## H11 Internal Cranial Fractures

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The goal of this presentation is to present the forensic anthropological community with examples of internal cranial fracturing and to emphasize the need to include internal examinations of the cranial bones in the protocol for forensic analysis of perimortem trauma.

This presentation will impact the forensic community and/or humanity by emphasizing the importance of examination of the internal cranial vault in assessing skeletal trauma.

The literature on cranial injuries focuses primarily on those visible on the external surface such as depressed fractures or those that transgress both inner and outer tables such as linear fractures. Experience with recent cases has highlighted the importance of internal examinations even in the absence of external indications of damage.

The anatomy of the skull is that of a sphere with a number of areas of weakness produced by foramina and areas of increased strength produced by buttresses. The outer table of dense bone provides a protective coat that, in many places of the cranial vault, covers a layer of trabecular bone known as diploe. The inner table provides direct protection for the brain and major blood drainage systems associated with the central nervous system.

Bone fracturing occurs when the abilities of bone tissue to withstand exceeds the bone's resilience. Being a combination of organic and inorganic materials, bone is capable of both elastic and plastic deformation prior to failure. Once bone is broken, however, the fracture will be transmitted through the bone until the energy is dissipated. Cranial fractures are usually depicted in the forensic literature as affecting primarily the outer table with secondary ramification on the inner table. In the two cases presented here, the outer table damage was minimal or absent while inner table or internal damage suggested more serious insults.

In the first case, the decomposed remains of an adult male were found in a field. Skeletal analysis for trauma was requested. The remains were cleaned and found to retain evidence of extensive sharp force trauma including multiple stab wounds to the back and lower side and cuts on the cervical vertebrae. External examination of the skull showed little evidence of damage however, internally, two points of impact were evident with extensive incomplete fracturing radiating from these points. Examination under low power magnification showed fine fracturing on the outer table but insufficient to give the impact points as clearly. Information gleaned about the crime suggested the victim was hit twice over the head with a flashlight, and was tortured with a knife before having his throat cut.

Similarly, in a case presented previously, compression fractures in the posterior portion of the supraorbital plates in the remains of an adult female in her mid-fifties suggested compression fracturing. External damage was limited to minor incomplete fracturing in the left lateral portion of the anterior vault and some in the orbits.

These cases suggest that internal examination either by craniotomy or illumination and visual examination are critical for a complete anthropological evaluation. The energy exerted on the outer table may be transmitted through these bones with little damage but passed through to the inner table in such a manner that fracture point is reached. Cranial vault injuries are more complex than is often appreciated and require more detailed analysis.

**Trauma Analysis, Cranial Fractures, Protocol**

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