OSTEOLOGICAL EVALUATION

Prepared by

EVAN MATSHES BSc, MD

Consultant Osteologist

Product No. SC-092-A

Human Male Asian Articulated Skeleton

Bone Clones, Inc.

OSTEOLOGICAL REPRODUCTIONS

9200 Eton Ave. Chatsworth, CA 91311

Phone: **(818) 709-7991** *or* **(800) 914-0091** *(USA only)*

Email: info@boneclones.com Web: www.boneclones.com

Human, Asian Male

PRODUCT NUMBER: SC-092
SEE ACCOMPANYING SKULL EVALUATION

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.

OSTEOLOGIC OBSERVATIONS:

General shape and configuration of the individual bones is within normal limits. There are no features suggestive of acute/recent or remote trauma. There is slight cortical irregularity of the bilateral distal humeri, bilateral distal femora, and proximal bilateral tibiae. The centra of the third and fourth thoracic vertebrae are fused. There is a somewhat prominent Schmorl's nodule on the superior surface of the twelfth thoracic centrum. The sacrum exhibits an extra sacral vertebra, presenting 6 sacral bodies. This anomaly is part of normal human skeletal variation.

TRAUMA:

All skeletal elements are atraumatic.

SEX DETERMINATION:

Pelvic morphology (male):

The pelvic inlet is somewhat 'heart-shaped'. The innominate bones are somewhat rugged and have prominent sites for musculofascial attachment. The ilium is somewhat prominent in the superoinferior plane (i.e., extends vertically). There are slight bilateral preauricular sulci. The greater sciatic notch is narrow. The subpubic angle is acute. The pubis is not significantly widened. Both innominates have a ventral arc. There is no subpubic concavity. The ischiopubic ramus is thick and its medial aspect is broad and flat. The obturator foramen is large and somewhat ovoid.
The sacrum is tall, narrow, and not prominently curved (in the anteroposterior plane).

The totality of pelvic features is most in keeping with male sex.[1-4]

Femoral head diameter:

The diameter of the femoral head is 45 mm. This is suggestive but not diagnostic of male sex.[5, 6]

Radial head diameter:

The maximum diameter of the radial head is 22 mm. This is suggestive of male sex.[7]

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

AGE DETERMINATION:

Epiphyseal Union:

All of the epiphyseal growth plates are fused. This suggests that the individual was older than 20 years at the time of death.[8]

Albert Method for Evaluation of Vertebral Centra Epiphyseal Union:

The pattern and stage of vertebral centra epiphyseal union are in keeping with an Albert score of 3. This suggests that the individual was in their middle 20's or older.[9]

Todd Pubic Symphysis Scoring System:

Degenerative features on the pubic symphyseal surface are in keeping with Todd phase 9. This suggests that the individual was 45 to 49 years old at the time of death.[10, 11]

Suchey-Brooks Pubic Symphyseal Phase:

Degenerative features on the pubic symphyseal surface are in keeping with a Suchey-Brooks phase V. This suggests that the individual was 45.6 years +/- 10.4 years (95% confidence interval 27 – 66 years) at the time of death.[12]

iScan-Loth Rib Phase Analysis*:

Degenerative features at the sternal end of the right fourth rib are in keeping with iScan-Loth phase 3. This suggests that the individual was 24-28 years old at the time of death.[13-16]

The totality of features is most in keeping with an adult between 35 and 50 years old at the time of death.

DETERMINATION OF STATURE:

Measurements were taken from RIGHT-sided elements.

Humerus	34.6 cm *Estimated height* = 175.9 cm +/- 4.25 cm
Radius	27.7 cm *Estimated height* = 180.1 cm +/- 4.60 cm
Ulna	30.1 cm *Estimated height* = 182.2 cm +/- 4.66 cm
Femur	47.9 cm *Estimated height* = 175.6 cm +/- 3.80 cm
Tibia	41.6 cm *Estimated height* = 180.5 cm +/- 3.27cm
Fibula	40.9 cm *Estimated height* = 178.7 cm +/- 3.24 cm

* Note: Assessment of iScan-Loth rib phase is very difficult if not impossible on cast specimens. Not only is an evaluation of very fine detail necessary (which may not be possible with some casts), but an estimation of bone weight, porosity, friability, etc., is required, and not possible without access to the original specimen.

The totality of data produced by regression equation calculations suggests that the individual stood between 172 cm and 187 cm tall.[10]

SUMMARY:

1. Male.
2. Most likely 35 to 50 years.
3. 172 cm. to 187 cm.
4. No evidence of trauma.
5. Unique identifying features.

   Fusion of T3/T4 bodies

EDUCATIONAL RESOURCES:

1. This is an excellent example of an adult skeleton.
2. Age assessment of skeletal remains is best done in the context of the entire skeleton. Integration of data from a broad set of studies is optimal. Investigators should offer the age range most safely suggested by the totality of studies. Students must be cautioned that statistical data is based on **populations**, and may not necessarily be reflective of reality in an **individual**.
3. Assessment of sex is best done through an evaluation of all available skeletal elements. That said, the pelvis is the most reliably sexually dimorphic element. Many other bones (including, especially, some of the long bones) can be used with some degree of reliability to determine sex. Many resources exist to assist students with such endeavors.[6]

REFERENCES:

1. Phenice, T.W. (1969). A newly developed visual method of sexing the os pubis. *American Journal of Physical Anthropology, 30*(2): pp. 297-301.
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. Bennett, K. (1993). *A Field Guide for Human Skeletal Identification*. 2 ed. Springfield, IL: Charles C. Thomas.
4. Krogman, W. and Iscan, M. (1986). *The Human Skeleton in Forensic Medicine*. 2 ed. Springfield, IL: Charles C. Thomas.
5. Mall, G., et al. (2000). Determination of sex from femora. *Forensic Sci Int, 113*(1-3): pp. 315-21.
6. Bass, W. (1995). *Human Osteology: A Laboratory and Field Manual*. Columbia, MO: Missouri Archeological Society.

7. Berrizbeitia, E.L. (1989). Sex determination with the head of the radius. *J Forensic Sci, 34*(5): pp. 1206-13.
8. Stewart, T. (1970). *Personal Identification in Mass Disasters*. Washington, DC: National Museum of Natural History.
9. Albert, A.M. and Maples, W.R. (1995). Stages of epiphyseal union for thoracic and lumbar vertebral centra as a method of age determination for teenage and young adult skeletons. *J Forensic Sci, 40*(4): pp. 623-33.
10. Ubelaker, D. (1999). *Human Skeletal Remains: Excavation, Analysis, Interpretation*. 3 ed. Washington, DC: Taxacum Press.
11. Buikstra, J. and Ubelaker, D. eds. (1994). *Standards for Data Collection from Human Skeletal Remains: Proceedings of a Seminar at the Field Museum of Natural History Organized by Jonathan Haas*. Arkansas Archeological Survey Research Series No. 44. Fayetteville, AR: Arkansas Archeological Survey.
12. Brooks, S. and Suchey, J. (1990). Skeletal age determination based on the os pubis: a comparison of the Acsadi-Nemeskeri and Suchey-Brooks methods. *Human Evolution, 5*(3): pp. 227-238.
13. Iscan, M.Y., Loth, S.R.and Wright, R.K. (1984). Age estimation from the rib by phase analysis: white males. *J Forensic Sci, 29*(4): pp. 1094-104.
14. Iscan, M.Y., Loth, S.R.and Wright, R.K. (1985). Age estimation from the rib by phase analysis: white females. *J Forensic Sci, 30*(3): pp. 853-63.
15. Iscan, M.Y. and Loth, S.R. (1986). Determination of age from the sternal rib in white males: a test of the phase method. *J Forensic Sci, 31(*1): pp. 122-32.
16. Iscan, M.Y., Loth, S.R. and Wright, R.K. (1987). Racial variation in the sternal extremity of the rib and its effect on age determination. *J Forensic Sci, 32*(2): pp. 452-66.

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
Consultant Osteologist

Human, Male, Typical Asian

Product Number: BC-253
Cross reference SC-092 (complete skeleton)

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 ectocranial morphology of the individual cranial bones is within normal limits. The sutural patterns are of expected configuration. 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. All teeth have an adult morphology and no deciduous dentition remains. The dentition is atraumatic. There are no dental restorations or prostheses. There is severe attrition. There is mild to moderate buccal furcation involvement of the mandibular first molar teeth, and the maxillary first and second molar teeth.

Features of Race:

The interocular distance is broad. The nasal root is depressed and the nasal angle is obtuse. The zygomatic bones are broad. The nasal aperture is narrow superiorly and broader inferiorly. The anterior nasal spine is slightly prominent, and the inferior margin of the nasal aperture is smooth. The maxillary dental arcade has a somewhat rounded-shape. There is mild alveolar prognathism. The maxillary incisors are shovel-shaped. There is no edge-on-edge incisal bite. There is a slight post-bregmatic depression. The calvarial sutures are complex.

The totality of features is most in keeping with those of an Asian individual.

Features of Sex:
There is mild prominence of the cranial sites for musculofascial attachment including especially:

- the nuchal lines
- the external occipital protuberance
- the mastoid processes of the temporal bones
- the temporal lines
- the supraorbital tori
- the masseteric tuberosities of the mandible
- the supramastoidal crest

There is a broad ascending mandibular ramus. The occipital condyles are prominent.

The nasion is smooth, and the supraorbital margins are blunted.

The inferior border of the mandible is somewhat squared.

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

Features of Age:
There are no identifiable fontanelles. The spheno-occipital synchondrosis is fused.

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

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

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

The sum of scores for the cranial vault (landmarks 1 through 7) is 8. This corresponds to an estimated age of 39.4 +/- 9.1 years.

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.

SUMMARY:

1. Asian.
2. Male.
3. 36.6 to 48.5 years of age; range 30.3 to 54.4 years of age.
4. No evidence of trauma.
5. No evidence of significant osteologic variations or pathology.

EDUCATIONAL RESOURCES:

1. This is an excellent example of a skull from an Asian individual.[2]
2. The concept of race assessment is controversial. It may be worthwhile to review the varying schools of thought on this issue. Short summaries from the perspective of the forensic anthropologist[3] and forensic pathologist[2] are readily available.
3. In many circumstances, the skull alone will allow an investigator to correctly determine sex.[4] However, the findings in the skull should never be treated in isolation; rather, they should be incorporated into your 'whole case' database. This database should include information obtained from all other aspects of the case. From an osteologic perspective, this includes (importantly) the bones of the pelvis. In this circumstance, sex assessment was also possible through examination of the post-cranial skeletal elements.
4. 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**. For additional information regarding age estimates for this individual, please refer to the disarticulated skeleton (SC-092).
5. 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. 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. Gill, G. (1998). Craniofacial criteria in the skeletal attribution of race. In *Forensic Osteology: Advances in the Identification of Human Remains*, K. Reichs, Editor. Springfield, IL: Charles C. Thomas.
4. Krogman, W. and Iscan, M. (1986). *The Human Skeleton in Forensic Medicine*. 2 ed. Springfield, IL: Charles C. Thomas.

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 with access to the postcranial skeleton.

Evan Matshes BSc, MD
Consultant Osteologist