



## Physical Anthropology Section – 2004

### **H68 Symmetrical Fracturing of the Skull From Self-Inflicted Gunshot Wounds: Reconstructing Individual Death Histories From Skeletonized Human Remains**

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The goal of this presentation is to describe a potentially diagnostic pattern of fractures associated with submandibular shotgun wounds.

This presentation will impact the forensic community and/or humanity by making it possible to diagnose submandibular, mid-line gunshot injuries from cranial fracture patterns, even in cases where the remains are skeletonized and highly fragmented.

The attendee will become familiar with a potentially diagnostic pattern of fractures associated with self-inflicted midline gunshot wounds. The three objectives of this poster is to present two cases in which skeletonized remains were found in association with a shotgun; to describe and display the observed perimortem "suite of fractures" in both cases and discuss the observed bilateral symmetry of those fractures; and to suggest a possibly diagnostic pattern of fractures consistent with self-inflicted midline gunshot wounds.

In the following two cases, skeletonized human remains were recovered from remote areas and submitted to forensic anthropologists. Following identification in each case, the main focus of the anthropological analysis was the skeletal trauma. In both cases, the skull was submitted in a highly fragmented state. Nevertheless, by focusing on the pattern of perimortem cranial fractures, the anthropologists contributed key information regarding the circumstances of death in these cases.

Case 1: In September of 2000, skeletonized human remains were recovered from a wooded area in mid-Michigan by a law enforcement search team. At the scene, a shotgun was found in association with the remains. Anthropological analysis determined that the remains were those of an adult male of European ancestry, and a positive identification was made through comparative radiography. The skull was recovered in a fragmentary state with at least 45 distinguishable fragments present. Most of the skull fragments were recovered making it possible for a complete reconstruction. During the process of charting and photographically documenting the linear fractures displayed by the skull, a bilaterally symmetrical perimortem fracture pattern became apparent.

The "suite of symmetrical fractures" observed in this case are enumerated by aspect as follows. The anterior aspect of the skull displays transverse fractures of the mandible in the chin region, vertical fractures of the mandibular body, Le Fort II fractures of the maxillae, tripod fractures of the zygomatics, and a midline frontal fracture. The lateral aspect of the skull exhibits fractures running along the temporal lines of the frontal, a diastatic fracture of the coronal suture which continues laterally along the parietals, horizontally oriented fractures of the parietal, and vertical fractures of the parietal. The basilar aspect of the skull displays occipital fractures adjacent and posterior to the foramen magnum, a midline fracture of the basi-occiput, as well as fractures of the palate and pterygoid processes of the sphenoid.

Based on this symmetrical pattern, as well as the pattern of mandibular fracturing, and the orientation of beveling on the palate and frontal bones, the trauma was attributed to a submandibular gunshot wound.

Case 2: In January of 2003, hunters discovered skeletonized human remains and an associated shotgun in a wooded area of the western lower peninsula of Michigan. The remains were those of an adult male of European ancestry. A positive identification was made through comparative mitochondrial DNA analysis. The cranium and mandible were recovered in a fragmentary and incomplete state, with only 26 skull fragments present. As a result, it was not possible to reconstruct the cranial vault. Even so, the recovered portions of the skull exhibited a bilaterally symmetrical fracture pattern very similar to the skull in the above case, which lead the authors to believe that this was a case in which either a submandibular or intraoral gunshot wound was the cause of the skeletal trauma.

In both of the above cases, the skulls did not exhibit the classic gunshot entry or exit injuries. They did, however, exhibit important evidence in the form of bilaterally symmetrical fracture patterns. This distinctive pattern is believed to be the result of submandibular or intraoral gunshot wounds in which there is a centralized explosive dispersion of gases. It is known that when these expansive gases enter the restricted space of the cranial vault, the increase in intracranial pressure causes fragmentation and fracturing of the skull. These two cases may illustrate that this type of fracturing does not occur randomly, but rather along predictable planes. The lines of fracture most likely occur in areas that are structurally weaker which crumple under the force of such explosive events. These findings lead the authors to believe that it may be possible to diagnose submandibular or intra-oral mid-line gunshot injuries from cranial fracture patterns, even in cases where the remains are skeletonized and highly fragmented.

**Forensic Anthropology, Shotgun Wounds, Skeletal Trauma**