

Postmortem Magnetic Resonance Imaging as an Objective Method for the Differential Diagnosis of a Stillborn and a Neonatal Death

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Abstract : An important part of forensic and autopsy research in perinatology is the answer to the question of life and stillbirth. Postmortem magnetic resonance imaging (MRI) is an objective non-invasive research method that allows to store data for a long time and not to exhume the body to clarify the diagnosis. The purpose of the research is to study the possibilities of a postmortem MRI to determine the stillbirth and death of a newborn who had spontaneous breathing and died on the first day after birth. MRI and morphological data of a study of 23 stillborn bodies, prenatally dead at a gestational age of 22-39 weeks (Group I) and the bodies of 16 newborns who died from 2 to 24 hours after birth (Group II) were compared. Before the autopsy, postmortem MRI was performed on the Siemens Magnetom Verio 3T device in the supine position of the body. The control group for MRI studies consisted of 7 live newborns without lung disease (Group III). On T2WI in the sagittal projection was measured MR-signal intensity (SI) in the lung tissue (L) and shoulder muscle (M). During the autopsy, a pulmonary swimming test was evaluated, and macro- and microscopic studies were performed. According to the postmortem MRI, the highest values of mean SI of the lung (430 ± 27.99) and of the muscle (405.5 ± 38.62) on T2WI were detected in group I and exceeded the corresponding value of group II by 2.7 times. The lowest values were found in the control group - 77.9 ± 12.34 and 119.7 ± 6.3 , respectively. In the group II, the lung SI was 1.6 times higher than the muscle SI, whereas in the group I and in the control group, the muscle SI was 2.1 times and 1.8 times larger than the lung. On the basis of clinical and morphological data, we calculated the formula for determining the breathing index (BI) during postmortem MRI: $BI = SIL \times SIM / 100$. The mean value of BI in the group I (1801.14 ± 241.6) (values ranged from 756 to 3744) significantly higher than the corresponding average value of BI in the group II (455.89 ± 137.32 , $p < 0.05$) (305-638.4). In the control group, the mean BI value was 91.75 ± 13.3 (values ranged from 53 to 154). The BI with the results of pulmonary swimming tests and microscopic examination of the lungs were compared. The boundary value of BI for the differential diagnosis of stillborn and newborn death was 700. Using the postmortem MRI allows to differentiate the stillborn with the death of the breathing newborn.

Keywords : lung, newborn, postmortem MRI, stillborn

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