

Bone Clones[®]

OSTEOLOGICAL REPRODUCTIONS

12-year-old Human Child Skull BC-135



Osteological Evaluation Report

Prepared by

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Human, Child (11-13 years)

Product Number: BC-135

Specimen Evaluated: Bone Clones® replica

Skeletal Inventory:

- 1 intact cranium
 - cortical bone overlying buccal aspect of left maxilla has been dissected away
- 1 intact mandible
 - cortical bone overlying buccal aspect of left mandible has been dissected away

General observations:

In general, the molding process has preserved significant details necessary for evaluation. The general shape and configuration of the skull is within normal limits. The general morphology of the individual visible cranial bones is within normal limits. Sutural patterns are of expected configuration; however, the lambdoid suture is markedly complex. The posterior and anterior intra-occipital sutures are fused. There is a sutural bone (Wormian ossicle) at the left parietal notch. The foramina are of expected configuration. The skull is atraumatic.

Dentition:

There are 16 teeth in the maxillary arcade and 16 teeth in the mandibular arcade. The following fully erupted teeth are present in the maxillae: 1.6 [#3], 1.4 [#5], 1.2 [#7], 1.1 [#8], 2.1 [#9], 2.2 [#10], 2.4 [#12], and 2.6 [#14].

The following fully erupted teeth are present in the mandible: 3.7 [#18], 3.6 [#19], 7.5 [K], 3.3 [#22], 3.2 [#23], 3.1 [#24], 4.1 [#25], 4.2 [#26], 4.3 [#27], 8.5 [T], 4.6 [#30], and 4.7 [#31].

The following partially erupted teeth are present in the maxillae: 1.7 [#2], 1.5 [#4], 1.3 [#6], 2.3 [#11], 2.5 [#13], and 2.7 [#15].

The following partially erupted teeth are present in the mandible: 3.4 [#21] and 4.4 [#28].

The following unerupted (but exposed) teeth have evidence of calcification (crown formation): 1.8 [#1], 2.8 [#16], 3.8 [#17], and 4.8 [#32].

Tooth 3.5 [#20] (seen under 8.5 [T]), and the developing roots of 4.7 [#31] are only visible after the buccal aspect of the mandibular cortical bone has been removed.

There are no dental restorations or prostheses. There is no significant attrition.

The maxillary incisors are shovel-shaped.

Non-Dental Features of Age:

Fontanelles

The anterior fontanelle is closed. The posterior, sphenoidal (anterolateral) and mastoidal (posterolateral) fontanelles are closed.

The spheno-occipital synchondrosis is open.

The calvarial sutures are all open (there is no evidence of ossification).

SUMMARY:

1. Age

Dental

Likely 11 - 13 years.

Mixed dentition pattern (nearly complete adult dentition).

Roots of 4.7 [#31] are ~2/3's developed.

Non-Dental

Likely less than 16 years.

Spheno-occipital synchondrosis open.

Closure: 10.5 – 16 years[1, 2].

EDUCATIONAL RESOURCES:

1. This is an excellent example of an adolescent's skull.
2. It may be appropriate to discuss the differences between primary and secondary dentition, eruption patterns, and controversies surrounding the timelines that 'typify' those eruption patterns.
3. Age assessment of skeletal remains is best done in the context of the entire skeleton. It is important for educators to emphasize that when limited to the skull, age assessment of subadult remains is best done through a coordinated evaluation of such features as dentition and fontanelle closure, as well as radiographs and/or computed tomography (CT) scans. This is particularly key for studies of tooth development (calcification, eruption). It is important to emphasize that the evaluation of a skull without these methods is artificial and not reflective of actual practice. However, the ability to analyze such remains from the strict perspective of osteology is fundamental, and students must feel comfortable analyzing subadult skulls and skeletons.
4. It is not currently possible to reliably differentiate amongst the major racial groups within subadults.[3]
5. It is not currently possible to reliably differentiate male and female infant and young child skeletal remains.[3]
6. In the evaluation of subadult skulls, particularly when studying 'typical' eruption patterns, students must be cautioned that statistical data is based on **populations**, and may not necessarily be reflective of reality in an **individual**.
7. It may be appropriate to discuss the concept of sutural (Wormian) bones and what role they may play in the forensic evaluation of cranial remains. It is most important that students understand sutural bones are normal variants which may be present with somewhat increased frequency in some racial groups; they must not be misdiagnosed as fractures.
8. This specimen is excellent for all students learning about tooth development and eruption patterns.

REFERENCES:

1. Konie, J. (1964). Comparative value of X-rays of the spheno-occipital synchondrosis and of the wrist for skeletal age assessment. *The Angle Orthodontist*, 34(4): 303-313.
2. Powell, T.V. and Brodie, A.G. (1963). Closure of the Spheno-Occipital Synchondrosis. *Anatomical Record*, 147: 15-23.
3. 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).

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. Evaluation of a child skull for age always involves radiography. Osteologic/odontologic evaluation of age based purely on visible eruption patterns is a useful basic skill, but is artificial and not representative of actual practice. My opinions regarding this skull were made without access to the postcranial skeleton.

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Bone Clones Disclaimer on Ancestry Assessment

The assessment of ancestry from human skeletal remains, particularly the skull, is a component historically included in the creation of a biological profile for forensic purposes. This practice involves the analysis of morphoscopic traits and metric variables that may exhibit population-specific patterns of variation. However, it is important to recognize the significant scientific and ethical limitations of this practice.

Race is not a biologically valid concept. Contemporary biological anthropology holds that race is a social construct with no discrete biological basis. Human variation exists on a continuum, shaped by complex interactions between genetics, environment, and culture—not distinct “racial” categories. Therefore, the identification of “race” or “ancestry” based solely on skeletal features is scientifically problematic and cannot be performed with high accuracy or precision.

Although some morphological traits of the cranium may reflect broad population-level patterns due to shared evolutionary history, these traits do not map neatly onto socially defined racial categories. Furthermore, categories such as “Asian,” “European,” or “African” are socially constructed labels that do not fully capture genetic or phenotypic diversity, and they should not be interpreted as exact or absolute identifiers. As such, ancestry estimation based on skeletal features should not be interpreted as the identification of race, and results should be presented with appropriate caution and clear communication of limitations.

Historically, law enforcement agencies have requested ancestry estimations as part of forensic reports. However, many biological anthropologists today are increasingly hesitant to include this component, as doing so may inadvertently reinforce outdated and harmful typological thinking—the idea that humans can be classified into discrete biological “types” based on physical features. Such typologies have a long and problematic history and are not supported by modern science.

In cases where ancestry estimation is included, it is done with the understanding that it is a probabilistic assessment—not a definitive classification—and it must be contextualized within a broader ethical framework that prioritizes scientific integrity, individual dignity, and the avoidance of reinforcing racial stereotypes.