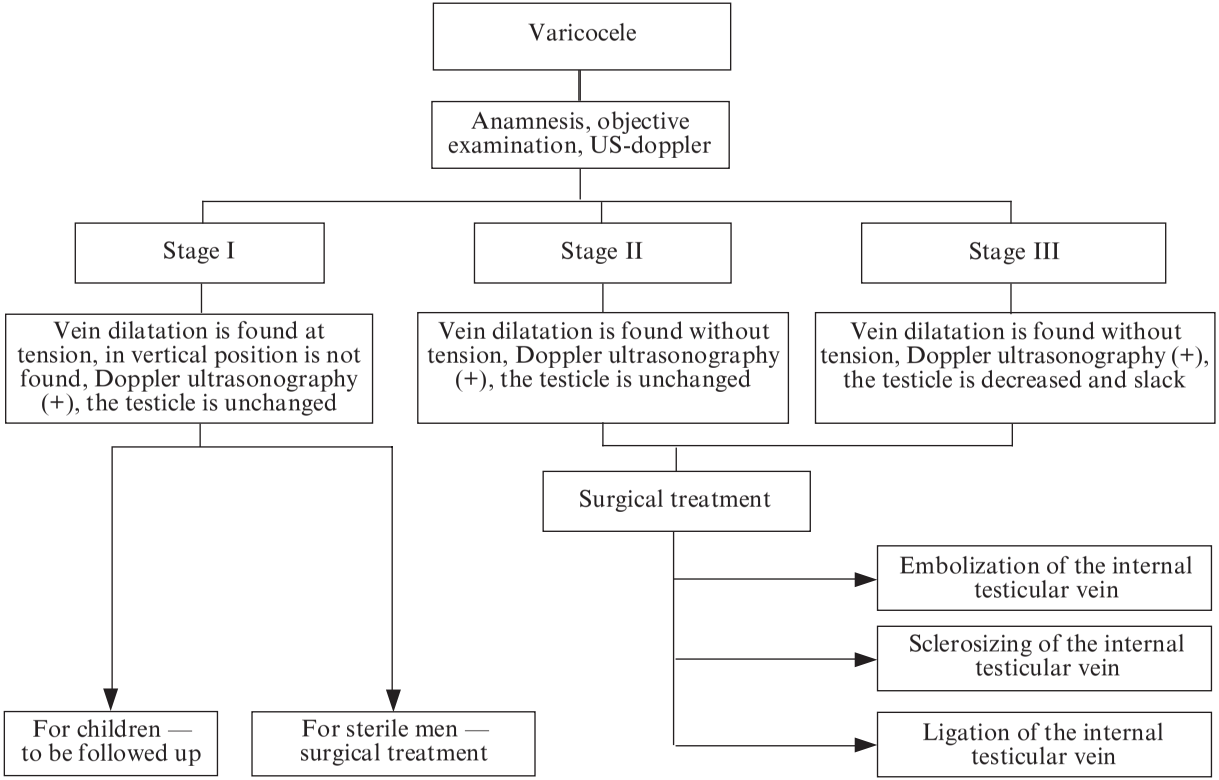


Fig. D8. Varicocele

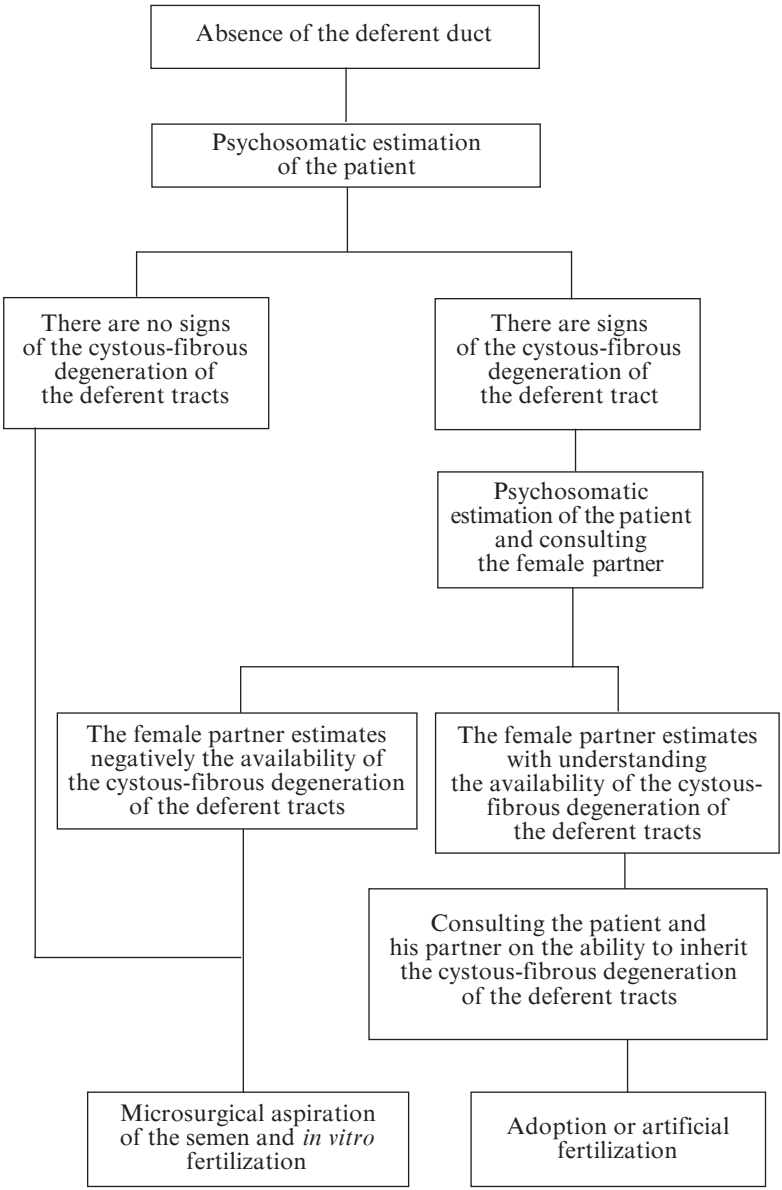


Fig. D9. Agenesis of the deferent ducts

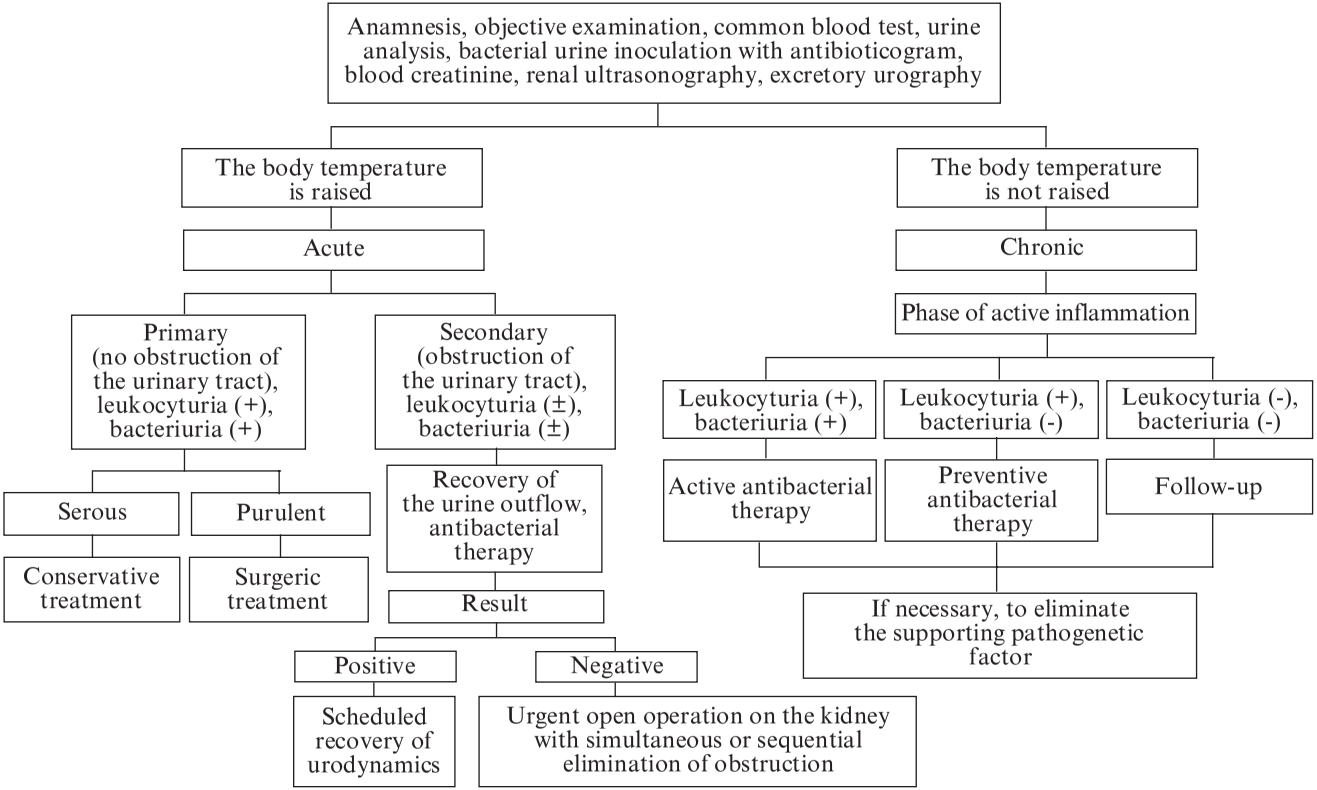


Fig. D10. Pyelonephritis

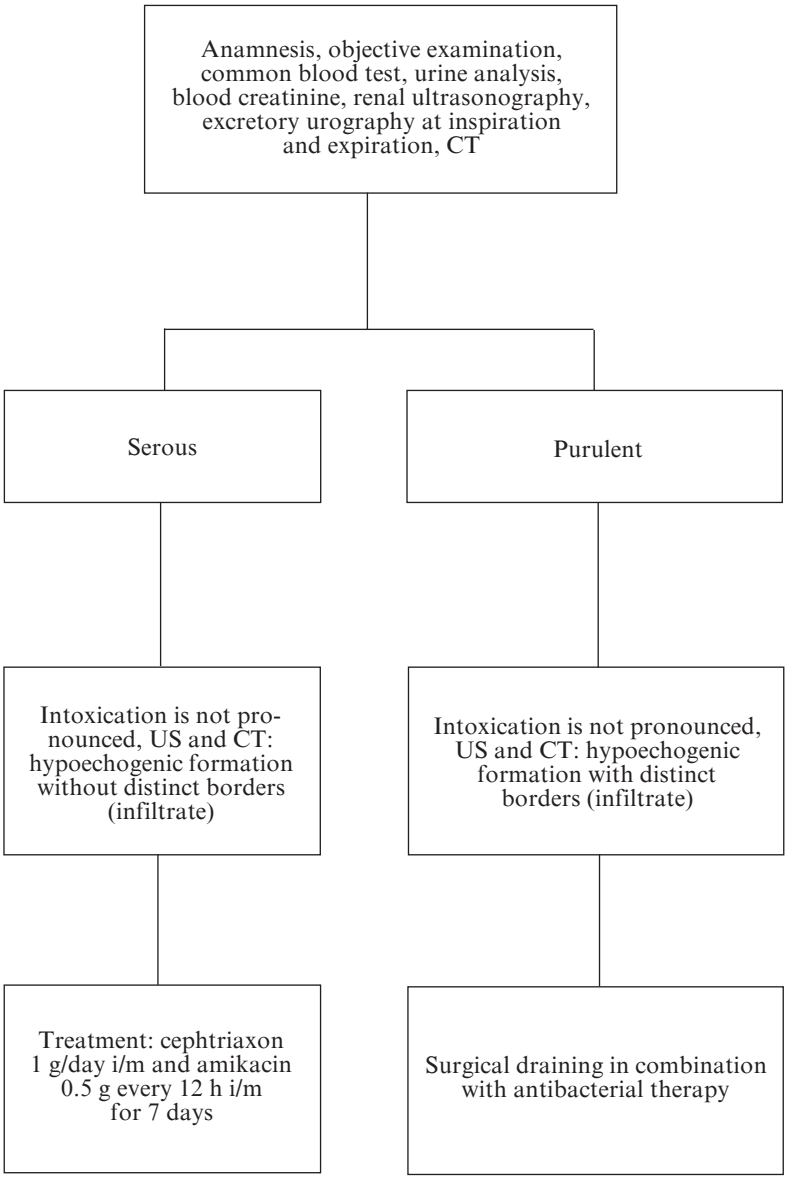


Fig. D11. Acute pyelonephritis

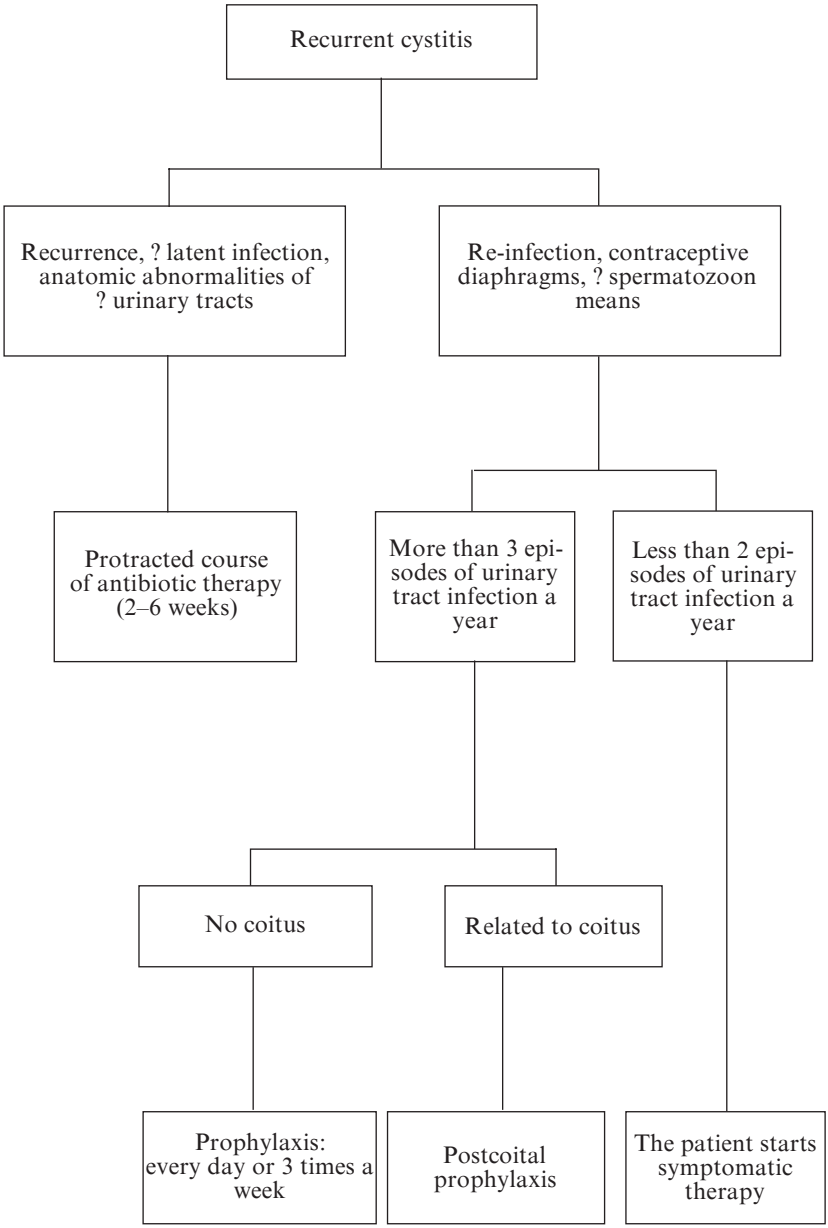


Fig. D12. Recurrent cystitis

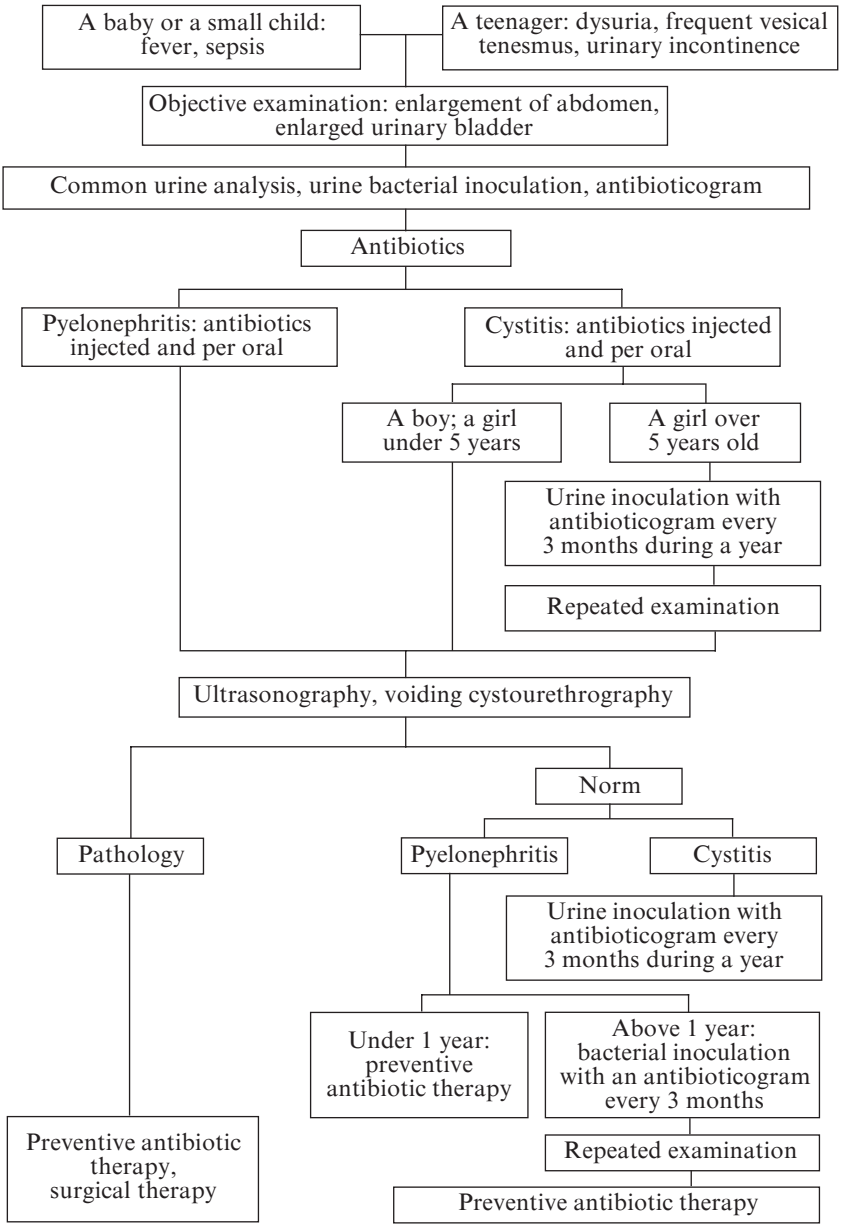


Fig. D13. Urinary tract infection in children

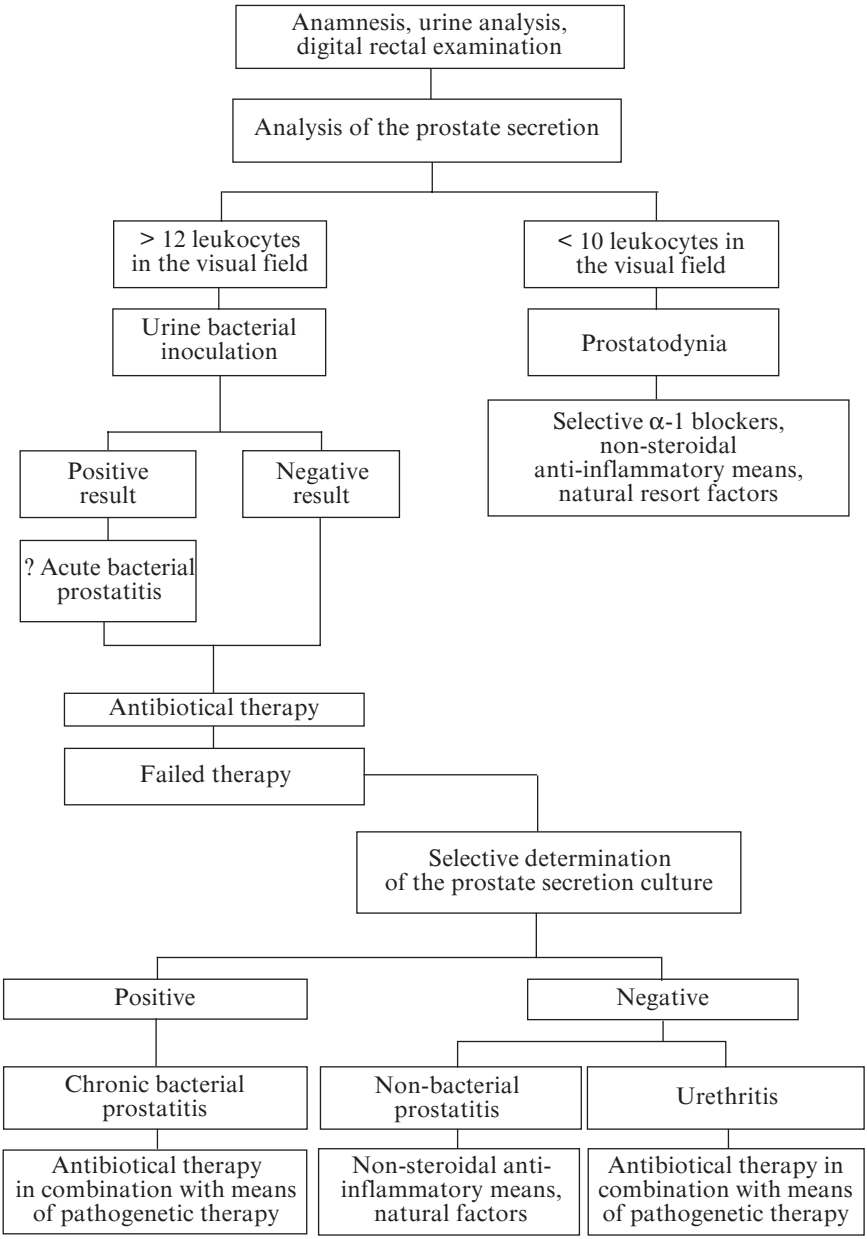


Fig. D14. Prostatitis

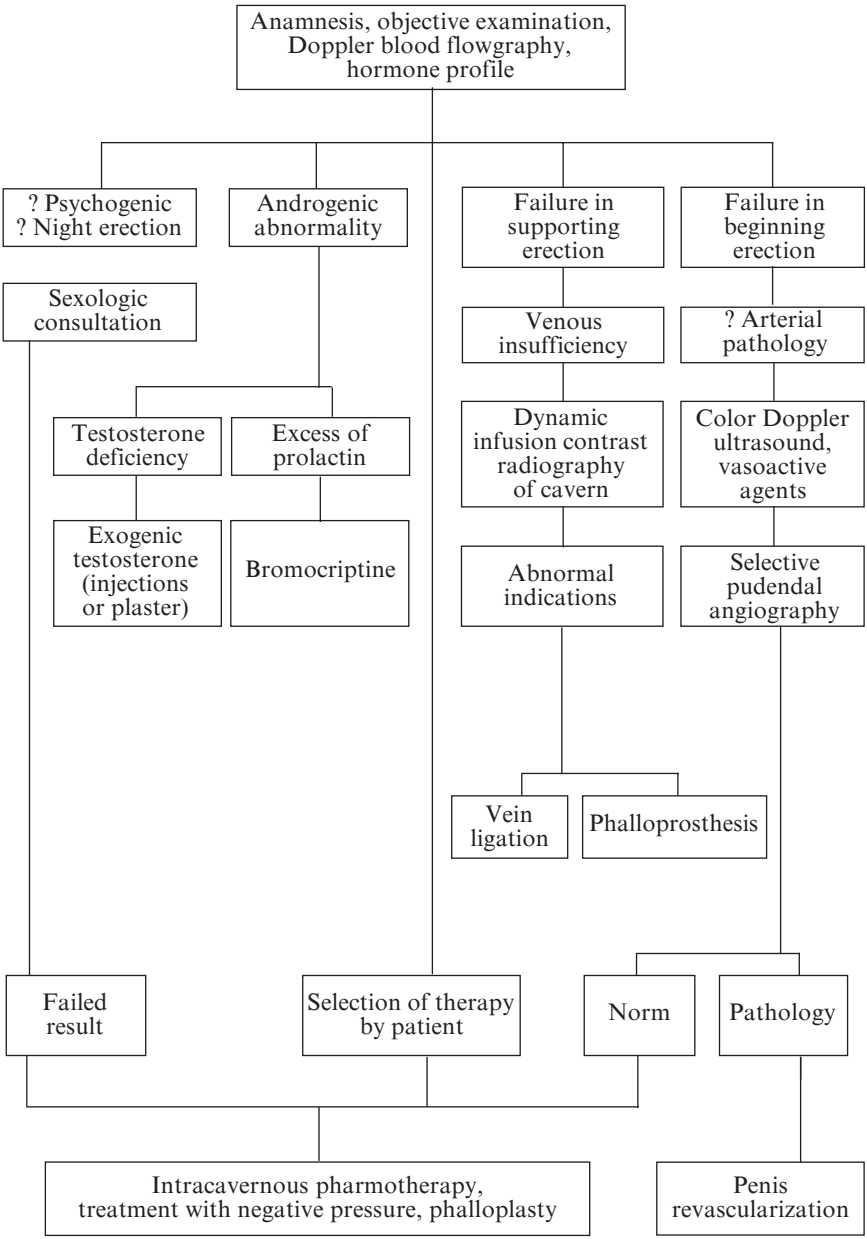


Fig. D15. Erection dysfunction

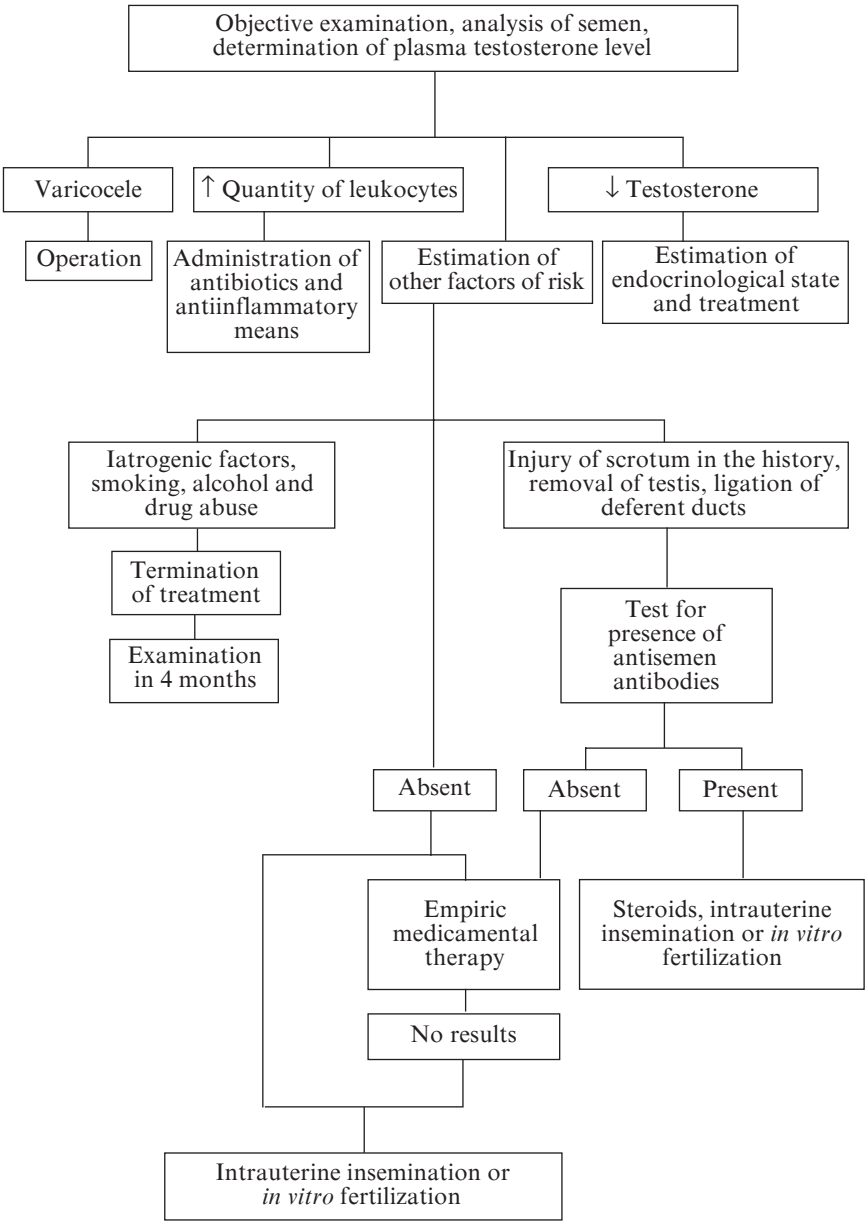


Fig. D16. Oligoastenospermia at normal ejaculate volume

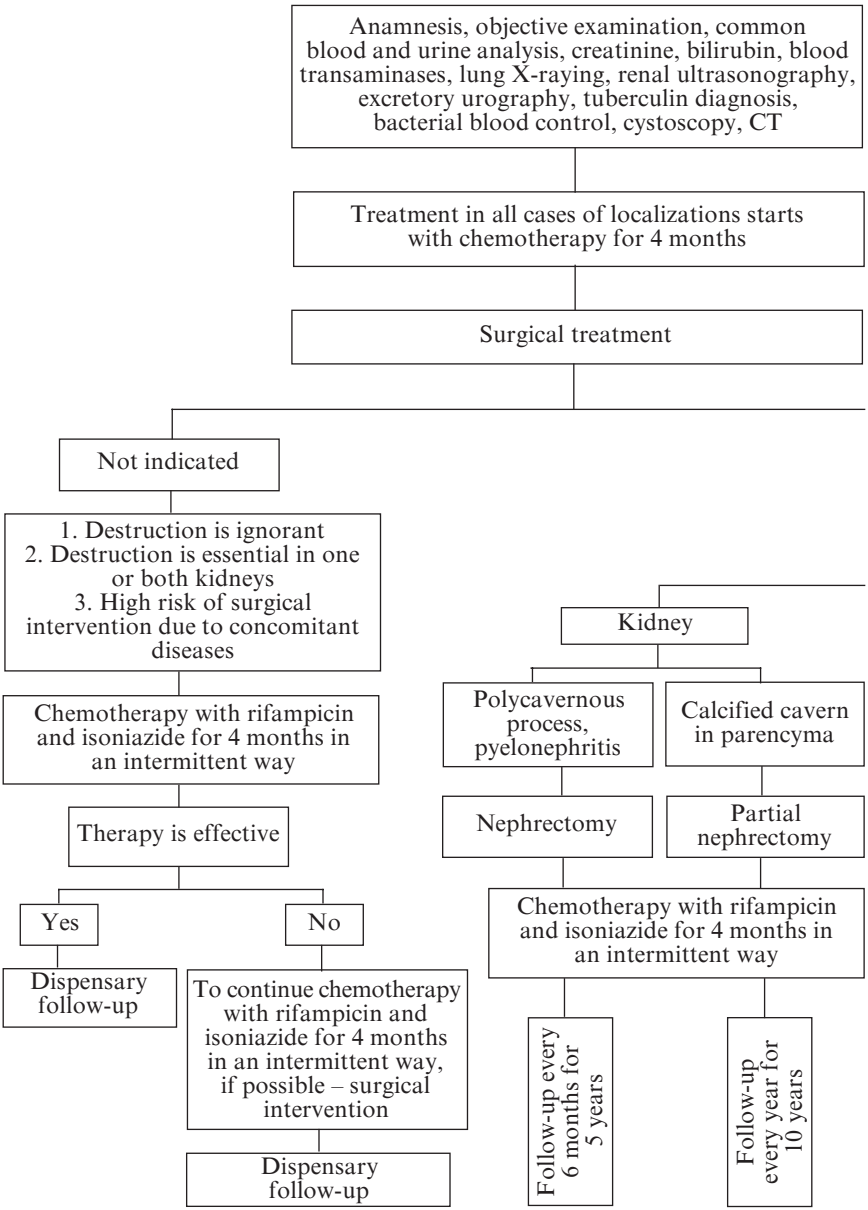
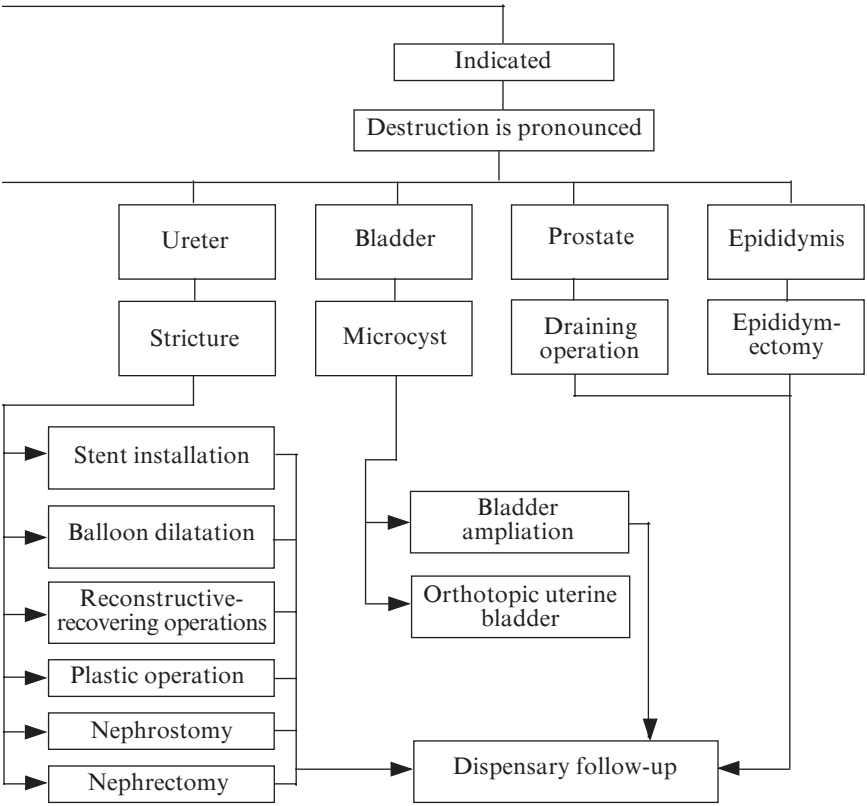


Fig. D17. Genital



tuberculosis

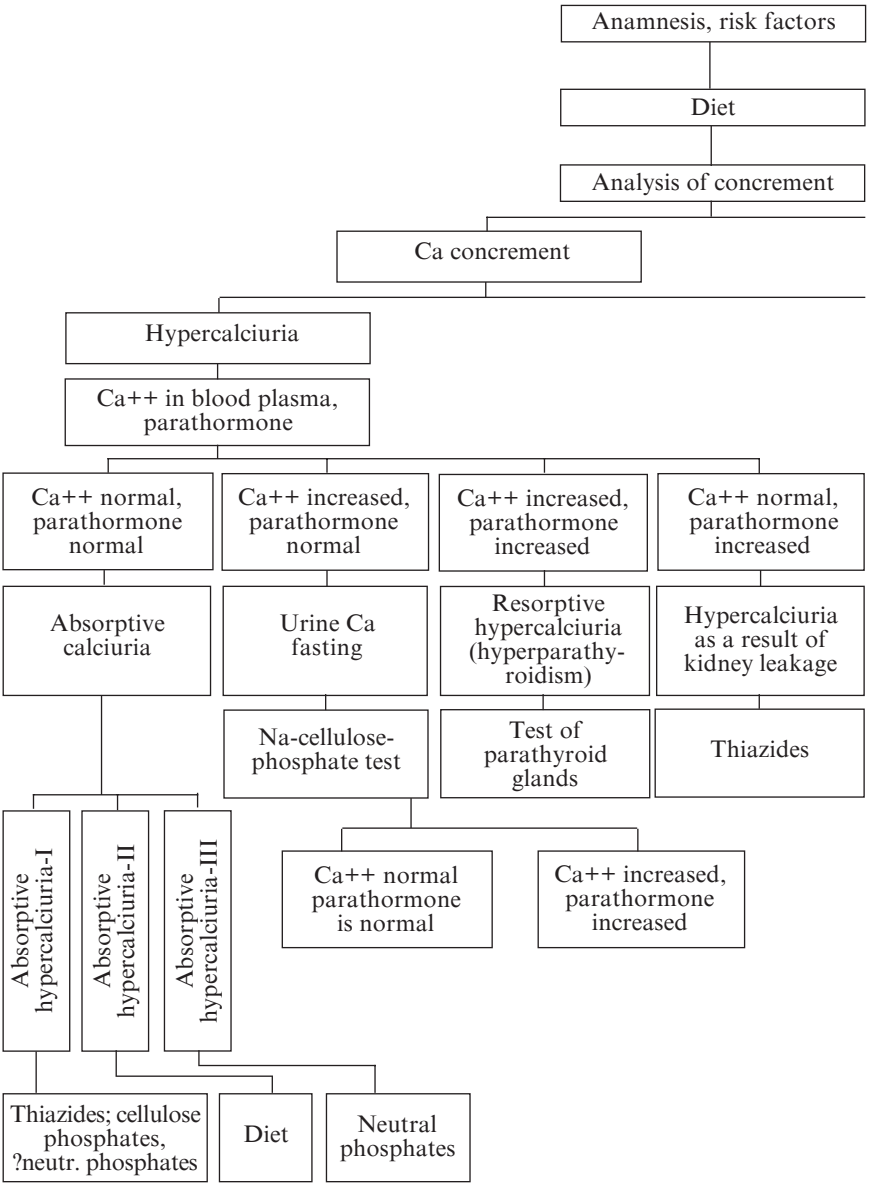
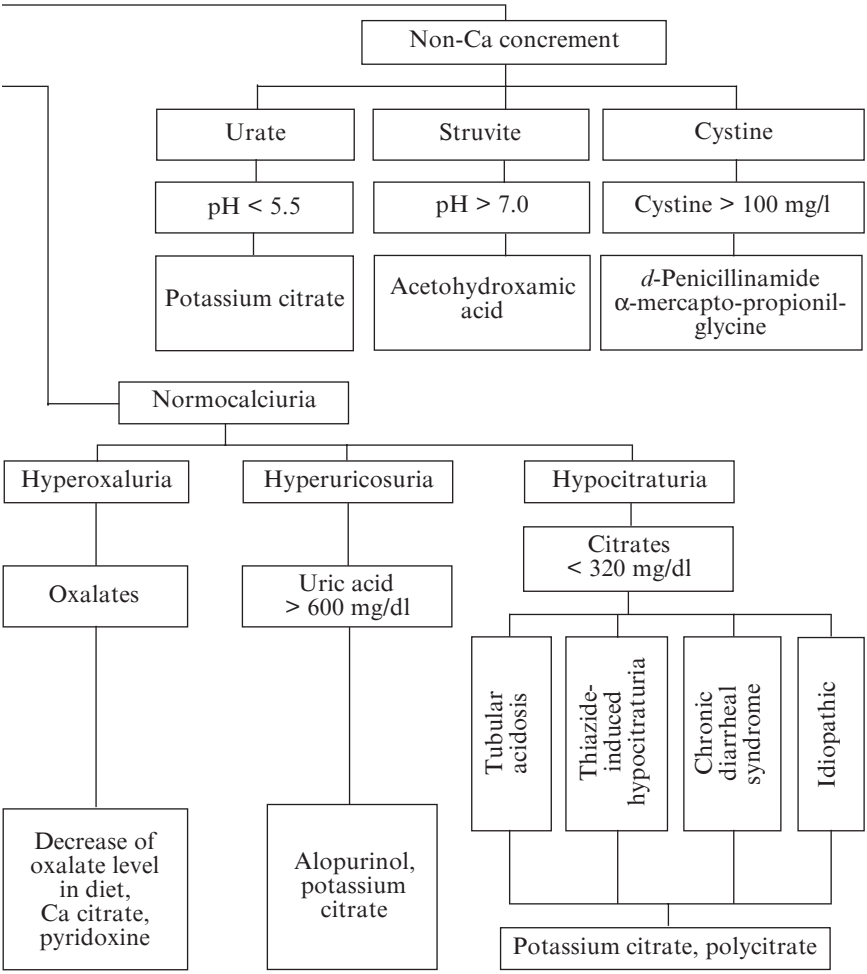


Fig. D18. Conservative treatment



of patients with urolithiasis

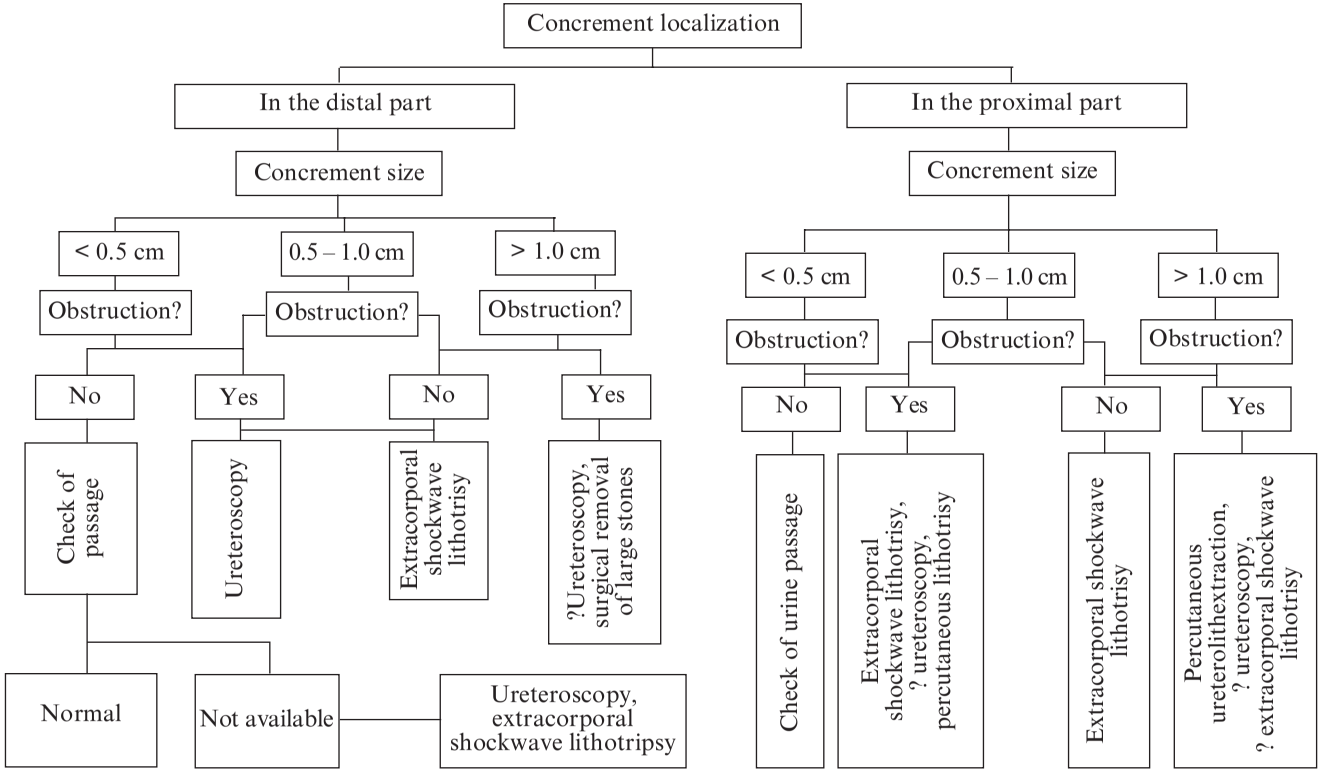


Fig. D19. Treatment of patients with concrements in ureters

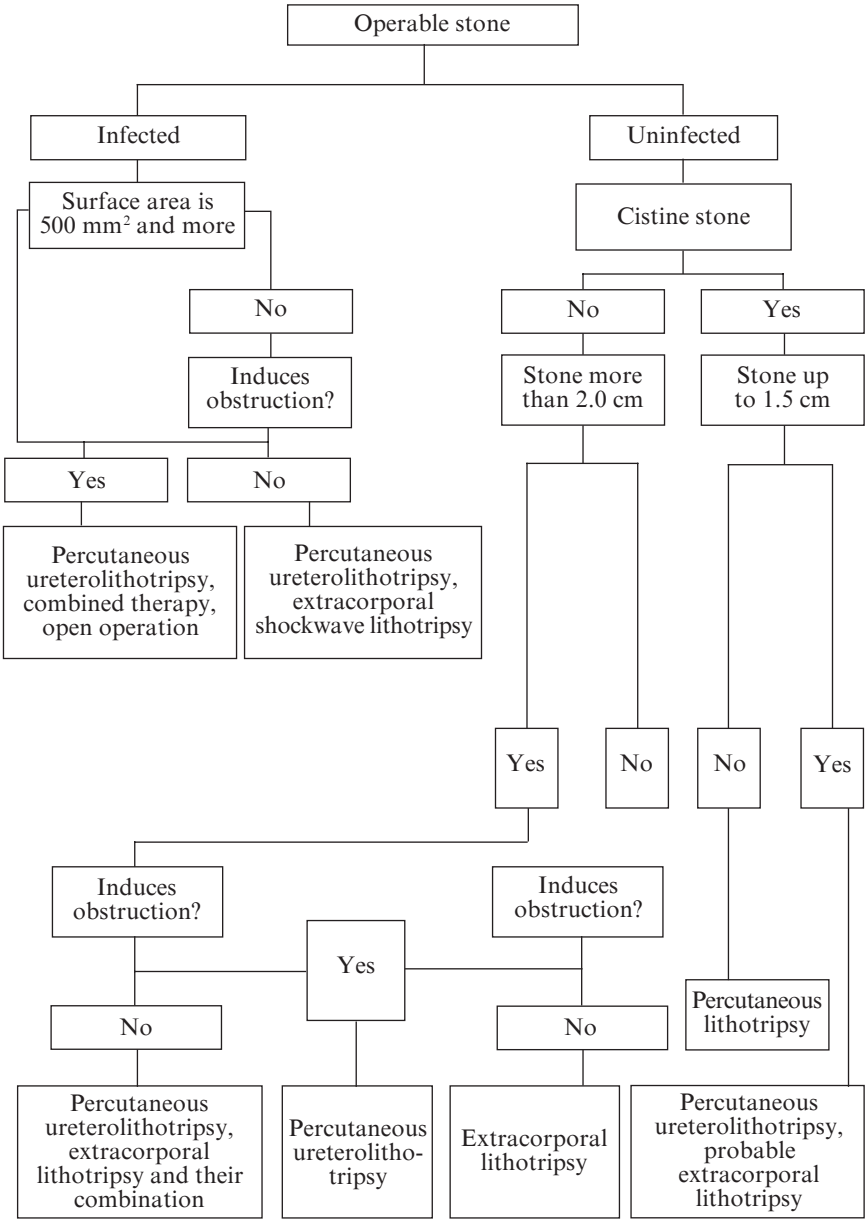


Fig. D20. Surgical treatment of patients with urolithiasis

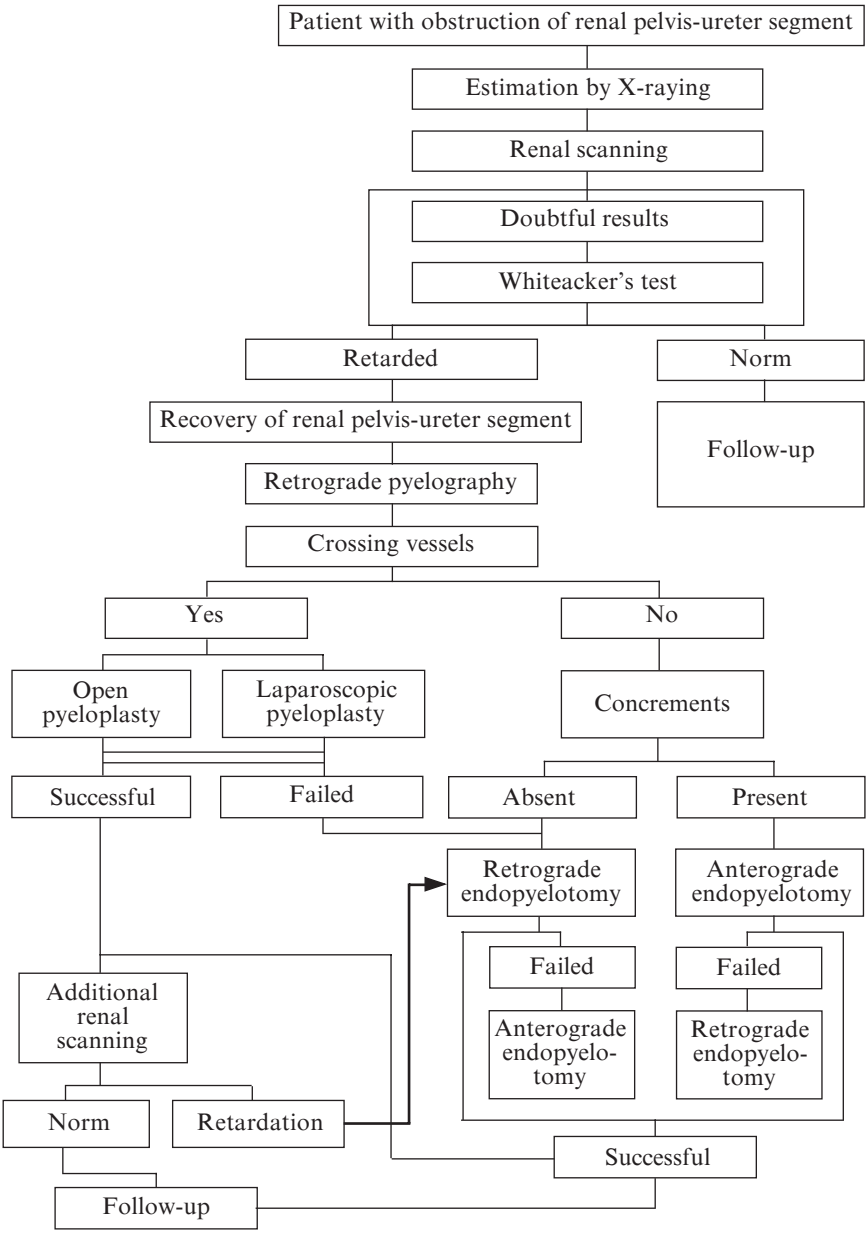


Fig. D21. Endourological approach to management of patients with obstruction of renal pelvis-ureter segment

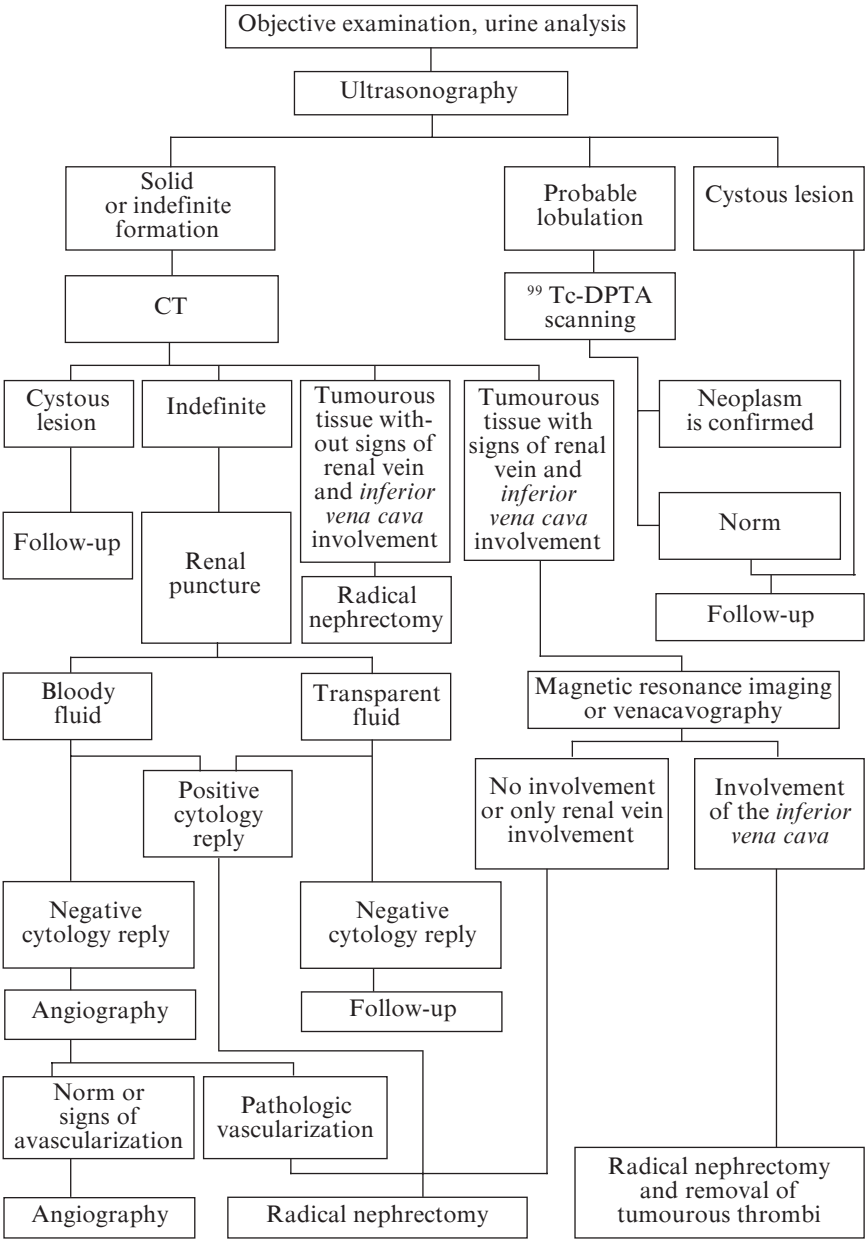


Fig. D22. Diagnosis and treatment of renal tumours

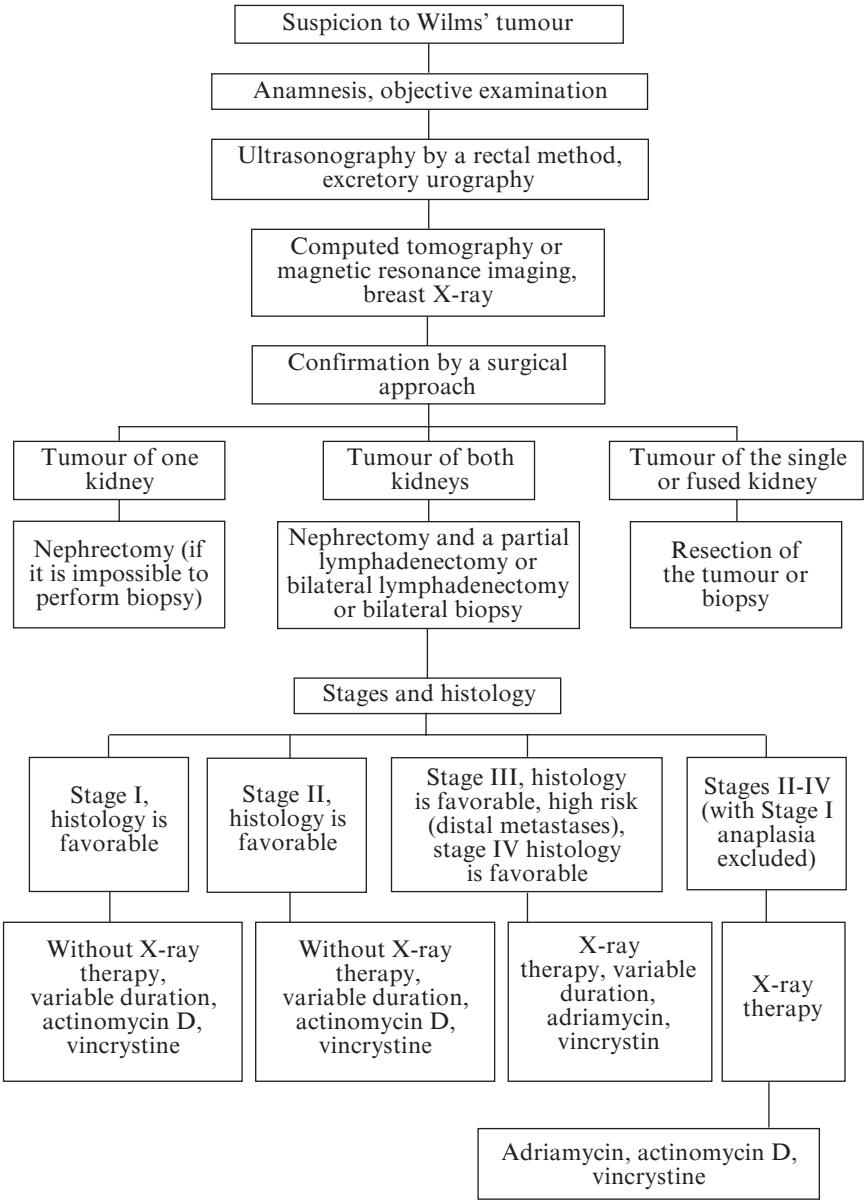


Fig. D23. Wilms' tumour

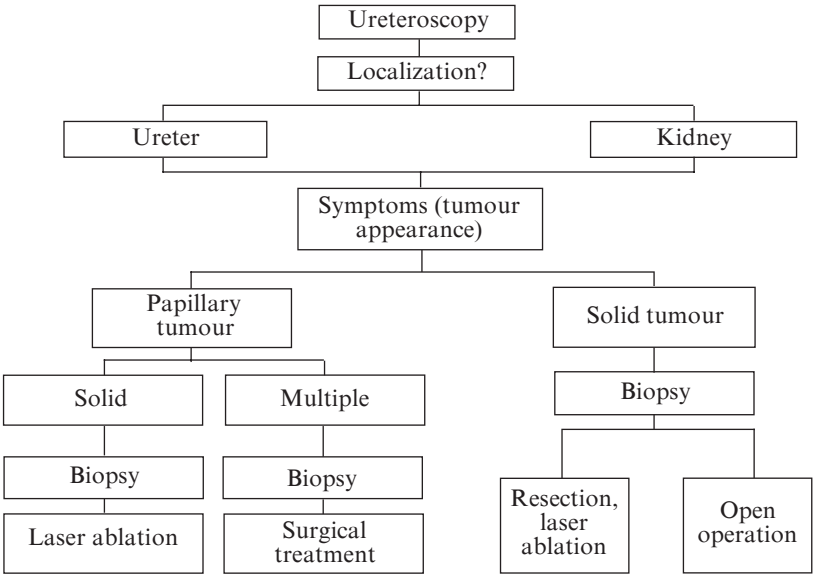


Fig. D24. Endourological management of patients with urothelial tumours of the upper urinary tracts

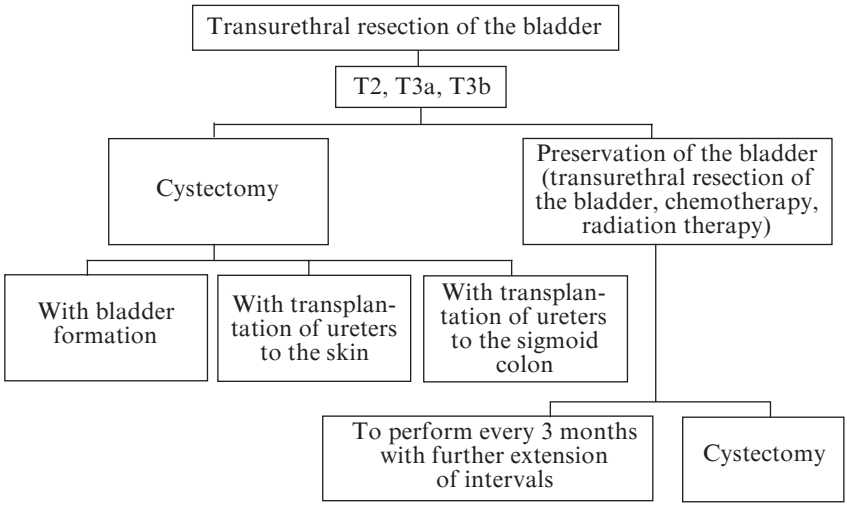


Fig. D25. Invasive bladder cancer

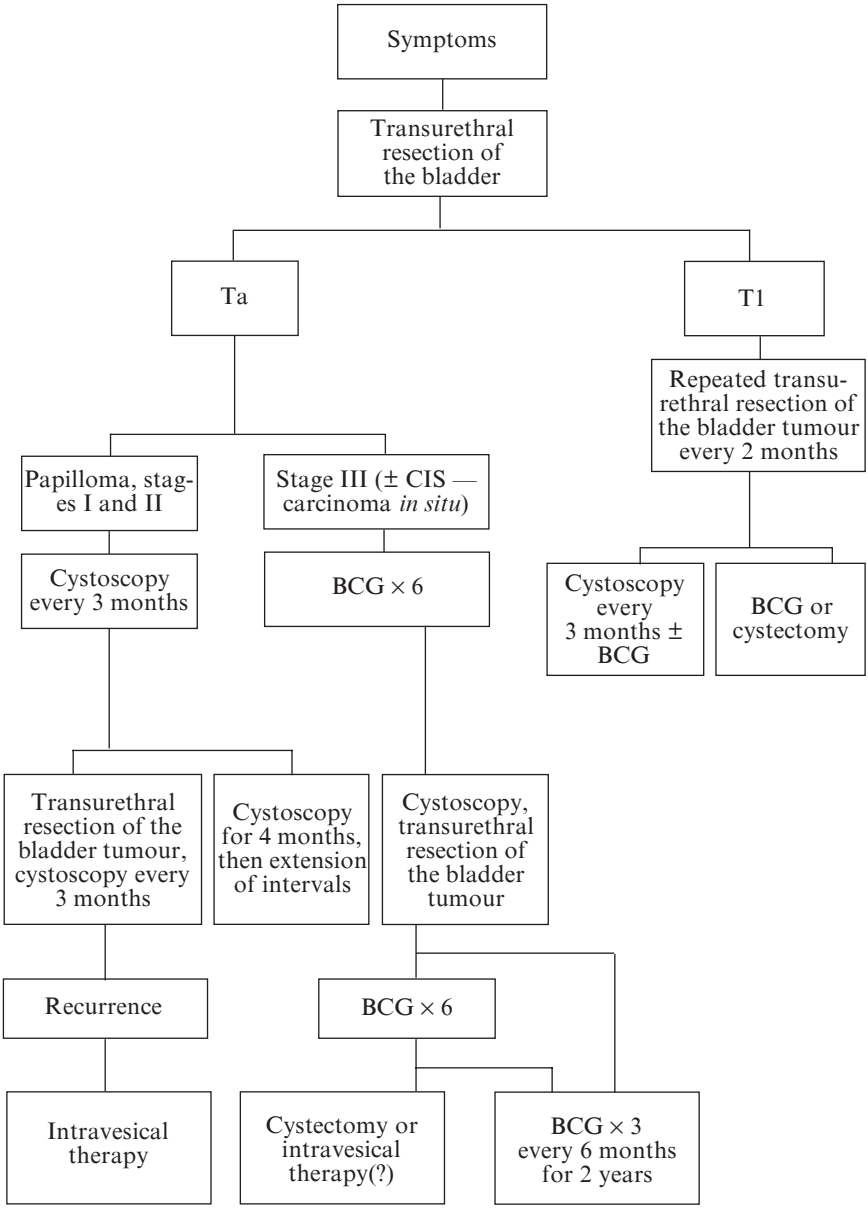


Fig. D26. Superficial urinary bladder cancer

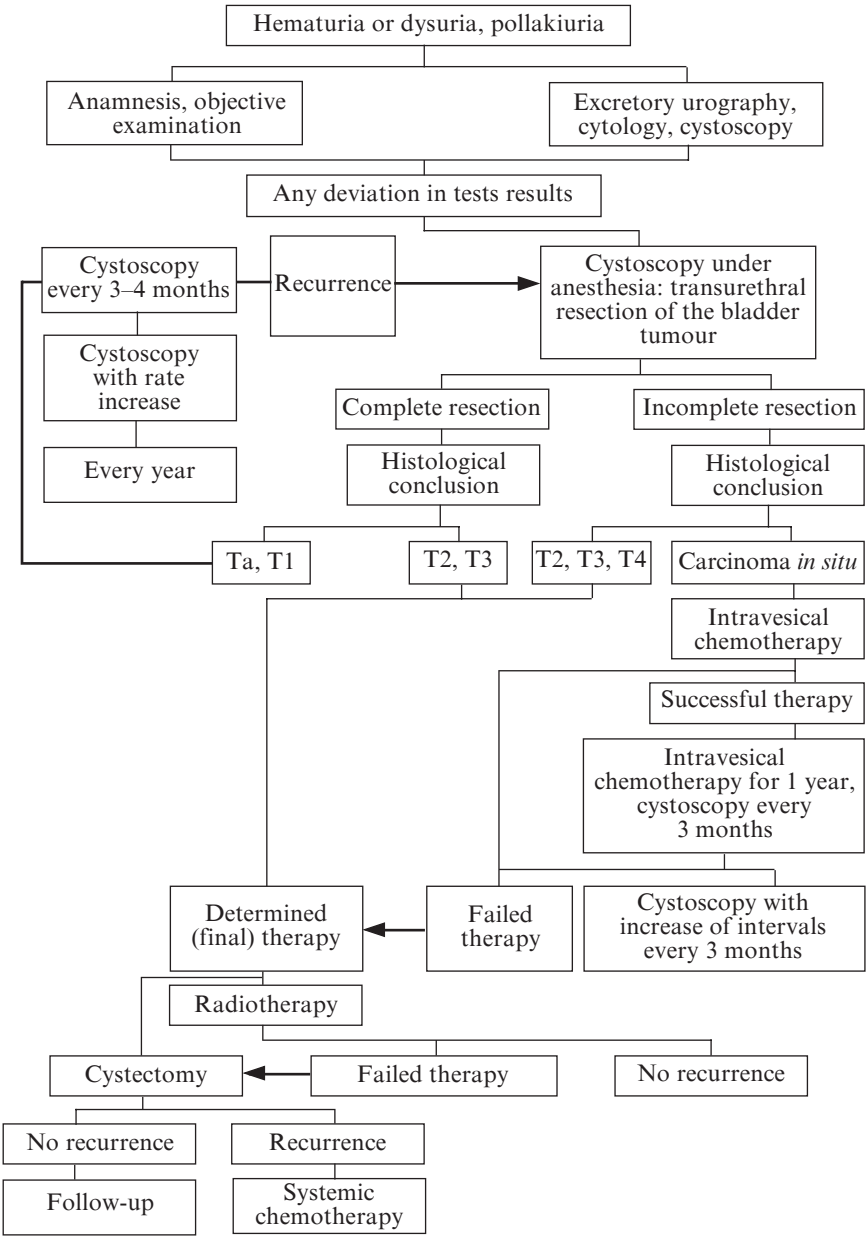


Fig. D27. Transitional cell carcinoma of the urinary bladder

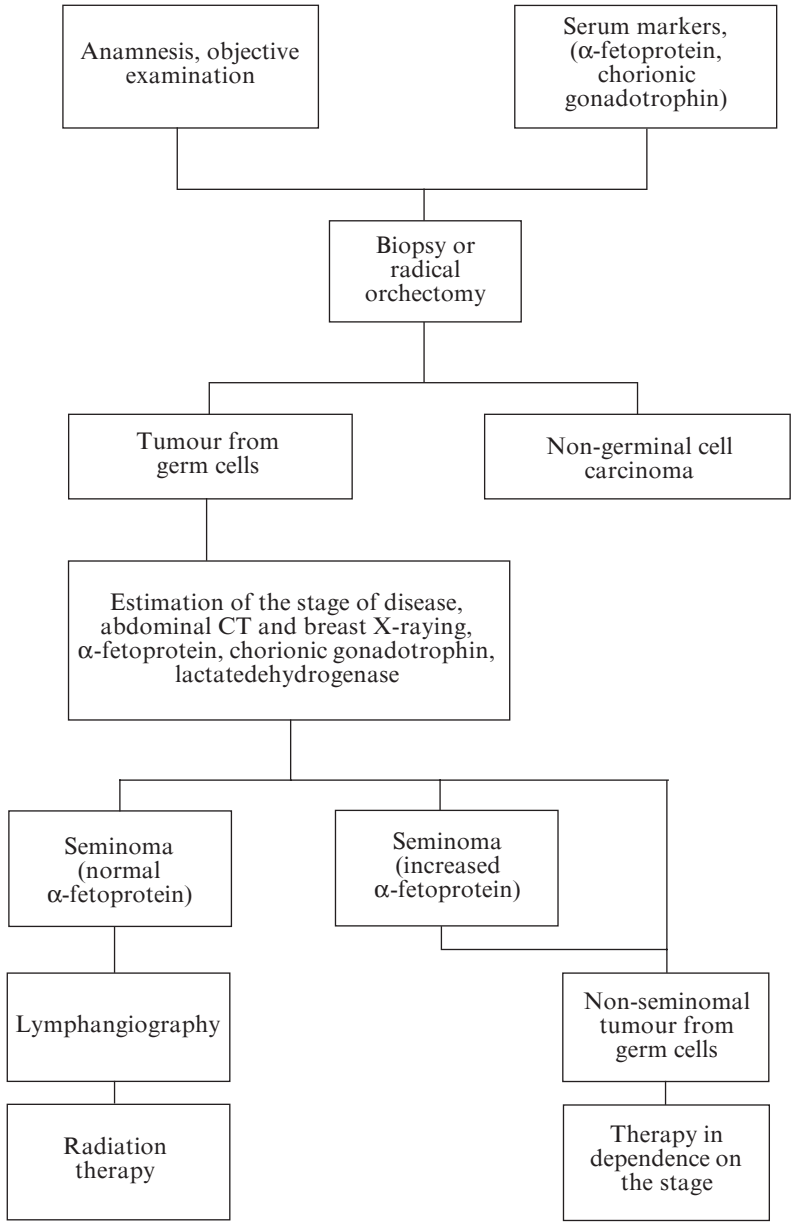


Fig. D28. Tumours of testis

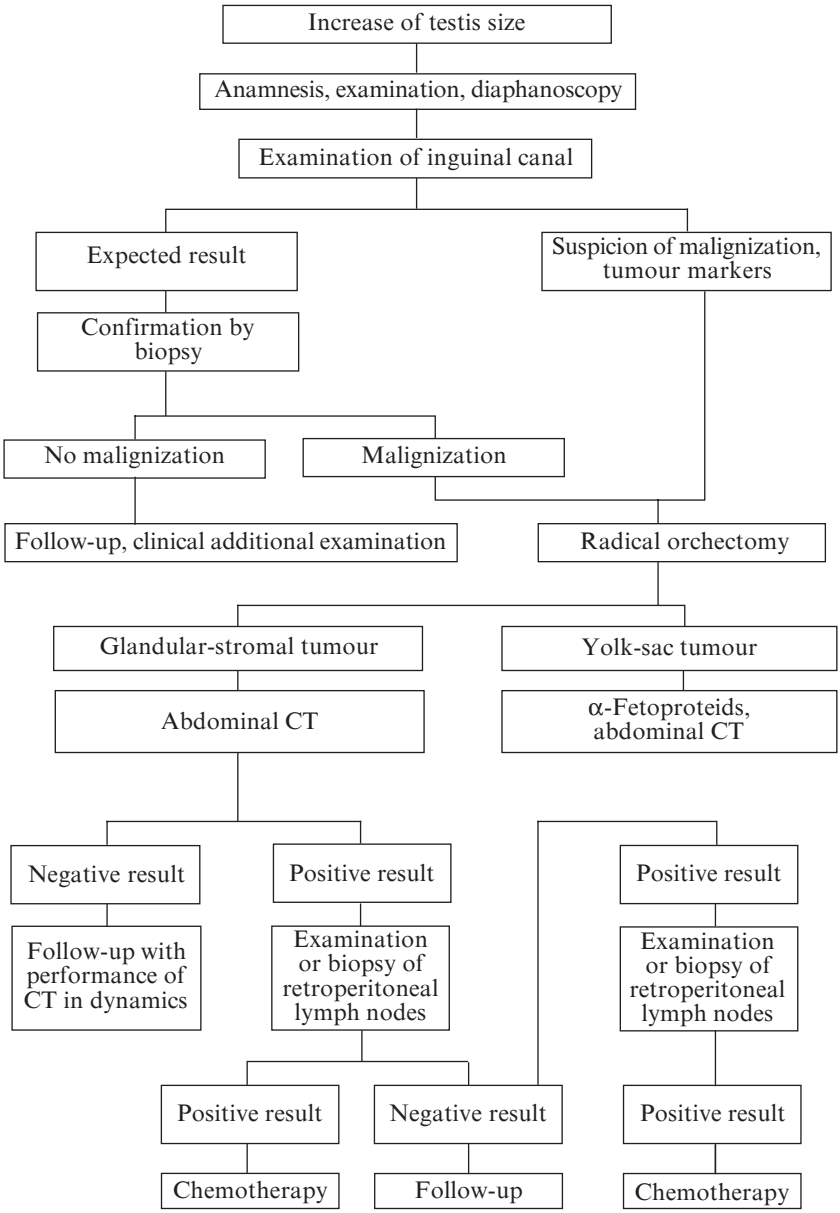


Fig. D29. Tumours of testes in boys

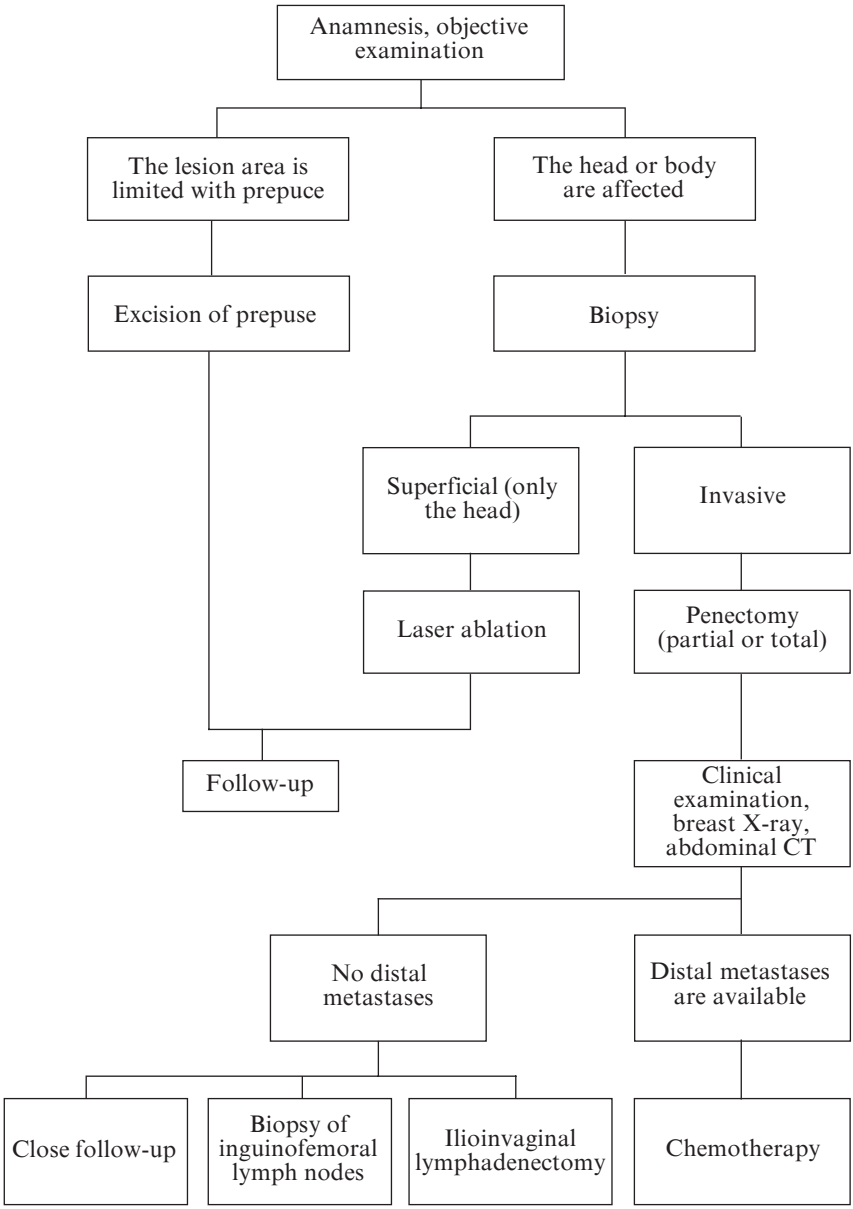


Fig. D30. Cancer of penis

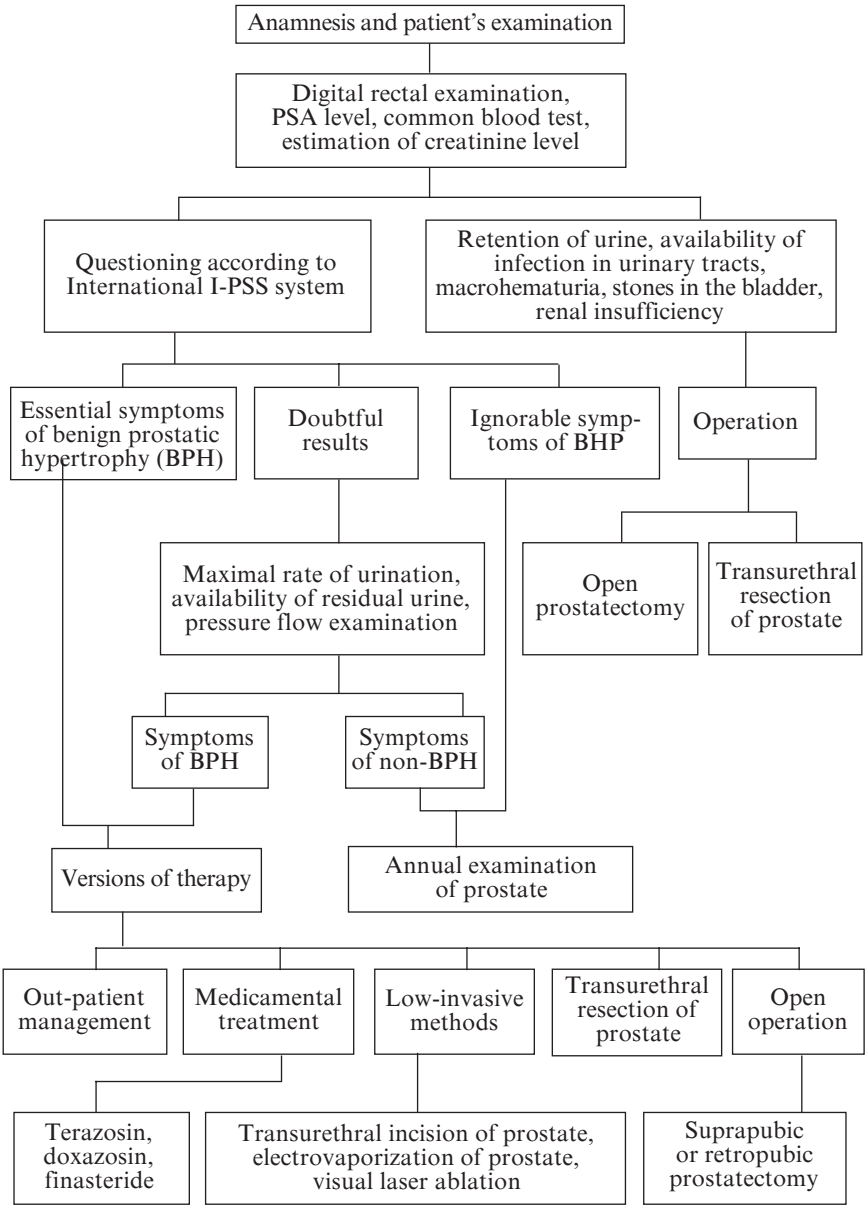


Fig. D31. Benign prostatic hypertrophy

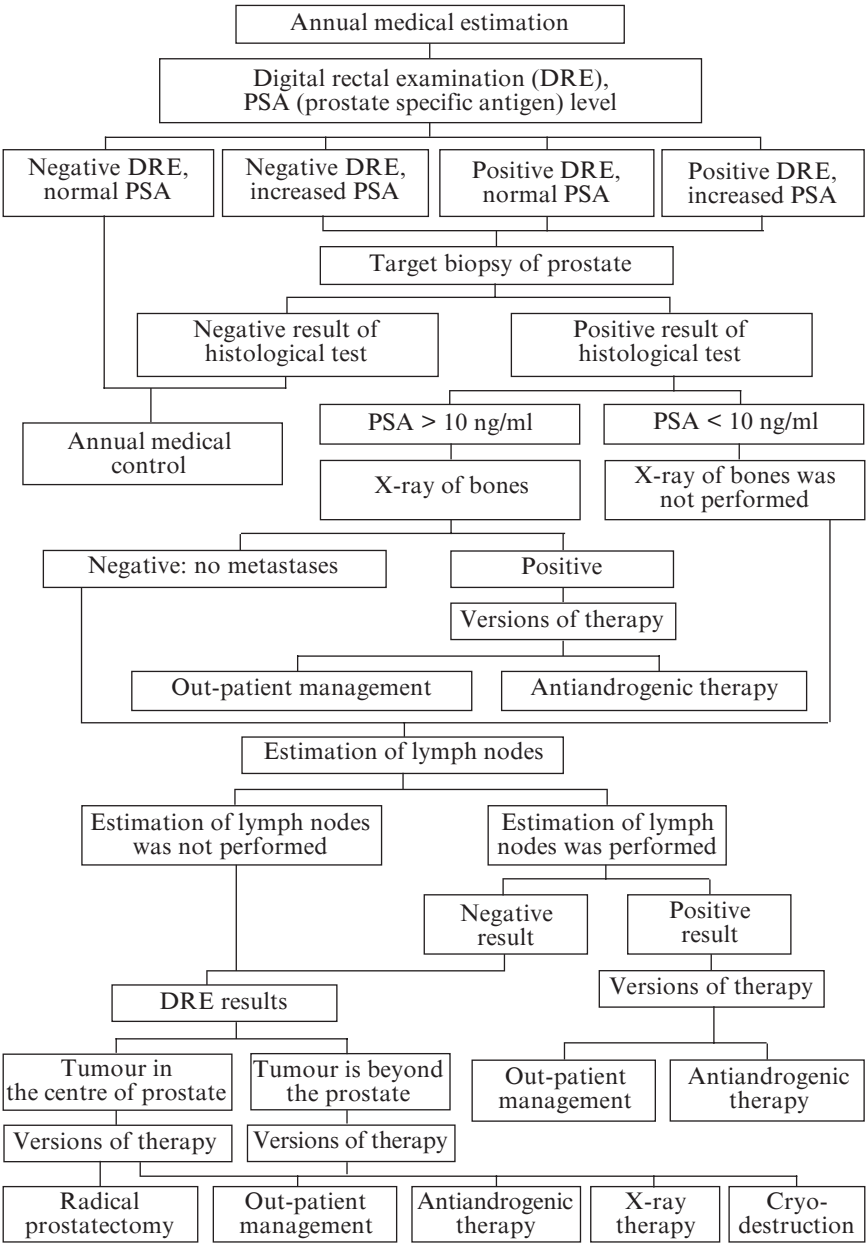


Fig. D32. Prostate carcinoma

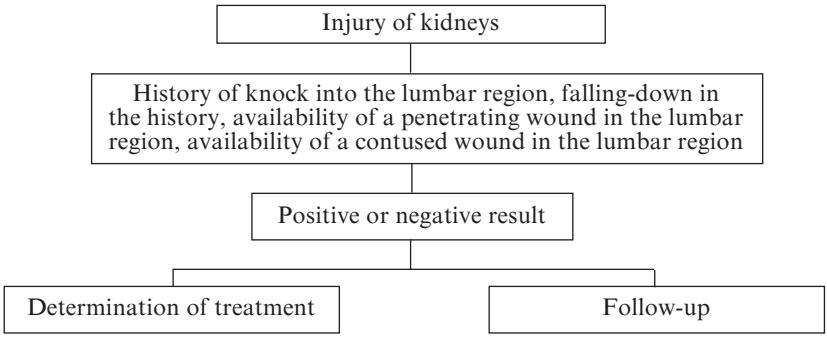


Fig. D33. Injury of kidneys

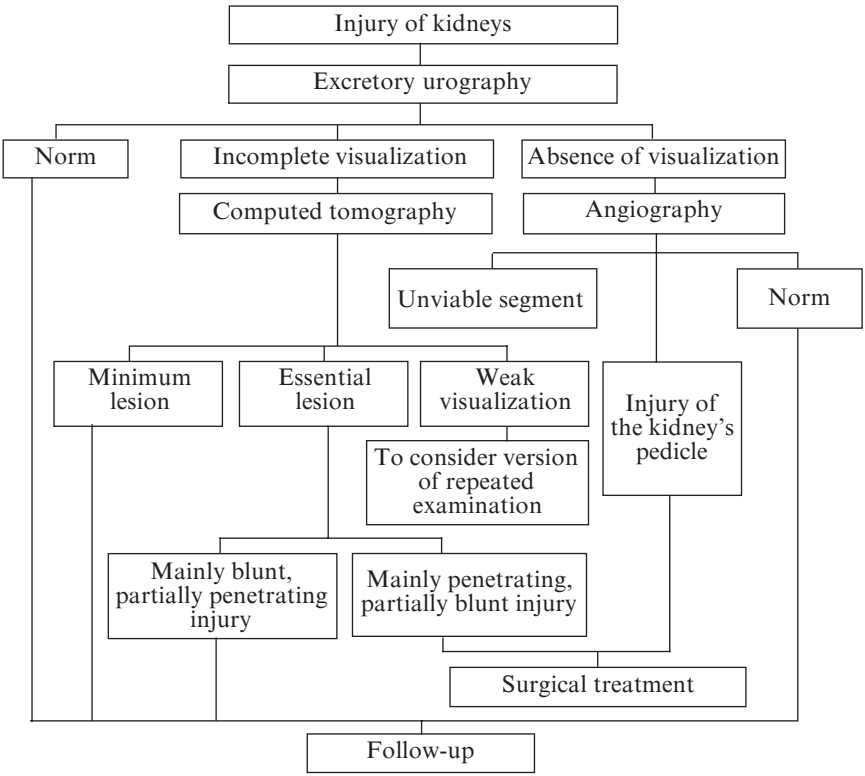


Fig. D34. Diagnosis and treatment of kidney injuries

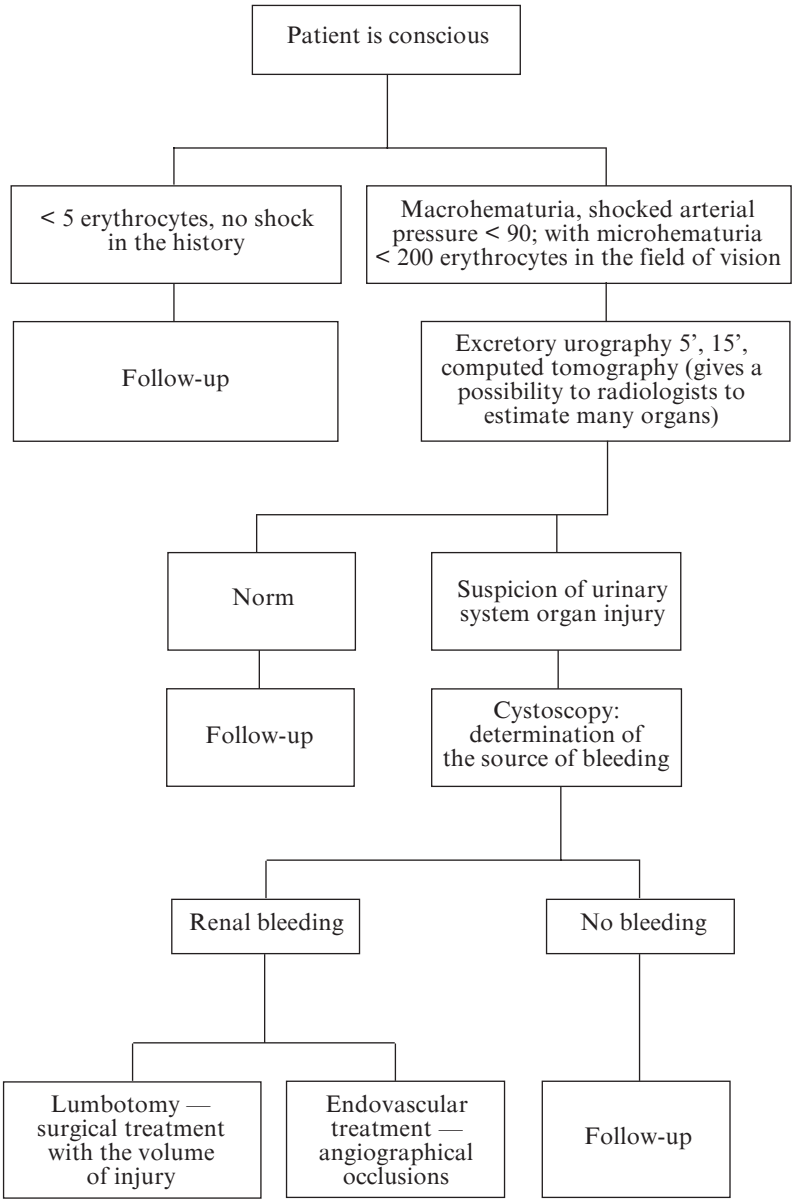


Fig. D35. Radiographic estimation of patients with a blunt renal injury

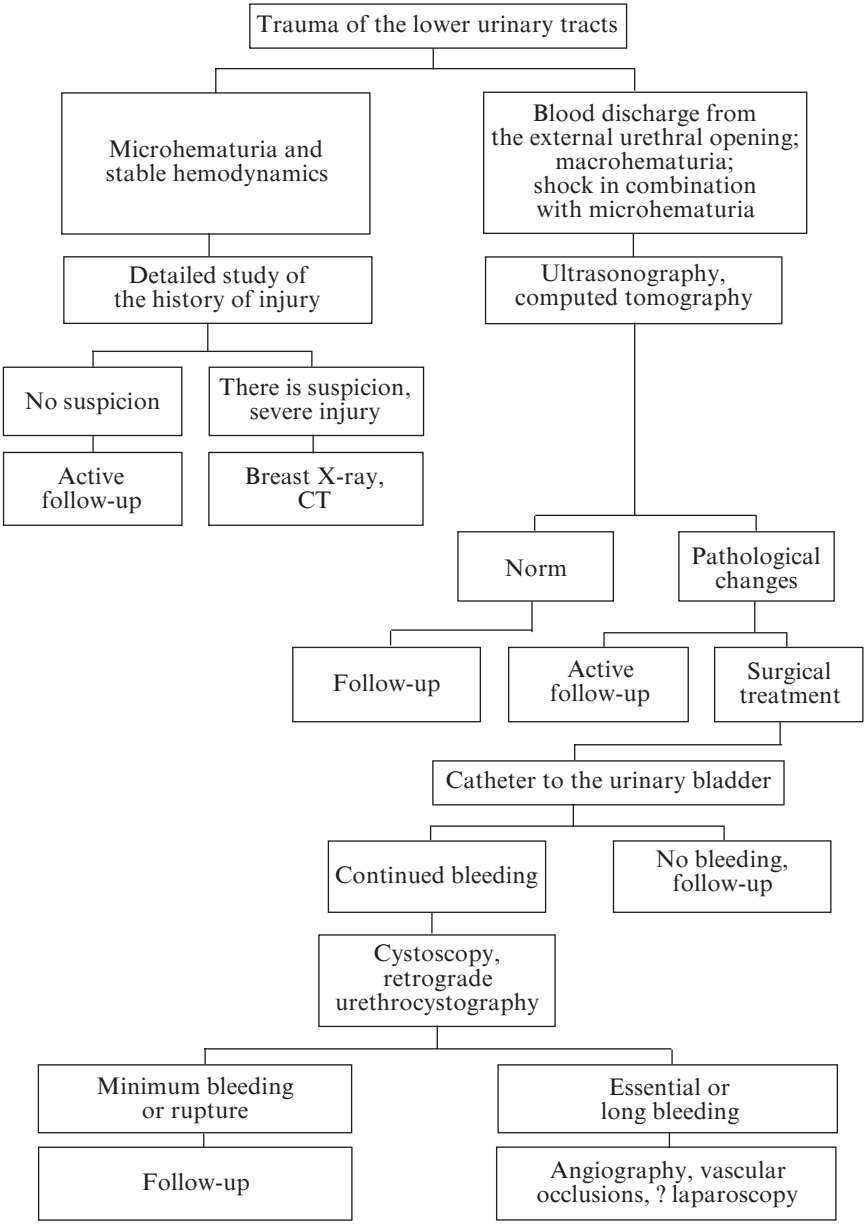


Fig. D36. Injury of the lower urinary tracts

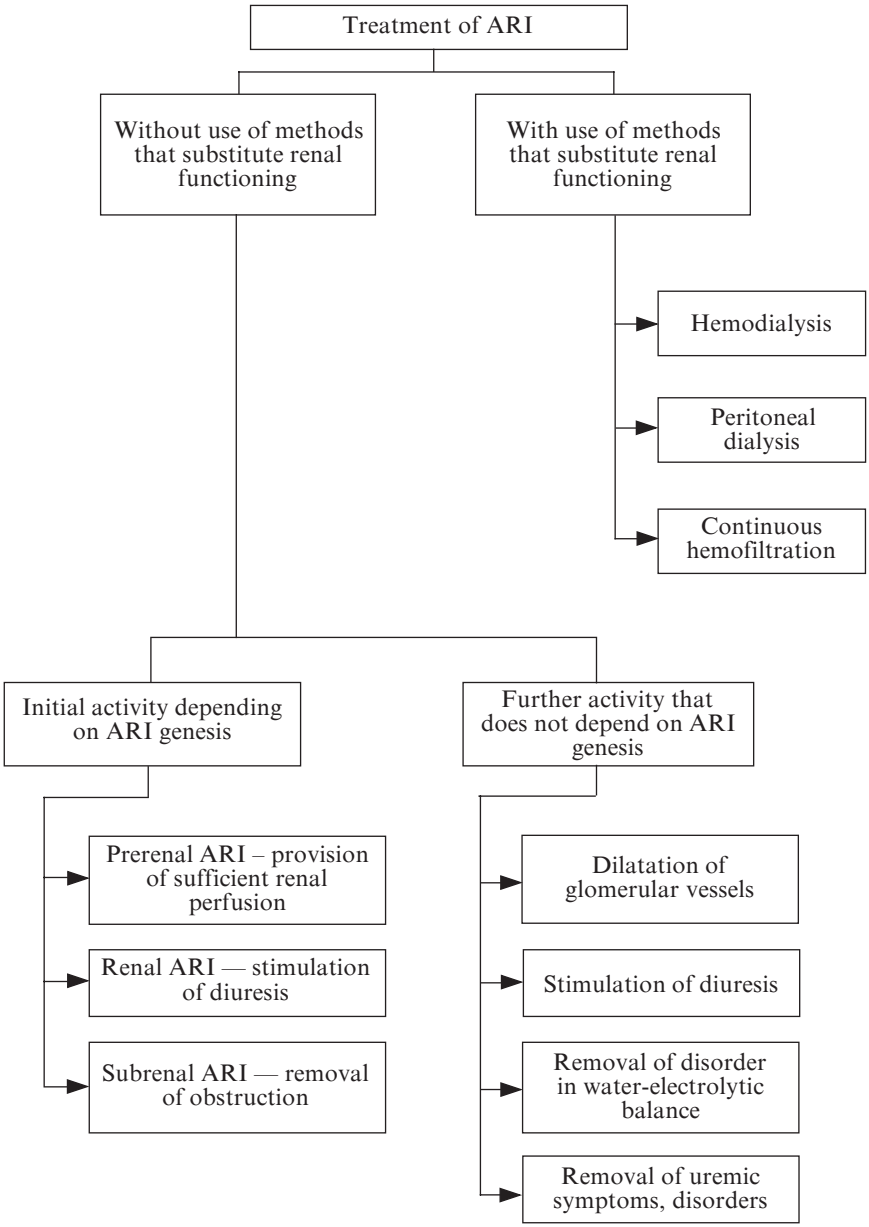


Fig. D37. Treatment of acute renal insufficiency

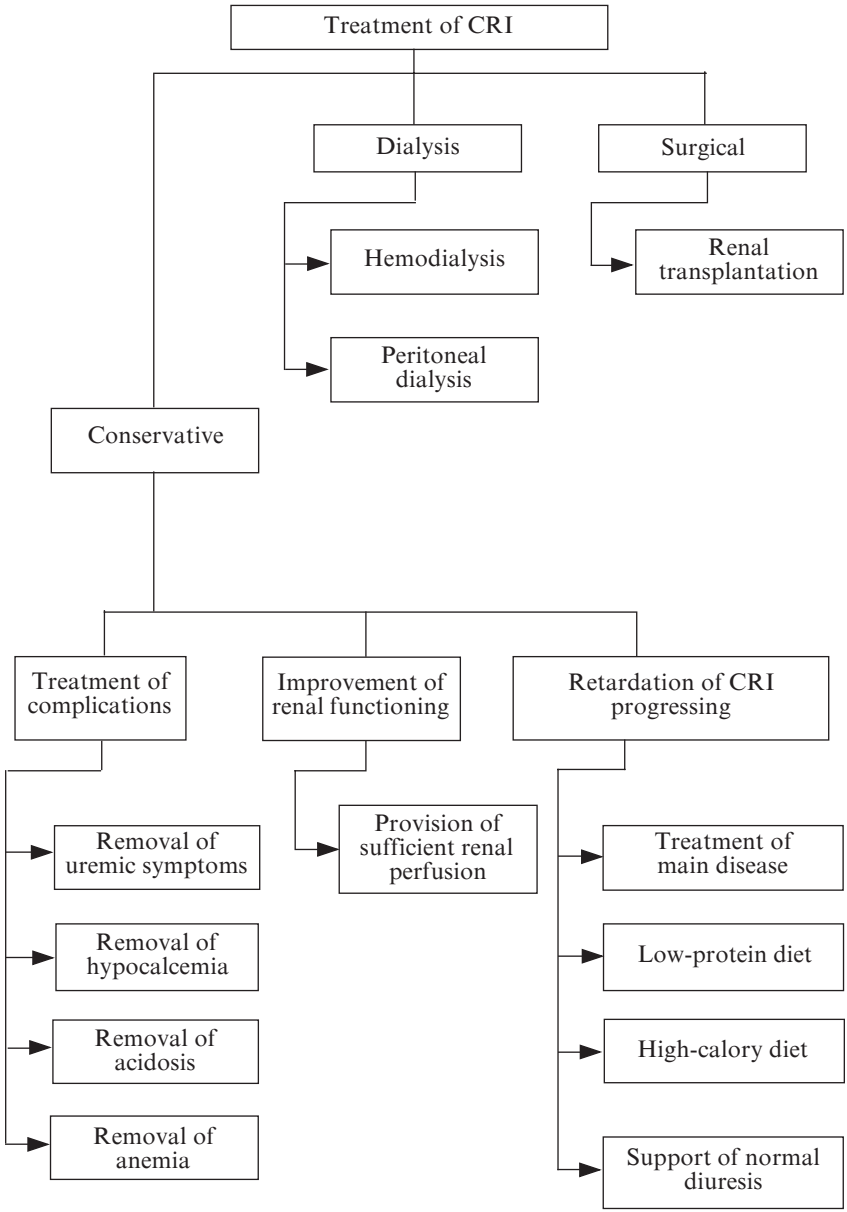


Fig. D38. Treatment of chronic renal insufficiency

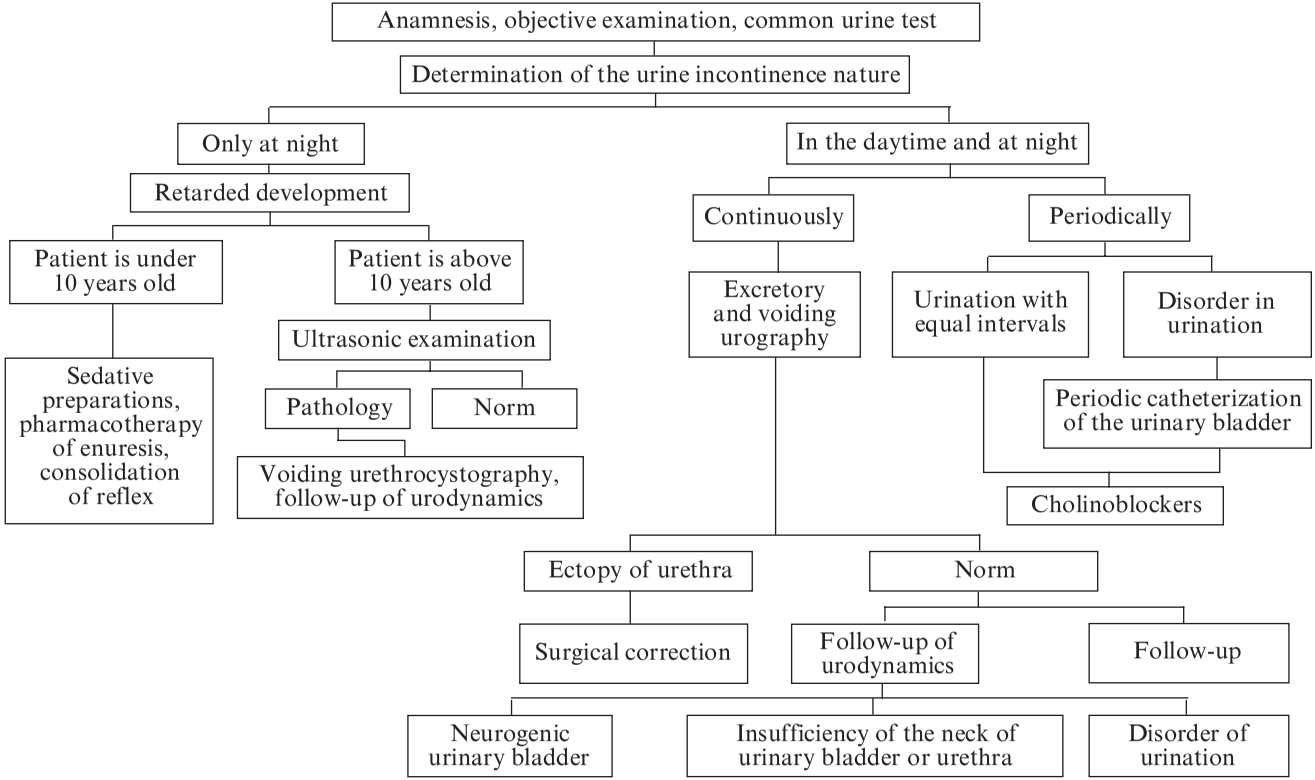


Fig. D39. Children with urine incontinence

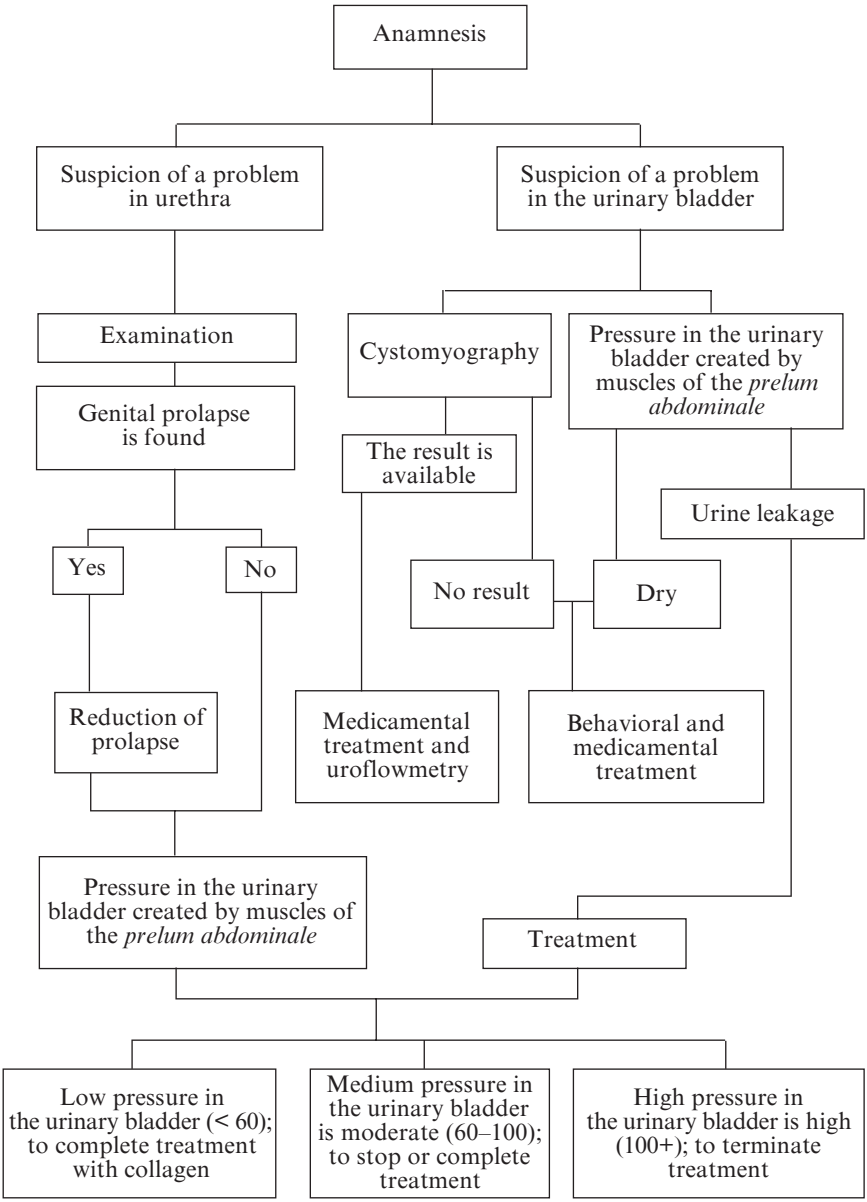


Fig. D40. Urine incontinence in women

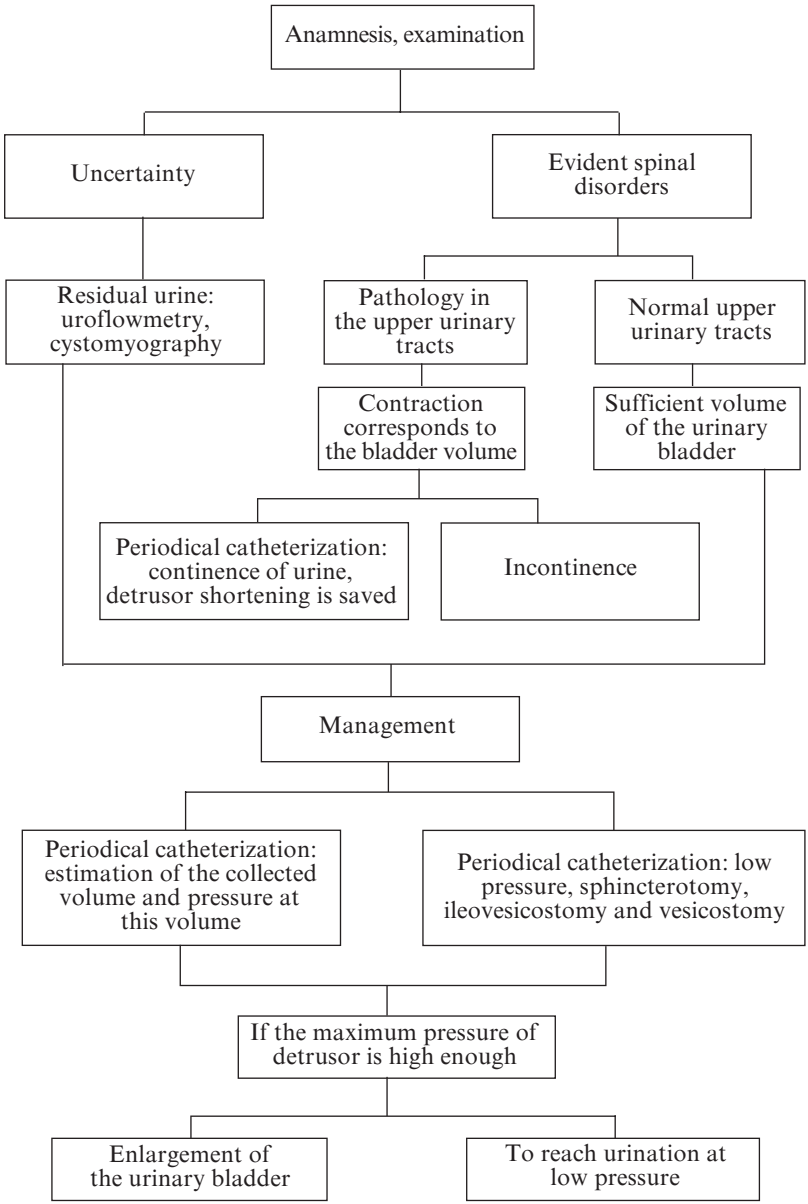


Fig. D41. Neurogenic urinary bladder

LIST OF ABBREVIATIONS

AGRH — analogue of gonadotrophic releasing hormone
ARI — acute renal insufficiency
ARR — acute renal retention
BPH — benign prostatic hypertrophy
BRGL — bilateral retroperitoneal glomerular lymphadenectomy
CADR — cumulative average dose of radiation
CG — chorionic gonadotrophin
PC — prostate cancer
CRI — chronic renal insufficiency
CT — computer tomography
CUB — cancer of urinary bladder
DHEA — dehydroepiandrosterone
DHT — dehydrotestosteron
DRE — digital rectal examination
FG — fluography
LAE — lymphadenectomy
LBTR — lymphoblast-transformation reaction
LDH — lactate dehydrogenase
MAB — maximal androgen blockade
NMR — nuclear magnetic resonance
OFE — orchifuniculectomy
PCT — polychemotherapy
PSA — prostate-specific antigen
RCC — renal cell carcinoma
RRP — radical retropubic prostatectomy
TCC — transitional cell carcinoma
TFD — focal dose of radiation
TGT — telegammatherapy
TM — tumor markers
TRUSG — transrectal ultrasonography
TUEV — transurethral electrovaporization
TUIP — transurethral incision of the prostate
TUR — transurethral resection
TURP — transurethral resection of the prostate
TUUS — transurethral ultrasound
UGD — urogenital disorders
USG — ultrasonography

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Художнє оформлення серії
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