MINISTRY OF HEALTH OF UKRAINE

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Departments of Pediatrics №2

CONFIRMED by

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METHODOLOGICAL RECOMMENDATIONS ON PRACTICAL CLASSES FOR STUDENTS

International Medical Faculty, course 6

Educational discipline "**PEDIATRICS**"

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1. **Topic № 5**

Perinatal lesions of the central nervous system in children. Medical supervision of children with perinatal pathology of the central nervous system. Leading clinical symptoms and syndromes in children with perinatal pathology of the nervous system.

Perinatal lesions of the central nervous system in children. Medical supervision of children with perinatal pathology of the central nervous system. Data of laboratory and instrumental studies in perinatal lesions of the nervous system in children. Differential diagnosis of perinatal CNS lesions in infants.

Perinatal lesions of the central nervous system in children. Medical supervision of children with perinatal pathology of the central nervous system. Tactics of managing children with perinatal lesions of the central nervous system in polyclinic conditions. Emergency care for convulsions in children according to the IMCI.

2. Relevance of the topic.

According to epidemiological studies, the frequency of diagnosis of "Perinatal lesions of the central nervous system" reaches 715: 1000 children in the first year of life. As the main and concomitant disease, this diagnosis is made in more than 90% of children treated in neonatology hospitals. According to most foreign authors, the frequency of hypoxic lesions in full-term infants is not more than 6: 1000 and ranges from 33% to 70% in premature infants.

3. Objectives of the lesson

3.1. General goals

Introduction to the concept, classification of perinatal lesions of the central nervous system in children, the algorithm of differential diagnosis of perinatal lesions of the central nervous system in children, tactics of management of children with perinatal lesions of the central nervous system.

3.2.Educational goals:

Students are obliged by their appearance, language culture and communication with a sick child and parents, medical staff, to show that deontology is an integral part of the moral and ethical norms of the medical profession.

3.3.Specific goals:

-know:

- determination of perinatal lesions of the central nervous system;
- classification of perinatal lesions of the central nervous system;
- differential diagnosis of perinatal lesions of the central nervous system in children;
- principles of medical counseling of children with perinatal lesions of the central nervous system;
- approaches to the treatment of diseases accompanied by perinatal lesions of the central nervous system;

3.4. On the basis of theoretical knowledge on the topic:

- be able to:

- to conduct interviews and objective examinations of children;
- assess the child's condition;
- assess the need to prescribe PD to the child
- make a plan of PD ;

- to master practical skills:

- clinical examination of children with perinatal lesions of the central nervous system;
- advising parents of patients with perinatal lesions of the central nervous system.
- moral and deontological principles of a medical specialist and the principles of professional subordination in pediatrics.

4. Materials of pre- classroom independent training (interdisciplinary integration)

№ p / p	Disciplines	Know	To be able
1	Anatomy	Anatomical features of children of different ages	EvaLNate the results of research on the body
2	Physiology	Normal indicators of functioning of a healthy organism	
4	Pathophysiology	Pathogenesis of pathology of the most common chronic diseases	Analyze the main links in the etiopathogenesis of the disease
5	Propaedeutics of internal diseases and propaedeutics of children's diseases	Typical complaints in the most common emergencies, the main clinical symptoms, methods of examination, differential diagnosis of diseases	Justify the diagnosis according to the classification
6	Pharmacology	Pharmacological action of necessary drugs	Prescribe appropriate treatment, taking into account the age dose
7	Organization of health care and social hygiene	Principles and organization of hospital and specialized care in case of emergency in a child	Make a treatment plan at the pre-hospital and hospital stages.

5. Content of the topic

Perinatal pathology of the central nervous system of the fetus - a pathological condition associated with oxygen deficiency during pregnancy and childbirth. This pathology is one of the most common among perinatal pathology and is one of the most common causes of perinatal morbidity (21-45% in the structure of all perinatal pathology).

Etiology:

1. Pathology of the mother:

- Somatic diseases of the pregnant woman, which lead to chronic intoxication of the fetus
- Acute infectious diseases or chronic foci of infection in the mother
- Eating disorders of pregnant women
- Metabolic disorders in the mother and fetus
- Preeclampsia of a pregnant woman

pregnancy and childbirth

- umbilical cord nodes
- wrapping the umbilical cord around the limbs, neck and torso;
- umbilical cord prolapse
- compression of the umbilical cord during childbirth with pelvic presentation (so childbirth with pelvic presentation is a borderline pathology, because in some cases childbirth can be without complications, and in others due to a slight delay in the head of the fetus, the latter presses the umbilical cord for a long time).

Bleeding:

- when the placenta is present, while blood circulation slows down or stops.
- Rupture of blood vessels with membranous attachment of the umbilical cord - pathology of attachment of the umbilical cord (to the membranes, the edge of the placenta). The growth of blood vessels can lead to rupture. Most likely it happens at an amniotomy.

Disorders of placental circulation due to dystrophic changes in blood vessels:

- with gestosis;
- at the transferred pregnancy there are processes of aging of a placenta
- trophic disorders.

Anomalies of labor - very prolonged or rapid labor, incoordination of labor.
3. Causes related to the fetus.
- Genetic diseases of newborns.
- Hemolytic disease of the newborn, associated with immunological conflict between mother and child, begins in utero.
- Heart defects.
- Other developmental anomalies.
- Intrauterine infection.
- Intracranial trauma of the fetus.
4. Asphyxia of newborns - partial or complete obstruction of the respiratory tract.
Pathogenesis:
In the hypoxic state, one of the causes of structural brain damage in newborns is cerebral hypoperfusion, which most often occurs in infants with a short gestational age. In general, hypoperfusion of the brain may be due to hypoxemia or insufficient oxygen supply to the bloodstream (possibly as a result of occlusion of arterial vessels). IschemicBrain damage in newborns is the result of complex pathobiochemical and pathobiophysical disorders, resulting in structural brain damage. Currently, the fact of moderate (mild) hypoxia is denied as the cause of severe organic brain damage. At the same time hypoxemia in newborns is combined with an increase in cerebral blood flow, due to which the brain is provided with sufficient oxygen (R.C. Vanucci, 1996). In the most severe cases, hypoperfusion of the brain leads to the development of energy deficiency and lactic acidosis, which trigger pathobiochemical reactions, the result of which is the formation of cerebral infarction (OG Sulima, 2003). The mechanisms of development of cerebral ischemia in full-term and preterm infants are relatively different and have their own characteristics. Thus, in full-term infants who have suffered asphyxia, metabolic acidemia (lactic acidosis) occurs, which causes cardiovascular failure, which in turn leads to a decline in systemic AT and ultimately to cerebral hypoperfusion - ischemia.
The high level of brain damage in premature infants is associated with its immaturity, features of vascularization at different stages of gestation, increased capillary permeability, the dependence of cerebral blood flow on disorders of general hemodynamics. In premature infants, hypoxia is exacerbated by the imperfection of autoregulatory mechanisms. The ratio of brain mass to body weight in such patients is large and is in children with very low and extremely low body weight from 16 to 20%. The latter requires an adequate heart rateejection for optimal blood supply to the brain. Therefore, any disease that leads to a decrease in cardiac output (respiratory distress syndrome, hypoxic cardiopathy) will affect the blood supply to the brain, which is one of the causes of intracranial vascular damage. With severe hypoxemia, the mechanisms of autoregulation of cerebral blood flow are disrupted, and the pressure in the cerebral vessels begins to change passively relative to systemic blood pressure, which leads to hypoperfusion of the brain and its ischemia.
Clinical picture.
With hypoxia there is tachycardia, bradycardia, arrhythmia, muffled tones. Normal heart rate - 120-160 beats / min. The appearance of meconium in amniotic fluid. At the beginning of hypoxia - increase and increase of movements. At the developed hypoxia - slowing down and lack of movements. Threatening hypoxia requires prevention, and what has begun - treatment.
Samples (biochemical, functional, hardware) are used for early diagnosis and heart rate is assessed.
The functional ones include:
exercise test - is to change the gas composition of the blood.
Thermal tests: hot compress or cold to the abdomen.
Administration of atropine or oxytocin.
These tests reveal the compensatory capacity of the fetus until hypoxia has developed.
Stress-free test - the reaction of the fetal heartbeat to their own movements. Normally, the fetal heart rate increases by 10-12 beats / min. If the fetus does not react, thenit is hypoxia. The heartbeat should also respond to contractions, which can be examined with a cardiotocograph: an ultrasound effect is used (records heartbeat and contractions), summarizes the heartbeat and issues a tape. The contractile activity of the uterus (tocogram) is also recorded. Deceleration - slowing of the heartbeat during contractions.

Early bradycardia, which coincides with the time of contractions, usually appears in the second period of childbirth, when the head passes through a narrow part. Late deceleration - bradycardia after contractions -a sign of late hypoxia. Electrocardiography and phonography of fetal heartbeat: very difficult to decipher, ie requires a computer for processing. In the first period of childbirth, the heart rate increases in response to the contraction, in the second period may be a short-term decrease in fetal heart rate associated with pressure on the head, with a head presentation up to 80 beats / min. , which is due to the peculiarities of the location of the head in the bottom. Rukhovaactivity: 5 movements in 30 minutes - the norm, in the first period - 1-3 movements, in the second period the fetus does not move normally. Examination of amniotic fluid for meconium - amnioscopy (you can say whether there is meconium or not) or to assess whether water is leaking (if there is no amniotic sac). Amniocentesis is usually used according to the indications of the mother or fetus: genetic pathology, hemolytic disease of the fetus. Bladder puncture is performed during transabdominal amniocentesis with the introduction of a needle into the amnioticcavity. For amniocentesis, the location of the placenta along the anterior wall should be ruled out. Transvaginal or suprapubic amniocentesis is used mainly in early pregnancy. Determination of acid-base balance can be done by examining amniotic fluid or blood from the anterior part of the fetus (so it is done only in childbirth, when there is no bladder). Study of uteroplacental circulation.
Determination of the level of placental hormones in the urine: you can judge the state of uteroplacental circulation and indirectly the state of the fetus. Determine estriol, pregnandiol (metabolite of progesterone), thermostable alkaline phosphatase in the mother's blood. Isotopic methods (more scientific method). Ultrasound: determine the size, structure of the placenta, malnutrition in chronic hypoxia. Prevention and treatment are carried out by the same methods.
Treatment:
Treatment should consist in eliminating the cause of hypoxia, as well as in the treatment of hypoxia (pathogenetic drug therapy and rapid stimulation of labor).

Tactics of managing children with perinatal lesions of the central nervous system

1. Oxygen therapy is performed with pure oxygen, oxygen-air mixture (oxygen is 60%), inhalation for 10-15 minutes. Hyperbaric oxygenation. You can even give birth in a hyperbaric oxygenation chamber.
2. Drugs aimed at improving placental circulation. Vasodilators: euphyllin, trental, curantil (the latter 2 are disaggregants and improve the rheological properties of blood), you can also prescribe rheopolyglucin. Estrogens increase uteroplacental circulation: natural estrogen - folliculin, artificial - sinestrol. Sigetin is an estrogen-like drug. Tocolytics - beta-blockers: partusisten, bricanil, salbutamol, ritodrine, alupent, ginepral.
3. Means that increase the resistance of the fetus to oxygen deficiency.
4. Drugs aimed at enhancing metabolic processes in the fetus: glucose, vitamin C, group B, calcium gluconate, calcium chloride, unithiol, cocarboxylase, cytochrome C, tivortin, instenon, etc.
5. Means to combat metabolic acidosis. Sodium bicarbonate is controlled by acid-base balance as it can easily lead to imbalance. There are women with small, medium, large body weight. Depending from this, a different amount of soda is administered: 100–150–200 ml intravenously and then intravenously 40 ml of 40% glucose. Delivery as soon as possible. The methods depend on the condition of the mother's body. During pregnancy and in the first period of childbirth, a caesarean section is used, in the second - obstetric forceps for the main presentation, in pelvic presentation - extraction of the fetus for the pelvic end.

6. Material andmethodological support of the lesson

6.1. Tests

1. What factors during pregnancy are at risk of perinatal pathology
A. Infectious diseases
B. Hypertensive disease
D. Anemia
E. All of the above.*
2. Hypoxic form of hypoxia due to:
A. Cardiovascular insufficiency of the mother
B. Increasing blood viscosity

C. Decreased concentration of fetal hemoglobin
D. Intoxication of fetal hemoglobinopathy
E. Decreased circulating blood volume
3. Acute form of fetal hypoxia occurs when
A. delayed pregnancy
B. Ruptures of the uterus
C. Diabetes mellitus
D. Immunological incompatibility of fetus and mother
E. Fetal infections
4. The resistance of the fetus to hypoxia is determined
A. The weight of the fetus
B. Amniotic fluid volume
C. The mass of the placenta
D. The degree of oxygen saturation of the mother's blood
E. The degree of maturity of organs and systems
5. Highly oxygenated blood by umbilical vein is suitable in the first place
to
A. Battle of the Strait
B. Liver
C. Lower extremities
D. Pulmonary artery
E. Abdominal aorta
6. Bradycardia is the heart rate
A. Above 120 beats / min
B. Less than 120 beats / min.
C. less than 160 beats / min
D. above 160 beats / min
E. less than 100 beats / min
7. Motor activity of the fetus by ultrasound is determined from
A. 3-4 weeks
B. 5-6 weeks
C. 7-8 weeks
D. 9-10 Sundays
E. 11-12 Sundays
8. For the treatment of intrauterine hypoxia use substances that affect the rheology of the blood
A. insulin
B. chimes
C. tocopherol acetate
D. ritodrine
E. euphyllin
9. Subacute hypoxia of the fetus is manifested before birth
A. 1-2 days
B. 3-4 days
C. 4-5 days
D. 5-6 days
E. 6-7 days
10. Amnioscopy should be performed with
A. 35 weeks
B. 36 Sundays
C. 37 Sundays
D. 38 Sundays
E. 39 Sundays

7. List of recommended reading

6.2. Information necessary for the formation of knowledge and *skills can be found in literary sources.*
-main:

1. Zubarenko AV, Aryaev NL, Starets EA and others . Pediatric skills in practice family doctor and pediatrician : textbook . - Odessa: Printed House Print South , 2014. - 232p.
2. Differential diagnosis of the most common diseases of childhood. Textbook / ed. V.M. Dudnik, 1st Edition. Vinnytsia: Nilan Ltd., 2017. 560 p.
3. Karen J. _ Markdante , Robert M. Kligman . Fundamentals of Pediatrics according to Nelson: translation of the 8th English . edition: in 2 voLNmes. VoLNme 1. Kyiv: VSV "Medicine", 2019. XIV, 378 p.
4. Karen J. _ Markdante , Robert M. Kligman . Fundamentals of Pediatrics according to Nelson: translation of the 8th English . edition: in 2 voLNmes. VoLNme 2. Kyiv: VSV "Medicine", 2019. XIV, 426 p.
5. Kryuchko TA, Abaturov AE, Kushnereva TV Pediatrics : textbook (University IV level); under ed. AND. Крючко , A.E. Abaturov . Kiev : VSI "Medicine", 2020. 224 p.
6. Pediatrics: a national textbook: in 2 voLNmes / Ed. prof. Berezhny VV Kyiv, 2013. Vol.1. Kyiv, 2013. 1040 p.
7. Pediatrics: a national textbook: in 2 voLNmes / Ed. prof. Berezhny VV Kyiv, 2013. Vol.2. Kyiv, 2013. 1024 p.
8. Pediatrics: a textbook for students . higher education _ level IV institutions accredited / edited prof. OV Severe. View. 5th, ed . and add . Vinnytsia: Nova Kniga, 2018. 1152 pp .: ill .
9. Pediatrics in two voLNmes, edited by Aryaev ML, Kotova NV T2, Diseases of young children. Pulmonology. Allergology. Cardiology. Gastroenterology. Nephrology. HIV infection. Primary health care textbook - Odessa .: ONMedU. - 2014. - P. 205-211, 212-218

-additionally:

1. Ananth C.V., Vintzileos A. Epidemiology of preterm birth and its clinical subtypes. J. Matern.-Fetal Neonatal. Med. 2006; 19 (12): 773-782.
2. Benjamin Y.H., Mauricio C. Hypoxic-Ischemic Brain Injury: Imaging Findings from Birth to Adulthood. RadioGraphics. 2018; 29: 417-439.
3. Fleischer A.C., Toy E.C. Sonography in Obstetrics and Gynecology: Principles and Practice. McGraw-Hill Companies, 2011. 1052 p.
4. Rossi A., Romanello I.F., Fachech G. et al. Evaluation of fetal cerebral blood flow perfusion using power Doppler ultrasound angiography (3D-PDA) in growthrestricted fetuses. J. Ultrasound Obstet. Gynecol. 2011; 38: 175-180.
5. Tang Y, Li W, Baskota M, Zhou Q, Fu Z, Luo Z, et al. Multisystem inflammatory syndrome in children during the coronavirus disease 2019 (COVID-19) pandemic: a systematic review of published case studies. Transl Pediatr. 2021 Jan. 10 (1):121-135.

6.3.Orienting map for independentwork with literature

№ p / p	The main tasks	Instructions	Answers
1	2	3	4
1.	Get acquainted with the literature and the purpose of the lesson	Get acquainted with modern ideas about etiopathogenesis , classification , clinical course and additional methods of diagnosing LP	Know the factors of development, classification , clinical picture of disease manifestations, hematological , immunological , radiological and functional signs of

		in children	diseases and conditions.
2.	Epidemiology	Know the prevalence among children.	Know: the prevalence of the most common diseases and pathological conditions in the pediatric population .
3.	Etiopathogenesis	Know the causes and mechanism of LP in children	Know that these conditions can be caused by medical factors, pathogens of infectious diseases
4.	Clinic	Describe the clinical picture	Remember 'the leading clinical symptoms of underlying conditions in children with LP
5.	Diagnosis	Know the diagnostic schemes for the treatment of diseases in children with LP	Use schemes for diagnosis and treatment of drugs in children

7 **. Materials for self- controlover quality inpreparation .**

A. Questions for self-control.

1. In the definition of perinatal lesions of the central nervous systemin children.
2. Classification of perinatal lesions of the central nervous systemin children.
3. Differential diagnosis of the main causes of perinatal lesions of the central nervous systemin children.Diagnostic algorithm of perinatal lesions of the central nervous systemin children.
4. Principles of medical counseling of children with perinatal lesions of the central nervous systemin children.
5. Approaches to the treatment of diseases accompanied by perinatal lesions of the central nervous systemin children.

B. Tests for self-control:

1. compensatory mechanisms that ensure the normal development of the fetus include:
1) reduced blood flow rate
2) used anaerobic glycolysis*
3) decrease in the level of fetal hemoglobin in the blood
4) increase the heart rate to 190 beats / min
5) reduce heart rate to 110 beats / min
2. The Hemic form of hypoxia is caused by
1) fetal heart defects
2) a decrease in the concentration of fetal hemoglobin*
3) malformations of large vessels
4) increased blood viscosity
3. Chronic fetal hypoxia develops when
1) polyhydramnios
2) gestosis*
3) uterine rupture
4) Multiple pregnancies
5) pelvic positions of the fetus
4. the volume of interstitial space in full-term pregnancy is equal to
1) 100-150 ML
2) 200-250 ML*
3) 300-350 ML
4) 350-400 ML
5) 500 ml
5. under the influence of oxygen deficiency in the fetal body, first of all, there is

1) reduction of bleeding through the intestinal veins
2) reducing the release of vaso active substances
3) drop in cardiac output
4) catecholamine release*
5) lowering blood pressure
6. fetal asphyxia is caused by
1) tachycardia and lack of oxygen
2) predominance of acidic metabolites
3) lack of oxygen
4) bradycardia
5) lack of oxygen and carbon dioxide saturation*
7. Tachycardia is the frequency of fetal heartbeat
1) above 140 BPM
2) less than 140 BPM
3)less than 120 beats / min
4) above 150 BPM
5) above 160 BPM*

B. Tasks for self-control:

Task. The child is 2 days old, admitted to the neonatal intensive care unit after an emergency delivery (Kessar autopsy), against the background of uterine bleeding, with an Apgar Score of 4-5 B. with a weight of 2120 G. from the Anamnesis, it is known that the mother suffered chickenpox at 6 months of pregnancy. During the examination, attention is drawn to a decrease in the child's motor activity, the child does not eat independently. Reflexes of the newborn period are not fully developed and are sharply reduced. There is no search or sucking reflex. The skin is pale. The peripheral lymph nodes are not enlarged. In the lungs, peril breathing, no wheezing. The heart tones are somewhat muted and rhythmic. The stomach is soft, painless, "frog-like". The liver and spleen are not palpated. Clinical blood test: Hb-132 g/l, erythra. - 4. 5x1012 / L, CP – 0.88, blood clot. - 495.0 x109 / L, Lake. - 5.4 x109 / L, P / I - 4%, s / I - 72%, E. – 1%, M. – 3%, L. -20%, ESR - 17 mm/h. Ultrasound of the abdominal organs: liver, spleen, pancreas of uniform structure, enlarged lymph nodes in the abdominal cavityClinical blood test: Hb - 132 g / l, erythr . - 4,5x10 ^{12} / l, CPU - 0,88, thrombus. - 495.0 x $^{10\ 9}$ / l, lake . - 8.4 x10 ^{9} / l, p / ya - 4%, s / ya - 72%, e. - 1%, m. - 3%, l. -20%, ESR - 37 mm / year.	
Question: 1.Make a preliminary diagnosis. 2. what additional studies should be conducted? 3. recommendations in patient management tactics?	Answers : Responses: 1.the diagnosis was established: perinatal damage to the central nervous system. Muscle hypotension syndrome. Delayed intrauterine development of the fetus. Hypotrophy. External hydrocephalus. 2. ophthalmoscopy 3. adjustment of probe nutrition with expressed mother's milk consultation with a neurologist for children consultation with a pediatric ophthalmologist body weight gain control as soon as possible transfer to independent sucking

8. Materials for the classroom independent training .

8.1. The list of educational practical tasks which must be performed during practical classes.

1. Collect anamnesis, select data that _ testify to the disease.

2. Find out the most informative signs of the disease during the ′objective and laboratory - instrumental examination of the patient.
3. Establish clinical diagnosis according to modern classification .

9. Instructional materials for mastering professional skills and abilities.

9.1. Methods of work, stages of implementation

1. EvaLNate received anamnesis of life and disease, identify risk factors
2. Conduct a clinical examination of the patient.
3. Make a plan for an additional examination.
4. EvaLNate the results of laboratory and instrumental examination.
5. Formulate clinical diagnosis according to the classification .
6. Prescribe treatment that is appropriate for the specific situation

10. Materials for self-control of mastering knowledge, skills, abilities

Tests

1. the acute form of DIC syndrome occurs when
1) gestosis
2) not carrying a pregnancy
3) hemorrhagic shock*
4) Dead fruit
5) Willebrandt's Disease
2. moderate-severe neonatal asphyxia is assessed in the following cases:
1) 1-2 points
2) 2-3 points
3) 4-5 points*
4) 7-9 points
5) 3-4 points
3. the study of the response of the fetal cardiovascular system in response to its motor activity is called
1) motor test
2) stress test
3) non-stress test*
4) test with contractions
5) Test with stimulated impulses
4. according to teratological tables, malformations of the brain can occur during pregnancy
1) 2-11 weeks*
2) 3-7 weeks
3) 6-10 weeks.
4) 6-11 weeks.
5) 10-11 weeks.
5. severe neonatal asphyxia is rated at ... points or lower
1) 2 points
2) 3 points
3) 4 points*
4) 9 points
5) 7 points
6. the level of α-fetoprotin in the mother's blood during fetal hypoxia
1) does not change
2) decreases*
3) depends on the estriol index
4) increases
5) depends on the degree of hypoxia
7. to assess the condition of premature newborns, use the scale proposed by

1) Khechinashvili
2) Apgar
3) Tsangeimeister
4) Silverman*
5) Danom