H81 Diagnosis of Anencephaly, a Common Lethal Neural Tube Defect, From Taphonomically Altered Fetal or Neonatal Skeletal Remains

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Attendees will learn about the prevalence and appearance of anencephaly and how it can be overlooked, or even misdiagnosed, in certain recovery contexts. Attendees will be able to implement a robust quantitative osteometric method to determine anencephaly from abandoned fetal or neonatal remains that have been scavenged or otherwise taphonomically altered.

Anencephaly is a relatively common birth defect that universally results in miscarriage or neonatal death. Establishing the cause of death is essential in cases of abandoned newborns, however, the determination of anencephaly from taphonomically altered fetal or neonatal skeletal remains can be difficult when recovery is incomplete due to scavenging animals or other taphonomic variables. A robust osteometric procedure was developed from documented cases of anencephaly which provides a probability statement that will impact the forensic community and/or humanity by assisting in the establishment of differential diagnoses of cause of death in abandoned fetal or neonatal remains.

Anencephaly is defined as the complete absence of a skull vault resulting from a failure of closure in the anterior neuropore. The prevalence of this lethal neural tube defect ranges between 1 in 1000 live births in the U.S. to between 5 to 7 in 1000 live births in some regions of Ireland and Wales. Establishing the cause of death is essential in cases of fetal or neonatal abandonment; however, the forensic anthropology and paleopathology literature displays a deficiency of diagnostic criteria to identify this relatively common defect when various taphonomic processes result in incomplete or altered fetal or newborn remains. Even fetal remains that are completely mummified can lead to initial misdiagnosis of anencephaly (Dupras *et al*., 2002).

Osteometric data was collected from 7 clinically documented anencephalic skeletons curated at the National Museum of Natural History, Smithsonian Institution, and contrasted with normal fetal database standards from Fazekas and Kosa (1978). Comparisons involving the proportions of basi-cranial elements (those most likely to be preserved in recovery contexts) yielded statistically significant differences related to the congenital abnormalities of this condition. Random sampling of the small documented anencephalic collection assisted in the creation of a suite of logistic regression models. These models were then tested on a partially preserved, archaeologically recovered, fetal skeleton that has been demonstrated to possess morphological traits strongly indicative of a profound neural tube defect involving the skull and vertebral column (Dudar, 2002). This archaeological case study was predicted to be anencephalic with a probability of $p>0.99$ with the developed logistic regression model.

This maximum likelihood-based method provides a robust procedure that will generate a probability of anencephaly that will assist in the differential diagnosis of cause of death in forensic contexts from taphonomically altered or scavenged remains.

Fetal Remains, Anencephaly, Cause of Death Diagnosis

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