



Pathology & Biology Section – 2008

G45 What Lies Beneath: An Unusual Congenital Anomaly in an Assault Victim

Kathryn H. Haden-Pinneri, MD, Jason M. Wiersema, PhD, and Jennifer*

C. Love, PhD, Harris County, Medical Examiner's Office, 1885 Old Spanish Trail, Houston, TX 77054-2098

This goal of this presentation is to describe an unusual and unexpected cervical vertebrae anomaly in a victim of assault and discuss its significance in the setting of a homicide.

This presentation will impact the forensic community by reviewing the importance of a posterior neck dissection in blunt trauma victims and by illustrating the importance of on-site forensic anthropology services.

A 22-year-old black male was physically assaulted by another male after an incident on a roadway. The victim became unresponsive immediately after the assault in which he was struck multiple times on the head and torso by the suspect's fists. No other weapon was utilized and the fight was witnessed. The incident lasted only a few minutes and the suspect left the scene, unaware that his victim had collapsed. Emergency personnel responded to the scene within minutes and despite aggressive cardiopulmonary resuscitative measures, the victim was pronounced dead at the hospital shortly after arrival.

The victim was obese, weighing 309 pounds with a body length of 71 inches (body mass index of 43.1). External examination revealed a few facial and extremity abrasions and contusions. Internal examination revealed a 3½ inch subscalpular hemorrhage over the left parietal bone and no other traumatic injuries, specifically, no subarachnoid hemorrhage. Incidentally, the decedent was found to have a urogenital anomaly comprised of fusion of the kidneys which were located in the pelvis. The heart weighed 475 grams and was mildly dilated. The coronary arteries had a normal distribution and no atherosclerosis. A complete back dissection performed to delineate any subcutaneous hemorrhage that may have been obscured by lividity was negative. A posterior neck dissection was performed which revealed focal hemorrhage around the upper cervical spinal cord between the first and second vertebral bodies, which were abnormal due to the presence of lateral foramina at the level of the first vertebral pedicles. Further dissection ensued with the assistance and guidance of our on-site forensic anthropologist.

The first through third cervical vertebrae were completely excised in order to examine and document the course of the vertebral artery. A small amount of adventitial hemorrhage was noted at the level of the second cervical vertebrae; however the artery wall was intact throughout. A small epidural hemorrhage was identified over the posterior aspect of the cervical spinal cord at the level of the first cervical vertebra. The vertebral arteries were removed and submitted for microscopic examination by the pathologist and the forensic anthropologist cleaned and examined the cervical vertebrae.

An atypical bilateral vertebral artery course was observed in the vertebrae. The vertebral arteries passed superiorly through the second vertebral transverse foramina, turned nearly 90 degrees and took a posterior course, doubled back at the level of the first vertebral laminae, then took a second 90 degree turn to pass through the first vertebral transverse foramina and continued superiorly into the cranium. The associated anomalous skeletal characteristics together result in an acutely angled course through which the vertebral arteries pass into the skull.

Microscopic examination of the vertebral arteries revealed fragmentation and degeneration of the elastic laminae, which was confirmed with an elastin stain.

This degeneration is felt to be a 'wear-and-tear' type phenomenon due to the abnormal course of the arteries through the vertebrae. Microscopic sections of the heart revealed myocyte hypertrophy and patchy interstitial fibrosis. Toxicology was negative.

Concomitant renal and cervical vertebrae anomalies are not uncommon and are seen in syndromes such as Klippel-Feil in which there are fused vertebrae and varying kidney abnormalities. The association between the urogenital system and the skeletal system occurs during the early embryonic stages of development. During the 4th and 5th weeks of development, the start of renal development occurs in the cervical region of the embryo and then extends caudally. Any interruption in this stage of development can result in anomalies involving the spine, kidneys and/or scapulae.

The vertebral artery course and microscopic appearance are quite abnormal; however are insufficient to account for the sudden death of this young man. Given the circumstances of the witnessed collapse following the physical altercation, the manner of death was ruled a homicide and the cause of death was determined to be sudden death following physical altercation.

Congenital Anomaly, Vertebral Artery, Cervical Vertebrae