AN OSTEOLOGICAL ANALYSIS OF SKELETONS FROM THE ROMAN NECROPOLIS OF *APULUM*, ALBA IULIA, ROMANIA[1]

Introduction

The study of human skeletal remains from the archaeological record has an important part to play in our pursuit of understanding human history. This paper will outline the analysis – preservation, sex assessment, age estimation, non-metric traits and paleopathological investigation – conducted on the four skeletons from the Roman necropolis of *Apulum*.

The area we know today as Transylvania was once part of Dacian territory which became a province of the Roman Empire under the Emperor Trajan, after its conquest in 106 AD. *Apulum* was the largest city in Roman Dacia and became the garrison of the XIII *Gemina* Legion until the withdrawal of Roman governance around 270 AD[2]. Today, the remains of *Apulum* lie beneath the Romanian city of Alba Iulia. The four skeletons in this study come from the 2008 excavations from the necropolis located south of the military camp, on the hill called *Dealul Furcilor* ("The Pitchforks' Hill")[3]. The site has been the focus of many archaeological excavations. Both inhumations and cremations have been discovered at this necropolis and the 2008 excavations uncovered four cremations and twenty-one inhumations[4].

The inhumations uncovered from the 2008 excavations were of two types: the body was placed either within a brick sarcophagus or directly in the ground, only wrapped in a cloth. M9, M11, M17 and M19 were inhumations within sarcophagi made of horizontally stacked bricks. The graves which contained M11 and M19 were the victims of grave-robbers and were discovered scattered inside

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[1] This study is based on the skeletal analysis conducted with the help of fellow colleagues Catherine Moon and Sara Anderson.

[2] Cristian Găzdac, Viorica Suciu, Ágnes Alföldy-Găzdac, *APVLVM*, Cluj-Napoca, Mega, 2009, pp. 1-4.

[3] Radu Ota, *Some Observations On The Latest Archaeological Researches Carried Out In The Roman Necropolis From Apulum (Alba Iulia)-"Dealul Furcilor-Podei"*, in *Ephemeris Napocensis*, XIX, 2009, p. 23; Mihai Gligor, Doru Bogdan, Paula Mazăre, Ştefan Lipot, Gabriel Balteş, *Morminte romane din necropola de pe Dealul Furcilor de la Apulum*, in *Terra Sebus*, II, 2010, p. 117; Florin Ciulavu, *Monede romane imperiale descoperite în necropola de la Alba Iulia – „Dealul Furcilor"*, in *Sargetia*, III, 2012, pp. 151-155.

[4] Gligor *et al.*, *Morminte romane*, p. 118.

and outside of their respective sarcophagi. Lime, which slows the rate of decomposition in buried remains, was discovered in the graves of M9 and M17[5].

Skeletal Analysis

How much survives of the skeleton will affect how much data can be collected, which methods can be employed and what the osteologist can infer from the remains with regard to the biological profile of the individual. Many factors can affect the survival of bone in the archaeological record from mortuary practices used on the body, the burial environment and taphonomic processes. Incomplete archaeological recovery and inappropriate curation practices may also reduce the number of bones present in a collection, thus reducing the amount of knowledge collected[6]. All four skeletons were examined at the "1 Decembrie 1918" University of Alba Iulia; no previous osteological analysis had been conducted on the remains[7]. Once cleaned, the skeletal material was laid out in anatomical position and macroscopically analyzed. The first part of the study involved producing an inventory for each skeleton; documenting whether skeletal elements were present or absent. All of the bones examined were very brittle and highly fragmented. The four skeletons were in varying levels of completeness.

Due to the state of preservation, certain inquiries could not be conducted; for example, stature estimation, which requires complete long bones to be measured and then, the measurement used to calculate an estimated height for the individual. The least complete skeleton was M11, which had <25% of the post-cranial skeleton and skull present. What had survived of the cranium was represented by five fragments; the long bones of the lower legs had fared better than the upper limbs, but they were still highly fragmented. M9 and M19's preservation was partial – between 25-75% of the skeletal elements were present. While M9 had better preservation of the lower limbs (femurs/tibias/fibulas/feet), M19 had better preservation of the upper limbs. M17 was the most complete, with >75% of its skeletal elements present (Figures I, II).

Sex Assessment

The assessment of sex in human skeletal material from archaeological collections is employed so that we may better understand the demography of past populations. If we are to gain a better perception of the historical populace, it is important that our sex assessment is as accurate as it can be[8]. The accuracy of the sex assessment by the osteologist will be influenced by the completeness and

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[5] *Ibidem*, pp. 128-9, 133-4, 136.

[6] Jane E. Buikstra, Douglas H. Ubleaker, *Standards for Data Collection from Human Skeletal Remains*, in *Arkansas Archaeological Survey Series*, 44, 1994, pp. 6-8.

[7] Gligor *et al.*, *Morminte romane*, pp. 117-118.

[8] Buikstra, Ubleaker, *Standards for Data Collection*, pp. 15-16.

preservation of the skeletal sample and the number of methods the data is subjected to[9]. Biological differences between human females and males are highly evident in certain soft tissue areas but, compared to other primate species, sexual dimorphism is limited in the human skeleton.

The biological sex of the four Roman skeletons were assessed using the criteria set out by Jane Buikstra and Douglas Ubleaker[10], who used morphological features of the pelvis and skull. While the entire skeleton should be considered when assessing the sex of an individual, sexual dimorphism is most pronounced in the skull and pelvis[11]. Sexing skeletons that had not reach sexual maturity in life can be more problematic, this is due to differences between sexes in humans do not become apparent until after puberty[12]. Preliminary examination of the size of the bones and epiphyseal fusion on all four skeletons determined that these individuals were adults (>16 years), and a more detailed age estimation was conducted, which shall be discussed in the next section

The pelvis is viewed as the most trustworthy area when assessing sex in skeletal remains due to the obvious reproductive difference between females and males. After the pelvis, the skull is then examined for traits. One could argue that the morphological traits of the skull do not have a sex specific role however, the skull usually fares better in surviving the archaeological record and can still be used to assess sex if the pelvis of the individual has not survived[13]. Post cranial measurements may also be used with sex assessment however, due to the state of preservation of all four skeletons analysis of metric data was not employed to determine sex.

Table 1 summarizes the traits of the pelvis and skull used in the sex assessment. Several traits were unobservable mainly due to the preservation and absence of elements of the pelvis. Ideally a number of traits in both the pelvis and skull would be analysed for sex assessment.

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[9] Richard S. Meindl, C. Owen Lovejoy, Robert P. Mensforth, Lydia Don Carlos, *Accuracy and Direction of Error in the Sexing of the Skeleton: Implications for Paleodemography*, in *American Journal of Physical Anthropology*, 68, 1985, pp. 79-85.

[10] Buikstra, Ubleaker, *Standards for Data Collection*, pp. 16-20.

[11] Simon Mays, *The Archaeology of Human Bones*, 2nd edition, London, Routledge, 2010, pp. 40-43.

[12] F.W. Rösing, M. Graw, B. Marré, S. Ritz-Timme, M.A. Rothschild, K. Rötzscher, A. Schmeling, I. Schröder, G. Geserick, *Recomandations for the Forensic Diagnosis of Sex and Age from Skeletons*, in *HOMO – Journal of Comparative Human Biology*, 58, 2007, 1, pp. 75-89.

[13] Meindl *et al.*, *Accuracy and Direction of Error*, p. 82, D.E. Walrath, P. Turner, J. Bruzek, *Reliability Test of the Visual Assessment of Cranial Traits for Sex Determination*, in *American Journal of Physical Anthropology*, 5, 2004, pp. 132-137.

Only the left *os coxae* of M9 was present and was fragmented into three pieces, the largest of which belonged to the ilium, were one could observe the narrow greater sciatic notch. This was the only trait which could be used from M9's pelvis. A smooth but pronounced nuchal crest could be observed on the occipital fragment from the cranium. It was determined that M9 was a probable male.

Unfortunately, the pelvis for skeleton M11 had not survived, and only a partial fragment of the anterior-superior aspect of the sacrum was present. The fragment of the frontal bone of the skull that was present included part of the left orbit, and while the supra-orbital margin was dull (a male trait), the supra-orbital ridge was gracile in appearance (a female trait). It was concluded that, due to the lack of traits that could be examined in both the pelvis and skull and the two differing traits on the frontal bone fragment, M11 was assessed as indeterminate.

The only trait that could be analysed for M17 from the pelvis was the narrow greater sciatic notch; all other elements on the innominate were absent. On the cranium, M17 displayed a pronounced supra-orbital ridge, dull supra-orbital margins and a robust nuchal crest. A square mental eminence was observed on the mandible. All of the traits described are attributed to males therefore M17's sex was assessed as a male. Like M9 and M17, M19 had a narrow greater sciatic notch and all other elements from the innominate were absent. On the cranium, the only trait that could be observed was the supra-orbital margin, which was dull. On the mandible, the mental eminence was square and gonial flare was present. From these observations it was concluded that M19 was assessed as a male.

There are a few issues that arise about the accuracy of methods used for sex assessment of human skeletal remains. Scrutinies of morphological traits like those used by Jane Buikstra and Douglas Ubleaker[14] are observations and thus, somewhat subjective, so the traits will be viewed differently between observers. Those which are used are often the "ideal" stereotype of a male or female trait, and not all males will have pronounced glabellas just as not all females will have small mastoid processes. The osteologist must also be aware, when using such methods, which populations they were developed on, as the extent of sexual dimorphism will differ between populations.

Age Estimation

Age assessment in skeletal remains involves estimating the individual's age-at-death. While age estimation in juvenile remains uses aspects of skeletal growth and development, one must look to the biological processes of degeneration and remodelling to estimate age-at-death in adult skeletal material. Attrition on the teeth, closure of the sutures on the cranium, morphology of the auricular surface

[14] Buikstra, Ubleaker, *Standards for Data Collection*, p. 16.

and pubic symphysis are all used to estimate individuals' age-at-death and being able to conduct age estimation relies on these elements surviving the archaeological record[15]. However, the rate of skeletal aging and degeneration will vary between individuals and populations. Factors such as lifestyle, environment, diet, activity and pathology of the individual affect the degeneration of the bones being analysed[16].

The preservation of the four skeletons had severe impact on the age estimation that was conducted. Unfortunately for M9 and M11, no age estimation could be concluded from dental attrition, auricular surface or pubic symphysis as the elements which needed to be analysed were not present. There was significant closure of the midlambdoid and lambda sutures on M9 which could possibly indicate an older individual[17]. However, due to their missing elements, all that could be concluded about M9 and M11's age-at-death was that they were adults (>18 years), due to the complete epiphyseal fusion and the size of the bones that had survived. For M17's age estimation tooth attrition was used, as teeth from both M17's maxilla and mandible were present, which gave an estimation of an adult of 35-40 years[18]. Degeneration of the left auricular surface on the pelvis[19] put M19's age range to 45-59 years, while the wear on the teeth gave an estimation of 40-55 years[20]. Taking both age ranges, the final age-at-death for M19 was given as an adult of 40-59 years.

Non-Metric Traits and Ancestry

"Non-metric traits" is a term that has been used to describe any minor morphological variations of skeletal anatomy which can take the form of differently shaped and sized foramina, ossicles, articular facets, crests, processes and other

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[15] C. Owen Lovejoy, *Dental Wear in the Libben Population: Its Functional Pattern and Role in the Determination of Adult Skeletal Age of Death*, in *American Journal of Physical Anthropology*, 68, 1985, p. 47; R.S. Meindl, C.O. Lovejoy, *Ectocranial Suture Closure: A Revised Method for the Determination of Skeletal Age at Death Based on the Lateral- Anterior Sutures*, in *American Journal of Physical Anthropology*, 68, 1985, pp. 57-66; C.O. Lovejoy, R.S. Meindl, T.R. Pryzbeck, R.P. Mensforth, *Chronological Metamorphosis of the Auricular Surface of the Ilium: a New Method for the Determination of Adult Skeletal Age at Death*, in *American Journal of Physical Anthropology*, 68, 1985, 1, pp. 15-28; S. Brooks, J.M. Suchey, *Skeletal Age Determination Based on the Os Pubis: a Comparison of the Acsadi-Nemeskeri and Suchey-Brooks Methods*, in *Human Evolution*, 5, 1990, pp. 227-238.

[16] Mays, *The Archaeology*, pp. 59; Tim D. White, Pieter Arend Folkens, *The Human Bone Manual*, Amsterdam, Elsevier Academic Press, 2005, pp. 363-364.

[17] Meindl, Lovejoy, *Ectocranial Suture Closure*, pp. 59-61.

[18] Lovejoy, *Dental Wear*, pp. 48-53.

[19] Lovejoy *et al.*, *Chronological Metamorphosis*, pp. 15-28.

[20] Lovejoy, *Dental Wear*, pp. 48-53.

elements[21]. Non-merit traits are not normally recorded by measurement but are either noted as being present or absent on the skeleton. These discrete traits are not generally considered to be pathological, that is, if an individual's "normal" function is not impaired and thus should not be considered "abnormal". Non-metric traits may still be observed on fragmented and poorly preserved bone but the researcher may lose signs of any traits if skeletal elements are missing. It is thought that the majority of non-metric variations have a genetic origin hence they have been used to study relationships between human populations. Patterns of relationships between populations obtained from analysis of non-metric traits resemble those obtained from the study of genetic markers as certain non-metric traits can occur in one regional population but not in another[22].

Of the four skeletons examined, the only non-metric trait that was detected was found on the cranial fragments of M9. A total of three wormian bones were observed: one ossicle at the lambda and two lambdoid ossicles (Figure III). These small sutural ossicles are the most commonly found non-metric trait and are found in many populations. They should only be noted if they are a separate ossification and not part of a complicated suture[23]. There has been much discussion and speculation as to what causes wormian bones, and from the literature consulted, it appears there is both a case of genetic predisposition and environment factors. From the elements of the other skeletons which were not pathological or missing, no other non-metric traits were observed, so it is possible that the other skeletons had non-metric traits but, due to the state of their preservation, that data is now lost to us.

Estimating ancestry is usually achieved through examination of the facial bones (zygomatics, nasal aperture, orbits, etc.). The fragmentation of the skulls, with elements of the facial bones either incomplete or absent, meant that no cranial metrics could be attained neither could an ancestry assessment be conducted.

Palaeopathology

The paleopathological analysis of skeletal material offers a wealth of information regarding disease and health in past populations; however, few infectious diseases leave any direct evidence on the skeleton. The majority of

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[21] A.C. Berry, *Factors Affecting the Incidence of Non-Metrical Skeletal Variants*, in *Journal of Anatomy*, 120, 1975, 3, p. 519; Mays, *The Archaeology*, p.153; White, Folkens, *The Human Bone*, pp. 406-410.

[22] Mays, *The Archaeology*, pp. 153, 162-164; T. Hanihara, *Morphological Variation of Major Human Populations Based on Nonmetric Dental Traits*, in *American Journal of Physical Anthropology*, 136, 2008, 2, pp. 169-182.

[23] Buikstra, Ubelaker, *Standards for Data Collection*, pp. 85-86.

skeletal material will show no sign of pathologies that they were afflicted with in life. If evidence of pathological change can be detected on bones it often means the individual was afflicted with the disease for a long period of time, as skeletal response to disease is slow[24]. Bone reaction to disease either leads to an increase or decrease in bone substance, though there may be a mixture of these processes. Due to this limited reaction and the fact that some diseases cause similar changes in skeletal elements, it is difficult to make an absolute diagnosis. All four skeletons were analysed macroscopically for evidence of pathological changes to the bones.

Skeleton M17 displayed pathological changes to the skull which took the form of irregular thickening of the endocranial surface of the frontal and parietal bones (Figure IV). The areas pathologically affected varied in thickness, the right side of the inner table of the frontal bone having the greatest thickness. There was also visible thickening of the occipital bone and new bony growths were observed along the nuchal crest**.** The meningeal grooves on the left parietal bone and the artery groove across the coronal suture were very deep (Figure V). Five lesions in total could be seen on the inner table of the frontal bone, plus two bony growths, the largest measuring 1.2 cm across (Figure IV). The mandible of M17 appeared to be unaffected and no other skeletal elements were affected by pathological change.

The most likely diagnosis of the pathological changes on the inner table of M17's skull is *hyperostosis frontalis interna* (HFI), a condition where there is excess bone growth manifesting on the inner table of the frontal bone which may extend to the temporal, parietal and the occipital bones of the skull. The changes are often bilateral but can also be unilateral. The aetiology and osteogenesis of this condition is unknown. Genetic predisposition, hormonal disturbances, obesity, environmental factors and metabolic diseases have all been listed as possible causes for the disease[25]. Modern medical studies have found that HFI is commonly found in older, postmenopausal women; however, this disease is not exclusive to the female sex[26].

[24] Charlotte A. Roberts, Keith Manchester, *The Archaeology of Disease*, 1st edition, Stroud, Sutton Publishing, 2005, p. 7; Mays, *The Archaeology*, p. 177.

[25] I. Hershkovitz, C. Greenwald, B.M. Rothschild, B. Latimer, O. Dutour, L.M. Jellema, S. Wish-Baratz, *Hyperostosis Frontalis Interna: an Anthropological Perspective*, in *American Journal of Physical Anthropology*, 109, 1999, 3, pp. 303-325; T. Hajdu, E. Fóthi, Z. Bernert, Molnár, G. Lovász, I. Kovári, K. Köhler, A. Marcsik, *Appearance of Hyperostosis Frontalia Interna in Some Osteoarcheological Series from Hungary*, in *Homo: internationale Zeitschrift für die vergleichende Forschung am Menschen*, 60, 2009, 3, pp. 185-205.

[26] Donald J. Ortner, *Identification of Pathological Conditions in Human Skeletal Remains*, 2nd edition, London, Academic Press, 2003, p. 416; H. May, N. Peled, G. Dar, O. Hay, J. Abbas, Y.

Cognitive impairment and psychiatric symptoms can occur in an afflicted individual, which results from compression of the cerebral cortex if the amount of new bone is excessive[27]. Though of considerable antiquity, HFI is rarely recorded in historic populations, though its possible prevalence in the past was higher, as HFI can only be viewed if the skull of an afflicted individual is broken[28]. It is usually detected in modern patients, when an X-ray of the head is conducted.

Paget's disease can also result in the thickening of the bones of the skull. It most commonly affects the skull, sacrum, spine and femora. Prominent meningeal vessel grooves and enlargement of the head due to the skull thickening can occur[29]. However, due to M17's pathological change being limited to the endocranial aspect of the skull and with no involvement of any other bones, *hyperostosis frontalis interna* is the more probable diagnosis.

The left orbital roof of M17 displayed signs of pitting and porosity called *cribra orbitalia*, but there were also signs of slight healing to the affected area. Many palaeopathologists hold that *cribra orbitalia* is caused by anaemia, especially the iron deficiency type; however, recent research by Philip Walker and his colleagues had found that it is more likely to be caused by bleeding beneath the periosteum, lining the eye orbits from a combined deficiency of vitamin B and C[30]. This may be an indication of the individual having limited access to foodstuffs rich in vitamins or it could also result from a decrease of the individual's absorption of nutrients due to an infection[31].

Masharawi, I. Hershkovitz, *Identifying and Classifying Hyperostosis Frontalis Interna via Computerized Tomography*, in *Anatomical Record*, 293, 2010, 12, pp. 2007-2011.

[27] G.I. de Zubicaray, J.B. Chalk, S.E. Rose, J. Semple, G.A. Smith, *Deficits on Self Ordered Tasks Associated with Hyperostosis Frontalis Interna*, in *Journal of Neurology, Neurosurgery, and Psychiatry*, 63, 1997, 3, pp. 309-314.

[28] Petra Rajić Šikanjić, *Analysis of Human Skeletal Remains from Nadin Iron Age Burial Mound*, in *Collegium Antropologicum*, 30, 2006, 4, pp. 795-799; Tony Waldron, *Palaeopathology. Cambridge Manuals in Archaeology*, Cambridge, Cambridge University Press, 2009, pp. 78-79; May *et al.*, *Identifying and Classifying*, pp. 2007.

[29] Roberts, Manchester, *The Archaeology*, pp. 250-251.

[30] Philip L. Walker, Rhonda R. Bathurst, Rebecca Richman, Thor Gjerdrum, Valerie A. Andrushko, *The Causes of Porotic Hyperostosis and Cribra Orbitalia: a Reappraisal of the Iron-Deficiency-Anemia Hypothesis*, in *American Journal of Physical Anthropology*, 139, 2009, pp. 109-120.

[31] *Ibidem*, p. 120.

Bony spurs were identified on the superior-anterior side of the right patella of M9 – the location of the attachment of the quadriceps tendon (Figure VI). These bony projections at the attachment of either a tendon or ligament are known as *enthesophytes* and are regarded as a bony response to stress at the tendon or ligament insertions indicating movement using specific muscles or groups of muscles[32]. Studies have shown that the frequency of *enthesophytes* increases with age. Robert Jurmain's[33] study showed that predisposing factors includes age, hormonal and genetic factors, diet, disease such as DISH ("Diffuse idiopathic skeletal hyperostosis") and activity.

M19 had no detectable pathologies to the bone, except carious lesions on the teeth, but dental pathology shall be dealt in the next section. M11 also had no detectable pathologies, but this may be due to preservation and the fact that a number of skeletal elements were missing.

Dental pathology

Unlike bone, dental hard tissue is not continuously renewed throughout an individual's lifetime. Wear and disease in teeth can only result in the destruction of tooth substance and once destroyed, the tooth substance cannot heal. Dental caries are the most common of dental diseases found in archaeological skeletons; it is recorded for archaeological populations more than any other dental disease[34]. It can occur as opaque spots on the tooth surface or as large cavities. It is characterised by progressive decalcification of enamel or dentine. Carious lesions can begin anywhere that plaque accumulates, often in the fissures of tooth crowns and in the interproximal areas. Dental caries are the result of fermentation of food sugars by bacteria that occur on the teeth in plaque[35]. It is the acidic waste products of these bacteria metabolising the food sugars that destroys the dental hard tissue, thereby causing caries cavities. Untreated caries can potentially be lethal, and advanced caries of a maxillary tooth can potentially lead to infections within the cranial cavity, such as meningitis or cavernous sinus thrombosis[36]. M19 was the only skeleton observed to have three carious lesions on the teeth (14, 16, and 47). As the teeth of M9 and M11 were not present, we cannot know for certain if these individuals had any dental pathology.

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[32] Roberts, Manchester, *The Archaeology*, pp. 146-147.

[33] Robert Jurmain, *Stories from the Skeleton: Behavioral Reconstruction in Human Osteology (Interpreting the Remains of the Past)*, Amsterdam, Gordon & Breach, 1999, pp. 141-184.

[34] Mays, *The Archaeology*, pp. 218-219, Roberts, Manchester, *The Archaeology*, p. 65.

[35] Simon Hillson, *Teeth*, Cambridge, Cambridge University Press, 2005, pp. 290-291.

[36] Mays, *The Archaeology*, p. 220.

Conclusion

At this moment, the data collected from these four skeletons does not allow us to make conclusions about the demography and health of the Roman population at *Apulum*. It is hoped that further analysis will be conducted on the other skeletons found at the necropolis and that this study, despite the small sample size, will contribute to better our understanding of life in Roman *Apulum*.

LYNSEY TOASÉ
University of Bradford

AN OSTEOLOGICAL ANALYSIS OF SKELETONS FROM THE ROMAN NECROPOLIS OF *APULUM* ALBA IULIA, ROMANIA

Abstract

The study of human skeletal remains from the archaeological record has an important part to play in our pursuit of understanding human history. This paper provides an osteological analysis conducted on four skeletons which were excavated from the Roman necropolis of *Apulum*, Alba Iulia. The traits analysed for age estimation and sex assessment determined that all skeletons were adults and most probably male. Non-metric traits and pathological conditions were also observed. It is hoped that this paper will be succeeded by further study of other skeletal remains excavated from the Roman Necropolis of *Apulum*, which shall provide us with a better understanding of demography and disease during the Roman occupation of the area.

KEYWORDS: *Apulum*, inhumations, sex assessment, non-metric traits, palaeopathology, dental pathology.

TABLE 1. Summary of the traits used to assess sex of the skeletons. Many traits were unobservable due to either damage or absence of the skeletal elements.

		Skeleton M9	**Skeleton M11**	**Skeleton M17**	**Skeleton M19**
Pelvis	Sub-pubic Angle	Unobservable	Unobservable	Unobservable	Unobservable
	Sub-pubic Concavity	Unobservable	Unobservable	Unobservable	Unobservable
	Ventral Arc	Unobservable	Unobservable	Unobservable	Unobservable
	Medial aspect of I-R	Unobservable	Unobservable	Unobservable	Unobservable
	Greater Sciatic Notch	Narrow	Unobservable	Narrow	Narrow
	Pre auricular Sulcus	Unobservable	Unobservable	Unobservable	Unobservable
	Obturator foramen	Unobservable	Unobservable	Unobservable	Unobservable
Sacrum		Unobservable	Unobservable	Unobservable	Unobservable
Cranium	Supra-orbital Ridge/ Glabella	Unobservable	Gracile	Robust	Unobservable
	Supra-orbital Margin	Unobservable	Dull	Dull	Dull
	Mastoid Process	Unobservable	Unobservable	Unobservable	Unobservable
	Nuchal Crest	Robust	Unobservable	Robust	Unobservable
Mandible	Mental Eminence	Unobservable	Unobservable	Square	Square
	Gonial Angle	Unobservable	Unobservable		
	Gonial flare	Unobservable	Unobservable	Present	Present
	Sex Assessment	**Probable Male**	**Indeterminate**	**Male**	**Male**

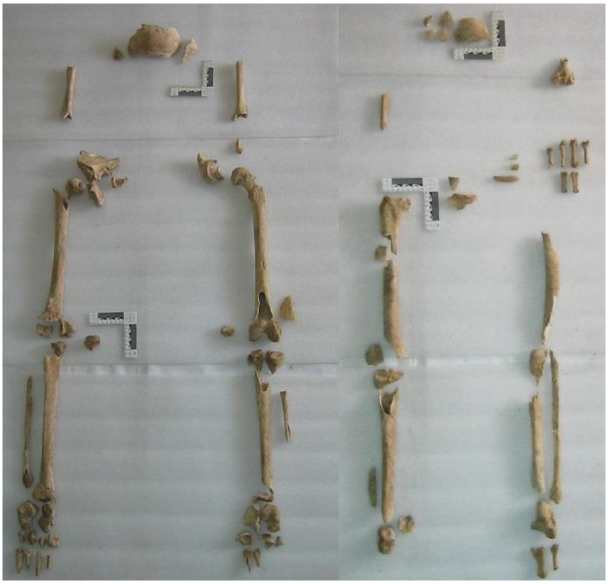

Fig. I. Skeletons M9 (left) and M11 (right) from Roman Necropolis of *Apulum*, Alba Iulia.

Fig. II. Skeletons M17 (left) and M19 (right) from Roman Necropolis of *Apulum*, Alba Iulia.

Fig. III. Suture ossicle on the occipital bone of M9.

Fig. IV. Endocranial aspect of M17's frontal bone
displaying pathological changes.

Fig. V. Endocranial aspect of M17's parietal bone displaying deep meningeal grooves.

Fig. VI. Anterior view of the right patella of M9. Enthesophytes are marked by the black arrows.