

### Theme 3

## FORENSIC MEDICAL EXAMINATION OF CORPSES OF THE NEWBORN

The examination of corpses of the newborn has its peculiarities in terms of both the autopsy technique and the investigators' questions to be solved by a forensic medical expert:

- 1) whether the baby was neonate;
- 2) whether the baby was mature;
- 3) what the duration of the intrauterine life was;
- 4) whether the baby was born alive or dead;
- 5) whether the baby was viable;
- 6) what the duration of the post-natal life was;
- 7) whether the baby was given the necessary care and proper nursing;
- 8) what the cause of death is and the prescription of its coming.

**Definition of neonatality.** The forensic medical notion of neonatality differs from the one established by clinicians. Obstetricians and paediatricians consider neonatality to be a period of 3-4 weeks after labour in which the newborn body adapts itself to life conditions beyond the mother's body. From the forensic medical point of view neonatality is a very short period of time: a baby is considered neonate if he or she has lived not more than 24 hours after birth. This is connected with the legal definition of *infanticide* – a murder of a baby by his/her own mother during labour or immediately after it. Neonatality is established on the basis of the umbilical cord, labour tumour, meconium, vernix caseosa and blood traces, and the presence of placenta. The umbilical cord is a string-like organ linking the foetus with the placenta and conducting foetoplacental blood circulation. A mature foetus usually has it 50-60 cm long and 1,5-2 cm thick.

A wet succulent umbilical cord with no signs of demarcation ring (or with initial signs of formation) is an indubitable proof of neonatality. This is also confirmed by an intact link between the umbilical cord and the afterbirth. The labour tumour is located in the front part of the foetus – the head – or in the buttocks and scrotum. It develops as a result of soft tissue infiltration with serous liquid with blood admixture. It is usually resolved within 2 or 3 days. If the clutch of the head was vigorous and lasting there may be a haemorrhage under the skull periosteum. Such injury is called cephalohaematoma. Depending upon the size it is resolved after 2 or 3 weeks.

Meconium is a dark green (rarely brownish or reddish for blood admixture) homogenous mass found in the large intestine, in the anus area or on the buttocks. Usually it is removed from the intestine within 1 or 2 days, occasionally it may linger for 3 or 4 days. Vernix caseosa is a fatty grey white mass covering the skin of the newborn. Occasionally it is found only in small quantity, usually in skin folds, sublingual cavities and groin. At proper washing of the newborn it disappears. Since the labour tumour, meconium and vernix caseosa sometimes linger for 2 or three days after labour, they cannot be regarded as an absolute proof of neonatality. The expert's statement on a baby's neonatality is set on the basis of the analysis of the total of established signs. Blood traces on the dead body can be evidence of neonatality if they come from maternal passages, i.e. if there are no injuries on the corpse that could be the source of haemorrhage. Such traces should be sampled for establishing their group specificity. At the same time blood from the vessels of the foetus (newborn) should be sampled for the same purpose.

Placenta is sometimes presented for forensic medical examination together with the corpse. If it is linked with the umbilical cord, it is the proof of neonatality.

**Definition of foetus maturity.** The definition of maturity embraces two notions. On the one hand it denotes the normal term of the foetus's staying in the maternal body (9 months or 280 days on average), on the other hand (and this is its basic meaning) it denotes the level of the foetus's physical development before labour. As the pregnancy term increases, the level of foetus maturity grows and after reaching the 10<sup>th</sup> month the foetus usually becomes mature. Foetus maturity is characterized by a number of features namely the body's weight and dimensions, presence of ossification focuses and others. The body length of a mature foetus is 47 to 62 cm but in the majority of cases about 50 cm. According to the latest research, nowadays the average body length of the mature newborn is 52-54 cm – acceleration manifests itself also in the increase of foetus dimensions.

The newborn with the body length below 45 cm are considered premature. The maturity of the newborn with the body length of 45-47 cm is established in the course of each particular examination on the basis of minute consideration and analysis of all characteristics of this state. The body weight of the mature newborn varies considerably. On average it is 3 – 3,5 kg. A foetus weighing less than 2,5 kg is considered premature. All the dimensions and the body weight characteristic of maturity refer to single foetuses, at multiple birth the body length and weight are lower. At autopsy one establishes the state of maturity characteristics – the presence of ossification focuses in the heel bone (8 – 10,5 mm in diameter), in the ankle bone (6,5 - 9 mm) and in the lower epiphysis of the femoral bone (5 – 7 mm) – Beckler's nucleus. Ossification focuses are round reddish lumps, this characteristic lingers even at considerable decay of the corpse. Maturity is also characterized by sufficient development of the

subcutaneous fat, the presence of lanugo in the area of shoulder girdle, hair on the head not less than 2 – 3 cm long. Nose and ear cartilages must be elastic, dense, nails on the hands must overhang fingertips, nails on the toes must reach toe-tips. Genitals must be regularly shaped, in boys testicles must be in the scrotum, in girls large lips of pudendum must cover small lips and the clitoris.

#### **Establishing the duration of intrauterine life.**

Experts establish the duration of intrauterine life of the newborn mainly on the basis of body length. A body length above 25 cm is divided in 5 and thus one gets the number of months of intrauterine life. If such division leaves a remainder, it is regarded as a sign of life in another month. With body length below 25 cm the given figure is square-rooted. The relative index of the duration of intrauterine life is the placenta weight and the length of the umbilical cord. Normally the placenta weight with a mature foetus is one fifth of the foetus weight. The placenta weight by the end of the 5<sup>th</sup> month is 175 g, by the end of the 6<sup>th</sup> month - 275 g, by the end of the 7<sup>th</sup> month - 375 g, by the end of the 8<sup>th</sup> month - 450 g, by the end of the 9<sup>th</sup> month - 500 g. The length of the umbilical cord by the 7<sup>th</sup> month is 42 cm, by the 8<sup>th</sup> month - 46 cm, by the 9<sup>th</sup> month – 47 cm, by the 10<sup>th</sup> month – 50 cm.

**Establishing neonatality or mortinatality.** The criterion of live birth is the appearance of extraperitoneal pulmonary respiration in a viable foetus. Mortinatality is birth not followed by independent respiration. To establish live birth one uses the so called live tests (pulmonary and gastrointestinal) and a histological examination of lung tissue. The presence of air in the lungs and the gastrointestinal tract before autopsy can be established by means of X-ray filming of the corpse.

**The pulmonary live test** is based on the change in the density of breathing lungs in comparison with non-breathing ones. The lungs of a non-breathing newborn are airless and dense, their surface is smooth and homogenous. They are small in volume, lie in the depth of pleural cavities and are covered by the heart and the thymus gland on the front. The relative density of non-breathing lungs is above 1, thus they go down in water. In section their tissue is evenly reddish and anaemic.

With the baby's first breath lungs begin to spread out and get filled with air, their volume increases, the relative density goes down below 1 and thus they float on water. On the surface and in section their tissue is variegated, marble-like, light red areas alternate with darker ones, at pressure the section surface releases not only blood but also bloody foam. Expert's estimation of the results of such a test does not always come easy. The positive result (floating lungs) is observed in cases when the newborn has breathed. Putrefied lungs also float on water, thus the test is not reliable at putrefying changes of the corpse. Partially floating are also the lungs of a mortinatus that has undergone pulmonary ventilation as well as frozen and completely thawed lungs of both live-born and still-born, and in secondary atelectasis with deflated lungs of a newborn that has breathed but not lived long.

**Gastrointestinal test.** Simultaneously with the beginning of independent breathing (sometimes even earlier) the child produces swallowing movements with which air penetrates into the gastrointestinal tract. For that matter the stomach and intestines acquire floating capacity which is the basis for the gastrointestinal test. Floating of the whole complex or of the stomach only indicates live birth. But air can also penetrate into the stomach at artificial pulmonary ventilation. With putrefied corpses this test is also proof less in view of putrefactive gases in the intestines.

Usually the results of the pulmonary and the gastrointestinal test coincide. But other combinations of results are also possible: lungs are afloat, stomach and intestines sink, the newborn has lived and breathed for a short period of time, too short for the air to penetrate the gastrointestinal tract. If lungs sink and the stomach is afloat, it may be the indication of secondary atelectasis. Histological examination of lungs is obligatory for establishing live birth or mortinatality. The lung alveoli and bronchioles of a mortinatus are deflated, of different shape and size, the alveolar epithelium is cubic, the elastic fibres are in the form of bundles and spirals. In the breathing lungs the alveoli are spread out their walls are thin, the alveolar epithelium is condensed, the capillaries are plethoric, the elastic fibres copy the lines of the spread alveoli.

**Establishing viability.** Viability is the capability of the newborn to continue life beyond the maternal body. To be viable a foetus must reach the known level of maturity and have no signs of handicaps or diseases which are inconsistent with life. Viability occurs a little earlier than full maturity. Foetuses with a pregnancy term below 28 weeks, a weight below 1000 g and a body length below 35 cm are considered unviable.

**Postnatal life duration.** A forensic medical expert usually has to establish the postnatal life duration of a newborn which makes up several minutes to hours.

For this matter one uses the changes in the characteristics of neonatality and live birth: changes of the umbilical cord and the umbilical ring, the degree of labour tumour resorption, the meconium passage. One can also establish the postnatal life duration on the basis of the degree of air penetration into the gastrointestinal tract: the stomach is filled with air within minutes; the whole small intestine takes 5-6 hours to be filled with air, later air appears in the large intestine and fills it within 10-12 hours. All these characteristics enable establishing only approximate postnatal life duration.