

Cranial Injuries in Six Mexican Soldiers Killed at San Jacinto

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The presentation presents baseline information on six crania from the San Jacinto Battleground that are part of the University of Pennsylvania Museum of Archaeology and Anthropology Samuel George Morton Cranial Collection.

The Friends of San Jacinto Battleground sponsored this investigation, with special thanks to Jan DeVault and Jeff Dunn.

As practicing forensic anthropologists, our team works with law enforcement and medical examiners on human identification cases involving either badly decomposed or skeletonized remains. The objectives usually concern establishing positive identification and evaluating evidence that helps determine the cause of death.

Much of this work concerns missing person cases, but it can also extend to mass disasters, such as our work with individuals who died in the Pentagon Plane Crash or the Waco Branch Davidian compound.

We are trained as anatomists and archaeologists, and know how to search for and excavate buried remains. Recovery sites are carefully documented and, in some cases, interpreted to juries as expert witnesses in a court of law.

As research scientists, we apply these same techniques and other methods to the study of human remains dating to the historic and prehistoric periods. Our knowledge begins with training in human anatomy and extensive experience derived from analyzing thousands of human skeletons. As you can read a book, my team can read a bone. The human skeleton can tell you about the life of an individual, not just about their death.

Sometimes our historical research deals with the examination of the remains of soldiers, and has included examinations of remains dating to the Revolutionary War, the War of 1812, and the Civil War.

It has been both fascinating and a privilege to assist with the examination and identification of historic period military remains, including the crew who went down with

the Confederate Civil War submarine *H.L. Hunley* off of Charleston, SC; men from the Union iron clad, the Monitor, and in terms of Texas, Confederate soldiers killed in the Battle of Glorieta Pass near Santa Fe, NM .

This past summer we examined men from the opposing force, Union soldiers killed during the Battle of Val Verde and buried at Fort Craig, NM.

This presentation has a surprising origin, a “who would have thought it issue” – preservation of human remains from the San Jacinto Battlefield.

They have not been lost, but instead carefully maintained as part of an early and irreplaceable anatomical collection that, even today, remains a valuable resource for scientific research.

Samuel George Morton, a medical doctor and member of the Philadelphia Academy of Natural Sciences, assembled this unique collection from 1832 until his death in 1851. Working with worldwide contacts, including anatomists, naturalists, military surgeons, and missionaries, he acquired crania from every occupied continent (Renschler and Monge). This renowned collection of 867 carefully labeled human crania predates other anatomical collections in the United States. Dr. Morton’s archival records and catalog, published in 1849, provide information about recovery context, identity, and the original collector. He assigned consecutive catalog numbers to each cranium recorded on the bone in durable India ink.

The five San Jacinto crania collected by John James Audubon in the spring of 1837 are numbered 555 to 558 and 690, and are also identified by printed labels attached to the frontal bone stating “Mexican Soldier, Slain at San Jacinto. Four of these crania have another label affixed to the side of the cranium. These labels, in conjunction with Morton’s (1849) *Catalog of Skulls* document the location of recovery, estimated age at the time of death, ancestry, unusual pathology, and the collector.

Dr. Morton identified the sixth San Jacinto cranium (No. 689) as “Mexican,” both in ink and with a tag attached to the frontal. An inscribed chain of custody is written across the right side of the cranium: “Charles A. Pearson to Dr. James Cooke, and Dr. Cooke to Samuel Morton.”

Dr. Morton’s concern with documentation makes this collection a valuable resource for scientific research concerned with population variation and secular change in cranial morphology from the early to mid 19th century to the present day.

After Dr. Morton’s death, the collection was donated to the Philadelphia Academy of Sciences. During the mid 1960s, the collection was transferred to the University of

Pennsylvania Museum of Archaeology and Anthropology, where it is carefully maintained and available for research.

For this work, we assembled an experienced Forensic Anthropology Research Team comprised of five members. Four are from the Smithsonian's National Museum of Natural History:

With me were osteologists Karin Bruwelheide and Aleithea Williams, and our Museum's Senior Science Photographer, Chip Clark.

Dr. Richard Jantz, Professor Emeritus of Anthropology at the University of Tennessee, Knoxville, joined us. Dr. Jantz was my dissertation advisor from more than thirty years ago. He specializes in quantitative morphometric variation in craniofacial morphology among human populations.

The UPENN Museum collections staff aided our work with special assistance provided by Dr. Janet Monge, Keeper of the Museum's Physical Anthropology collections.

Objectives of this Study:

We examined each cranium to determine the individual's age, sex, and evidence of dental and bone pathology, including injuries sustained prior to the battle, as well as those that occurred at the time of death.

Our inventory includes observations describing preservation of the remains.

As a military series, I expected most of these men to be young adults. The ages assigned by Dr. Morton present an older profile: two that were 30 years old, three that were 40 years old, and one that was 50 years. Standards for determining age have improved. Dr. Morton's age estimates are too high for some of these men. This series, however, is not comprised of teenagers.

Dr. Jantz measured each cranium using a digitizer that records three-dimensional coordinates of defined landmarks. The resulting measurements quantitatively describe the shape of the cranial vault and face. These data were compared to reference populations, including Mexican Americans, several European groups, American Whites, and several Indian tribes including Guatemalans, Mayans, the Chumash from Southern California, and the Zuni from New Mexico.

The craniofacial morphology of the San Jacinto series is homogeneous with the exception of cranium No. 690. This individual appears to be of unmixed European ancestry. The

closest comparison groups are only those of Old World Europeans (Berg, Zalavar, Norse).

The remaining five individuals show features consistent with an admixed European - Native American origin, as seen in many Mexicans.

As part of our examination, we document bone preservation. In my field, this is recognized as making a taphonomic assessment, which considers postmortem processes that can alter bones.

This series is homogeneous in its preservation and was collected after soft tissue decomposition had occurred. The crania are in exceptionally good condition, and with minor exception, are free of desiccated tissue. They show no indication of sun bleaching, or exfoliation of the outer bone table, which indicates that they were not exposed to weathering for an extended period.

None of these crania show modifications caused by animal scavenging. As forensic scientists, we frequently see damage caused by rodents and carnivores, such as dogs and coyotes. In my West Virginia cases I also see bone destruction caused by bears.

Historic accounts of the Battleground report that cows chewed up nearly all of the human bones. Cattle will eat bone, a condition referred to as osteophagic behavior. Controlled dietary studies link this to an appetite for phosphate caused by phosphorous deficiency. Bone is the most common source of phosphorous a cow is likely to encounter (Schulkin 2001).

Case Files

Ben Milam

Milam was a leading figure in the Texas Revolution. He was a Kentuckian and had served in the War of 1812.

We examined his remains when his monument was being moved in Milam Park in San Antonio.

He is best known for his call for volunteers to storm the city of San Antonio in December 1835 with his impassioned plea:

“Who will go with old Ben Milam into San Antonio.”

He was shot in the head by a Mexican rifleman. Milam was 47 years old.

Photographs

Exit wound in the left parietal

Trauma to the spinal column – Schmorl’s depressions – a common finding in horsemen

Arthritic changes in the knees

SANJACINTO-PENN-690

Photography:

- Frontal, right and left lateral views of the cranium (small perforation in the left frontal)
- Occlusal view of the dentition; fracturing of the maxillary alveolus
- Close-up of edged fracture on the anterior of the right frontal

This is a complete cranium in good condition. Patina, like the others, is brown in color with small amounts of adhering soil.

Writing on the frontal bone presents the Morton and Penn Museum catalog numbers: “690 / L606.”

A label attached to the lower frontal bone states “Mexican Soldier, Slain at San Jacinto.”

Labeling on the right parietal and temporal bone is partially present. The tag remnant reads “...cicatrized saber....wound of thefrontis. Slain at San Jacinto, 1836. J.J. Audubon, Esq.”

Dr. Morton’s catalog record notes a difference from the others, as he identifies ancestry as “Mixed Indian and Spaniard? His assigned an age of 30 years.

This male shows European features. Our age range is 20 to 24 years.

Dentition:

No teeth were lost antemortem and the nine teeth present show little wear and barely any decay.

As you view the photographs of the maxillary dentition, you will note that postmortem tooth loss is extensive, particularly involving the front teeth. Anterior teeth, the incisors, canines and premolars are single rooted, which is why anterior teeth tend to be lost postmortem more frequently. Upper molars tend to have three roots, which provides for a more secure holding in the tooth sockets.

Pathology:

The middle conchae, fragile scroll-like bones in the nasal chamber, are enlarged, likely due to chronic inflammation due to allergies. (He suffered from a “runny nose.”)

Antemortem Trauma:

The right frontal bone has a partially healed, tear-shaped, bladed injury along the temporal line, approximately 19 mm superior to the orbital margin. The defect measures 13 mm in length (anterior-posterior) with a maximum width of 5 mm in its inferior aspect. The weapon depressed the outer table margin inward, penetrating the inner table. On the inner table, the line of penetration measures approximately 7 mm in length.

Perimortem Trauma:

The cranium presents two probable perimortem injuries. The left lower frontal bone has a small perforation with a depressed margin that opens into the frontal sinus. Discoloration of the inwardly depressed margin indicates that it is an old, perimortem injury. This irregular perforation measures 5 mm by 4 mm.

The anterior left and right maxillae have perimortem fracturing of the alveolar bone. The incisors and canines are not present and the facial surfaces of their sockets are damaged with the exception of the right central incisor. The right canine has a fine radiating fracture that extends superiorly for a distance of 9 mm above the damaged socket margin. The septum between the left lateral incisor and canine is partially missing and a small hairline fracture extends superiorly from the damaged incisor alveolus. The lingual surfaces of these tooth sockets show less damage, though the left canine socket does have minor breakage to the lingual margin. The appearance of these combined fractures suggests a blow to the mouth.

SANJACINTO-PENN-555

The No. "555" is written on the frontal bone in India ink. The right parietal has similar but additional information on a label stating "555. Mexican Soldier with three cicatrized gunshot wounds in the right parietal bone."

Photography:

- Frontal view
- Left and right lateral views
- Basilar view showing paracondyloid process on left side
- Occlusal view of the dentition
- Oblique view of healed perforations in the right parietal

The cranium is in good condition. The nasal chamber contains a sandy sediment, as do the external auditory canals and foramina in the base of the cranium. The left and right nasal bones show postmortem fracturing of the distal thirds. A small patch of desiccated tissue, containing a single hair, is adhered to the left temporal squamous.

Dr. Morton assigned an age of about 40 years of age, and, based on the current Age Standards, we agree with an age range of 35 to 42 years.

Dentition:

Five teeth are present in the maxillae. The right first premolar and both the first and second molars are present. The third molars were never present due to congenital absence. The right maxillary first incisor was lost during life and the socket was in the process of remodeling at the time of death. The left first premolar was also lost antemortem and its socket shows more advanced resorption. The right lateral incisor has a beginning periapical abscess. The left first molar has a large cavity in its distal interproximal and occlusal surfaces, which exposed the pulp chamber, leading to an abscess. The represented teeth show moderate alveolar bone resorption from periodontal disease. Dental wear is slight.

Pathology:

No definite perimortem trauma is noted on the cranium. A blow to the mouth may have caused fracturing of the anterior maxillary alveolus.

A large paracondyloid process is present on the left side of the cranial base. It measures 14 mm anterior-posterior by 14 mm transverse with a height of about 10 mm. The inferior surface of the process is flattened with lipping and microporosity from contact with the atlas. During life it articulated with the transverse process of the first cervical vertebra. This is a rare genetic trait.

Antemortem Trauma:

The right parietal has three healed, circular injuries, two with inner table perforations and one that is a small circular depression on the outer table. They appear to have been inflicted simultaneously. The largest defect measures 6.5 mm in diameter and is located in the mid-right parietal, exhibiting a smooth rounded margin. This defect has a rounded, smooth margin.

The second largest, located 11 mm posterior to the lower right coronal suture, has a maximum diameter of 5.3 mm. This defect is beveled and decreases in size towards the inner margin, which measures 3.9 mm superior-inferior by 2.5 mm anterior-posterior. The walls of the defect are smooth and rounded (healed).

The third and smallest indentation is present below the second perforation, immediately posterior to the right inferior coronal suture at the superior temporal line. This man recovered from this injury.

I reviewed UPENN CT images of this cranium to check for the presence of embedded metallic particles from small shot or shrapnel. No radio-opaque articles are identifiable. A future step would be to take plain film radiographs of this cranium (and two others with gunshot wounds), and to scan the bone surfaces for the presence of metals using X ray fluorescence.

Dr. Morton's impression was that these healed perforations were produced by shot. This interpretation still seems valid. They represent relatively low impact damage, as could have been caused by buckshot fired from a shotgun or a buck and ball type load. The lack of penetration suggests low velocity, probably in part due to some distance from the firing weapon. The fractures have remodeled and the man survived.

SANJACINTO-PENN-556

Photography:

- Frontal, left and right lateral views of the cranium
- Posterior view of cranium showing large occipital protuberance – a male feature
- Occlusal view of the dentition
- Close-up of healed blunt force trauma to mid-face

This cranium is complete and in good condition. A desiccated piece of loose brain tissue is present inside the vault.

The cranium is that of a male based on numerous features including an overall robust appearance, moderate development of the brow ridges, and a pronounced nuchal crest and occipital protuberance. The cranium is heavy. The face is relatively flat with lateral flaring of the zygomatic bones. The palate is wide and deep.

An age range of 30 to 34 years is based on features of the dentition and cranium.

The lambdoidal suture has a complicated pattern with multiple ossicles near lambda.

Dentition:

Seven maxillary teeth are present in their sockets, including: the left and right first, second, and third molars, and the right second premolar. All other teeth were lost postmortem. Both first premolars have fragments of tooth roots in the sockets. No carious lesions or abscesses are present and only trace tooth wear is noted. Calculus deposits are slight.

Pathology:

The facial bones display healed crushing trauma from a single blow to the mid-face. A large area of depressed, fractured frontal, nasals, and maxillae defines this injury. The total affected area measures 60 mm transverse (across the frontal, essentially superior mid-orbit to mid-orbit), by 55 mm superior-inferior. The latter dimension extends from a point superior to glabella inferiorly to a fracture line that crosses the frontal process of the right maxilla halfway through the nasal opening. The right frontal process and right nasal are depressed inward. Both nasals were fractured slightly above their midpoint and their distal halves are missing. The vertical plate of the ethmoid deviates toward the right side as a result of the blow. The frontal process of the left maxilla was also fractured, with left side deviation of its most superior end. This injury was produced by blunt force trauma. The nose and midface were severely damaged. Breathing through the nasal chamber was significantly impaired.

SANJACINTO-PENN-557

Written on the frontal bone is the following: "MEXICAN SOLDIER, Slain at San Jacinto, / L606/ 557". Writing on the left parietal includes, "557. Mexican Soldier / L336. A rifle ball entered....and passed out of the left parietal (only partially legible).

The cranium of this male, aged 30 to 34 years, is complete and in good condition. A paper tag with provenience information is on the frontal and left parietal bones. A small caliber bullet entered the left inferior occipital with the exit in the superior left parietal adjacent to the coronal suture.

The cranium appears polished from cleaning and handling. No desiccated tissue is present.

Dentition:

The dentition is represented by the right maxillary second and third molars in their sockets and the tooth roots of the left first and second molars. The crowns of these teeth were broken off postmortem. The right maxillary second molar has a large occlusal carious lesion and the third molar has a smaller mesial-occlusal cavity. No abscesses are present.

Pathology:

Widespread ectocranial porosis is present on the frontal, parietal, and occipital bones.

The facial bones have a diagonally oriented, well-healed, blade injury. Abnormal bone development and displacement with a linear crease were caused by a blade injury that transected obliquely through the superior right nasal bone (near nasion) and the right maxilla immediately anterior and below the inferior orbital rim. The blade cut through facial tissue into the bone of the right mid-face to a depth of 2.5 mm. The length of the cut, as measured from nasion to the most inferior edge on the right maxilla, is 48 mm.

A gun shot entrance wound is present in the inferior left nuchal region of the occipital bone. The projectile entered posteriorly and slightly superior to a line half way between the foramen magnum and mastoid process (slight posterior displacement). The entrance wound is circular with a diameter of 9 mm. Three fine radiating fractures originate at the margin. Two are located on the anterior-inferior edge of the defect. The longest has a length of 7 mm. The other hairline crack is located on the superior-medial edge of the entrance defect and has a length of 4 mm. The projectile traveled upward and anteriorly and exited the left superior parietal at the coronal suture. The exit has external beveling and a larger opening as compared to the entrance. The actual opening is oval-shaped and measures 15 mm by 11 mm. The total area affected by beveling measures 30 mm transverse by 22 mm anterior-posterior. There are no radiating fractures from the exit wound. The projectile entrance and exit wounds in this cranium are small and were produced by a small caliber bullet (the opening could be attributed to a buckshot penetration from a shotgun or buck and ball type load. In consultation with several of you, and considering the angle of penetration, I lean more toward something like a small

caliber “Kentucky” rifle or non-military type firearm carried by a volunteer or as a personal sidearm.)

SANJACINTO-PENN-558

This is a complete, well-preserved cranium of a man aged 27 to 34 years. These facial features reflect Native American and European admixture.

Photography:

- Frontal, and left and right lateral views of the cranium
- Gunshot entrance wound at pterion (lower left frontal and adjacent sphenoid) with blowout fracturing of the lateral left orbit; close up frontal view of the orbit
- Projectile exit at right asterion
- Bullet pathway through the cranium travelling posteriorly from left to right

Dentition:

All maxillary teeth were lost postmortem, but the broken tooth root of the right first molar remains in its socket. No abscesses are noted. The facial surface alveolar bone of most of the anterior dentition shows postmortem breakage.

Pathology:

A large projectile entrance wound is located on the left inferior frontal bone and adjacent greater wing of the sphenoid. The roughly circular opening has a superior-inferior measurement of 23 mm by approximately 17 mm anterior-posterior. The projectile entered the cranium immediately behind the frontal process of the zygomatic bone at the level of the fronto-zygomatic suture. The superior-lateral orbital plate was blown out and has internal beveling into the eye orbit. The projectile traveled posteriorly from left to right and downward, exiting at right asterion. A somewhat irregular radiating fracture extends from the entrance wound along its inferior-posterior aspect, coursing posteriorly across the lower temporal squamous and supramastoid region, terminating at the lower temporo-lambdoidal suture. This undulating fracture line has a length of approximately 83 mm.

The exit wound is located at right asterion and involves the occipital and adjacent posterior-inferior right parietal along the lambdoidal suture. This large opening, measuring approximately 25 mm in diameter, has pronounced external beveling. No radiating fractures extend from the exit wound. The size of the projectile entrance and exit wounds seems consistent with a large caliber ball.

SANJACINTO-PENN-689

This male, aged 24 to 28 years, is represented by a complete cranium in good condition. The frontal bone is labeled "L606", along with the Morton number "689". A paper label affixed to the frontal states "MEXICAN." The right parietal and lower frontal bones are inscribed with the following script in India ink: "Mexican Skull from the Battle Ground of San Jacinto. Presented to Doc. James Cooke by Chal A. Pearson / # / Presented to Dr. J. Morton Philad by James Cooke MD of Fredericksburg VA." The museum record lists the collector as W.M. Blackford, Esq. According to Jeff Dunn (copy of email correspondence dated 1/29/09), Dr. Cooke "was the brother of William G. Cooke who fought at San Jacinto."

Photography:

- Frontal view
- Left and right lateral views
- Occlusal view of the dentition
- Posterior view of the two blade injuries in the posterior vault
- Close-up views of each blade injury
- Close-up of anterior alveolar bone breakage

The cranium is yellowish-grey to brown in color and is free of desiccated tissue. The left medial orbital plate has been broken out postmortem. Two small drill holes, former mounting perforations, are present in the left and right mid-parietals immediately superior to the squamosal suture.

The dentition is represented by first maxillary molars. All other teeth have been lost postmortem. The third molar sockets indicate that the roots of these teeth were fully developed.

The posterior vault has two sharp-bladed injuries: one caused by a tomahawk-like weapon and the other caused by a sabre. One strike was an upwardly directed oblique impact that cut into and removed an oval-shaped slice of outer table and diploë, beginning slightly below lambda in the occipital and progressing into both parietals. The blade cut to a depth of approximately 4.5 mm, but did not slice through the inner table. This injury was recorded on the pathology form on the right parietal, however both parietals, and to a lesser degree the occipital, were damaged. The transverse measurement is 52 mm by 21 mm superior-inferior. Imperfections, caused by sharpening the blade, are reflected in striations produced in the cut bone.

A second, parallel, sharp blade impact cut transversely and deeply into the superior occipital, causing avulsion fracturing of the inner table. This cut has a transverse

measurement of 83 mm with a maximum width of 1 mm. Upon impact, the blade twisted slightly, causing uplifting of the superior cut edge. A radiating fracture courses 44 mm anteriorly from the left edge of the cut into the left parietal.

The existence of this small series is highly significant. It informs us of the lives and deaths of these men, taking us in a more direct and intimate way to a few of the men who served in the Mexican army under General Santa Anna and who died at the Battle of San Jacinto.

More can be learned from them.

Today the Morton collection continues to be an important resource for research into human anatomy, paleopathology, and studying secular change and quantitative variation among world populations, including secular change. The questions and methods have changed dramatically, and will continue to evolve contributing toward the resolution of questions not conceived of in Dr. Morton's day, or even today.

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