

OSTEOLOGICAL EVALUATION

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Product No. BCM-803

**Human Female Skull,
Blunt Force Trauma**



Bone Clones, Inc.

OSTEOLOGICAL REPRODUCTIONS

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Human Female Skull, Blunt Force Trauma (Hit by Truck)

Product Number: BCM-803

Known Information:

This skull is from a Native American female who died when hit by an 18-wheel truck. This information was documented at the time of the individual's death.

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, Female, Blunt Force trauma (hit by truck)

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Specimen Evaluated: Bone Clones® replica

Skeletal Inventory:

- 1 partial cranium
 - calvarium (cut) and skull base
 - much of the anteroinferior facial skeleton is absent
- 1 partial mandible
 - separated into 2 halves
 - coronoid processes intact, condylar processes absent bilaterally

General observations:

Where possible, the molding process has preserved significant details necessary for evaluation. The general shape and configuration of the skull is within normal limits. The ectocranial morphology of the individual cranial bones is within normal limits. The sutural patterns are of expected configuration. There are no sutural bones (Wormian ossicles). The foramina are of expected configuration. Along the anterior endocranial aspect, there is very prominent hyperostosis frontalis interna that extends into the middle cranial fossa on the right.

Dentition:

The maxilla is absent. There are 5 teeth in the mandibular arcade. All teeth have an adult morphology and no deciduous dentition remains. There are no dental restorations or prostheses. There is a moderate degree of attrition.

The following mandibular dentition is present: 3.8 [#17], 3.4 [#21], 4.4 [#28], 4.5 [#29], and 4.8 [#32].

The atraumatic gomphoses of 3.3 [#22], 4.1 [#25], 4.2 [#26], and 4.3 [#27] are empty and are without signs of healing.

The gomphoses of 3.2 [#23] and 3.1 [#24] are fragmented and empty.

The gomphoses of 3.7 [#18], 3.6 [#19], 3.5 [#20], 4.6 [#30], and 4.7 [#31] are absent (healed).

At the root of 4.5 [#29], there is an irregular, moderately well circumscribed bony round abnormality that is fused to the tooth. There is dehiscence of the overlying cortical bone on the buccal surface.

Features of Race:

The interocular distance is not prominently widened. The nasal root is flat. It is not possible to assess the nasal angle, zygomatic bones, nasal aperture, maxilla, the degree of prognathism, or the morphology of the maxillary incisors. There is no post-bregmatic depression. The calvarial sutures are predominantly simple.

It is not possible to determine race.

Features of Sex:

There is no significant prominence of the cranial sites for musculofascial attachment. There is very slight prominence of:

- the temporal lines
- the supraorbital tori
- the masseteric tuberosities of the mandible

There is a narrow ascending mandibular ramus. The nasion is smooth, and the supraorbital margins are blunted. The inferior border of the mandible is rounded.

The totality of features is most in keeping with female sex.

Features of Age:

There are no identifiable fontanelles. The spheno-occipital synchondrosis is fused.

Five ectocranial osteologic landmarks are evaluated for degree of suture closure according to the Meindl and Lovejoy method*.[1] Scores are assigned as follows:

1	--
2	--
3	--
4	--
5	--
6	2
7	2
8	1
9	1
10	1

* As is always the case with casting, there is a tendency towards overscoring.

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The sum of scores for the anterior cranium (landmarks 6 through 10) is 7. This corresponds to an estimated age of 45.5 +/- 8.9 years.

Trauma:

The mid-facial region, maxillae, and zygomatic processes of the frontal bones are absent. The margins of this large facial skeleton defect are irregular and sharp. A vertical fracture in the mandible is through the gomphosis of the left central incisor (3.1 [#24]). The gomphosis of the left lateral incisor (3.2 [#23]) is fragmented. Both right and left condylar processes are fractured at the neck and absent.

The large mid-facial defect with irregular edges and the mandibular fractures are consistent with blunt trauma. [2]

SUMMARY:

1. Not able to determine race.
2. Female.
3. 45.5 +/- 8.9 years (based on very limited assessment of ectocranial suture closure of the anterior cranium only).
 - a. The above age range is based on the data provided by this limited assessment and should not be interpreted as being precise.
4. Blunt trauma of face.
 - a. Absent mid-facial skeleton.
 - b. Paramidline fracture through mandible.
 - c. Absent bilateral mandibular condyles.
5. Hyperostosis frontalis interna, moderate.
6. Bony lesion fused to root of 4.5 [#29] tooth.
 - a. Differential diagnosis includes cementoblastoma and sequelae of a periapical abscess.
 - b. Radiologic and histologic evaluation would be required.

EDUCATIONAL RESOURCES:

1. This is an excellent example of blunt facial trauma. The findings are consistent with the history of being hit by a truck.
2. Evaluation of demographic features can be very difficult if not impossible with fragmentary and/or otherwise badly altered/injured remains. It may be appropriate to discuss these limitations within the context of this case, and to cover other methodologies that could be of investigative utility, including metric analyses.
 - a. Age assessment of skeletal remains is best done in the context of the entire skeleton. Assessment of the degree of suture closure can be used with some degree of success[1]; however, there is tremendous variability in the degree of closure process. Students must be cautioned that statistical data is based on **populations**, and may not necessarily be reflective of reality in an **individual**.
3. Hyperostosis cranii is commonly identified on head computed tomography (CT) scans in the living, and at autopsy. It is a benign condition and not in and of itself associated with subsequent neurologic dysfunction. It may be identified in individuals who had prominent changes in brain size, such as in those who were treated with ventriculoperitoneal shunts (for conditions like hydrocephalus); in these individuals, it can be profound and circumferential.[3]
4. It may be appropriate to use this specimen as a discussion piece for the range of autopsy artifacts that may be present in human remains that have made contact with anatomic and forensic pathologists.
5. This specimen demonstrates a good example of what is most likely a cementoblastoma. This may serve as a good discussion piece for the broad spectrum of benign, low grade and malignant osseous and soft tissue tumors that may involve the jaws and skull. It is important to emphasize that a diagnosis cannot be made without utilization of both radiography and histology.

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REFERENCES:

1. Meindl, R.S. and Lovejoy, C.O. (1985). Ectocranial suture closure: a revised method for the determination of skeletal age at death based on the lateral-anterior sutures. *American Journal of Physical Anthropology*, 68(1): 57-66.
2. Matshes, E. and Lew, E. (2006). Forensic osteology. In *Forensic Pathology: Principles and Practice*, D. Dolinak, E. Matshes, and E. Lew, Editors. San Diego, CA: Elsevier (Academic Press).
3. Wolf, D.A. and Falsetti, A.B. (2001). Hyperostosis cranii ex vacuo in adults: a consequence of brain atrophy from diverse causes. *Journal of Forensic Science*,. 46(2): 370-3.

DISCLAIMERS:

This report is meant only as a teaching tool for introductory level students of the anatomical, anthropology or forensic sciences who might be using this specimen to learn human and forensic osteology. Evaluation of osteologic material is best done with original specimens. My evaluation was based solely upon studies of a Bone Clones® replica. My opinions are based solely upon the material presented to me. 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) studies, histology, etc. My opinions regarding race and sex are based only upon non-metric analyses. Evaluation of cranial suture closure is most accurately assessed endocranially as the sutures are known to close from the endocranial table towards the ectocranium. My opinions regarding this skull were made without access to the postcranial skeleton.

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