G20 Examination of the Cervical Spinal Cord in Infants and Toddlers

Mehdi Koolaee, MD, 10436 Rockville Pike, Apt 401, Rockville, MD 20852; Ana Rubio, MD, PhD, OCME, 111 Penn Street, Baltimore, MD 21201; Olga Pletnikova, MD, PhD, John Hopkins University, Dept of Path-Neuropathology Unit, 600 N Wolfe Street, Baltimore, MD 21287; Zabiulah Ali, MD, OCME, 900 W Baltimore Street, Baltimore, MD 21223; Joseph J. Chen, MD, University of Maryland Medical Ctr, Dept of Radiology, 22 S Greene Street, Baltimore, MD 21201; Narita J. Shet, MD, University of Maryland Medical Ct, Dept of Radiology, 22 S Greene Street, Baltimore, MD 21201; David R. Fowler, MD, OCME, 900 W Baltimore Street, Baltimore, MD 21223; and Juan Troncoso, MD, 558 Ross Building, 720 Rutland Avenue, Dept of Neuropathology, Baltimore, MD 21205*

After attending this presentation, attendees will understand the methodology and different techniques available for examination of the cervical spinal cord and adjacent structures in infants and toddlers to properly diagnose trauma, malformations, or natural disease processes resulting in death.

This presentation will impact the forensic science community by demonstrating the advantages of the *en bloc* examination of the neck structures, including the spinal cord, vertebrae, neurovascular, and adjacent soft tissues over the standard post-extraction spinal cord examination in death investigations of infants and toddlers.

Abnormalities of the spinal cord and surrounding tissues, due to malformations or other processes whether traumatic, ischemic, or vascular, could either explain death or develop after the event that ultimately led to death. The differentiation between these two possibilities is the key to correct diagnosis and interpretation. Although CT scan is considered the best imaging method to rule out cervical skeletal abnormalities or injuries, it lacks sensitivity to diagnose soft tissue pathology. Injuries to spinal cord parenchyma, such as bleeding, may be identified on CT imaging when large enough, but due to the small size and naturally and technically occurring artifacts, evaluation of the parenchyma, nerves, and ganglia is limited. Furthermore, in contrast to the cerebral region, radiographic separation of subarachnoid, subdural, and epidural spaces in the cervical region by CT is very difficult. The standard assessment of the cervical spinal cord including cervicomedullary junction is challenging due to visualization and removal difficulties and the possibility of adding artifact during the removal process. Maintaining the anatomic relation of the spinal cord, nerve roots, and vascular supply with the surrounding osteocartlaginous structures provides more precise assessment of the individual elements with connections and surrounding spaces that aid in the pathophysiologic interpretation of the findings. Specifically, if the subarachnoid, subdural, and epidural spaces remain in place, the intraspinal vertebral artery as well as the points of entry and exit can be examined and the nerve roots and root ganglia can be followed.

Cases included non-sequential infants and young children who had an autopsy at the Office of the Chief Medical Examiner (OCME) in Baltimore, Maryland. The cervical spines and surrounding tissues were removed *en bloc* from the occipital base to the upper thoracic spine following previously described dissection techniques. After decalcification and horizontal serial sectioning, the tissue blocks were processed and whole mount sections at all levels were obtained and stained with Hematoxylin-Eosin (H&E) and additional special stains, if needed, included immunohistochemical stain with beta-Amyloid Protein (APP). Postmortem CT scans obtained at the OCME were blindly evaluated by two separate radiologists and a forensic pathologist with radiologic training. The results of the CT and pathologic evaluation of the neck in a group of children less than four years of age will be presented.

Cervical Cord, Infants and Toddlers, CT and Histologic Examination

 ** Presenting Author*