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CASE REPORT

A Forensic Anthropological Study of Human Remains Attributed to the Apostle James Alphaeus

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ABSTRACT: We present the forensic anthropological study of the relic of the skull of James Alphaeus, which was preserved in the Chapel of the Relics of the Cathedral of Santiago de Compostela (Spain). The remains consist of skull fragments and another few bones, which are in a state of carbonization and highly fragmented. The results show that the remains belong to a mature adult male individual, and the injuries to the skull were probably produced by a cutting blunt instrument such as a sword. These results lead us to doubt the identity of the remains.

KEYWORDS: forensic anthropology, carbonization, sword, James Alphaeus, James the Lesser, relic

Introduction

The author secured permission for the investigation of the remains attributed to James Alphaeus (also called James the Lesser) through a request made to the General Management of Historical and Documentary Heritage of the Ministry of Culture of the Council of Galicia in 1991. The condition of the sacred Relic of the osseous remains required that the investigation take place in the Chapel of Relics of the Cathedral, with the permission of the dean, for only ten days. Removal of the remains from the cathedral environment to carry out complementary examination was not permitted. The study was performed in November 1991.

The religious authorities of the Cathedral of Santiago de Compostela decided to submit this Relic for scientific study to find out what the real contents of the James Alphaeus shrine were. The author proposed the most extensive and profound anthropological study of the case considering these spatial and temporal limits.

Scientific Study of Religious Relics

Modern scientific study of religious relics is not widespread. Searching in various scientific search engines for bibliographic references containing the words "relic AND bone" generates only a dozen relevant articles, and doubts linger in all of these studies about the identity and authenticity of the remains and the restrictions that Church authorities put in place regarding their investigation (Alterauge et al. 2016; Ball 2017; van Strydonck et al. 2009).

No documentation exists of any scientific study of relics in the Santiago de Compostela Cathedral since the end of the nineteenth century, when it was established that human remains found in the crypt might belong to James the Greater (Freijeiro & Pardo 1989).

The identity and/or authenticity of remains is a central aspect of every scientific study of a relic or of historic human remains, but it is almost impossible to turn to genetic studies, which can help establish identity (Martínez-González 2012).

For this reason, the identity and authenticity of an ancient religious relic can only be either excluded (if the required information exists) or estimated. It is possible that the identity of the remains belonging to the saint or relevant historic personage cannot be confirmed.

The Relic of James Alphaeus

Mauricio Burdino (later the Antipope Gregory VIII) brought the head of James Alphaeus, Apostle-Bishop of Jerusalem, from that city in 1108 AD. Doña Urraca (Queen of Castilla y León in the twelfth century) seized the Relic and gave it to Diego Gelmirez, Bishop of Santiago who, as part of a special ritual, deposited it in a gold chest in 1116 AD. In 1322, Archbishop Don Berenguel de Landoria sent the bust that we know today to be carved (Barral 1991). Bishop Diego Gelmírez received the head as a symbol of his own personal

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FIG. 1—*Reliquary bust of James Alphaeus.*

triumph, without doubting its attribution to James the Greater (Xacopedia 2015).

The Bust-Shrine of James Alphaeus is also called *Caput Argenteum*. It is a silver, gilded bust measuring 48.5 × 48.5 × 26 cm. It is the most famous of the shrines of "Tesouro Compostelano" (Figure 1). It contains primarily cephalic osseous remains attributed to James Alphaeus. The work (possibly made in 1322) is attributed to Rodrigo Eans, the silversmith of the cathedral (Barral 1991).

Importantly, in 1921, a fire destroyed various relics of this chapel. Although it seems that the fire did not directly affect this shrine, it is possible that the fire's heat may have indirectly affected the remains due to the metallic composition of the bust.

The Life and Death of James the Lesser

James Alphaeus was one of Jesus' apostles and is called the "brother of Jesus" in the sacred scriptures. James the Lesser occupies ninth place in the four lists of the apostles. Mark gave him the name "lesser" to differentiate him from the other apostle James, who was the son of Zebedee and John's brother. He was probably younger and smaller than James "the Greater." For this reason, James Alphaeus is also known by the name James the Lesser (Hophan 1957). The New Testament also makes repeated allusions to James as "Jesus' brother." As Hophan (1957) states, this presents a problem for understanding the meaning of the description "brother of Jesus" and whether James, brother of the Lord, is the same as the apostle James the Lesser, Alphaeus's son, a dilemma that experts on the scriptures have not yet cleared up.[1]

1. The word "hermanos" has a broader meaning in the ancient and modern language of the East, in some ways equivalent to our term "cousin." It refers not only to strict brotherhood, but also to other degrees of close kinship like nephews, brothers-in-law, and cousins, and even to express an intimate friendship or shared nationality.

According to information recovered by ancient historians of the Catholic Church (Hegessipus), James Alphaeus died in the year 62 AD when he was 92 years old after living an ascetic life.

There are three different versions of his death (martyrdom):

1) According to Hegessipus, James Alphaeus was pushed from the top of the Temple by the Pharisees and then stoned. The same author adds that shortly afterwards, a textile worker (*batanero*) dealt him a blow with his stick and smashed James' head. As a result, a stick or cudgel always appears in representations of James Alphaeus (de Cesarea 2008).
2) In this same text by Eusebio de Cesarea, there is a second version of James Alphaeus's death: he was thrown down and stoned but also, a textile machine worker who was there, "picking up a stick which he used to whip the animals, struck Justo's head and with this happy martyrdom ended his days" (de Cesarea 2008).
3) According to Josefo,[2] Ananías held a judicial council and brought James (Jesus' brother) and others before it, accusing them of violating the law. He was sentenced to be stoned (Barclay 1988).

All versions of the manner of James Alphaeus's death seem to coincide with the fact that he possibly died as a consequence of a traumatic brain injury produced by a stick or a textile worker's cudgel, or as a result of the impact of stones on his head. Each scenario involves blunt, but not sharp, instruments.

The Life and Death of Santiago the Greater

It is also worth highlighting in this historical introduction that James the Greater died at the age of 49, decapitated by Herod Agrippa I, possibly in the year 44. There are references to the death of James the Greater in *Acts of the Apostles* (12, 1–3) and in other texts in which his death by decapitation with a sword is confirmed. This type of death was the customary penalty among Jews condemned for idolatry, a crime of which James the Greater could have been accused (Castellá Ferrer 1610).

Material and Methods

The osseous remains extracted from the Shrine of James Alphaeus are presented in Table 1. It shows many bone fragments in a state of complete carbonization and incomplete

2. *Antigüedades de los Judios*, 20, 9, 1.

TABLE 1—*Identifiable osseous pieces found in the interior of the Shrine of James Alphaeus.*

Nº	Description	Maximum Measurements	Conservation
1	Frontal orbital margin and squama	114 × 59mm	Carbonized
2	Left frontal orbital apophysis	29 × 16 mm	Incomplete calcination
3	Frontal frag. Right frontal squama	26 × 18 mm	Incomplete calcination
4	Frontal frag. Right frontal scale	50 × 26 mm	Incomplete calcination
5	Frontal frag. right frontal scale	19 × 15 mm	Incomplete calcination
6	Frontal frag. left frontal scale	Long max: 66 mm	Carbonized
7	Frontal frag. left frontal scale	Long max:10 mm	Carbonized
8	Spongy frag. and internal table	12 × 3 mm	Incomplete calcination
9	Right parietal frag.	Long max: 71 mm	Carbonized
10	Right frontal frag.	Long max: 90 mm	Carbonized
11	Right parietal frag.	Long max: 54 mm	Carbonized
12	Right parietal frag.	Long max: 98 mm	Carbonized
13	Interparietal triangular frag.	Long max: 51 mm	Carbonized
14	Interparietal frag.	47 × 7 mm	Incomplete calcination
15	Right parietal frag.	Long max: 29 mm	Carbonized
16	Interparietal frag.	48 × 34 mm	Carbonized
17	Right parieto-occipital frag.	83 × 28 mm	Incomplete calcination
18	Left temporal frag.	54 × 33 mm	Carbonized
19	Left temporal frag.	64 × 28 mm	Carbonized
20	Left mastoid frag.	49 × 29 mm	Carbonized
21	Left temporal frag.	21 × 24 mm	Carbonized
22	Upper maxillary frag.	Anch max: 26 mm	Carbonized
23	Left first upper molar (26)	L max: 17.3 mm	Carbonized
24	Low rib fragment	L max: 43 mm	Carbonized
25	Upper rib fragment	L max: 24 mm	Carbonized

calcination with white impregnations, some of which have been reduced to dust.

From a total of 25 identifiable osseous fragments that were selected, we created 6 groups based on relationships of morphological consistency. The fragments were attached using cyanoacrylate. Measurements of the fragments were taken with a Vernier caliper. Conventional anthroposcopy and anthropometry were performed (Brothwell 1987; Reverte Coma 1981, 1991; Rivero de la Calle 1985). Removal of the bones from the cathedral in order to undertake complementary studies (radiological, chemical dating) was not authorized, so we were not able to carry them out.

The methods employed to estimate sex and age were chosen according to the material present in the study and, in all cases, the recommendations established by the Spanish Association of Forensic Anthropology and Odontology (Serrulla 2013).

Results

We explain on one hand the results of the study related to the reconstructive identification and on the other hand, the signs of trauma and taphonomy found.

Information on Reconstructive Identification

Table 2 shows information of anthropological interest.

Information on reconstructive identification is compatible with a skull belonging to a mature, adult male (estimated age range according to the Meindl-Lovejoy method 31–65 years old, median 45.2).

Signs of Trauma Found

In the left frontal zone (pieces 6 and 7), there is an oblique section of diploe with structural deformity in the outer table consistent with a perimortem injury produced by a cutting blunt instrument that may be continuous with the clear border of the section found in pieces 9, 10, and 11 (Figs. 2–4). It is not possible to evaluate the pattern of the associated fracture.

In the interparietal area (posterior sagittal suture area), an oblique section of diploe of about 64 mm in length is observed, with signs of incomplete calcification. It appears to be without signs of osseous regeneration on the edges, and it has an accompanying fracture pattern compatible with an injury produced by a cutting blunt instruments (Figure 3).

TABLE 2—*Information relevant to anthropology. MD: Mesiodistal; MLDBcrn: Mesio-lingual-distal-buccal crown. The scores assigned to estimate the sex are based on the criteria in Ferembach (1980), cited by Krenzer (2006).*

Nº	Description	Information of Interest
1	Frontal orbital margin and scale	Glabella (+1), Orbital margin (+1) and frontal bone inclination (+1). (+1): Male.
6	Frontal frag. left frontal scale	Perimortem injury by cutting blunt instrument
7	Frontal frag. left frontal scale	Perimortem injury by cutting blunt instrument
9	Right parietal frag.	Outer coronal suture: significant closure; internal: complete Straight line of fracture continuous with 10 and 11.
10	Right frontal fragment	Outer coronal suture: significant closure; internal: complete Straight line of fracture continuous with 9 and 11.
11	Right parietal fragment	Open parieto-temporal D suture. (AGE range: 31–65 years) (Meindl-Lovejoy 1985) Straight line of fracture continuous with 9 and 10.
12	Right parietal frag.	Open D parieto-temporal suture.
14	Interparietal frag.	Perimortem injury by cutting blunt instrument Complete closure sagittal suture (S3 and S4) (AGE range: 31–65 years) (Meindl-Lovejoy 1985)
17	Right parieto-occipital frag.	Incipient closure lambdoidal suture (L2 and L3). (AGE range: 31–65 years) (Meindl-Lovejoy 1985)
23	Left upper first molar (26)	Long MD crown 11 mm Diameter MLDBcrn: 11.3 mm Estimated for the second upper molar: Probability: Male:70–73% Female:26–29% (Viciano 2012)

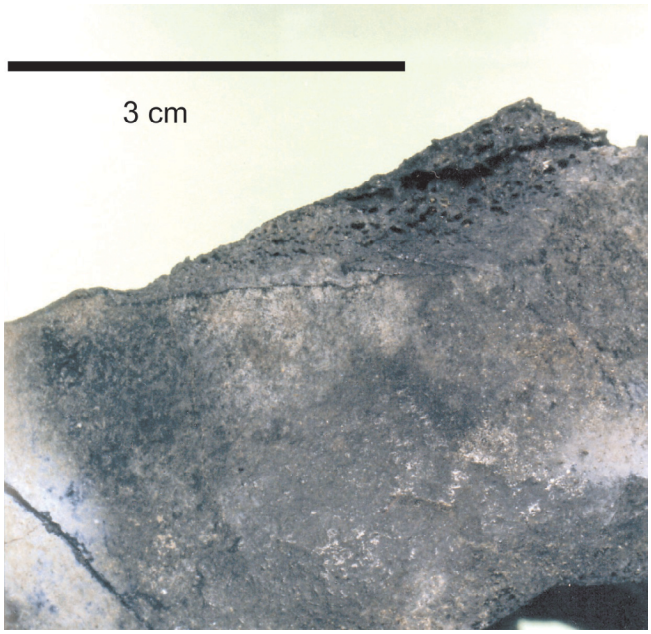

FIG. 2—*Left frontal bone injury by a cutting blunt instrument. Photograph modified through small changes in luminosity, contrast and saturation to allow for observation of the injury in the carbonized bone.*

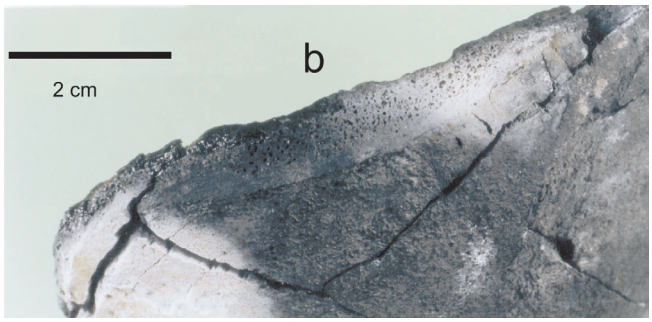

FIG. 3—*Right parietal bone injury produced by cutting blunt instrument. Photograph modified though small changes in luminosity, contrast and saturation to allow for observation of the injury in the carbonized bone.*

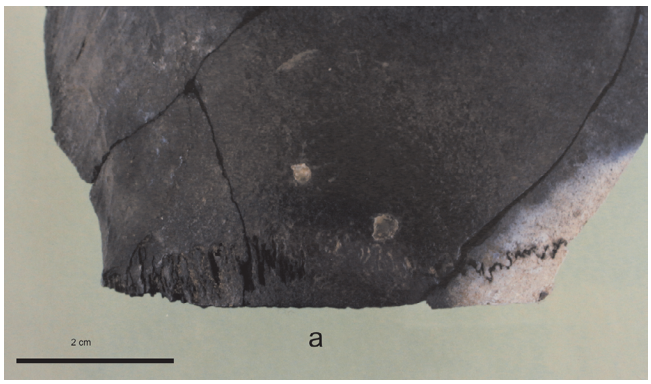

FIG. 4—*Edge of the coronal suture on the right side.*

In the right frontal parietal area, a peculiar alignment of the fragments with the left frontal injury is observed. The fracture margin of this injury through the diploe is distinctly perpendicular. The injury is compatible with a cut produced by a cutting blunt instrument (Fig. 4).

Together the three injuries described above are depicted in Figure 5, which includes guides indicating the location of the injuries in the skull and the frontal and parietal fragments.

Study of Heat Damage

A large part of the frontal bone shows an appearance of incomplete calcination both inside and outside of the skull:

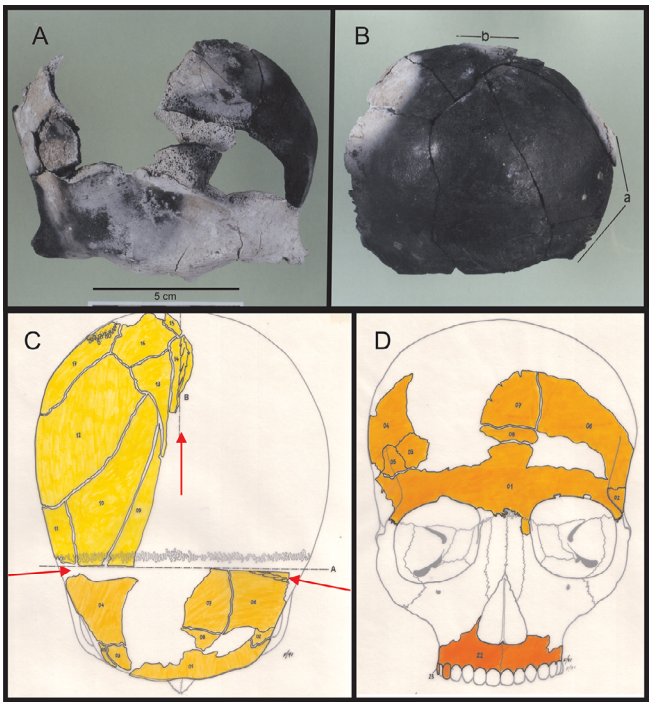

FIG. 5—*Group of frontal bone fragments (ectocranial view); B: Group of right parietal fragments, where the letter "a" indicates the frontal area injury (Figure 4) and the letter "b" the injury described for the interparietal area (Figure 3); C: Graphic representing the view from above of the combinations of frontal and parietal bone fragments, where the letter "A" indicates the cutting blunt frontal injury and the letter "B" the cutting blunt interparietal injury (red arrows). D: Graphic showing the front view of the frontal and upper maxillary bone fragments.*

a white, grayish color with some blackish areas. A small solid impregnation, whitish in color, is evident in the outer table. The fact that the bone has maintained its structure (it is not fragile) with an apparently low degree of moisture is notable.

The parietal fragment, in contrast, shows an intense black matte color due to carbonization on a large part of its surface except in the occipital area. The posterior interparietal border and part of the anterior border with the frontal bone show a grayish, white color of incomplete calcination. As with the frontal fragment, the bone has maintained its structure well and shows a very low degree of moisture.

The other bones (upper jaw, molar, and rib fragments) appear completely carbonized without whitish or grayish areas.

Discussion of Results

Historical Aspects and Circumstances of Death

From an academic point of view, many authors have criticized the so-called "sacred scripture," especially the work of "ancient historians of the Church" who seem to mix legend, literature, and real events in their writings (Martos García 2012). Like other experts (Gunkel 1928), this author asserts for example that some scriptural texts like Genesis are full of legends, as well as a significant portion of the Bible, both the New and Old Testaments. While they are texts of enormous cultural and religious importance, the writings of Hegessippus, Eusebio de Cesarea, and Flavio Josefo do not meet the same scientific and methodological standards in the current historical investigation.

As a result, some facts relevant to this investigation cannot be taken as completely certain, as there could be some information that we employ today as antemortem data about which—in the scope of the forensic sciences—their veracity is usually unquestioned. For instance, it seems logical that errors could exist about the age of death and year of birth of both James Alphaeus and James the Greater. Errors are possible even in the manner of their martyrdom: James the Lesser possibly died from the textile worker's stick, and James the Greater was probably decapitated by Herod.

The entire journey of James the Lesser's head could be even more inaccurate, starting with the burial site (Jerusalem) to its arrival to the hands of Bishop Gelmírez in Compostela in 1116. Many more sources of uncertainty could have emerged during the hundreds of years during which the supposed the head of James the Lesser spent in the cathedral. The cathedral was invaded on many occasions by pirates and thieves and suffered all kinds of attack. In the fourteenth century, the cathedral was transformed into a fortress to protect it from medieval attacks, constructing defensive towers such as the Clock Tower (Torre de Reloj) (García Iglesias 1993).

Biological Profile and Injuries Discovered

The estimation of sex and age in this case is based on very few elements: just three characteristics of the frontal bone were examined to estimate the sex, and little more than a few centimeters of observable cranial sutures for the age. In the case of the sex, the molar was also examined, applying measurement criteria estimated from the second molar (Viciano 2012), with a result favoring the male sex (70–73%). However, in regards to the sex, the features examined (glabella, supraorbital margin, and frontal bone inclination; the three with masculine scores) are characteristics with considerable sexual dimorphism (Walrath et al. 2004). Viciano finds that there is almost a 30% probability that it is not male, so the fact that it was not possible to examine more features implies significant uncertainty; this should be considered.

In relation to age, it should be mentioned that the method used (Meindl & Lovejoy 1985) has been widely criticized for the wide margins of age that it provides for its reliability (Ruendigt et al. 2018). In this case, there is even more

uncertainty, given that it has not been possible to evaluate the complete state of all the sutures of the cranial vault, the base, nor other characteristics of other bones. In any case, it seems reasonable to conclude that the skull is that of a mature adult individual. According to what is known about the individual, the skull may belong to a person more than 35 years old (Robledo et al. 2013).

This biological profile does not allow us to eliminate either James Alphaeus or James the Greater as the person to whom this skull may belong. However, the results obtained from the study seem more compatible with James the Greater than with James Alphaeus.

Few doubts remain about the violent perimortem origin of the injuries and the instrument that caused death, particularly those found in the interparietal and left frontal area. We are looking at lesions likely produced by a cutting blunt instrument such as a sword (Berg 2008). Many authors have characterized the diagnostic aspects of this type of injury well: a distinct section of diploe, an associated fracture pattern, and signs of structural deformity on the edge of the outer table (Aromatario et al. 2016; Kanz & Grosschmidt 2006; Petrone et al. 2018).

The position in which the injuries discovered appear is notable. On one side the parietal, the fracture pattern indicates that the frontal lesion was anterior to the parietal, as the lines of the parietal pattern are not continuous with the frontal bone but instead end on the cut line on the right side of the frontal bone.

On the other hand, the existence of these two strikes on the skull allows us to argue that the case could be related to the so-called "death by three strikes" (Reverte Coma 1981) in which the condemned prisoner suffered first a hit on the side of the head that knocked him unconscious (which in this case corresponds to Injury A in Figure 5C), then a second strike, once the victim is on the ground, that aims to kill with a blow to the back of the head (Injury B in Figure 5C), and finally a third strike, decapitation, to assure the prisoner is dead. In our case there is only evidence of the first two blows, given that it has not been possible to examine the vertebrae of the neck.

Agreements and Disagreements: Are the Remains of James Alphaeus Authentic?

Death by a cutting blunt instrument accords more with the death of James the Greater, who was executed by decapitation in the year 44 AD at the age of 49. We do not have the same evidence to support the hypothesis of James Alphaeus's death, at the age of 92 in the year 62 AD (compatible information), possibly with a worker's stick or by stoning (incompatible information). The results of this study show that the osseous remains discovered in the shrine of James Alphaeus perhaps do not belong to this saint, if we accept as valid the historical information about the manner of his death (martyrdom). They could also belong to the James the Greater.

Since the arrival of James Alphaeus's head to Compostela in 1116, the Church, through Bishop Gelmírez, expressed doubts about whether it belonged to James the Lesser. According to sources, Gelmírez had no doubt that the head belonged to James the Greater. Mauricio Burdino, the bishop of Braga, who brought the head from the Holy Land, stated that the head was that of James the Greater, seemingly to discredit the Compostelan church, which was his rival. The Compostelan church preferred not to question whether they may have had the entire body of James the Greater. For this reason, they attributed it to James the Lesser. When it became known that the Cathedral of Ancona (Italy) also claimed to have the head of James Alphaeus, more doubts emerged.

In contrast to James Alphaeus, scientific studies exist about James the Greater. The historical information relevant to the scientific studies performed on the remains attributed to James the Greater dates to the end of the nineteenth century. A report by three university professors from Santiago de Compostela confirmed that they could belong to the Apostle James; since then, there do not seem to be doubts.

Excavations carried out in the Cathedral of Santiago de Compostela in 1878–79 permitted the location of osseous remains 30 m deep in the greater chapel behind the altar. During the excavation, a Roman mausoleum was found with the inscription of the name of one of the disciples to which the sacred scripture attributes the transport of James the Greater's body from Jerusalem (*Athanasios martyr*) (Freijeiro & Pardo 1989). This incident led Pope Leo XIII to believe that they could be the remains of the apostle. Through Cardinal Payá, he ordered that they be studied by three professors from the Universidad de Santiago (Antonio Casares, Francisco Freire, and Timoteo Sánchez Freire) who reached the following conclusion in an expert ruling made July 20, 1879, in response to three concrete questions that Church representatives posed to them:

1) *The well-known bones belong to three incomplete skeletons of as many individuals, of different development and age: of these, those of the first two passed away between the end of the second and the middle of the third physiological stage of life; while the third skeleton seems also to have been in this third stage.*
2) *It is not possible to state with certainty the age of the bones; but considering the state of their integrity and composition, which is so similar to that of a Celtic skeleton mentioned, they are centuries old.*
3) *Regarding the age, it seems logical that the bones may have belonged to the bodies of the Holy Apostle and his two disciples.*

The current assessment of these conclusions allows us to argue the following:

1) As a result of the age assessment undertaken and considering the life expectancy at the end of the nineteenth century in Galicia, during the last third of the nineteenth century (45 years according to Muñoz Pradas [2005]), the experts did not include the age of James the Greater in any of the three thirds that they discuss. However, we cannot exclude it solely based on the age assessment that we carried out. Nothing is mentioned about the sex of the individuals, which is notable because during that period Physical Anthropology in Spain was only beginning to be established in university environments (Reverte 1991).
2) It is possible that the bones may be ancient not only for the reasons presented, but rather mainly because of the archaeological context in which they were discovered (close to a Roman mausoleum).
3) The phrase in which the remains are arbitrarily attributed to the apostle and his disciples does not seem to have much scientific basis. It may be foolish to attribute the remains to these persons solely because of a hypothetical age compatibility and for the non-specific estimated postmortem interval ("centuries of existence"). Currently no professional would allow an identity estimation based on this information.

Taphonomic Aspects

Regarding the study of the heat damage we should add that in accordance with the experimental studies of bone cremation and other studies, we now understand how bone behaves when it is affected by heat, according to temperature (Devlin & Herrman 2008; Holck 1996; Symes et al. 2015; Walker et al. 2008).

In their studies, these authors show the different changes in coloration that bone undergoes at different temperatures. It is important to consider this in these experimental studies so that the authors do not create the exact conditions in which the examined bones were burned in this case. In the case of the remains attributed to James Alphaeus, the dry bone was stored in a metal container, meaning the bone was affected only by the heat of the oven effect produced by the container, not burned by the oven directly.

Although these conditions were not reproduced in the studies mentioned, in general there seems to be agreement that the carbonization of the bone (black matte color) occurred at around 600°C, while the calcination (gray whitish color) was obtained at 800°C, during a period of at least 30 minutes.

It is also interesting to highlight in this section that two different types of fracture patterns of the skull bone are evident in the few fragments examined:

a) In the right parietal fragment there is a pattern of fracture characteristic of cutting blunt perimortem injuries, with primary and secondary lines of fracture derived from the depletion of energy in the tomb (Pope & Smith 2004; Symes et al. 2015).
b) In the frontal fragment (above the orbits) there are disorganized fractures without a clear pattern and evidence of delamination of the outer table, signs of postmortem injuries produced by heat (Pope & Smith 2004; Symes et al. 2015). Along with the frontal bone injuries compatible with those produced by a cutting blunt instrument, not enough bone was preserved to evaluate its fracture pattern.

As such we can confirm that the parietal and frontal injuries produced by a cutting blunt instrument are clearly perimortem and not the result of the taphonomic effect of heat.

Conclusions

The fragments of bone discovered in the shrine of James Alphaeus possibly belong to a mature adult, male individual older than 35 years of age. The examined remains show signs of perimortem injuries produced by a cutting blunt instrument like a sword. The injury to the frontal bone was produced before the parietal lesion and was possibly the result of an execution, the so-called "death by three strikes" in which the third strike (though not present in this case) was cutting off the head.

The signs of trauma found in the skull bones show signs of decapitation. From this we can deduce two hypotheses, if we accept the martyrdom described by historians of the Catholic Church and scriptures:

1) That the remains do not belong to James Alphaeus.
2) That the skull may belong to James the Greater.

The examined skull is incomplete, very fragmented, and shows significant structural damage caused by heat. It is estimated that it could have been subjected to temperatures between 600 and 800°C.

References

Alterauge A, Becker T, Berndt B, Jackowski C, Losch S. Testing "saintly" authenticity: Investigations on two catacomb saints. *Radiographics* 2016;36(2):573–579.

Aromatario M, Cappelletti S, Bottoni E, Fiore PA, Ciallella C. Weapon identification using antemortem CT with 3D reconstruction, is it always possible?—A report in a case of facial blunt and sharp injuries using an ashtray. *Legal Medicine* 2016;18:1–6.

Ball P. Material witness: Is this holy relic preserved? *Nature Materials* 2017;16(5):503.

Barclay W. *Los hombres del Maestro*. Bilbao: Desclée de Brouwer; 1988.

Barral A. *Busto-relicario de Santiago Alfeo. Rodrigo Eans 1322?* In: *Galicia No Tempo: Monasterio de San Martíno Pinario*. Santiago de Compostela: Xunta de Galicia; 1991.

Berg GE. Probable machete trauma from the Cambodian Killing Fields. In: Kimmerle EH, Baraybar JP, eds. *Skeletal Trauma: Identification of Injuries Resulting from Human Rights Abuse and Armed Conflict*. Boca Raton, FL: CRC Press; 2008: 314–319.

Brothwell DR. *Desenterrando huesos: La excavación, tratamiento y estudio de restos del esqueleto humano*. Mexico City: Fondo de Cultura Económica; 1987.

Castellá Ferrer M. *Historia del apostol de Iesus Christo Sanctiago Zebedeo, patron y capitan general de las Españas*. Madrid: En la oficina de Alonso Martin de Balboa; 1610.

Devlin JB, Herrmann NP. Bone color as an interpretive tool of the depositional history of archaeological cremains. In: Schmidt CW, Symes SA, eds. *The Analysis of Burned Human Remains*. London: Academic Press; 2008:109–128.

de Cesarea E. *Historia Eclesiástica. La formación de la Iglesia desde el siglo I hasta el siglo III.* Barcelona: Editorial Clie; 2008.

Ferembach D, Schwidetzky I & M Stoukal. Recommendations for age and sex diagnoses of skeletons. *Journal of Human Evolution* 1980:9:517–549.

Freijeiro AB, Pardo IMG. Hallazgo en el mausoleo del Apóstol Santiago del título sepulcral griego de su discípulo San Atanasio. *Boletín de la Real Academia de la Historia* 1989;186(2): 209–220.

García Iglesias, XM. *La Catedral de Santiago de Compostela*. A Coruña, Spain: Xuntanza Editorial; 1993.

Gunkel H. *What Remains of the Old Testament: And Other Essays*. New York: George Allen & Unwin; 1928

Holck P. *Cremated Bones: A Medical-Anthropological Study of an Archaeological Material on Cremation Burials*. 2nd ed. Oslo, Norway: Anatomical Institute, University of Oslo; 1996.

Hophan O. *Los Apóstoles*. Barcelona: Editorial Litúrgica Española; 1957.

Kanz F, Grossschmidt K. Head injuries of Roman gladiators. *Forensic Science International* 2006:;160(2–3):207–16.

Krenzer U. *Compendio de Métodos Antropológico Forenses ara la Reconstrucción del Perfil Osteobiológico: Tomo II Métodos para la Determinación del Sexo*. Guatemala: Centro de Análisis Forense y Ciencias Aplicadas; 2006.

López Ferreiro A. *Historia de la Santa A. M. Iglesia de Santiago de Compostela*. Santiago: Impresión y encuadernación del Seminario Conciliar Central; 1898. Tomos III, VI y VII.

Martínez-González LJ, Martínez-Espín E, Álvarez JC, Albardaner F, Rickards O, Martínez-Labarga C, Calafell F, Lorente JA. Surname and Y chromosome in Southern Europe: A case study with Colom/Colombo. *European Journal of Human Genetics* 2012;20(2):211–216.

Martos García AE. El método de la historia de las formas: Hermann Gunkel y las leyendas de la "Biblia". *Tejuelo* 2012;13:48–69.

Meindl RS, Lovejoy CO. Ectocranial suture closure: A revised method for the determination of skeletal age at death based on the lateral-anterior sutures. *American Journal Physical Anthropology* 1985;68(1):57–66.

Muñoz Pradas F. Geografía de la mortalidad española del siglo XIX: Una exploración de sus factores determinantes. *Boletin de la Associación de Geógrafos Españoles* 2005;40:269–310.

Petrone P, Brunetti A, Niola M, Di Lorenzo P, Borrelli L, Buccelli C, Graziano V. To kill or be killed: The coup de grâce for a warrior after multiple sword wounds. *Anthropologischer Anzeiger* 2018;75(4):311–323.

Pope EJ, Smith OC. Identification of traumatic injury in burned cranial bone: An experimental approach. *Journal of Forensic Science* 2004;49(3):431–440.

Reverte Coma JM. *Antropología Médica I*. Madrid: Editorial Rueda; 1981

Reverte Coma JM. *Antropología Forense*. Madrid: Ministerio de Justicia; 1991.

Rivero de la Calle M. *Nociones de Anatomía Humana aplicadas a la Arqueología*. Ciudad de la Habana: Editorial Cientifico-Técnica; 1985.

Robledo MM, Sánchez JA, Fernandez JJ. Estimación de la Edad. In: Serrulla F, coord. *Recomendaciones en Antropología Forense*. Asociación Española de Antropología y Odontología Forense (AEAOF); 2013: 73–81. http://www.aeaof.com/web/blog/recomendaciones-en-antropologia-forense-aeaof-2013.pdf.

Ruengdit S, Prasitwattanaseree S, Mekjaidee K, Sinthubua A, Mahakkanukrauh P. Age estimation approaches using cranial suture closure: A validation study on a Thai population. *Journal of Forensic Legal Medicine*. 2018;53:79–86

Serrulla F, coord. Recomendaciones en Antropología Forense. Asociación Española de Antropología y Odontología Forense (AEAOF); 2013. http://www.aeaof.com/web/blog/recomendaciones-en-antropologia-forense-aeaof-2013.pdf.

Symes SA, Rainwater CW, Chapman EN, Gipson DR, Piper AL. Patterned thermal destruction in a forensic setting. In: Schmidt CW, Symes SA, eds. *The Analysis of Burned Human Remains*. London: Academic Press; 2015:17–59.

van Strydonck M, Ervynck A, Vandenbruaene M, Boudain M. Anthropology and 14C analysis of skeletal remains from relic shrines: An unexpected source of information for medieval archaeology. *Radiocarbon* 2009;51(2):569–577.

Viciano J. Métodos Odontométricos para la Estimación del Sexo en Individuos Adultos y Subadultos [doctoral thesis]. Granada: Universidad de Granada; 2012. https://hera.ugr.es/tesisugr/21453512.pdf. Accessed April 21, 2019).

Walker PL, Miller KWP, Richman R. Time temperature, and oxygen availability: An experimental study of the effects of environmental conditions on the color and organic content of cremated bone. In: Schmidt CW, Symes SA, eds. *The Analysis of Burned Human Remains*. London: Academic Press; 2008:129–135.

Walrath DE, Turner P. Bruzek J. Reliability test of the visual assessment of cranial traits for sex determination. American Journal of Physical Anthropology 2004;125:132–137.

Xacopedia. Santiago el Menor. Ediciones Bolanda. Xunta de Galicia. http://xacopedia.com/Santiago_el_Menor. Created 2015. Accessed April 17, 2019.