OSTEOLOGICAL EVALUATION

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Product No. BCM-806

Human Male Skull, Classic Entry-Exit Gunshot Wounds

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Maxwell Museum of Anthropology:

The Maxwell Museum of Anthropology's Laboratory of Human Osteology, at the University of New Mexico, specializes in numerous facets of physical anthropology. The laboratory serves as a repository of human remains and includes prehistoric, historic, documented, and forensic remains.

Established in 1984 by Dr. J. Stanley Rhine, the Maxwell Museum's Documented Skeletal Collection has grown to include 237 individuals (as of July 2005) encompassing both sexes, all ages, and many population groups. The skeletal remains are obtained by donation, either by the individual before death, or by the family of a deceased loved one. Information on the sex, age, population affinity, and cause of death is available for the majority of these individuals, allowing students and visiting researchers to develop and test new techniques and theories.

Since 1995, prospective donors or their families have been asked to provide health and occupational data as well. With this information, researchers are able to examine the skeletal manifestations of particular diseases including degenerative joint and disc diseases, lymphoma, and osteoporosis, as well as the reaction of bone to repetitive motions and trauma. Recent research has included efforts towards the identification of handedness in individuals, determination of body mass from the skeleton, and variation in cranial damage from various projectiles. The importance of the Documented Collection cannot be overstated. No other institution in the American West has as large a collection of human skeletal remains with such extensive demographic data.

Bone Clones is grateful to the Maxwell Museum for allowing us to select specimens for reproduction from their valuable collection and granting us exclusive casting rights to these pieces.

Human Male Skull Classic Entry-Exit Gunshot Wounds

Product Number: **BCM-806**

Specimen Evaluated: **Bone Clones® Cast**

Skeletal Inventory: **1 neurocranium with partial facial bones**

Osteological Observations:

This is the cranium of a modern human male with perimortem fractures caused by a small-caliber gunshot wound. Classic entry and exit wounds are present together with extensive peripheral injuries. The facial bones are fractured off in a near-complete LeFort II (pyramidal) pattern.

Figure 1:

Dentition:

There is no maxilla and therefore no teeth.

Features of Race:

There is insufficient anatomical information from which to estimate race.

Features of Sex:

The cranium is characteristically male. It has pronounced supraorbital ridges, a rounded supraorbital margin, and double frontal bossing. The mastoid processes and suprameatal crest are moderately large, and the external occipital protuberance is clearly defined.

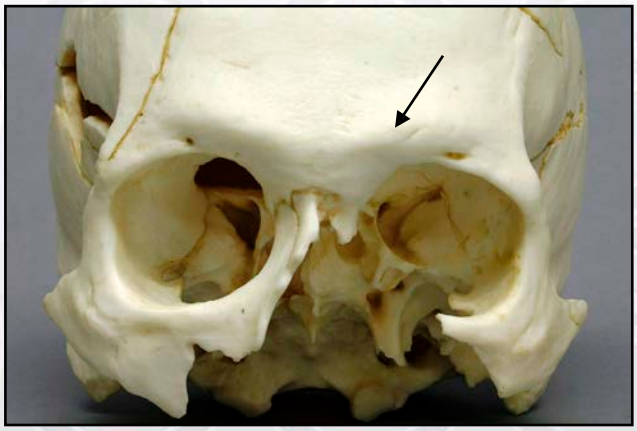
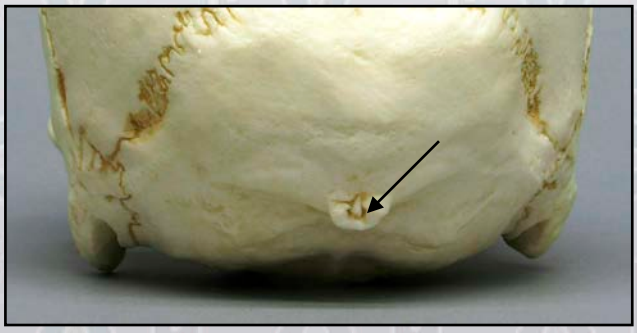


Figure 2: Frontal View of Orbits.

Note the protuberant masculine shape of the supraorbital ridges (arrow). The rounded supraorbital margins and the double frontal bossing can be evaluated by touch when compared with a known female skull.

Figure 3: Posterior View of Occipital

Note the well-defined external occipital protuberance (arrow). It is the attachment site for the medial nuchal ligament and tends to be much more significant in individuals with larger back and neck musculature (usually males).



Features of Age:

This individual is definitely an adult, but there is very little age-related information to rely upon for age estimation. The sagittal suture is partially fused, and the parietal bones have thickened on both sides of the sagittal suture -- both are indications of an age beyond the mid-twenties. There is no indication of advanced age: the cranial sutures are all visible, the temporomandibular joint lacks the changes characteristic of major tooth loss, and the occipital condyles do not appear to have been altered by osteoarthritis. A closer age range cannot be established without more skeletal and/or dental information.

Evidence of Trauma:

This person sustained a gunshot wound to the head near the time of death (perimortem trauma). The entrance is on the right parietal bone near the intersection of the frontal, parietal and temporal. The exit is on the left portion of the frontal. The entrance and exit wounds can be identified by the shape of the wound and the direction of the bevel. Entrance wounds bevel inward. In other words, the diameter of the wound on the outer table of bone is smaller than the diameter of the wound on the inner table of bone. Exit wounds bevel outward and tend to look crater-like (cone-shaped) from the outside of the skull.

The trajectory of the bullet is from right to left and directed upward at approximately 45-degrees from horizontal. The trajectory might be consistent with a self-inflicted wound by a right-handed person.

Primary fractures radiate outward in a starburst pattern from both the entrance and exit wounds. Secondary fractures are created by outward deformation of the cranium as intracranial pressure increases as a result of the energy released by the traveling bullet. The secondary fractures terminate on primary fractures, providing a record of the split-second sequence of events. In this cranium, one primary fracture travels across the entire forehead from right to left. It begins at the entrance wound on the right and ends at the squamous portion of the left temporal. A secondary fracture extends outward from the exit wound and is stopped by the long transverse fracture originating at the entrance wound – simple evidence that the entrance wound preceded the exit wound.

Facial fractures are frequently a consequence of gunshot wounds to the braincase. In this case, the increase in intracranial pressure resulted in a “blowout” of the facial bones. The damage begins with fracture of the thin bones of the cribriform plate of the ethmoid and the posterior wall of the right orbit. It then extends through the nose and separates the bones of the lower face. The soft tissue of the face would have held the bones in place at the time of the wound, but subsequent loss of soft tissue often results in loss of fragile facial bones.

The right zygomatic arch is broken at the suture between the temporal and zygomatic bones. The mechanism of this break is not obvious, but it is probably secondary to the gunshot wound. In other words, it may have been caused by the separation of the lower face or by a blunt force injury, such as a fall after the gunshot wound.

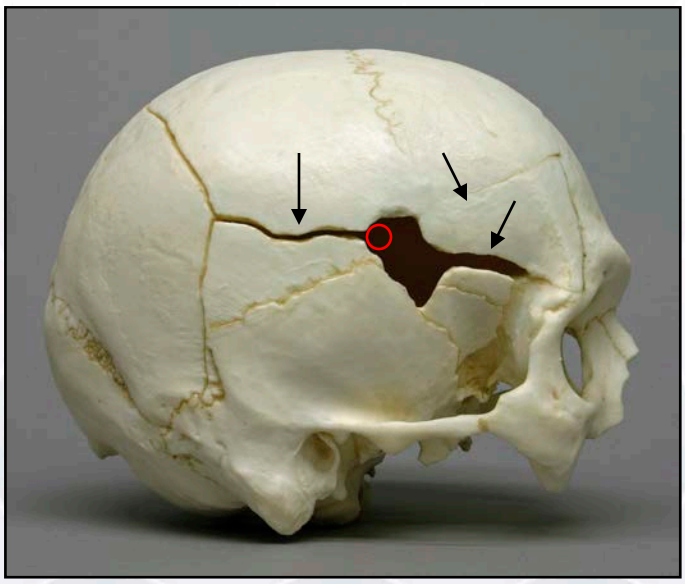


Figure 4: Right Lateral View of Entrance Wound

The actual site of impact is indicated by the red circle. The beveling cannot be seen, but it can be felt on the inside of the skull. Arrows indicate the major radiating fractures. One additional (short) radiating fracture terminates at the squamosal suture. The bone anterior to the impact site is missing.

Figures 5, 6: Left Lateral View of Exit Wound with Close-up

The exit site is identifiable by the sharp external bevel and crater-like shape. One of the small radiating fractures terminates at the long transverse fracture extending from the entrance wound on the right side. (See close-up photo.)

Figure 7: Basilar View of Superior Orbital Break

The facial fractures are a consequence of the cranial damage. As the bullet passed through the brain, it released energy, causing an increase in intracranial pressure. The neurocranium expanded and cracked; the thin bones of the nose and eye orbits broke outwardly, and the face was fractured. (The facial bones may have been further damaged and lost as a result of post-mortem events.)

SUMMARY:

1. Race: Undetermined.
2. Sex: Male.
3. Age: Adult.
4. Trauma: Gunshot wound to the cranium with clear entrance and exit wounds, substantial peripheral damage, and loss of facial bones.

Educational Resources:

1. This is an excellent skull to use for displaying the trauma caused by a close-range, small-caliber gunshot wound. The classic, inwardly-beveled entrance wound can be compared directly with the outwardly-beveled exit wound.
2. Educators may want to use this skull as a launching point for the discussion of projectile trajectory and the relative position of the hand on the gun at the time of discharge. It provides an opportunity to compare evidence of homicide with that of suicide.
3. The anatomist may wish to consider potential damage to the brain and ask whether or not the wound was survivable if facial damage could have been repaired.

4. Another discussion can revolve around the actual cause of death. Was the death due to the gunshot wound itself, or was it due to peripheral damage caused by the bullet's kinetic energy expended within the tissue?

5. This is a good example to use in conjunction with other skulls that have sustained different types of trauma -- either blunt-force or sharp-force. This gunshot wound can be compared with larger caliper wounds or shotgun wounds. It can also be compared with other types of gunshot wounds as well as all manner of instruments, e.g., machetes, surgical tools, motor vehicles, etc. The comparison will serve to clarify evidence left by types of "weapons" in relation to shape, material, and velocity.

References:

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Disclaimers:

This report is meant only as a teaching tool for introductory level students of anatomy, anthropology or forensic sciences who may be using this specimen to learn human and forensic osteology. My opinions are based solely upon the material presented to me and without access to the postcranial skeleton. This is somewhat artificial as in real forensic investigations additional studies would be undertaken prior to the formulation of diagnoses and the production of a report. These studies might include plain film radiography, computed tomography (CT), histology, etc. My opinions regarding race and sex are based solely upon non-metric analyses.

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