H112 Supra-Inion Depressions in a Pediatric Medical Examiner Sample: Support for a Synergy of Developmental and Biomechanical Etiologies

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The goal of this presentation is to demonstrate the forensic significance of a small cranial anomaly, the supra-inion depression (SI), which has previously been associated with child death in Native American populations of archaeological age. Attendees will be provided with a description of SI morphology, a brief overview of the published literature regarding the anomaly, and the results of a review of crania from 659 medico-legal cases dating from 2005 - 2008 in which the maximum age of the decedent is 6 years. Case studies of crania that contain a supra-inion depression will be discussed.

The impact to the forensic community lies in the dissemination of information regarding this little understood skeletal anomaly, the circumstances in which it develops in children presenting to medical examiner/coroner offices, and the importance of the SI as a symptom of morbidity on autopsy.

Supra-inion depressions, concave features located in or lateral to the sagittal plane of the occipital just superior to inion, have been described occasionally in the bioarchaeological literature. However, the etiology and incidence of these anomalies in the medical examiner setting has not been adequately studied. The discovery of a non-infectious, classically shaped SI in a 17 month old child with TORCH syndrome during postmortem examination at the Harris County Medical Examiner's Office (HCME) in 2008 triggered a photographic review of all previously examined HCME medico-legal child death cases from the first six months of the year 2008 (112, 74 supra-inion regions clearly viewable). Due to the retrospective use of photographs, only the presence/absence of SI, associated infectious bone, sutural fusion, and distortion of the occipital, parietals and frontal were scored. Cause of death was recorded for all cases. Two additional cases from this time period with SI's were identified (3/74 = 4%), a two year old female with a history of cerebral palsy and epileptic seizures whose cause of death is bacterial sepsis, and a two year old male who experienced a delayed hospital death with fever, cause of death pending. The cranium of the female child has a flattened occipital and the vault is unusually tall. No infectious bone reaction is visible in the area of the SI. The cranial shape of the male who spent a week in a hospital bed prior to death is normal in appearance, but the bony margins of the SI appear inflamed. In light of these preliminary results, a retrospective review of 447 cases from the years 2005-2007, as well as physical examination of current cases, are ongoing.

The growth and development of the cranium is affected by a number of genetic/congenital disorders, for example, the various TORCH syndromes, Apert's syndrome, Crouzon's syndrome, and Pfeiffer syndrome. These disorders routinely result in premature synostosis of one or more of the major cranial sutures, causing the cranial bones to compensate in shape. Growth and development of the occipital is a complex process that derives from the fusion of four individual components: the squamous, two lateral components, and a basal component. Although it varies among individuals, fusion of the four components typically begins in the perinatal period and is complete by age six. Premature fusion of any of the major sutures during these ages can disrupt development of the occipital in relation to the four components and the other bones of the skull. The environment experienced by the child from infancy to six years can also impact the final shape of the occipital. Positioning of the infant on the back for long periods of time, especially if exacerbated by lack of movement resulting from developmental delays, can result in plagiocephalic or scaphocephalic abnormalities. Further, the supra-inion area is posteriorly projecting and the skin of the scalp is thin. The opportunity for bone involvement in this area following a skin infection may be increased. Bacterial and fungal infections, or even seborrheic dermatitis (cradle cap), may become severe in the absence of treatment, perhaps explaining the noted association between SI's and infection.

The association between the presence of SI's, syndromic abnormalities, developmental pressure from biomechanical forces, and presence of infection in medical examiner cases suggests that SI's may be an indicator of morbidity. These anomalies should be routinely observed and documented photographically during the pediatric postmortem examination.

Supra - Inion Depressions, Occipital Anomaly, Forensic Anthropology

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