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STUDIA ARCHAEOLOGICA

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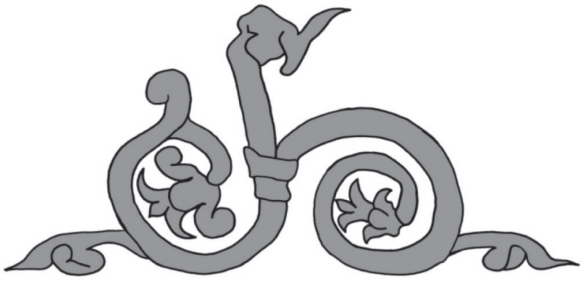

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Implications of a tibia and fibula fracture in the secondary adaptation of the skeleton of an individual discovered in Nădlac "Lutărie" (Arad County)*

Luminița Andreica

Abstract: The present study focuses on the analysis of a fracture on the level of the left tibia and fibula diaphysis of a male individual from the mature adult age category. The skeleton was discovered during the 2004 archaeological campaign in Nădlac "Lutărie" (Arad County) in an Early Medieval cemetery. Fractures are among the pathological lesions most often encountered in past populations. I have analyzed the implications of this fracture on the individual's locomotion and implicitly on the modifications that occurred due to this trauma on the level of the significant articulations.

Keywords: fracture, arthrodic modifications, disc herniation, Early Medieval cemetery, Nădlac.

Introduction

Clinical studies claim that biological factors such as age, osteoporosis, reduction of bone mass due to the lack of activity, and poor health can make an individual susceptible to the onset of fractures during casual work. Studies performed on modern populations have demonstrated that factors of the surrounding environment, such as geographical location, climate, technological level, occupation, and everyday life style play a dominating role in fracture etiology. Daily routine activities and poor health, both catalysts of accidental falling, are the primary explanation of fractures in the case of modern populations, even if our society has excelled in technology and medical discoveries. Through analogy, daily activities and poor health might be responsible for some fractures in the case of populations from the past[1].

The skeleton to be analyzed here was discovered during the 2004 campaign in Nădlac, on the spot called "Lutărie". It has been labeled M 04 and is in a good state of preservation and representation.

It was found in an Early Medieval cemetery where eight other skeleton were also discovered during the 2005 campaign and another, single skeleton was uncovered during the subsequent year[2]. In the case of the nine individuals discovered during the campaigns performed after 2004, the anthropological analysis has been performed and published[3]. For objective reasons, the skeleton inventoried with no. M 04 was recovered by the Arad Museum after the publication of anthropological data on the nine skeletons mentioned above.

The present analysis completes the anthropological picture of a necropolis from the end of the first millennium in the Lower Mureș Valley.

Methods

In order to estimate the age of the individual according to his cranial skeleton, I observed the degree of obliteration of the cranial sutures[4], while according to the postcranium I employed as age indicators the modifications on the surface of the pubic symphysis[5], the sternal end of the ribs[6], and the auricular surface of the ilium[7]. The sternal end of the ribs is in the VIth stage of development, thus indicating an approximate age of 43–55. The surface of the pubic symphysis displays modifications

* English translation: Ana M. Gruia.
1 Judd, Roberts 1998, 44.
2 Mărginean, Huszarik 2007.
3 Băbău *et al.* 2008.
4 Meindl, Lovejoy 1985, 57–66.
5 Işcan 1989, 152.
6 Işcan 1989, 111.
7 Işcan 1989, 164.

typical to the age of 45.6 years, while the auricular surface of the ilium is in the Vth stage of development. One can thus estimate that the individual died at ca. 45–55 years of age.

The skeleton belongs to a male individual. On the cranium I have identified all the five osteological elements: the nuchal crest, the mastoid processes, the supraorbital margins, the prominence of the glabella, and the mentonian eminence. All five indictors of gender were evaluated on a 1 to 5 scale (with 1 – typically female and 5 – typically male)[8]. The nuchal crest, the mastoids, and the supraorbital margins are in the fourth degree of development, while the prominence of the glabella and the mentonian eminence are typical to the fifth degree.

As for the postcranial skeleton, the pelvis provides the most precise piece of information in determining gender. The following osteological components of the pelvis were observed in the determination of gender: the subpubic concavity, the *ischiopubic* ramus, the ventral arc, the preauricular sulcus, and *greater sciatic* notch[9]. The subpubic concavity is convex, the *ischiopubic* ramus is very wide, the ventral arc is not visible, the preauricular sulcus is missing, and the *greater sciatic* notch is very narrow.

Results and discussions

Two oblique, healed fractures can be noted on the left side of the tibia and fibula (Fig. 1). The first fracture is located in the middle of the diaphysis, while on the fibula the fracture is located in the upper third of the diaphysis. The leg became shorter due to these fractures: by ca. 3 cm from the length of the tibia (the maximum length of the right side tibia is of 34.9 cm, while the left side tibia measures 31.5 cm in length) and by 2 cm from the length of the fibula (the maximum length of the right side fibula is of 33.7 cm, while that on the left side measures 31.8 cm in length). Consistent callus has formed around the fracture; it has a non-homogenous aspect, with certain perforations specific to signs of infection (Fig. 2). This was probably an open fracture.

The situation of the right side clavicle is also interesting, since it shows a completely healed fracture in the distal half of the clavicular body, more precisely in the area of the conoid tubercle (Fig. 3). Due to the fracture, the length of the clavicle was reduced by ca. 0.8 cm (the maximum length of the right side clavicle is of 13.3 cm, while the maximum length of the left side clavicle is of 14.1 cm). It is possible that this fracture took place in the same time as that of the lower left limb, during falling.

Fig. 1. Healed fracture on the left side tibia and fibula

Fig. 2. The formation of callus with infection signs in the area of the fracture on the left tibia diaphysis

[8] Buikstra, Ubelaker 1994, 19–20.
[9] Buikstra, Ubelaker 1994, 18.

Fig. 3. The right side clavicle with a completely healed fracture on the distal half of the body

Other modifications that can be related to the fracture of the shank bones

On the right side, the osteoarthritis on the level of the coxofemoral articulation suggests that the hip articulation was under mechanical stress. On the level of the acetabulum, in the upper part of the *crescent-moon* shaped surface, one can observe arthrosic modifications. The head of the femur on the right side also presents arthrosic modifications, much more developed than those on the left side. Inside the acetabulum one can note a half-circle-shaped incision. There are very few available specialized studies that explain the causes of such marks. Saunders (1978)[10] claimed that the onset of this incision is nothing more than a reminiscence of a supernumerary bone (the acetabular bone). On the contrary, Mafart (2005)[11] has explained the existence of this mark as the result of mechanical stress. He based his conclusion on his research on the pelvic belt bones of 425 individuals discovered in cemeteries from France dated between the thirteenth and the seventeenth century.

All these arthrosic modifications can be explained by the fact that the individual, after the accident that made his leg shorter, did not feel safe leaning on that side and thus almost his entire weight was supported by the right side of his body.

The acromioclavicular articulation displays bilateral osteoarthritis. These arthrosic modifications can also occur as a consequence of the fractures suffered by the individual. Traumatic arthritis refers to the modifications of the articulations as a consequence of trauma (fractures, injuries, dislocations). The most affected articulations are those of the lower limbs (hip, knee, ankle), followed by those of the elbow and the shoulder[12].

On the body of the three final cervical vertebrae (C5, C6, and C7) one can observe the presence of Schmorl Nodules, both on the upper and lower surfaces, while *osteophytes can be noted on the thoracic and lumbar vertebrae, on the anterior side of the articular margins* (Fig. 4). These might indicate a disc herniation that causes the space between the intervertebral discs to narrow. The degenerative pathology on the level of the spine is among the most common lesions discovered on skeletons from the past. Unfortunately, the dimensions of the space between the intervertebral discs cannot be measured accurately since, in such cases, the spine is disarticulated[13].

Fig. 4. Cervical vertebrae with signs of degenerative pathology

[10] Saunders 1978.
[11] Mafart 2005, 208–215.
[12] Aufderheide 1998, 105.
[13] Aufderheide 1998, 96–97.

Disc herniation can be the result of physical exercise that forces the spine to flex and bend, but it can also onset during trauma caused by lifting weights or falling from a significant height[14].

Arthrosic modifications can be observed on the level of the distal epiphysis of metatarsus I and II on the right side (Fig. 5), possibly caused by mechanical stress exerted on the foot; for a significant period the individual only leaned on the right leg while walking.

Fig. 5. Metatarsus I and II with arthrosic modifications on the distal epiphyses

Conclusions

Very often, the detailed anatomical analysis of a single skeleton can bring to light a series of data on that person's history. In the present case, the pattern of these traumas, i.e. the fractures of the shank bones, of the clavicle, and the pathology of the spine indicate that these lesions could have only been caused by a traumatic event. Fractures on the level of the clavicle and of the bones of the lower limbs are associated with falling from heights since the individual usually lands on his shoulder or lower limbs[15]. Such fractures are, for example, frequent among riders[16]. This statement is supported by the funerary inventory of this individual. A trapezoidal-shaped saddle stirrup and an iron articulated bit were recovered from the area of his legs[17].

The traumas can be related to this man's daily activities. During the Early Middle Ages, but not only, men were responsible with performing hard labor and were thus more prone to accidents.

An abnormal mechanic of the lower limbs has forced the individual to walk with a limp, and this had consequences since the skeleton displays modifications on the level of certain articulation on the right side of the body (on the coxofemoral and the acromio-clavicular articulations).

The formation of callus on the level of the fractures suggests that the individual survived the traumatic event. Nevertheless, the fracture has healed with certain complications, leaving behind traces of an infection of the callus. This is very frequent in the case of open fractures, when one of the ends of the broken bone pierces the skin. Another factor that favors the onset of infection is precarious living conditions.

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14 Gonzalez, Concepcion 2005, 250.
15 Judd, Roberts 1999, 240.
16 Prokopec, Halman 1999, 355.
17 Mărginean, Huszarik 2007.

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Abbreviations

AAC	Acta Archaeologica Carpathica. Cracovia.
AARMSI	Analele Academiei Române. Memoriile Secțiunii Istorice. București.
ACSSTU	Annals. Computer Science Series Tibiscus University. Timișoara.
ActaArchHung	Acta Archaeologica Academiae Scientiarum Hungaricae. Budapest.
AÉ	Archaeologiai Értesitõ. Budapest.
AGGH	Acta Geodaetica et Geophysica Hungarica. Budapest.
AIINC	Anuarul Institutului de Istorie Națională Cluj. Cluj-Napoca.
AISC	Anuarul Institutului de Studii Clasice. Sibiu.
AJPA	American Journal of Physical Anthropology. New York.
Alba Regia	Alba Regia. Annales Musei Stephani Regis. Az István Király Múzeum Közleményei. Székesfehérvár.
AMN	Acta Musei Napocensis. Cluj-Napoca.
AMP	Acta Musei Porolissensis. Muzeul Județean de Istorie şi Artă Zalău. Zalău.
AnB S.N.	Analele Banatului, Serie nouă. Timișoara.
Analele ANTIM	Analele Asociației Naţionale ale Tinerilor Istorici din Moldova. Chișinău.
Apulum	Apulum. Alba-Iulia.
ArchKorrbl	Archäologisches Korrespondenzblatt. Urgeschichte, Römerzeit, Frühmittelalter. Mainz.
ArhMed	Arheologia Medievală. Brăila, Reşiţa, Cluj-Napoca.
AS	Acta Siculica. Sepsiszentgyörgy/Sfântu Gheorghe.
ATS	Acta Terrae Septencastrensis. Sibiu.
AUVT	Annales d'Université Valahia Targoviste, Section d'Archéologie et d'Histoire. Târgoviște.
BAM	Brvkenthal Acta Mvsei. Sibiu.
BAR International Series	British Archaeological Reports, International Series. Oxford.
Banatica	Banatica. Muzeul Banatului Montan. Reșița.
BÁMÉ	A Béri Balogh Ádám Múzeum Évkönyve. Szekszárd.
BCȘS	Buletinul Cercurilor Științifice Studențești. Istorie-Arheologie-Muzeologie. Alba Iulia.
BerRGK	Bericht der Römisch-Germanischen Komission des Deutschen Archäologischen Instituts, Frankfurt a. M .- Berlin.
BHAB	Bibliotheca Historica et Archaeologica Banatica. Timișoara.
BSNR	Buletinul Societății Numismatice Române. Societatea Numismatică Română. București.
Caietele CIVA	Caietele CIVA. Cercul de Istorie Veche și Arheologie. Alba Iulia.
CCA	Cronica cercetărilor arheologice. București.
CCDJ	Cultură şi civilizaţie la Dunărea de Jos. Muzeul Dunării de Jos. Călăraşi.
CN	Cercetări Numismatice. Muzeul Național de Istorie a României. București.
CNA	Cronica Numismatică și Arheologică, Societatea Numismatică Română. București.
Corviniana	Corviniana. Acta Musei Corvinensis. Hunedoara.
Crisia	Crisia, Muzeul Ţării Crişurilor, Oradea.
Cumania	Cumania. A Bács-Kiskun Megyei *Önkormányzat* Múzeumi Szervezetének *Évkönyve*. Kecskemét.
Dacia N.S.	Dacia. Recherches et Découvertes Archéologiques en Roumanie, Bucureşti; seria nouă (N.S.): Dacia. Revue d'Archéologie et d'Histoire Ancienne. Bucureşti.
DMÉ	A Debreceni Déri Múzeum Évkönyve. Debrecen.
DolgKolozsvár	Dolgozatok az Erdély Nemzeti Múzeum Érem- és Régiségtárából (Travaux de la section numismatique et archéologique du Musée National de Transylvanie). Kolozsvár/Cluj-Napoca.

DolgSzeged	Dolgozatok a Szegedi Tudományegyetem Régiségtudományi Intézetéből. Szeged.
Drobeta	Drobeta. Muzeul Regiunii Porților de Fier. Drobeta Turnu-Severin.
EME	Erdélyi Múzeum Egyesület. Cluj-Napoca.
EphNap	Ephemeris Napocensis. Cluj-Napoca.
ETF	Erdélyi Tudományos Füzetek – Erdélyi Múzeum Egyesület. Kolozsvár/Cluj-Napoca.
FdI	File de istorie, Muzeul de Istorie. Bistrița.
FolArch	Folia Archaeologica. A Magyar Nemzeti Múzeum Évkönyve. Annales Musei Nationalis Hungarici. Budapest.
Germania	Germania. Anzeiger der Römisch-Germanischen Komission des Deutschen Archäologischen Instituts. Berlin.
História	História – történelmi folyóirat. Budapest.
HK	Hadtörténelmi Közlemények. Budapest.
HOMÉ	A Herman Ottó Múzeum Évkönyve. Miskolc.
Istros	Istros. Muzeul Brăilei. Brăila.
JAHC	Journal for the Association of History and Computing. Michigan University.
JahrbRGZM	Jahrbuch des Römisch-Germanischen Zentralmuseums zu Mainz, Mainz.
JAMÉ	Janus Pannonius Múzeum Évkönyve. Pécs.
KL	Kartografické listy. Bratislava.
Korall	*Korall Társadalomtörténeti Folyóirat*. Budapest.
Közl	Közlemények az Erdélyi Nemzeti Múzeum Érem- és Régiségtárából. Kolozsvár/Cluj-Napoca.
Lucrări	Lucrări Ştiinţifice. Istorie-Ştiinţe-Pedagogie, Institutul Pedagogic. Oradea.
GT	Geographia Technica. International Journal of Technical Geography. Cluj-Napoca.
Marisia	Marisia. Marisia. Studii și materiale. Arheologie – Istorie – Etnografie. Târgu-Mureș.
MCA	Materiale și Cercetări Arheologice. București.
MEKSB	A Miskolci Egyetem Közleménye. A sorozat, Bányászat. Miskolc.
MFMÉ StudArch	A Móra Ferenc Múzeum Évkönyve. Studia Archaeologica. Szeged.
MFMÉ MonArch	A Móra Ferenc Múzeum Évkönyve. Monumenta Archeologica. Szeged.
MHB	Monumenta Historica Budapestinensia. Budapest.
MIM	Materiale de Istorie și Muzeografie, Muzeul de Istorie a Municipiului București. București.
MSW	Materialy Starozytne Wczesnosredniowieczne. Kraków.
MW	Materialy Wczesnośredniowieczne. Kraków-*Wrocław*-Warsawa.
NK	Numizmatikai Közlöny, Magyar Numizmatikai Társulat. Budapest.
NNT	Norsk Numismatisk Tidsskrift.
NZ	Numismatische Zeitschrift, herausgegeben von der numismatischen Gesellschaft in Wien. Wien.
OJA	Oxford Journal of Archaeology, Oxford.
OpHung	Opuscula Hungarica. Budapest.
PBF	Praehistorische Bronzefunde.
Potaissa	Potaissa. Studii și comunicări. Turda.
PZ	Prähistorische Zeitschrift. Berlin.
Régészeti Füzetek	Régészeti Füzetek. Magyar Nemzeti Múzeum. Budapest.
RÉSÉE	Revue des Études Sud-Est Européenes. l'Institut d'Études Sud-Est Européennes de l'Académie Roumaine. București.
RI	Revista de Istorie, Institutul de Istorie „Nicolae Iorga". București.
RM	Revista Muzeelor. Centrul pentru Formare, Educație Permanentă și Management în Domeniul Culturii. București.
RRH	Revue Roumaine d'Histoire, Academia Română. București.
Sargetia	Sargetia, Muzeul Civilizației Dacice și Romane Deva.

Savaria	Savaria – a Vas megyei múzeumok értesítője. Pars historico-naturalis. Szombathely.
SCIVA	Studii și Cercetări de Istorie Veche (și Arheologie). București.
SCN	Studii și Cercetări Numismatice. Institutul de Arheologie „Vasile Pârvan". București.
SCȘI	Studii și Cercetări Științifice. Istorie.
SIB	Studii de Istorie a Banatului. Universitatea de Vest Timișoara.
SlovArch	Slovenská Archeológia. Bratislava.
SMIM	Studii și Materiale de Istorie Medie. Institutul de Istorie „Nicolae Iorga". București.
SMK	Somogyi Múzeumok Közleményei. Kaposvár.
SSCR	*Social Science Computer Review. North Carolina State University.*
Speculum	Speculum. Cambridge Journals Online. Cambridge.
StComCaransebeș	Studii și Comunicări. Etnografie. Istorie. Caransebeș.
StComSatuMare	Studii și Comunicări. Satu Mare.
Stratum plus	Stratum plus Journal. High Anthropological School University. Cultural Anthropology & Archaeology.
Studia Caroliensia	Studia Caroliensia. A Károli Gáspár Református Egyetem szakfolyóirata. Budapesta.
Studia Comitatensia	Studia Comitatensia. Tanulmányok Pest Megye Múzeumaiból. Szentendre.
Századok	Századok. A Magyar Történelmi Társulat Folyóirata. Budapest.
Terra Sebus	Terra Sebus. Acta Musei Sabesiensis. Sebeș.
Thraco-Dacica	Thraco-Dacica. București.
Transilvanian Review	Transilvanian Review/Revue de Transylvanie. Cluj-Napoca.
TS	Történelmi Szemle. A Magyar Tudományos Akadémia Történettudományi Intézetének Értesitöje. Budapest.
UPA	Universitätsforschungen zur Prähistorische Archäologie. Bonn.
VAH	Varia Archaeologica Hungarica. Budapest.
VMMK	Veszprémi Megyei Múzeumok Közleményei. Veszprém.
World Archaeology	World Archaeology. London.
ZfA	Zeistchrift für Archäologie. Berlin.
Ziridava	Ziridava, Complexul Muzeal Arad. Arad.
ZMSW	Zeitscrift für Münz-, Siegel- und Wappenkunde. Berlin.