


ODESSA NATIONAL MEDICAL UNIVERSITY

**Department of Radiation Diagnostics, Therapy, radiation medicine
and Oncology**

METHODICAL RECOMMENDATIONS FOR STUDYING THE TOPIC:

"Radiation semiotics of diseases of the teeth and jaws".

(for the 3th year students of the dentistry faculty)

Approved
at the methodical meeting of the department
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Protocol №1
Head Department  **Sokolov V.M.**

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"Radiation semiotics of diseases of the teeth and jaws»- 2 years.

1. Actuality of theme.

The guidelines of dentists are to optimize the methods of treatment and research of patients, reduce the impact of radiation and responsible allocation of health resources. Radiation manifestations of pathological changes in the bones of the maxillofacial region allow you to fully and quickly assess the severity of the patient's condition and provide timely care to the patient. Knowledge of the features of radial semiotics allows to achieve results in the optimal time.

2. Objectives of the lesson:

2.1 General objectives:

1. Know the general pathological symptoms of diseases and be able to recognize them on radiographs.
2. Be able to determine the radiative manifestations of changes in the bones of the maxillofacial region.

2.2 Educational:

1. Deontological - to provide information for conversations of students (future doctors) with patients about the feasibility of radiological examinations of the maxillofacial region.
2. Responsibility - to report information that implies the responsibility of a physician who uses ionizing radiation for diagnostic or therapeutic purposes.
3. Legal representations - information on this topic allows the doctor to avoid unfounded accusations of complications during the disease after medical or diagnostic procedures.

2.3. Specific goals:

- *know*:

1. Clearly distinguish the normal picture from pathological changes on radiographs.
2. Features of radiological manifestations of various pathological changes in dental patients.
3. Correctly interpret pathological changes that are detected during the radiological examination of the patient.

2.4. Based on theoretical knowledge on the topic:

- *master the techniques / be able /:*

1. Be able to determine the need for radiological examination of the patient in each clinical case.
2. Be able to justify the appointment in the patient's medical history and fill out referrals for examination.
3. Interpret (evaluate) the findings of the study.
4. Be able to explain to the patient the results of radiological examination.

3. Materials for classroom independent training (interdisciplinary integration).

Names of previous disciplines	Acquired knowledge and skills
1. Anatomy	1. Be able to describe the structure of the cerebral and facial parts of the skull. 2. Know the structure of the temporomandibular joint. 3. Identify the anatomical features of different groups of temporary and permanent teeth. 4. Draw a diagram of individual pathological radiation symptoms.
2. Histology	Ability to draw a diagram of osteoporosis, osteosclerosis, atrophy, necrosis of the maxillofacial area.
3. Pathological anatomy	Ability to draw a diagram of osteoporosis, osteosclerosis, atrophy, necrosis, osteolysis, maxillofacial area.

4. Content of the topic (text or thesis), graph-logical structure of the lesson.

- 1.1. X-ray image of pathological processes of the musculoskeletal system is expressed by the presence of a number of symptoms, which are based on changes in the structure and shape of bones. Different combinations of these symptoms cause a variety of radiological pictures that are observed in certain types of diseases. When the joint is affected, it can cause various serious pathological changes: stretching (distorsio) - excessive tension of the joint capsule and ligament, which can lead to hemorrhage in the joint and increased fluid secretion.
- 1.2. **Dislocation**(luxatio) - a condition in which the head of the mandible emerges from the articular fossa, often with a ruptured ligament. The smaller the head is covered by the fossa, the higher the probability of dislocation, with a very wide opening of the mouth of the condyles can slip out of the articular fossa without stretching or rupture of the ligament. Slipping the head of the mandible forward from the articular tubercle can lead to painful separation of the bite.
- 1.3. Arthritis is an inflammation in the joint, often accompanied by the release of purulent fluid into the joint cavity, which leads to painful swelling of the joint capsule. This can cause irreversible changes in bone and cartilage elements.
- 1.4. Osteoarthritis is a degenerative change in the joint, as well as a common name for chronic diseases of the joint. Clinical picture -

thinning of cartilage and bone growth with age or overload. X-ray symptoms of joint damage are mainly:

- changes in the size of the X-ray joint space;
- changes in the nature of the contours and shape of the articular surfaces and articular ends of the bones.

These symptoms may be different or, more often, in different combinations. The symptom of narrowing of an X-ray joint crack has the greatest practical value, testifies to full or partial death of articular cartilages. Narrowing of the X-ray joint space can be uniform or uneven. The complete disappearance of the X-ray joint space with the appearance of its trabecular pattern in place is evidence.

- 1.5. The following pathological changes can occur when bone tissue is affected: Osteoporosis - loss of bone substance. Radiologically it is reflected in the form of a decrease in the intensity of bone shadow or the appearance of defects in bone tissue. An increase in the amount of bone, on the contrary, leads to an increase in the intensity of bone shadow, and under certain conditions - and to increase its volume. These processes in pathological conditions can be local or general. In osteoporosis, the trabeculae of both the spongy and compact parts of the bone become thinner and then disappear completely. Osteoporosis is a dystrophic process that occurs without changing the external shape of the bone, and is not an independent disease, but only a reversible symptom. It is observed in a number of pathological conditions in inflammatory diseases, traumatic injuries, endocrine disorders, etc. The method of early diagnosis of systemic osteoporosis is osteodensitometry, which allows you to estimate in absolute numbers the density of bone tissue. X-ray examination allows to diagnose osteoporosis in more pronounced stages. In children, osteoporosis appears and disappears much faster than in adults. Radiologically, there are two types of osteoporosis: spotted and uniform. Spotted osteoporosis, usually observed in the early periods of the acute process of the disease, is characterized by the presence of many areas of enlightenment of various sizes, with blurred contours having a rounded, oval or polygonal shape. The cortical layer of the bone usually remains altered. The bone in the relevant area appears to be transparent. Rare delicate trabeculae barely trap X-rays, sometimes they are almost indistinguishable. The cortical layer thins throughout and stands out with the intensity of its shadow. According to the location and extent of osteoporosis is local, regional, widespread and systemic.
 - A. Local osteoporosis is located in a limited area of the main lesion.
 - B. Regional osteoporosis covers the entire anatomical region corresponding to the localization of the pathological process. common osteoporosis is characterized by damage to the entire bone and indicates a severe course of the disease.

B. Systemic osteoporosis affects all skeletal bones. It is of great diagnostic value and indicates the secondary nature of the changes due to the common cause.

- 1.6. True bone atrophy is characterized by a decrease in bone volume. It can be an expression of physiological involutional processes (senile atrophy), or a consequence of various pathological changes (atrophy from inactivity, neurotrophic, hormonal, etc.).
- 1.7. **Destruction**- destruction of bone substance with its replacement by other pathological tissue. The destructive process can be of different origins: inflammatory, blastomatous, etc. and is characterized by the formation of single or multiple defects in the bones. On the radiograph, destructive changes have the form of foci of enlightenment of various shapes and sizes, with uneven, blurred or, conversely, clearly delineated contours.
- 1.8. **Osteolysis** - in contrast to destruction, there is a complete and traceless resorption of bone without replacement of any pathological tissue. At the same time all elements of bone tissue disappear - a cortical layer, a spongy substance and subchondral plates that is accurately found out on radiographs.
- 1.9. **Osteonecrosis**- necrosis of the bone due to insufficient or complete cessation of nutrition. There are two types of osteonecrosis: septic and aseptic. septic infectious osteonecrosis is often a continuation of the destructive process of purulent or caseous bone melting. Aseptic necrosis most often occurs in the areas of bone that are exposed to the greatest load, and is usually observed in adolescence. The radiological picture is very diverse, but typical is the fragmentation of the relevant area of bone with the presence of individual particles of bone substance, characterized by increased shadow intensity.
- 1.10. **Osteosclerosis**- there is an increase in the amount of bone substance per unit volume of bone, ie excessive formation of bone tissue. Radiologically, osteosclerosis is expressed in changes in the structure of the spongy substance. Some trabeculae are sharply thickened, their number increases, and the light spaces between them decrease. An increase in the transverse size of a bone of any origin is called hyperostosis. The periosteum is sensitive to various types of irritation and in a number of diseases (injuries, inflammation, tumors, etc.) is actively involved in the process with the formation of ossified periostitis. Radiologically, periostitis is detected only in the phase of calcification of the periosteum, which occurs some time after the onset of the disease or traumatic bone injury. In children, the periosteum reacts particularly quickly and calcification occurs on the 7th-10th day; in adults, for 12-14 days. The calcification of the periosteum initially has the form of a thin shadow strip located parallel to the cortical layer, separated from it by a light gap. Later,

the shadow of the periosteum becomes denser, expands and gradually merges with the cortical layer, which thickens accordingly.

5. Materials of methodical providing of employment.

1. Bone model with osteosclerosis and osteoporosis.
2. Radiographs for individual work of students.
3. Slide presentation of the teacher on the topic of the lesson.
4. Video projector, screen.
5. Student workbooks.

In class, together with the teacher, students analyze the symptoms and symptom complexes of major skeletal diseases, their pathological basis. Then they receive radiographs, which show the main semiotic manifestations of bone and joint disease. It is necessary to learn to correctly recognize certain types of general pathological symptoms of skeletal diseases, their combinations, to draw a conclusion about their nature. After the analysis of radiographs, students make schematic sketches of them and make a short protocol of the radiological conclusion. The results of individual work of each student are discussed by the whole group under the guidance of the teacher.

5.1. Tasks for self-examination of the ascending level of knowledge and skills.

1. Name the signs of a normal radiographic image of the teeth of the upper and lower jaw. Are they different?
2. Specify variants of the normal radiographic image of the mandible by density.
3. Explain the meaning of the terms: "osteoporosis, osteosclerosis, osteonecrosis, osteolysis, atrophy, destruction."
4. Name the radiation signs of osteoporosis, osteosclerosis, osteonecrosis, osteolysis, atrophy, destruction.
5. Describe the structure of the mandibular joint in the norm.
6. Give radiological signs of mandibular dislocation.
7. Give radiological signs of osteoarthritis and arthritis of the mandibular joint.

5.2. The information necessary for the formation of knowledge and skills can be found in textbooks:

-main (basic):

1. Radiology (radiation diagnostics and radiation therapy). Kyiv, Book Plus, 2018. -721 p.
2. Radiology (radiation diagnostics and radiation therapy). Test tasks. Part 1. Kyiv, Book Plus. 2015. -104 p.
3. Radiology (radiation diagnostics and radiation therapy). Test tasks. Part 2. Kyiv, Book Plus. 2015. -168 p.
4. Radiology (radiation diagnostics and radiation therapy). Test tasks. Part 3. Kyiv, Book Plus. 2015. -248 p.

5. Smaglyuk LV Basic course in orthodontics / LV Smaglyuk, AE Karasyunok, AM Belous. - Poltava: Blitz Style, 2019. - P.151-152.

6. Tkachenko PI Clinical and morphological aspects of anomalies in the development of teeth / PITkachenko, II Starchenko, SO Bilokon, OV Gurzhiy. - Poltava: ASMI LLC, 2014.– 79 p. (Monograph).

7. Radiation diagnostics: [In 4 vols.] / Koval G.Yu., Mechev DS, Miroshnichenko SI, Sharmazanova OP, Shcherbina OV etc. / Ed. G.Yu. Blacksmith. - Kyiv: Medicine of Ukraine, 2018. - Vol.1. - 302 p

-Auxiliary:

1. Abdelkarim A. Three-dimensional imaging for indirect-direct bonding could expose patients to unnecessary radiation. Am J Orthod Dentofacial Orthop. 2017Jan; 151 (1): 6. doi: 10.1016 / j.ajodo.2016.10.006. PubMed PMID: 28024783. Никберг И.И. Ionizing radiation and human health. К. Health, 1989, p. 6-13.
2. Educational edition Center for testing the professional competence of specialists with higher education in the fields of "Medicine" and "Pharmacy". Collection of test tasks for passing the license exam: Step 3. Dentistry. Kyiv. Center for testing the professional competence of specialists with higher education in the fields of "Medicine" and "Pharmacy" (in Ukrainian) 2018. - 24 p.
3. Possibilities of modern x-ray examination methods for diagnostics of hidden dental caries of approximal localization / I. I. Sokolova, S. I. German, TV Tomilina et all // Wiadomości Lekarskie. - Vol. LXXII, N 7. - 2019. - P. 1258–1265. (Scopus).
4. Radiographic studies in dentistry: recommendations for the selection of patients and limiting radiation exposure. Educational and methodical manual for interns in the specialty "Dentistry" and dentists / Sokolova II, Udovychenko NM, Herman SI and others. // Kharkiv KhNMU, 2020, p.4-37.
5. Westbrook K., Cout Roth K., Talbot J. Magnetic resonance imaging: a practical guide to the lane. with English - 3rd ed. M .: BINOM, 2015.
6. Kovalsky OV, Mechev DS, Danilevich VP Radiology (radiation therapy, radiation diagnostics). - Vinnytsia: "New Book", 2017.- 518 p.
7. <http://www.dentalexpert.com.ua/index.php/stomatology/article/view/200>.
8. <https://www.slideshare.net/medumed/ss-8800317>
9. <https://stom.tilimen.org/izmeneniya-kolichestva-i-formi-zubov.html>
10. EBS publishing house "Doe" Address: <http://e.lanbook.com/>
11. Database of publications "Polpred.com Media Review" Address: <http://www.polpred.com/>

5.3.Orienting map for independent work with literature on the topic «Radiation semiotics of diseases of the teeth and jaws».

№	Task	Instructions for the task	Independent records of students
1.	To study the main signs of bone structure in the norm of the jaws.	Draw in a workbook a diagram of the structure of the bones in the norm of the jaws.	
2.	To study the radiation signs of osteoporosis, osteosclerosis, osteonecrosis, osteolysis, atrophy, destruction.	Schematically sketch in a workbook these changes in the beam image.	
3.	Find features in the radiographic image of macular, local, regional and systemic osteoporosis.	Write in a workbook features in the radiographic image of macular, local, regional and systemic osteoporosis.	
4.	To study the structure of the mandibular joint in the radial image.	Schematically draw in the workbook the mandibular joint in a radial image.	
5.	To study the radial signs of disorders in the mandibular joint in the radial image.	Write in a workbook signs of dislocation, osteoarthritis and arthritis of the mandibular joint in the X-ray image.	

6. Materials for self-control over the quality of training.

Questions for self-control.

1. Name the radial signs of the teeth of the upper and lower jaws.
2. Describe the options for the structure of the jaws by density (uniform density, multi-mineralized, heterogeneous density).
3. Explain what is exostosis and endostosis of the jaws.
4. Provide a diagram of the mandibular joint in the X-ray image in the norm.
5. Explain the terms: osteoporosis, osteosclerosis, osteonecrosis, osteolysis, atrophy, destruction.

7. Practical work (tasks) performed in class:

1. Draw a diagram in a workbook dentition.
2. Draw in a workbook jaw structure options (uniform density, multi-mineralized, heterogeneous density). Give an explanation.
3. On the radiographs provided by the teacher, find signs of osteoporosis, osteosclerosis, osteonecrosis, osteolysis, atrophy, destruction. Prove your opinion.

8. Topic of the next lesson: "Radiation signs of inflammatory diseases of the teeth and jaws."

9. Tasks for UDRS and NDRS on the topic of the next lesson:

Eclipse and enlightenment. Local change in tooth density and structure. Caries. Periodontitis (classification by radiological manifestations). Radiation signs of chronic fibrous periodontitis. Chronic granulating periodontitis of different localizations. Radiation signs of periodontitis (images of mild, moderate and severe stages). Generalized periodontitis. Periodontitis. Staging by radiological signs.

Methodical recommendations were _____ as. Katerina DOIKOVA