G18 The Virtual Hydrostatic Test

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After attending this presentation, attendees will understand the techniques and procedures available to distinguish a stillborn fetus from a liveborn neonate.

This presentation will impact the forensic science community by demonstrating another tool in the determination of live birth.

The hydrostatic test has been used for hundreds of years to help determine if there has been a live birth. Criteria for live births include respiration, heartbeat, food in the stomach, or a vital reaction of the umbilical stump or any injury. The hydrostatic test involves placing the lungs in water to see if they float. If the lungs float, it could be due to aeration or putrefactive gas from decomposition. To exclude decomposition, a portion of liver is also placed in water. If the liver also floats, the test is inconclusive. If the liver sinks, the floating lungs are considered to be aerated. Aeration can also be caused by artificial respiration due to resuscitation efforts and such information should be sought. Histology of the lungs has also been used to assess respiration. Expanded alveoli are consistent with respiration and collapsed alveoli with stillbirth; however, microscopic examination should not be the sole criterion used. Reportedly, there have been stillborns with expanded alveoli and live births with collapsed alveoli.

Computed tomography (CT) is being increasingly used in the practice of forensic pathology. CT is helpful in determining fractures, especially of bones not normally examined during autopsy (e.g., spine), detecting foreign bodies and their trajectories, and detecting air (e.g., pneumothorax). CT can also aid in estimation of gestational age by measuring the femur length.

Presented are two cases of fetal deaths of estimated gestational ages 21-23 and 23-25 weeks in which both the hydrostatic test and CT were performed. In one case, the lungs sank in water and there was no air seen in the lungs or gas in the liver on CT. Histology of the lungs showed collapsed alveoli. In the other case, the lungs floated in water, the liver sank, and air was seen in the trachea, bronchi, and both lungs on CT; and no gas was present in the abdomen. Histology of the lungs showed areas of expanded alveoli and collapsed alveoli. In both cases, the CT was used to corroborate the estimated gestational age.

Because assessment of live birth is a critical and difficult decision, as many factors as possible should be taken into consideration. Postmortem CT offers another assessment to consider in this determination. Further study and correlation with existing methods seems warranted.

Hydrostatic Test, Postmortem CT, Virtual Autopsy

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