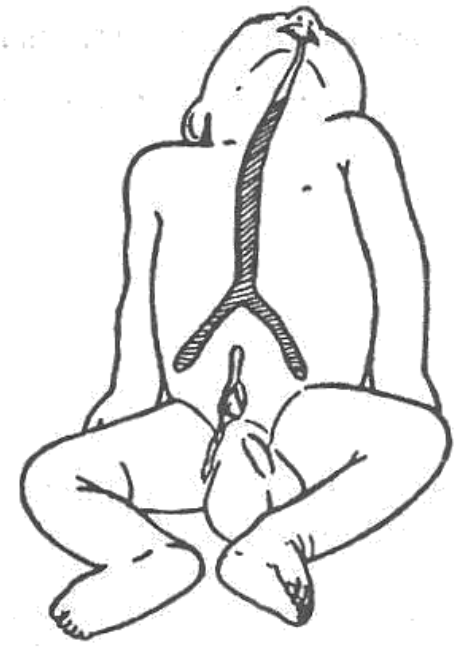
Module 1. The organization of forensic-medical examination and general problems of forensic medicine. Forensic-medical principles of examination violent and natural death

The sub module 2. Forensic-medical thanatology

Theme 5. Forensic-medical examinations of infants

Guidelines for students and interns



Модуль 1. Організація судово-медичної експертизи та загальні питання судової медицини. Судово-медичні засади експертизи насильницької та ненасильницької смерті

Змістовний модуль 2. Судово-медична танатологія

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для студентів та лікарів інтернів

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
Харківський національний медичний університет

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Compilers: Vasil Olkhovsky
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Упорядники: Ольховський В.О.
Губін М.В.
Каплуновський П.А.
Сокол В.К.

Substantiation of the Topic. The category of corpses that are subject to forensic-medical expert examination also includes the corpses of foetuses and infants. The realization of forensic medical examination of such corpses differs from examination of corpses of the adults. It is necessary to know these features and to be able to solve the problems arising at investigating bodies.

Duration of practical classes: 3 academic hours

Purpose of the Practical Class: to master the methods of solving the main problems connected with autopsy of an infant, study the peculiarities of technique of autopsy of a newborn, the procedure of diagnosis and expert conclusion.

Direct purpose of study:

1. Reveal and describe specific morphological signs during autopsy of an infant (or during the analysis of task-cards);
2. Determine if the newborn is a full-term, mature, viable, and the duration of its intra-uterine and extra-uterine life;
3. Determine the cause of death of an infant;
4. Make a forensic medical diagnosis and draw up conclusions at autopsy of an infant.

Basic level of knowledge and skills (before the practical class):

1. Reasons of a pathomorphological autopsy;
2. Order of the documents drawn up in pathologic anatomy;
3. Principles of a pathologist's diagnosis;
4. Dialectic-materialistic and medical interpretation of essence of life and death;
5. Peculiarities of microorganisms physiology, rotting fermenting, decay;
6. Changes in a human body which are connected with dying.

Visual Aids and Material Tools

1. Different natural specimens and some reports of autopsy; the object of the investigation is the protocol part of the «Report of forensic autopsy" and additional cases materials.
2. Studying tables, photos, and video.

Technological card of carrying out of practical classes

№	Level	Time (min)	Manuals	Place of carried
1	Control of initial level of knowledge on the topic	15	Oral answering	Class room
2	Analysis the scheme of the description specific morphological signs during autopsy of an infant	15	Tables with scheme	Class room
3	Studying theme of classes on corps	60	Corps	Autopsy room
4	Conclusion about cause of death of an infant	10	Oral answering	Class room
5	The decision of situational tasks	30	Situational tasks	Class room
6	Classes summarising	5	-	Class room

BLOCK OF INFORMATION

According to the Law of Ukraine, "Infanticide is murder of a newborn child by his/her mother during delivery or immediately after it" (Article 117 of CC). The mother can be charged with the offence, only when the circumstances justify it, such as when the infant is killed by its mother while suffering from mental disease due to a stress associated with her pregnancy, delivery, puerperium, or lactation. In such cases, the mother may not be held wholly responsible for killing the infant.

Infanticide does not include the death of foetus during labour, when it is destroyed by craniotomy or decapitation. Infanticide is rare and usually is committed by a young unmarried woman or a widow at the time of or within a few minutes or hours after the birth. The alleged mother should be examined for signs of recent delivery; her mental condition, and any other condition explaining abnormal delivery responsible for injury to the newborn (e.g., contracted pelvis, precipitate delivery) should be noted.

In regard to the child, the following forensic-medical questions must be answered:

1. Whether the child was live-born or stillborn (dead-born)?
2. Whether the newborn child was full-term and mature?
3. Whether the infant has attained viability or not?
4. What was the intra-uterine age?
5. If born alive, how long did the child live?
6. Whether there were signs of appropriate care for newborn child?
7. What was the cause of death?

Peculiarities of Autopsy of Infants

The procedure here is almost the same as that employed for an adult but with a few differences.

External Examination

Clothes and wrappings: These may be pieces of old clothes of the mother, newspapers, plastic bags, blankets, etc. They are helpful for identification.

Appearances of the body: Absence or presence of vernix caseosa may indicate whether the body has been washed or not. Signs of violence may be found in the form of nail marks and contusions in the area of the mouth, nose, neck and head. Foreign bodies may be found in the mouth and upper respiratory passages. The state of other natural orifices should also be observed at this stage. The nape of the neck should be carefully examined for any injuries, including barely visible punctured wounds. Decomposition changes, if present, are similar to those seen in adults and help to ascertain the time that has passed since death. Any evidence of maceration or mummification suggests intrauterine death.

Maturity data: The critical parameters for the solution of the question about Maturity in the forensic aspect are the weight of a child's body - 1000 g, crown-heel length - 35 cm, weight of the placenta - 400 g.

Malformations: The head must be examined for bulging fontanels (hydrocephalus) and the back for spina bifida. Hands and feet should be inspected for abnormal number of digits, the mouth and palate for cleft palate, and the rectum for patency. Irregularities in consistency of bone must be looked for (osteogenesis imperfecta is associated with many broken bones).

Umbilical cord: This is examined to determine its length, whether unduly short or long, and whether it has been cut, tied (indicates that the delivery has been attended by someone), torn or still attached to the placenta. The cut end is examined for signs of a vital reaction. The cord is also being examined for abnormal twists, knots. Signs of vital reaction in the stump indicate the interval between birth and death. The region of the umbilicus should be examined to determine possible infection and a histological examination of the cord is essential if infection is suspected.

Placenta: Common histological abnormalities in stillbirths include placental infarcts, haemorrhagic endovasculitis, retroplacental haematomas, acute chorioamnionitis, and hydrops.

Birth injuries: If there is any evidence of birth injury, it should be specially noted.

Internal Examination:

Unlike opening corpses of adult persons a median cut of integuments is started not from a level of the thyroid cartilage, it is performed through the lower lip, dissecting all the thickness of the lower lip and the tissues of the chin up to the bone.

Soft tissues of the lip and chin are separated to the right and to the left from the corners of the lower jaw. The skin rags on the neck are separated without subcutaneous fat. On the neck, the cut gets only through the skin, and on the chest - up to the sternum. All the layers of the abdomen wall are dissected from epigastric area up to symphysis pubis, leaving the umbilical ring on the right.

Before taking out the organs of the mouth, neck, thoracic and abdominal cavities, corresponding ligatures are imposed and two organ complexes are made:

1) heart, thymus, and lungs;
2) stomach and intestines.

They are used for carrying out Hydrostatic tests.

Mouth: A newborn child is often smothered by stuffing wads of paper or cloth put into the mouth. Therefore, the interior of the mouth should always be examined when infanticide is suspected.

Neck: It is examined for internal injuries, and trachea - for foreign objects, froth, mucus, amniotic fluid, etc. A special attention must be paid to the occipital region.

Thorax: The shape of the chest, whether dome-shaped or flat, is noted. Before opening the thorax, the abdomen is opened and the position of the diaphragm is noted by passing a finger up to its concave arch. The lungs are examined for their volume, color, consistency, weight, and the presence of petechial haemorrhages.

Hydrostatic Lung Test (Galenus-Schreyer's Test)

This test is based on the fact that in the breathing process the volume of the lungs increases, overcompensating the weight of the additional blood, as a result, and their specific gravity diminishes. A ligature is tied on the bronchi, and the lungs are separated. Each lung is individually placed into water. If they float, each lung is cut into 12 - 20 pieces, and they are placed into water.

The Hydrostatic Stomach-Bowel Test (Breslau's Test)

Air is swallowed into the stomach during respiration. The stomach and intestines are removed after tying double ligatures at each end. They float in water if respiration has taken place, otherwise they sink.

Head: The scalp is opened by the usual incision from ear to ear and the flaps are reflected. The skull is opened by cutting with scissors anteroposterior ly and across, and reflected as two flaps Observation is made regarding injuries to fontanels (especially punctured wounds through anterior fontanels), tears of meninges, tentorial tears (common in forceps delivery), haemorrhages and lacerations of brain.

Other organs are examined for their development, any malformations, asphyxial signs, and injuries.

Genitals: These are examined for any malformations. The position of the testes, whether descended or where located, is noted.

Limbs and Sternum: These are examined for presence of focuses of ossification to fix the age of the foetus. Focus (or centre) of ossification for the calcaneum appears by the 5th month, the four divisions of the sternum by the 6th month, talus by the 7th month, and lower end of the femur by the 9 th month (Beclard's nuclei - brownish-red nucleus, which is surrounded by a bluish-white cartilage). During birth, the focuses of ossification are usually present in the cuboid and upper end of tibia.

The following technique is usually adopted to demonstrate the focuses of ossification at autopsy. Thus, the ossification centres give information about the viability and maturity of the new-born. Spinal channel and spinal cord are necessarily researched in purpose on presence of the birth injuries and other pathological changes.

Additional examinations

For immunological researches during autopsy take blood for definition of group (this is carried out necessarily at research of corpses of unknown newborns) and on Rhesus factor (at suspicion on haemolytic disease, which has arisen because of the serologic conflict).

For histological research of internal organs (it is obligatory in all cases) take the lung tissue and other organs and tissues, including placenta, brain and spinal cord (in cases of birth injuries, asphyxia, congenital toxoplasmosis), adrenal glands (at birth injuries), salivary, submandibular and parotid glands (for diagnostic of cytomegalia), heart muscles (at fibroelastosis), etc.

Forensic toxicological research is made at suspicion that the reason of death was poisoning.

Withdrawal of material for microbiological research is made in case of death from an infectious disease.

X-ray investigation of the whole corpse of a newborn is made before auopsy. By roentgenograms, presence of air (gas) in the lungs, stomach, and intestines; focuses of ossification in various bones, damages of bones are determined

Establishment of New-Birth

In forensic medicine, the period of new-birth is considered to be a short time interval (the first day after delivery) during which the child has the signs inherent to foetus.

The signs of the new-birth are divided into external (presence of the umbilical cord, vernix caseosa, traces of blood on the skin in absence of its injuries) and internal (Caput Succedaneum, Cephalhaematoma).

Among the external signs of the new-birth the major one is presence of the umbilical cord. The fleshy glistening umbilical cord with a normal spiral twist and without signs of demarcation or with its beginning is evidence of new-birth.

At first, the skin is bright-red, it becomes darker on the second or third day, and then it turns brick-red, yellow, and normal in about a week.

Vernix caseosa covers the skin, mostly in the axilla, inguinal region and folds of the neck, buttocks and persists for 1 or 2 days. Vernix caseosa is a white cheesy substance, made up of sebaceous secretion and epithelial cells. Being sticky, it cannot be easily removed. It protects the foetal skin against maceration while in liquor amnii. Sometimes, it may be absent at birth and it is removed by washing. On the undamaged skin of the newborn baby in some cases it is possible to find the blood traces from maternal passages of mother.

Caput Succedaneum is a valuable sign when present. It may not be present in precipitate labour. It is an oedematous swelling of the presenting part of the head during delivery. On a cut, it has a jelly consistence. Caput succedaneum gradually disappears in about a day to about a week after birth.

Cephalhaematoma is a localized accumulation of blood deep to the scalp, between the periosteum and bone surface. The haematoma is limited to the pe-riosteal sheath of a single bone, commonly the right parietal bone, and never crosses a suture line. Cephalhaematoma is rare, and varies in size from 1 cm to 5 cm. The haematoma swelling often tends to increase during the first day or two after birth, as more and more blood accumulates, but gradually shrinks in subsequent weeks as the blood is absorbed.

Meconium is a green, sticky substance consisting of thickened bile and mucus. The meconium is completely excreted from the large intestine in the first 24 to 48 hours after birth, but in breech presentation and also in severe anoxia, the meconium may be excreted completely before birth. Meconium stains are brownish-green and stiffen the cloth. The reaction is acid.

Establishment of Viability

Viability means the stage of maturity at which a foetus with normal intra-uterine development is able to maintain a separate existence after birth in usual conditions. A child is viable after 210 days, or seven months of intra-uterine life, and in some cases after 180 days or six months but in most of these cases the foetus is immature.

A full-term and mature foetuses if they have no malformations or the diseases incompatible with a life are viable. However, viable can be low-birth-weight foetuses which have reached a minimal degree of a maturity necessary for a life.

Newborns with weight 500-1000 g refer to foetuses with extremely low weight, 1000-1500 g - with very low weight and 1500-2500 g - with low weight of the body at the birth. In all named cases of live-birth are possible preservation of a life and perinatal development of the child in corresponding conditions of intensive therapy and nursing.

In forensic medical practice the viable infant is considered normally developed infant if it was born after VIII lunar months of pregnancy (the body length being more than 40 cm, the body weight being more than 1500 g).

Establishment of Maturity and Duration of Intra-Uterine Life

Normal pregnancy of the woman proceeds X lunar months (280 days) and comes to end with physiological delivery by full-term foetus. Thus, full-term is considered an infant who was born after 37-42 weeks of pregnancy.

The maturity of a foetus means such a degree of its physical development which provides readiness of organs and systems to extra-uterine life. The maturity is characterize by a complex of signs: the length and weight of the body, the sizes of the head, the condition of the skin, hair, nails, external genitals, umbilical cord, placenta, focuses of ossification. A full-term foetus, as a rule, is mature.

The intra-uterine age of a foetus can be approximately determined according to length of the umbilical cord and weight of the placenta.

If it is determined that the infant is low-birth-weight and premature it is necessary to establish its intra-uterine age. An estimate of foetal age in medico-legal work is frequently of importance. For this purpose, the following data about the development of the foetus may give some guidance in forming an approximate idea as to the age of a foetus. In the data, the crown-heel length of the embryo or foetus is based on simple formula by Haase, which states that the square root of the length of the foetus in centimetres gives the approximate age of the foetus in months in the first five months.

Establishment of Live-Birth

Following birth, the process of aeration of lungs becomes operative and the pulmonary circulation becomes established. These two vital functions which occur at birth of a living child produce physical changes in the chest, lungs, and stomach and intestine. These changes are as follows (Table):

Table

Differential diagnostics between Live- born and still-born child

Characteristics	Live-born Child	Still-born Child
Section of lungs	Abundant frothy blood exudes on section	Little froth less blood exudes on pressure
Galenus-Schreyer's test	Positive." expanded areas or whole floats in water	Negative: whole and parts sink in water
Microscopic picture of lungs	The bronchi, bronchioles and alveoli are well expanded. The alveoli lined by flattened epithelium; interalveolar septa are thin; elastic fibres are tense, argyrophilic fibres are pressedon edges of alveoli, in alveoli are hyaline membranes.	The bronchi, bronchioles are not expanded. The alveoli are completely atelectatic and lined by cuboidal epithelium. There are the thick interalveolar septa, twisted elastic fibres in the form of thick and short fascicle, thin twisted argyrophilic fibres.
X-ray investigation (Dillon's Test)	Positive	Negative
Breslau's Test	Positive: Presence of air in the stomach and intestine	Negative

Criminal Causes of Death

1) Acts of commission that is the use of mechanical violence and poisoning (active infanticide).

2) Acts of omission or neglect (passive infanticide).

Acts of commission: Deaths from violence may take place in the same way as in adults but certain methods of infanticide are common, namely mechanical asphyxia, fracture of the skull, fracture and dislocation of the cervical vertebrae, other injuries, and poisoning.

Mechanical asphyxia by pressing the face on the pillow, or by closing the nose and mouth by a cloth or by hands, is common. The presence of foreign bodies, e.g. rag or cotton wool, in the mouth or air passages when accompanied by internal signs of asphyxia points to homicide. Strangulation, either by hand or by ligature, is common. When manual strangulation is resorted to, bruises from the pressure of the fingers or depression and scratches from the finger nails will be observed, and there is commonly injury to the deeper tissues. Occasionally, umbilical cord is used as a ligature to simulate accident. In such cases, examination of the cord may show that it has been roughly handled. In accidental deaths with the umbilical cord tightly twisted round the neck, there is no excoriation in and around the ligature mark and the lungs are generally found in a foetal condition. Drowning is frequent form of infanticide.

Fractures of the skull by dashing the head on the floor or wall, or inflicting blows on the head, usually leave unmistakable marks of violence.

Fracture and dislocation of the cervical vertebrae may be produced by twisting the neck. They may be produced accidentally by forcible rotation of the neck while correcting a malposition of the foetus or extracting the head in a breech presentation.

Other injuries, such as stab and incised wounds, are rare. Stab wounds may be caused by needles, pins or scissors and may penetrate the heart, brain, medulla or other internal organs.

Poison may be used for the purpose of infanticide.

Acts of omission: Deaths from omission at birth more commonly relate to: omission to make the necessary preparation for the birth of the child (e.g., arrangement for medical aid); omission to tie the cord after dividing it; (3) omission to remove the child from the mother's discharges; omission to protect the child from cold and heat, and omission to supply proper food to it.

QUESTIONS FOR STUDENT'S INDEPENDENT WORK

1. Definition of "infanticide".
2. Problems to be solved during expert examination of the corpse of an infant.
3. Peculiarities of autopsy of a newborn.
4. Concept definition of "live-birth", the methods of diagnosis of live-birth during autopsy. Hydrostatic tests technique.
5. Concept definition of "new-birth" in medico-legal aspect the methods of diagnosis.
6. Concept definition of "viability" and "maturity" of foetus, the methods of diagnosis.
7. Methods of determination of duration of intra-uterine and extra-uterine life.
8. Methods of infanticide and causes of violent death of newborns.

TESTS FOR SELF-ASSESSMENT

1. What is mean the "infanticide"?
   A. Murder of the newborn child by father
   B. Murder of the newborn child by relatives
   C. Murder of the newborn child by any person
   D. Murder of the newborn child by doctors in hospital
   E. Murder of the newborn child by mother during labours or at once after them
2. How many times the newborn child was living if the air was present in a stomach and in the top part of a small intestine?
   A. No more than 30 minutes
   B. Not more than 3 hours
   C. About one hour

D. About 6 hours
E. More than 6 hours

3. Where is situated the places of ossification which calls "Beclard`s nuclei"?
A. In a distal part of ulna
B. In a proximal part of fibular
C. In a distal part of numeral bone
D. In a lower end of the femur
E. In a haunch bone

4. In what time of pregnancy the places of ossification which calls "Beclard`s nuclei" is appearing?
A. This places appears about the 32th week
B. This places appears about the 34th week
C. This places appears about the 38th week
D. This places appears about the 40th week
E. This places appears about the 9th month

5. What is the microscopic picture of lungs from live-born child ?
A. The alveoli are completely atelectatic
B. There are the thin twisted argyrophilic fibres
C. The alveoli lined by flattened epithelium
D. There are the thick interalveolar septa
E. There are twisted elastic fibres in the form of hick and short fascicle

ANSWERS

1 — E; 2 — B; 3 — D; 4 — E; 5 — C

After the practical class every student should know:

1.Peculiarities of autopsy of a newborn;
2. Definition of "live-birth", "new-birth", "viability" and "maturity" of foetus, methods of diagnosis during autopsy. Hydrostatic tests technique.
3. Methods of determination of duration of intra-uterine and extra-uterine life.
4. Causes of violent death of newborns

should be able to:

1. Reveal and describe specific morphological signs during autopsy of an infant (or during the analysis of task-cards);
2. Determine if the newborn is a full-term, mature, viable, and the duration of its intra-uterine and extra-uterine life;
3. Determine the cause of death of an infant;

4. Make a forensic-medical diagnosis and draw up conclusions at autopsy of an infant.

📖 THE RECOMMENDED AND USED LITERATURE

Basic:

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Навчальне видання

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