“Starchild Skull”
An Osteological Evaluation
Final Report

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The purpose of this study is to document osteological cranio-facial features using objective & scientific measurements. The purpose of the second study was to establish the cranial capacity by volume. I had no knowledge of this specimen nor its history prior to my initial assessment in August 2016.

General observations:

The skull is symmetrical but abnormally shaped with the basic components of a human skull: i.e., a frontal bone, two temporals, two parietals, and an occipital. However, both maxilla and mandible bones are missing and the zygomatic arches are broken.

The skull is atraumatic with no trepanation noted. However, one large irregular shaped square area on the right parietal has been removed by a modern saw tool apparently for past testing (post-mortem). A large area of 109 mm has been removed or broken from the inferior skull completely obliterating the foramen magnum and the occipital condiles. The extensive loss of bone has irreversibly damaged any further examination of this area.

Morphology of this skull is highly aberrant with significant “ballooning” of the cranium noted. Skull thickness is 3.10 mm. There is no evidence of brow ridges. The orbital sockets are unusually shallow measuring a depth of only 0.5 inches. Both parietals are bulged. All sutures present with partial fusion noted. No abnormal widening of the sutures are noted. Atypical fossa in the sagittal suture is noted down to where the foramen magnum should be. Fontanelles are closed. The

occipital region is abnormally flattened. Etiology unknown. Two wormian ossicles are noted. The external occipital protuberance is absent from the center of the occipital bone.

Cranial volume:

Skull measurements were conducted using both straight & elliptical digital calipers. Cranial volume was measured using rice to determine the weight. The weight was then converted from kilograms (kg) to cubit centimeters (cm^3) to determine volume. The density of the rice (753 kg/m^3) was factored in.

Result: Cranial volume[1]: 1640 cm^3. Cranial capacity is outside of normal accepted parameters.

Summary:

Unable to determine age or sex for this study. No teeth or mandible were present with this specimen at the time of examination. No evidence of artificial cradle-boarding is noted. Hydrocephaly should be ruled out based on the following evaluation.

Because of the abnormal bulging of the skull, the most common claim is that the person suffered from hydrocephaly. Cerebral spinal fluid (CSF) is produced in the ventricles which normally drains into the spinal cord. The pathology for hydrocephalus presents if there is a blockage that causes CSF not to drain properly. This will cause a gradual increase of pressure in the brain raising the intracranial pressure. In a baby with hydrocephaly, fluid accumulates inside the cranium which is why it's commonly called 'water on the brain' and the increased pressure causes the soft open sutures to expand forcing the head to enlarge. As a result, this causes the brain to flatten itself against the cranial vault inside the skull causing a "ballooning effect" of the skull.

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[1] Cranial capacity is a measure of the volume of the interior of the cranium (also called the brain-case or skull volume). The most commonly used unit of measure is the cubic centimeter or cc. The volume of the cranium is used as a rough indicator of the size of the brain, although this is not an indicator of the potential intelligence of the organism.

While the Starchild skull does have a ballooning effect, it does not display the typical “roundness” in the occipital region you would expect to see. There is a significant depressed notch at the base of the sagittal suture which is not present in hydrocephaly. Pressure on the brain would not cause two symmetrical twin “bulges” while leaving a distinctive depression where the two parietal bones meet. Hydrocephaly would cause unfused sutures to expand out. The cranial sutures in the Starchild are not separated. The sagittal suture in the Starchild Skull is normal at the time of death. No abnormal widening of the sutures are noted. Thus, the Starchild’s skull shape could not have been caused by internal pressure resulting from hydrocephaly as the sutures would be expanded out abnormally. This specifically rules out hydrocephaly.

When this specimen is compared to known brachycephaly cases, striking similarities in skull shape are notedly apparent. While hydrocephaly can cause malformation of the skull, it does not cause specific deformities in facial features. Juxtaposed, brachycephaly can cause symmetrical distortions of the skull with severe flattening of the back of the skull. Brachycephaly can also cause shallow, almond-shaped eye orbits and a small face all of which is present in the Starchild specimen. These characteristics are inconsistent with hydrocephalus. Two experts on cranio-facial abnormalities, Dr. Patricia Hummel and Dr. Jeffrey A. Fearon, both agree this specimen fits the description of brachycephaly.

Differential diagnosis should include congenital deformations and/or pathology such as Down Syndrome with brachycephaly which cannot be ruled out. The Starchild skull specimen is scientifically consistent with brachycephaly vs hydrocephaly in my opinion.

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* This report is an independent, scientific study of the skull based on my assessment of this specimen from a strict osteological and forensic evaluation.

References

Ali FE, Al-Bustan MA, Al-Busairi WA, Al-Mulla FA, Esbaita 44EY. (2002). Cervical spine abnormalities associated with Down syndrome. Pubmed.

Altintas AG, Gul Aksoy FG, Altintas CS, Midillioglu IK, Duman S. (1999). Evaluation of findings in Crouzon's syndrome. Pubmed.

Dihaj S, Abada A, Baha Ali T, Benhaddou M, Rais L, Hamdani M, Amraoui A, Zaghloul K. (2005). Apert syndrome: a reported observation. Pubmed.

E. H. Aylward, PhD, N. J. Minshew, MD, K. Field, BA, B. F. Sparks, BS and N. Singh, BS. (2002). Effects of age on brain volume and head circumference in autism. Pubmed.

Graham JM Jr, Kreutzman J, Earl D, Halberg A, Samayoa C, Guo, X. (2005). Deformational brachycephaly in supine-sleeping infants. Los Angeles, CA 90048, USA.

Hutchison BL, Hutchison LA, Thompson JM, Mitchell EA. (2004). Quantification of plagiocephaly and brachycephaly in infants using a digital photographic technique. Department of Pediatrics, University of Auckland, New Zealand. Pubmed.

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).

Med-Policy. (2006). Cranial Orthosis. [on line]. Available: www.bluecrosswisconsin.com/provider/medpolicy/policies/OR-PR/cranial_orthosis.html>

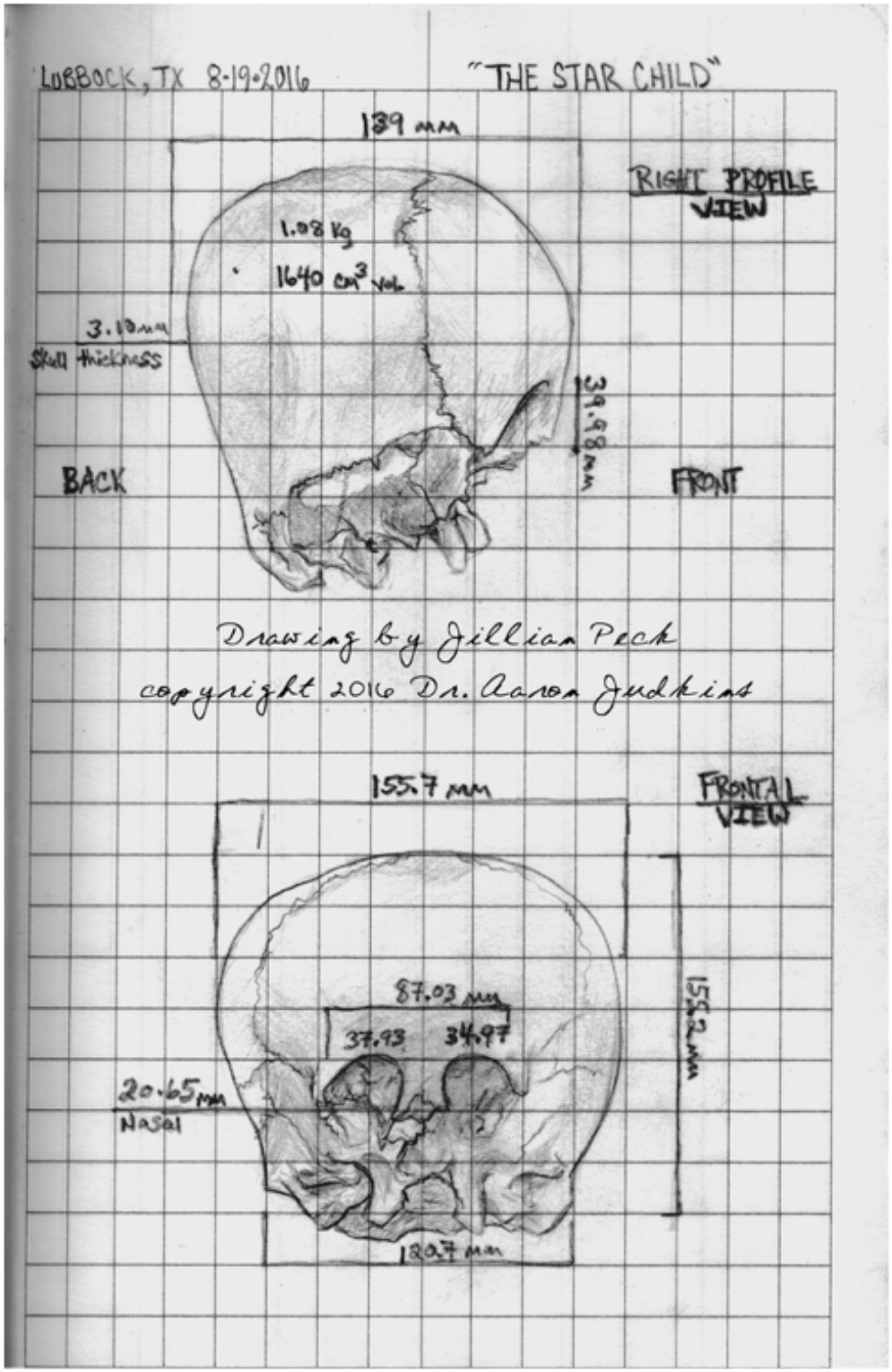
McDonald, W. (1999) Forensic Faces. [on line]. Available: www.alienufoart.com/ForensicFaces.htm>

Plastic and Craniofacial Surgery. (2006). Craniosynostosis. [on line]. Available: www.kidsplastsurg.com/craniosynostosis.html

Venes, D. Thomas, C. Taber, C. (2005). Taber's Cyclopedic Medical Dictionary. The F.A. Davis Company.

www.utmb.edu/otoref/grnds/congenital-abnormal-101122/congen-abnorm-

slides-101122.pdf
Walker, Alan & Shipman, Pat. The Wisdom of the Bones. New York: Knopf, 1996.


LUBBOCK, TX 8-19-2016
"THE STAR CHILD"
139 mm
RIGHT PROFILE VIEW
1.08 kg
1640 cm³ vol.
3.10 mm
Skull thickness
139.98 mm
BACK
FRONT
Drawing by Jillian Peck
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155.7 mm
FRONTAL VIEW
87.03 mm
37.93
34.97
20.65 mm
Nasal
155.72 mm
120.7 mm