Bone Clones®

OSTEOLOGICAL REPRODUCTIONS

Human 14 to 16-month-old Child Skeleton
SC-187

Osteological Evaluation Report

Prepared by

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Human Child Skeleton

Product Number: SC-187

Specimen Evaluated: Bone Clones® replica

Skeletal Inventory: 1 intact cranium (see accompanying skull evaluation)
1 intact mandible (see accompanying skull evaluation)
1 complete postcranial skeleton

GENERAL OBSERVATIONS:

In general, the molding process has preserved significant details necessary for evaluation. The remains are totally skeletonized.

OSTEOLOGICAL OBSERVATIONS:

General shape and configuration of the individual bones is within normal limits.

AGE DETERMINATION:

	Left (mm)	Right	Estimated Age
Humerus	100.3	98.63	0.5 to 1.5 years
Radius	80.97	78.15	0.5 to 1.5 years
Ulna	87.3	86.31	0.5 to 1.5 years
Femur	129.06	129.3	0.5 to 1.5 years
Tibia	107.94	109.3	0.5 to 1.5 years
Fibula	101.4	103.4	0.5 to 1.5 years
Ilium	59.65	59.62	0.5 to 1.5 years

SUMMARY:

1. Age

   The estimated age from evaluation of the skull is 12-16 months (see attached BC-187 report).

   The estimated age range from evaluation of the long bones is 0.5 to 1.5 years.

EDUCATIONAL RESOURCES

1. Both the articulated and disarticulated versions of this skeleton are fantastic illustrations of the osteologic anatomy of a young child.

2. Many people are uncomfortable with human subadult osteology because of the apparent complexity of the anatomy. This can be overcome with frequent exposure to a teaching specimen such as this, combined with thoughtful reading of *Developmental Juvenile Osteology* by Scheuer and Black, as well as *Osteology of Infants and Children* by Baker, Dupras and Tocheri.

3. Inexperienced osteologists may confuse elements of the developing human skeleton with those of small animals; it may be appropriate and/or advantageous to make such comparative specimens available for analysis during laboratory sessions, or to make direct comparisons during didactic teaching sessions.

4. It can be most beneficial to the student to have access to radiographs of subadults at various stages of development.

5. Comparison to skeletal elements at various stages of development can be very useful. I suggest KO-340-CSET, SC-183-A, SCM-186-D and SC-226-A.

6. It is not currently possible to reliably differentiate amongst the major racial groups within subadults.[1]

7. It is not currently possible to reliably differentiate male and female infant and young child skeletal remains.[1]

REFERENCES:

1. 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.

Evan Matshes BSc, MD, FRCPC
Consultant Osteologist

Human Child Skull (14-16 months)

Product Number: BC-187

Specimen Evaluated: Bone Clones® replica

Skeletal Inventory: 1 intact cranium
1 intact mandible

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. There is the (nasal) remnant of a partial metopic suture. Remnants of the mendosal suture are at the right and left lateral extents of the occipital bone. The anterior and posterior intra-occipital sutures are open. There is a small sutural bone (Wormian ossicles) along the left limb of the lambdoid suture. The foramina are of expected configuration. The skull is atraumatic.

Dentition:

There are 11 teeth in the maxillary arcade and 9 teeth in the mandibular arcade. All teeth have a deciduous morphology; there are no adult teeth. There are no dental restorations or prostheses. There is no significant attrition.

The following fully erupted teeth are present in the maxillae: 5.2 [D], 6.1 [F], 6.2 [G], 6.4 [I].

The following fully erupted teeth are present in the mandible: 7.4 [L], 7.2 [N], 7.1 [O], 8.1 [P], 8.4 [S].

The following partially erupted teeth are present in the maxillae: 5.5 [A], 5.3 [C], 6.3 [H], 6.5 [J].

The following partially erupted teeth are present in the mandible: 7.3 [M] and 8.2 [Q].

The following unerupted (but very minimally exposed) teeth have evidence of calcification: 1.6 [#3], 2.6 [#14], 7.5 [K], and 8.5 [T].

The following sockets are beginning to form: 3.6 [#19] and 4.6 [#30].

The atraumatic gomphoses of 5.4 [B], 5.1 [E], and 8.3 [R] are empty and are without signs of healing.

Non-Dental Features of Age:

Fontanelles

The anterior fontanelle is open; it is 0.8 cm in the anteroposterior plane, and 1.1 cm in the transverse plane. The posterior and sphenoidal (anterolateral) fontanelles are closed; there is the slight suggestion that the right mastoidal (posterolateral) fontanelle is still open.

The spheno-occipital synchondrosis is open.

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

SUMMARY:

1. Age

Dental

Likely 14 – 16 months.

Non-Dental

Likely 12 – 14 months.

Anterior fontanelle open.
Closure: median 13.8 months[1], range 4 – 26 months.[2]

Posterior fontanelle closed.
Closure: 2 – 3 months.[3]

Sphenoidal (anterolateral) fontanelle closed.
Closure: 2-3 months.[3]

Right mastoidal (posterolateral) fontanelle possibly open.
Closure: 1 year.[3]

Spheno-occipital synchondrosis open.
Closure: 10.5 – 16 years.[4, 5]

Posterior intra-occipital suture open.
Closure: 1 – 3 years.[6]

EDUCATIONAL RESOURCES:

1. This is an excellent example of a young child'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.[7]
5. It is not currently possible to reliably differentiate male and female infant and young child skeletal remains.[7]
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.

REFERENCES:

1. Kiesler, J. and Ricer, R. (2003). The abnormal fontanel. *American Family Physician*, **67**(12): 2547-52.
2. Tunnessen, W.W., Jr. (1990). Persistent open anterior fontanelle. *JAMA*, **264**(18): 2450.
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4. 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.
5. Powell, T.V. and Brodie, A.G. (1963). Closure of the Spheno-Occipital Synchondrosis. *Anatomical Record,* 147: 15-23..
6. Scheuer, L. and Black, S. (2000). *Developmental Juvenile Osteology*. San Diego, CA: Elsevier (Academic Press).
7. 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).

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