ANTHROPOLOGICAL ANALYSIS OF THE HUMAN OSTEOLOGICAL REMAINS DISCOVERED IN THE TUMULAR CEMETERY FROM CERNAVODĂ – A2 HIGHWAY (TUMULI NOS. 7, 7A, 7B)

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Keywords: tumular necropolis, Cernavodă, Early Bronze Age, paleodemography, paleopathology.

Abstract: The paper proposes an anthropological analysis of the skeletons digged out from three tumuli discovered on the Cernavodă-Medgidia segment of highway A2 (district of Constanţa), investigated archaeological in the year 2011 (tumuli 7, 7A and 7B). The tumular necropolis was dated on the basis of the archaeological inventory in the Early Bronze Age. Archaeological diggings produced 10 human skeletons, most of them preserved quite well, thus permitting a thorough anthropological analysis. The osteological material was analysed anthropometrically, demographically and paleopathologically. Special attention was paid to the bones anomalies and pathologies capable of providing clues on the daily activities as well as on the health condition of the subjects, all these aspects contributing to establish the lifestyle of the community under investigation.

Cuvinte cheie: necropola tumulară, Cernavodă, epoca bronzului timpuriu, analiza demografică şi paleopatologică.

Rezumat: Lucrarea prezintă analiza antropologică a scheletelor deshumate din trei tumuli descoperiţi pe tronsonul Cernavodă-Medgidia (jud. Constanţa) al autostrăzii A2 şi cercetaţi arheologic în anul 2011 (tumulii 7, 7A şi 7B). Necropola tumulară a fost datată pe baza inventarului arheologic în epoca bronzului timpuriu. Săpăturile arheologice au scos la lumină 10 schelete umane, majoritatea aflate într-o stare de conservare satisfăcătoare, astfel încât s-au pretat unei analize antropologice amănunţite. Materialul osteologic a fost studiat din punct de vedere antropometric, demografic şi paleopatologic. O atenţie deosebită a fost acordată anomaliilor şi patologiilor osoase care pot oferi indicii asupra activităţilor cotidiene şi asupra stării de sănătate, toate aceste aspecte ajutându-ne la conturarea stilului de viaţă al comunităţii studiate.

Introduction

The tumular necropolis is situated in the South-East part of Romania, more precisely South Dobrudja – one of the richest provinces in archaeological and historical vestiges. Geographically, the territory belongs to the Plateau of South Dobrudja, characterized by a steppe and forest steppe bioclimate. Extended archaeological investigations have been initiated in 2010, concurrently with the initiation of work at the A2 Highway (Constanţa-Cernavodă), when several funeral complexes (tumuli) have been discovered. Administratively, the zone under investigation belongs to the district of Constanţa, village Peştera, not far from the town of Medgidia. Nowadays, the estimated[1] number of tumular structures of various sizes is around 20. The first tumulus (no. 3), analysed in the year 2010, provided especially interesting results, being rich in archaeological remains; the results obtained by specialists have been published[2] in 2011 in an interdisciplinary volume.

The osteological material analyzed in the present study comes from tumuli nos. 7, 7A and 7B. These three funeral complexes have been investigated in the autumn of 2010 by archaeologists Alexandru Morintz, Andrei Măgureanu and Cristian Ştefan, under the coordination of Christian Schuster from the "Vasile Pârvan" Institute of Archaeology of Bucureşti[3]. The exhumed skeletons belong to persons buried with an E-V or S-N orientation, flexed on either left or right side, or stretched on their back. Based on the inventory discovered in the three tumuli, the authors of the excavations assert[4] that the chronological period to which the tumular necropolis might belong is Early Bronze Age.

[1] Schuster *et al.* 2011.

[2] *Ibidem.*

[3] The archaeologists who excavated the human skeletons entrusted us with the osteological material and offered complete information on the archaeological context. The authors are grateful for their most kind support and collaboration.

[4] Morintz *et al.* 2012.

Materials and working methodology

The human osteological material investigated here is represented by 10 skeletons, of which five are males, three females and two – belonging to the *infans I* (0-7 years) group – of non-determinable sex. These 10 skeletons belong to the tumular necropolis of Cernavodă, being exhumed from tumuli nos. 7 (five skeletons), 7A (three skeletons) and 7B (two skeletons). The osteological material is well-preserved (in a ratio around 70%), thus permitting a minute anthropometric and morphoscopic analysis.

The anthropological study began with the restoration and marking of the osteological remains, after which morphoscopic examination and collection of anthropometric data followed. Determination of sex and age at death was followed by conformative and morphoscopic analysis, and investigation of the pathologies, anomalies and epigenetic characters. At the individuals deceased before the age of 20 (*infans I*, *infans II* and *juvenis*), the determination of age at death was based on their dental evolution[5], on the concrescence extent of epiphyses at the diaphyses of the postcranial bones, and on the length of the bones of the appendicular skeleton, *versus* the length standards of the long bones, established from measurements taken as early as the intrauterine stage[6]. Determination of the age at death for subjects older than 20 years (*adultus*, *maturus* and *senilis*) considered the modification of the pubic symphyseal surface and of the auricular surface of the ilium, the aspect of the spongious tissue in the bones of the appendicular skeleton, the cranial suture closure, the tooth wear, and the existence of certain pathological processes associated with advanced age[7]. For sexual diagnosis, the following complex of characters was considered: general shape of the pelvis, size and openness of the greater sciatic notch, the appearance of the sacrum, robustness of the skeleton, development of muscular joints and insertions, cranial relief, forehead shape and leaning degree, robustness and shape of the mandible[8].

Individual osteological analysis provided information on the basis of which some anthropometric, conformative and somatoscopic characteristics could be subsequently established from the values of direct measurements, and also from the calculation of the conformation indices[9]. Evaluation and categorization of the absolute and relative values made use of the dimorphic scales of Alexeev and Debetz[10]. The somatoscopic and morphological observations were registered and analyzed with the methods recommended by Broca, von Eickstedt and Olivier[11]. The probable stature of each individual was calculated from the lengths of the long bones of the superior and inferior members. The dimensional scales proposed by Manouvrier, Bach, Breitinger, Trotter, Gleser were also employed[12].

There were also analysed skeletal particularities viewed in the literature as functional adaptations and occupational or life style markers, or mechanical enthesopathies, as follows: markers of aquatic activities (auditory exostoses or torus), markers of equestrian activities (presence of the femoral pilaster and hypotrochanteric spur, presence of enthesopathies on *linia aspera*, presence of supplementary femoral trochanter and Poirier's facet), markers of hard work activities (femoral and tibial diaphyseal shape, platymeric index, platycnemic index, degree of development of the humeral deltoid insertion, development of bone relief and of the muscular insertions, frequency of the supratrochlear foramen of the humerus, frequency and localization of the squatting facets on the talus and tibia).

The epigenetic cranial and postcranial characters, called non-metric or discrete, and appreciated by several specialists as carrying a high biological significance and (at least some of them) a high heritability, their determinism being dictated by both environmental[13] and hereditary[14] factors were also included in the category of anomalies. In the end, the presence of osteopathies and osteoanomalies was calculated per sex group, as well as reported at the entire population. Their identification and also estimation of the development extent were based on the methods, criteria and techniques recommended by specialists[15].

The demographic analysis was also considered important and useful for establishing the size of the social group under study, as well as for a socio-economic characterization of the community and

[5] Ubelaker 1987, 1254-1263.

[6] Maresh 1955, 725-742; Schaefer *et al.* 2009.

[7] Ferembach *et al.* 1979, 7-45; Schmitt 2005, 1-13.

[8] Buikstra, Ubelaker 1994; Walrath *et al.* 2004, 132-137; Blanchard 2010.

[9] Martin, Saller 1956-1966.

[10] Alexeev, Debetz 1964.

[11] Broca 1875, 1-204; Von Eickstedt 1934; Olivier 1969.

[12] Manouvrier 1892, 227-233; Bach 1965, 12-21; Breitinger 1938, 249-274; Trotter, Gleser 1958, 79-123.

[13] Piontek 1979, 95-110; *idem* 1988, 321-327; Bergmann, Hauser 1985, 165-171; Kaur *et al.* 2012, 189-194.

[14] Sjøvold 1984, 223-246; Rubini 1997, 454-462.

[15] Slootweg 2007; Waldron 2009; Ortner 2003; Aufderheide, Rodriguez-Martin 1998.

estimation of its health condition. The paleodemographic study of the population exhumed from the tumular necropolis of Cernavodă involved a particularly careful investigation of the characters indicating the sex and age of the 10 human skeletons, the more so that, statistically, the size of the group is quite reduced. No cases preventing determination of the age at decease or, in the case of adults, of sex, were encountered. The demographic data of the skeletal series under analysis (tumuli nos. 7, 7A and 7B) were compared[16] with those collected for the synchronous skeletal series exhumed from tumulus no. 3 of the same complex at Cernavodă. The following demographic indices were considered: mean life duration/life expectancy at birth, general and infantile mortality, structure on sexes and structure on ages[17].

Tumulus no. 7 – Grave no. 1 (T_7, G_1)

The skeleton is incomplete as the cranial bones could not be restored due to advanced fragmentation and alteration owed to pedological factors. The postcranial skeleton, also incomplete, included the following pieces: three rib fragments, the left clavicle, a fragment of the right coxal bone (from the sciatic notch region), the humeri, the ulnae and fragments of radial diaphyses, and fragments of the femora, tibiae and fibulae. This very gracile skeleton belonged to a ***female*** subject, approximately 40-45 year-old (***maturus*** category). Some of the bone remains show slight reddish (ochre) traces, randomly distributed on the external bone wall of the humeri and femora.

The mandible (table 1). The only preserved part was the masticatory portion of the left horizontal and left vertical ramus. Even if considerably altered by the soil, its gracefulness is still obvious. The vertical ramus is large and short, while the relief at the *gonion* is attenuated, in the same plane with the horizontal ramus.

Dentition was analysed based on the three molars present in alveoli on the inferior left hemiarch, and also according to other three teeth found among the other bone remains, detached *post mortem*: inferior left P1, inferior left P2 and inferior left C. All six teeth are highly attrited (III-IV degree). No evidence of caries.

The postcranial skeleton (table 2) is gracile, typically feminine. The postcranial bones were fragmented during cleaning, which prevented any measurements. However, some observations could be made. The femora, apart from a small subtrochanteric relief, had a quite obvious pilaster for a woman, the *linia aspera*, also defined as the femoral rough line. A prominent and rugged *linia aspera* indicates over-stress of the group of muscles inserted in these locations, and is also an indicator of equestrian activities[18].

Pathologies, anomalies, epigenetic traits

The left side of the frontal bone evidences a ***complete supraorbital foramen*** (fig. 1) – which is a good marker for the climatic conditions in which the subject had lived – in our case, a cold and humid climate[19].

The right humerus has a ***supratrochlear foramen*** (fig. 2) – indicating hypermobility of the arm, namely repetitive flexion-extension movements[20].

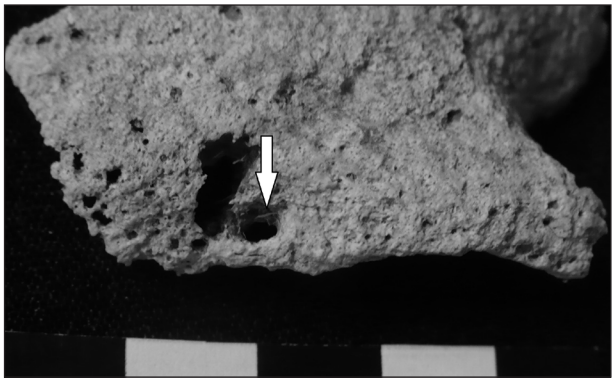

Fig. 1. T_7, G_1, ♀, 40-45 Y. O. Frontal, complete supraorbital foramen.

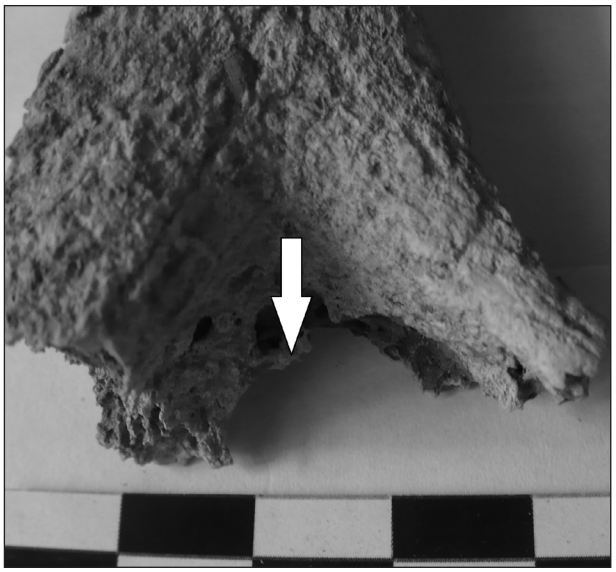

Fig. 2. T_7, G_1, ♀, 40-45 Y. O. Right humerus, supratrochlear foramen.

[16] Schuster *et al.*, 2011.

[17] Hoppa, Vaupel 2002; Chamberlain 2006.

[18] Blondiaux 1994, 97-110; Molleson, Blondiaux 1994, 312-316.

[19] Tomaszewska *et al.* 2013, 58-70.

[20] Nayak *et al.* 2009, 90-64.

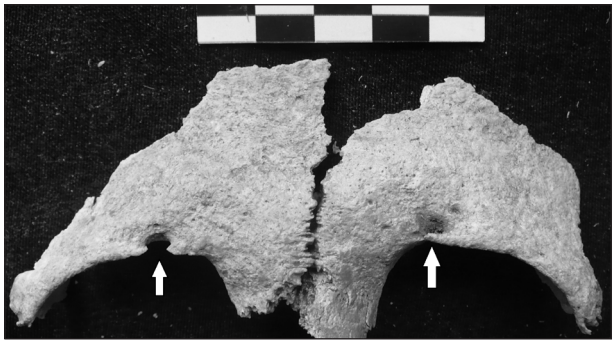

Fig. 3. T_7, G_2, ♀, 55-60 Y. O. Left side – supraorbital complete foramen, right side – supraorbital notch.

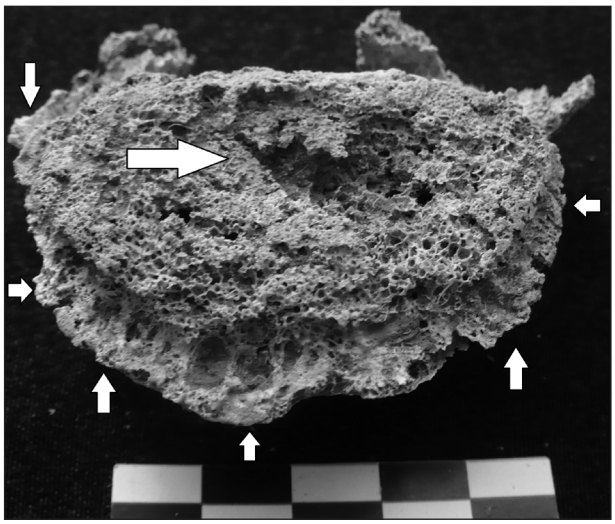

Fig. 4. T_7, G_2, ♀, 55-60 Y. O. L_5 vertebra showing osteophytes and Schmorl's node.

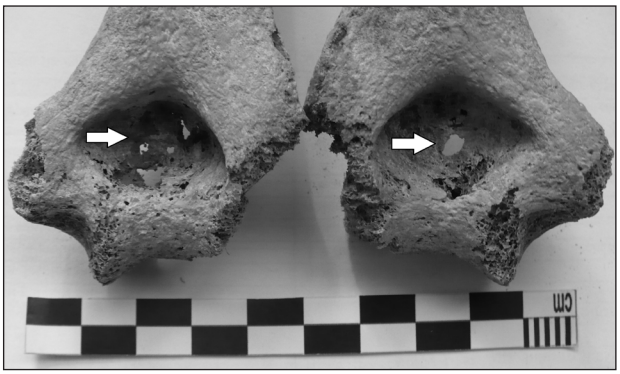

Fig. 5. T_7, G_2, ♀, 55-60 Y. O. Supratrochlear foramen of the humeri.

Tumulus no. 7 – Grave no. 2 (T_7, G_2)

The osteological remains of this skeleton are precariously conserved. The skull is represented by fragments of the frontal, parietal, temporal, occipital, zygomatic and upper maxillary bones. The mandible is intact. The considerable fragmentation and the numerous absent parts prevented skull restoration. The postcranial skeleton, even if fragmented, is represented by all bones of the superior and inferior members and by almost all girdles bones. The spine, hardly represented, includes only the axis and a few, highly fragmented dorsal and lumbar vertebrae. The skeleton is quite gracile, whereas the density of the bone tissue is low. The remains belonged to a ***female*** subject with the age at death around 55-60 years (***maturus*** category).

The neuroskull (table 1). Apparently, the forehead was medium to small, and the occipital – slightly convex (average curvature) and of reduced height. The bone relief is weakly developed, both on the frontal and on the occipital bone (glabellar 2, supraorbital 1, external occipital protuberance 1-2), and on the mastoid process (degree 2-3).

The facial skeleton (table 1). The zygomatic bones are narrow, the pyriform aperture is anthropine.

The mandible (table 1), typically feminine, is especially gracile, with reduced width and depth values. The horizontal ramus is moderately high and very narrow/thin, the vertical one is narrow and high, the mentonier region shows a button aspect, while the goniac relief is attenuated, in plane with the horizontal branch. The robustness index is very low.

Dentition shows neither caries nor other infectious processes, the loss of teeth occurring only *post mortem*. Dental wear is especially advanced: in the jugal area – of the IVth degree, in the masticatory one – degree IV or even V. The dental crowns are almost completely eroded, and dentin is exposed. Deposits of supragingival dental calculus should be also mentioned.

The postcranial skeleton (table 2), quite precariously preserved because of advanced fragmentation, is gracile. The femora are asymmetrical from the point of view of platymeric and pilaster indices: the right femur is platimer, with a small pilaster, the left one is hyperplatimer without a pilaster. The subtrochanteric relief has a crest and a fossa. Unlike the femora, the tibiae are symmetrical, giving a mesocnemic-type index. The humeri, asymmetrical by the index of the diaphysary section, belong to the platybrachic (the left) and eurybrachic (the right one) category, with a weakly-pronounced deltoidian relief, showing a supratrochlear foramen.

Pathologies, anomalies, epigenetic traits

All teeth present in the alveolus, as well as the ones detached *post mortem*, show a thin layer of ***supragingival calculus/tartar*** – a mineralized bacterial plaque. There are no caries present on teeth.

The mastoid apophyses show an ***exsutural mastoid foramen*** – a characteristic useful for establishing the extent of endogamy[21].

The left supraorbital region has a ***complete supraorbital foramen***, while the right one shows a ***supraorbital notch*** (fig. 3) – both characteristics providing suggestions on the climatic conditions under which the analyzed subject had lived – a cold and humid climate[22].

In the postcranial segment, the female skeleton presents numerous signs indicating ***degenerative osteoarthritis*** – a disease of the joints, associated with advanced age and hard labour, constantly involving the backbone and the musculature.

In this case, most of the bones of the inferior and superior members are affected, as well as some bones of the scapular girdle (the clavicles) and the spine, the last one being represented only by a few fragmented pieces, among which the body of L_5 vertebra. Some bone excrescences were observed on the bones of the members: osteophytes in the areas of the joints, and enthesophytes in the areas of muscular insertion. Osteophytes had been formed on the vertebral bodies as a result of bone pressure or friction, caused by the different forms of stress exercised on the bone surface and maintained for a long time[23]. Apart from osteophytes, the vertebral bodies also show Schmorl's nodes (fig. 4), their presence indicating that the woman developed activities which over-stressed her backbone, being also a sign of some degenerative diseases of vertebral disc associated with advanced age.

The humeri evidence a ***supratrochlear foramen*** (fig. 5) – which is a result of either hypermobility or/ and clumsiness[24].

A feature observed on the anterior margin of the distal extremity of the tibiae is the additional joint facets – ***squatting facets***, which may provide direct information on the habit of staying in crouched position during daily work[25].

Another important characteristic to mention is the ***preauricular sulcus,*** which may appear as a traumatic result of child birth upon the coxal bones. In this case the sulcus is of "grooves of pregnancy" type[26].

[21] Tomaszewska *et al., op. cit.*

[22] *Ibidem*.

[23] Duthie, Bentley 1983.

[24] Singhal, Rao 2007, 105-107; Mahajan 2011, 128-132.

[25] Satinoff 1972, 209-212.

[26] Kurihara *et al.* 1996, 1037-1040.

Tumulus no. 7– Grave no. 3 ($T_{7,}$ G_3)

The skeletal remains of this subject, very well preserved, are represented by an almost complete *cranium* (only the nasal region is absent), which had to be restored, and a postcranial skeleton including almost all bones of the members, girdles and vertebral column. Mention should be made of the absence of the left radius and of the calcanei. This extremely robust skeleton, in both its cranial and post-cranial region, belonged to a ***male*** subject with age at death of 18-20 years (***juvenis*** category).

The neuroskull (table 1). The form of the neurocranium, in *norma verticalis*, is ovoid, while, in *norma occipitalis* is of "house"-type. The cranial vault is very long, high and moderately large. The cephalic index is dolichocranic, at the superior limit of the category, whereas the poriobregmatic longitudinal and transversal indices place the skull in the ortochrane and metriochrane categories. The vertical contour indicates a leaning forehead, a long, hardly-arched line of the crown and a high, convex occipital. The forehead is eurimetopic and oval, with crests of intermediary type. The occipital bone is medium large. The bone relief is very well pronounced on the frontal bone (glabellar 3, supraorbital 2), moderate on the occipital bone (1-2) and very pronounced on the mastoid process (degree 5).

The facial skeleton (table 1). The zygomatic bones are large-sized, with pronounced relief, considerable height, and at an intermediary position *versus* the temporal bones. The piriform aperture is of anthropine type. The palatine vault shows a paraboloid convergent contour and median depth.

The mandible (table 1), although typically masculine and very robust, has medium width and depth. The horizontal ramus shows small height and medium thickness, while the vertical one – moderate height and width. The mentonier region is pyramidal and prominent, and the goniac relief is attenuated, at the same level with the horizontal ramus. The index of mandibular robustness is high.

Dentition seems to have been intact during life, the loss of some teeth having occurred only *post mortem*. The degree of dental wear is very low (I-II), with some incipient traces of enamel erosion on the primary masticatory teeth. Molars 3 erupted shortly prior to the death. Mention should be made of the total absence of caries, of infectious processes and of the calculus.

Fig. 6. T_7, G_3, ♂, 18-20 Y. O. Left orbital roof showing possible osteoid osteoma.

Fig. 7. T_7, G_3, ♂, 18-20 Y. O. Congenital rib fusion, bilateral.

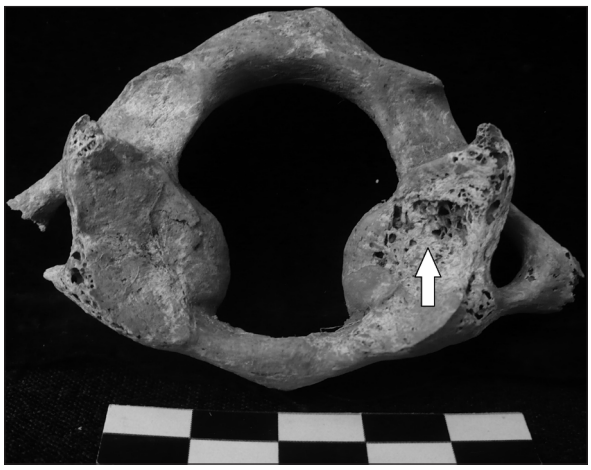

Fig. 8. T_7, G_3, ♂, 18-20 Y. O. Atlas. Corrosion (secondary osteoarthritis).

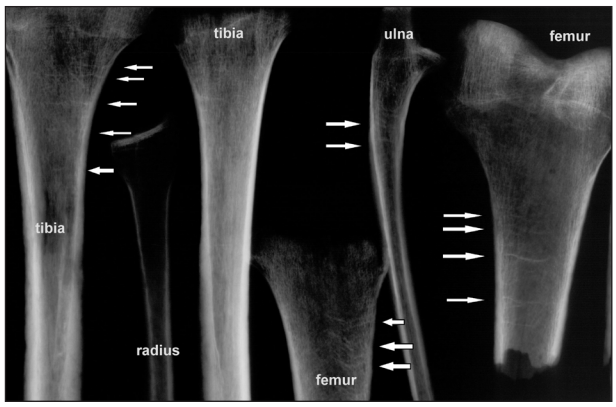

Fig. 9. T_7, G_3, ♂, 18-20 Y. O. Harris lines (tibia, femur, radius and ulna).

The postcranial skeleton (table 2) is extremely robust. The femora are platimere, with no pilaster. The subtrochanterian relief was observed only at the left femur, which is moderately developed, represented by the crest, fossa and additional trochanter – markers of equestrian activities (horseback riding)[27]. The tibiae are platycnemic, having additional joint squatting facets.

The stature (table 2), calculated in good conditions, from the bones of both the superior and inferior members, belongs to the supra-medium male category, at its upper limit.

Pathologies, anomalies, epigenetic traits

On the lambdoid suture of the skull, mention should be made of eight ossicles, three on the left side and five on the right one, known in the literature as ***Wormian bones*** or intersutural bones – representing ossification anomalies with a high degree of heritability. In our case, the Wormian bones show moderate to small sizes.

On the left superior orbitary wall, a circular unevenness, about 0.7-0.8 cm in diameter, may be observed (fig. 6); it is probably an ***osteoid osteoma*** – a small-sized benign tumoral bone formation, usually asymptomatic, frequently occurring in children, adolescents and young adults[28].

The left supraorbitary region shows a ***supraorbitary notch*** – a marker for the cold and moisty climatic conditions[29].

This juvenile man also shows a congenital malformation that is rarely present either in the osteological collections or at present – ***rib fusion*** (fig. 7). Fusion between two neighbouring ribs, situated on the same side, is usually associated with a series of vertebral anomalies of the thoracic segment[30], a situation that can be neither confirmed nor invalidated in our case, as the only piece preserved from the backbone of this man is the lumbar vertebra no. 5. The costal fusion occurred between the costal pairs 2 and 3, symmetrically, bilaterally, being localized at the vertebral end.

The atlas shows ***corrosion*** in the region of the joint to the occipital left condyle (fig. 8) – which is one of the manifestations of osteoarthritis, in our case – of ***secondary osteoarthritis***, generally manifested in young persons as a consequence of some diseases (*e.g.* rheumatoid polyarthritis). The sternum of type III – according to Ashley[31] – shows

[27] Blondiaux 1994, *op. cit.*; Molleson, Blondiaux 1994, *op. cit.*

[28] Ruggieri *et al.* 1998, 225-228.

[29] Tomaszewskav *et al.*, *op. cit.*

[30] Aufderheide, Rodriguez-Martin, *op. cit.*, 69.

[31] Barnes 1994, 114-125.

a growth anomaly which caused its ***hypoplasia***, namely an insufficient development, manifested as size diminution. As a secondary osteoarthritis, implicitly a rheumatoid polyarthritis, is suspected in this case, sternal hypoplasia may be an effect of such a disease.

The femora have an additional ***trochanter*** – a characteristic directly related with the intense activity of the groups of muscles inserted on bone's posterior side. It is also a marker of equestrian activities (horseback riding)[32].

The tibiae show ***squatting facets*** in the contact areas with the tali bones – a re-modelling induced by the repeated crouching/squatting during daily activities[33]. In this case, the additional joint facets are situated in the anterior median part of the distal tibia epiphysis, which indicates that the bodily weight of this individual was a central one.

Harris lines are present at the level of the long bones' metaphyses, and much more intense on the tibiae and femora (fig. 9 and fig. 10), indicating an interruption in bone growth during childhood, a proof of some episodes of crisis/physiological stress, such as subnutrition, malnutrition, acute diseases, infections, avitaminoses, hunger or intoxications[34].

Tumulus no. 7– Grave no. 4 ($T_{7,}$ G_4)

This skeleton is represented by an incomplete *cranium* and by an almost complete postcranial skeleton. The osteological remains belong to a ***male*** subject with an approximate age at death of 35-40 years (***maturus*** category). On the whole skeleton, at both cranial and postcranial level, uniformly distributed reddish (ochre) traces are clearly visible on the anterior, posterior and lateral sides.

The neuroskull (table 1). Viewed in *norma verticalis*, the shape of the neurocranium is ovoid (fig. 11) while in *norma occipitalis* is of "house"-type. The cranial vault is long and medium-large. The cephalic index is mesochranic, at the inferior limit of the category. The vertical contour indicates a leaned forehead, a long and slightly arched line of the crown and a high and slightly convex occipital bone. The forehead is metriometopic and oval, with intermediary crests. The occipital bone is narrow, while the parietal-occipital transverse index situates it in the middle category. The bone relief is extremely well-developed (glabellar 4-5, supraorbital 2-3, occipital 3, mastoid 5). The whole skull evidences archaic characters.

[32] Blondiaux 1994, *op. cit.*; Molleson, Blondiaux 1994, *op. cit.*

[33] Satinoff, *op. cit.*

[34] Papageorgopoulou *et al.* 2011, 381-391.

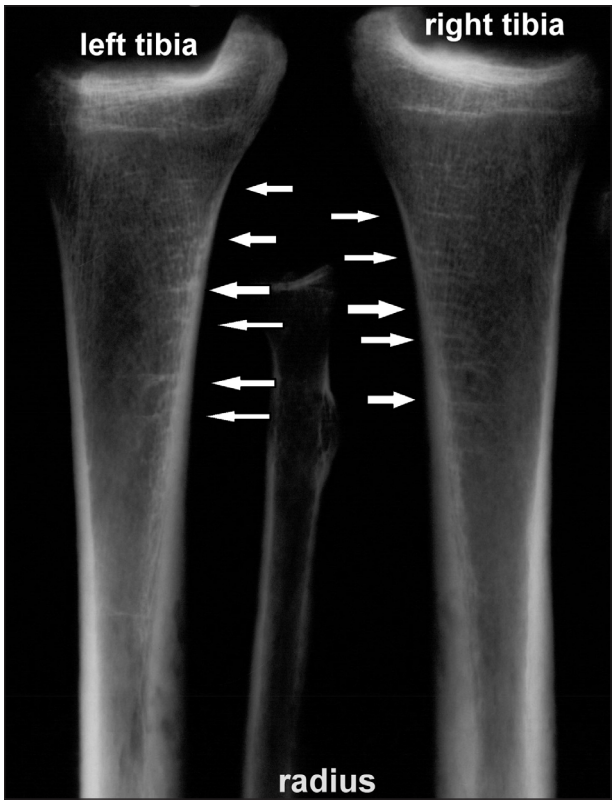

Fig. 10. T_7, G_3, ♂, 18-20 Y. O. Harris lines (right and left tibia).

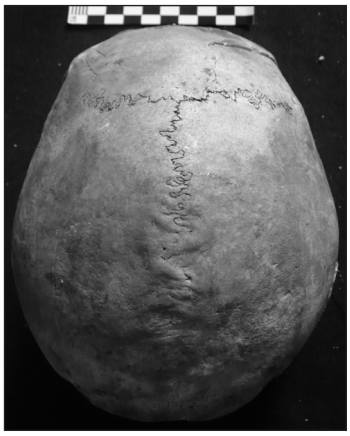

Fig. 11. T_7, G_4, ♂, 35-40 Y. O. Cranium. *Norma verticalis*.

Fig. 12. T_7, G_4, ♂, 35-40 Y. O. Cranium. *Norma facialis*.

Fig. 13. T_7, G_4, ♂, 35-40 Y. O. Left temporal bone. Auditory torus

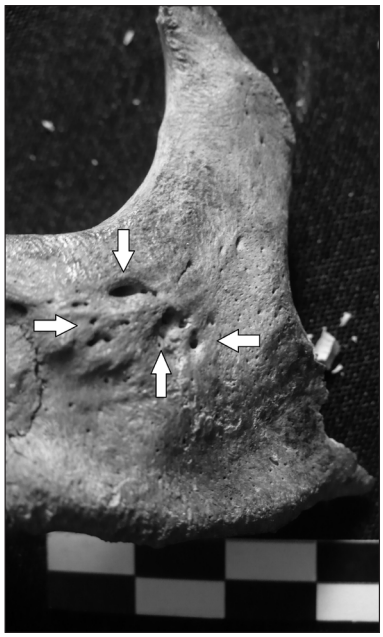

Fig. 14. T_7, G_4, ♂, 35-40 Y. O. Multiple zygomatico-facial foramina.

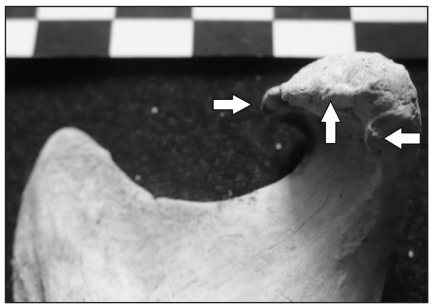

Fig. 15. T_7, G_4, ♂, 35-40 Y. O. Osteophytes at the left mandibular condyle.

Fig. 16. T_7, G_4, ♂, 35-40 Y. O. Lumbar vertebral bodies showing multiples osteophytes.

The facial skeleton (table 1, fig. 12). The orbits are mesoconch. The zygomatic bones are high, with a well-developed relief, situated at intermediary position *versus* the temporal bones. The canine fossa is slightly contoured. The piriform aperture is of the "ditch" type. The palatine vault has a convergent paraboloid contour and is very deep. Similarly with the cranial vault, the facial skeleton of this male also shows archaic characteristics.

The mandible (table 1) has a medium to large depth. The horizontal ramus is moderately high and not very thick, while the vertical one is high and large. The mentonier region is pyramidal, and well evidenced. The goniac relief is well represented, exceeding the plane of the horizontal ramus. Even if the mandible appears as extremely massive, the calculated index of robustness places it in the small masculine category.

The dentition is extremely altered by pedological factors. Both the dental pieces still present in the alveolus and those detached *post mortem* are extremely fragile and deteriorated. Two teeth had been lost *in vivo*: the central superior left incisor and the superior right premolar 2. In the masticatory region, the wearing degree varies from I to IV: M2 – III towards IV degree of wearing; M3 – I towards II degree of wearing. None of the 15 teeth present show caries or calculus.

The postcranial skeleton (table 2) is extremely robust and massive. The femora are hyperplatimere, having a crest and a subtrochanterian fossa and pilaster – markers of equestrian activities (horseback riding)[35]. The tibiae are hyperplaticneme, with additional joint facets at the contact with tali bones. The humeri are platybrachic, with an extremely pronounced deltoidian relief. The fibulae are grooved, and with a triangular diaphysary section.

The stature (table 2), calculated in good conditions, belongs to the large masculine category, at its extreme superior limit (large towards very large).

Pathologies, anomalies, epigenetic traits

The external auditory regions have an ***auditory exostoses*** (fig. 13), a trait with genetic determinism in the opinion of some specialists[36], but also an anomaly caused by environmental factors, such as low temperatures, cold wind, humidity and especially aquatic (cold water) activities[37].

Parietal foramina are present on the parietal bones, in the area of the sagittal suture and of

[35] Blondiaux 1994, *op. cit.*; Molleson, Blondiaux 1994, *op. cit.*

[36] Berry, Berry 1967, 361-379.

[37] Hutchinson *et al.* 1997, 417-422; Özbek 2012, 181-186.

the *lambda* point. The left mastoid process has three ***exsutural foramina***. The left zygomatic bone shows ***multiple zygomaticofacial foramina*** (fig. 14). The supraorbital region shows at both orbits ***complete supraorbital foramina*** (extremely large and deep). These four traits represent instruments for measuring the degree of endogamy and also markers of the environmental conditions under which the subject had lived – a cold and humid climate.

Numerous components of the skeleton show both, on the skull (the temporomandibular joint), and on the postcranial skeleton (the spine, the humeroulnar joint, the clavicles, the bones of the inferior and superior members) the existence of osteoarthritis. As the age at death of this man is under 40 years, the malady is a ***secondary osteoarthritis*** that manifests in young persons as a result of some diseases, such as ***rheumatoid polyarthritis***. In our case, osteoarthritis manifested both through the development of osteophytes and enthesophytes, and through joint deformation.

Consequently, the mandible developed osteophytes in the area of contact with the skull (fig. 15). The spine shows osteophytes on almost all thoracic and lumbar vertebrae (fig. 16). Bone excrescences are also present on both patellae, on a few phalanges (fig. 17), and in the left humero ulnar joint. In this last case the effects of the disease were much more severe, up to bone deformation of the ulna (fig. 18).

Another manifestation of osteoarthritis in this man is the development of enthesophytes on almost all long bones of the superior and inferior members, and also on the clavicles. The traces left on the bones by the muscle insertions, accompanied by enthesophytes illustrate the physical efforts made by the subject along his life: sustained arm movements in anterior, posterior and lateral direction, flexion and extension of the forearm and the supination movement, movements of the inferior members through extension and flexion, external rotation and thigh extension, and knee flexion. All these movements and, implicitly, the group of muscles responsible for them, leave profound traces, which appear as excavations in the bone wall[38].

On both distal epiphyses of the tibiae, additional joint facets are present (fig. 19) – ***squatting facets*** – as a remodelling bone effect of repeated crouching (hyperdorsiflexion), accompanied by heavy physical activities.

[38] Teodorescu 1982; Chiriac *et al.* 1995.

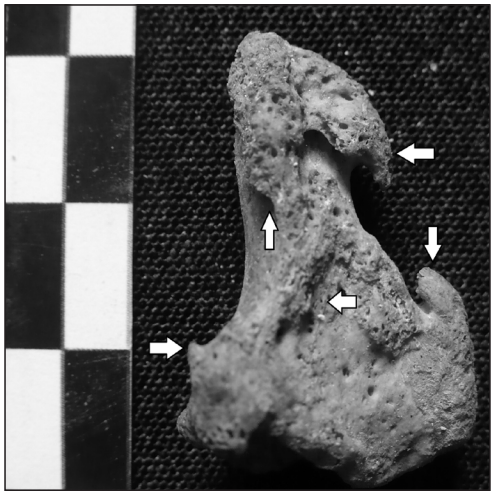

Fig. 17. T_7, G_4, ♂, 35-40 Y. O. Distal phalanx showing osteophytes.

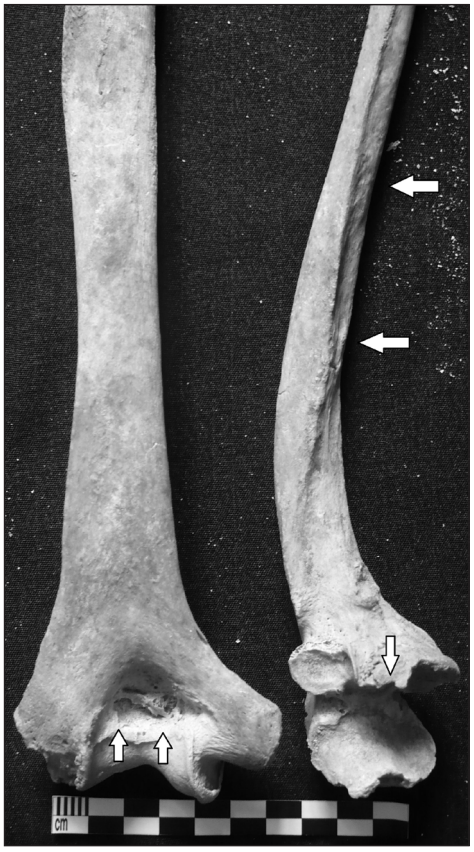

Fig. 18. T_7, G_4, ♂, 35-40 Y. O. Osteoarthritis of the left humeroulnar joint.

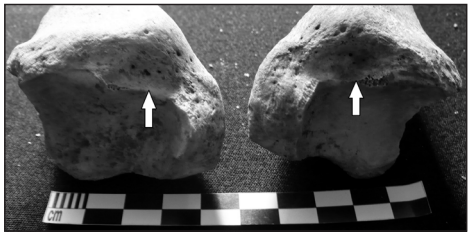

Fig. 19. T_7, G_4, ♂, 35-40 Y. O. Anterior surface of the lower end of the tibiae showing squatting facets.

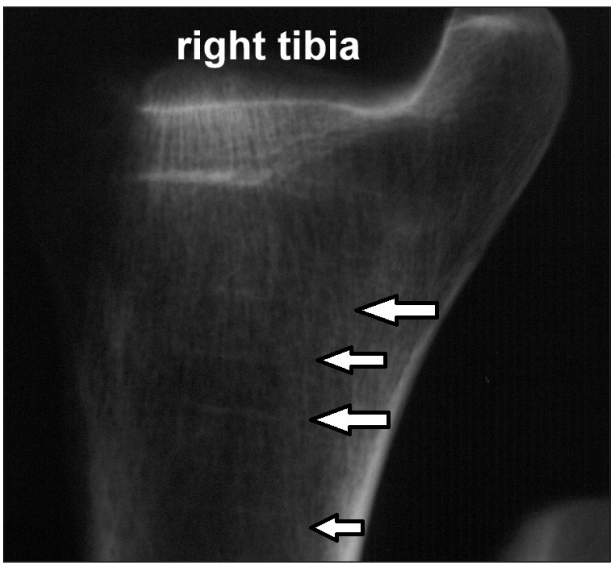

Fig. 20. T_7, G_4, ♂, 35-40 Y. O. Harris lines.

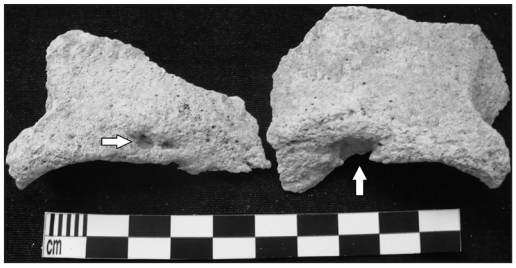

Fig. 21. T_7, G_5, ♂, 40-45 Y. O. Right side – supraorbital complete foramen, left side – supraorbital notch.

Fig. 22. T_{7A}, G_1, ♀, 35-40 Y. O. Maxilla and mandible, profile view.

Fig. 23. T_{7A}, G_1, ♀, 35-40 Y. O. Mandible, occlusal surface.

The metaphyses of the long bones show the presence of ***Harris lines*** (fig. 20) – representing interruptions of bone growth, namely physiological stress/crisis: subnutrition, malnutrition, acute diseases, infections, avitaminoses or intoxications[39]. The lines are more pronounced on the tibiae.

Tumulus no. 7– Grave no. 5 ($T_{7,}$ G_5)

The skeletal remains of this person are considerably fragmented – for example, the skull is represented by only nine fragments (from the frontal bone, parietal bones, right temporal bone and the right mandibular half), while the postcranial region is represented by a fragment of the scapula and the diaphyses of the long bones of the superior members (humeri, radii and ulnae). These bone pieces, showing an extremely pronounced robustness, belonged to a ***male*** subject with the age at death of 40-45 years (***maturus*** category).

The neuroskull (table 1). The cranial relief is extremely pronounced on both the frontal bone (glabellar 4, supraorbital 2-3) and on the mastoid process (degree 5).

The mandible (table 1), represented only by its right side, appears as very robust. The vertical ramus is short and large, the horizontal one is high.

Dentition. During his life, the man suffered at least two dental losses, namely the right inferior molars 1 and 2, whose alveolus is wholly healed and resorbed.

The postcranial skeleton (table 2) appears as extremely robust. According to their section indices, the humeri are pronouncedly eurybrachic, the insertion places of the deltoidian muscles showing deep reliefs, excavations on the bone wall, and enthesophytes.

Pathologies, anomalies, epigenetic traits

The right supraorbitary region of the frontal bone has a ***complete supraorbital foramen***, and the left one has a ***supraorbital notch*** (fig. 21), both representing responses of the organism (in particular, of the head), through thermoregulation, to the low ambiental temperatures. That suggests the fact that the individual lived in a cold and humid climate.

The insertions of the deltoidian muscle on the diaphysis of the humeri left traces in the bone wall, accompanied by ***enthesophytes***. These two phenomena appear as manifestations of the ***osteoarthritis*** installed at young age, while also revealing the physical effort constantly made by this subject

[39] Papageorgopoulou *et al., op. cit.*

with his arms, by means of movements in anterior, posterior and rising direction.

Tumulus no. 7A – Grave no. 1 ($T_{7A,}$ G_1)

This skeleton is relatively well conserved. From the cranium, only the left half could be reconstituted, the right one being too fragmented and incomplete. The mandible is intact. The postcranial skeleton, even though fragmented here and there, is represented by all its components. The following elements are missing: five cervical vertebrae, seven thoracic vertebrae, the whole lumbar vertebral segment, the right clavicle and the sternum. This quite gracile skeleton belonged to a ***female*** subject with the age at death of 35-40 years (***maturus*** category).

The neuroskull (table 1). Viewed in *norma verticalis*, the form of the neurocranium is ovoid while in *norma occipitalis* is of "house"-type. The vertical contour indicates a convex and oval forehead, with intermediary-type crests. The cranial relief is weakly developed on the frontal bone (glabellar 1-2, supraorbital 1) and moderately on the mastoid processes (degree 2-3).

The facial skeleton (table 1). The piriform aperture is anthropine. The palatine vault shows a convergent paraboloid contour, small depth and mesostaphyline palatinal index. As a general profile, the facial skeleton seems to have had a superior alveolar prognatism (fig. 22), an appreciation justified especially by the leaning angle of dental abrasion.

The mandible (table 1, fig. 22 and fig. 23) is moderately gracile, with small width and depth. The horizontal ramus is low and moderately thick, while the vertical one is high and large. The mentonier region has a button aspect, and the goniac relief is attenuated, at the same level with the horizontal ramus. The index of robustness has medium values.

Dentition (fig. 22 and fig. 23) shows neither caries nor infectious processes of different nature. The wearing degree is different. In the masticatory regions, wearing varies from degree I (M3) up to degrees II-III (M2) and even IV-V (M1). The jugal teeth, as well as the primary masticators, evidence increased wear (degree IV). Worth mentioning is that such a wear is extremely advanced for an age of 35-40 years, which induces the idea that, possibly, this woman used her teeth as an instrument of work (supporting, cutting, grinding). On the other hand, such an advanced wear might have been also caused by the consumption of hard, raw or fibrous food.

The postcranial skeleton (table 2) is gracile. The femora are hyperplatimere, with no pilaster and with a very weakly developed subtrochanterian relief. The tibiae are mesocnemic. The humeri, when considering the index of diaphyseal section, are asymmetrical: the right one is platybrachic, the left - eurybrachic. Both humeri show in their distal extremity incipient supratrochlear foramen.

Pathologies, anomalies, epigenetic traits

On both dental arches, especially on the mandible, a thin layer of ***supragingival calculus/tartar*** (mineralized bacterial plaque) is present. The deposit is grey-yellowish, towards brown. Caries are absent; a phenomenon that can be explained by the incompatibility of the two processes (calculus *versus* caries)[40].

The frontal bone shows ***metopism*** – a non-metric trait characterized by the persistence of the metopic suture (fig. 24), a suture which, generally, closes completely during early childhood. As to the possible cause of such a phenomenon, the genetic factor is usually mentioned[41].

The left part of the frontal bone has a ***supraorbital notch***, which represents a good marker of the climatic conditions (cold and humid) under which the subject had lived[42].

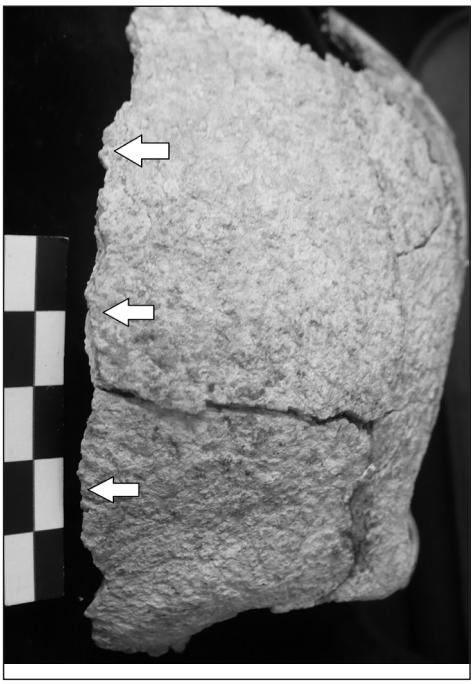

Fig. 24. T_{7A}, G_1, ♀, 35-40 Y. O. Frontal bone showing metopism.

[40] Slootweg, *op. cit.*

[41] Castilho *et al.* 2006, 61-66.

[42] Tomaszewska *et al.*, *op. cit.*

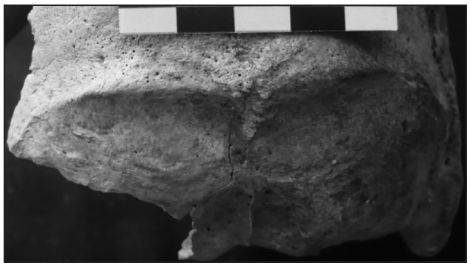

Fig. 25. T_{7A}, G_2, ♂, 45-50 Y. O. Occipital. Superior and inferior nuchal lines.

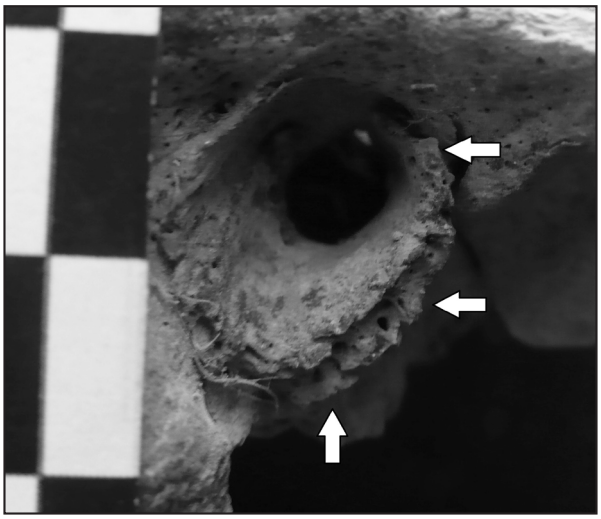

Fig. 26. T_{7A}, G_2, ♂, 45-50 Y. O. Right temporal bone. Auditory exostoses.

Fig. 27. T_{7A}, G_2, ♂, 45-50 Y. O. Retroarticular bridges/spurs on the atlas.

Both humeri show in their distal extremity a ***supratrochlear foramen*** – which is the effect of hypermobility (when the arm is repeatedly stretched-extended)[43] or of clumsiness[44].

Tumulus no. 7A – Grave no. 2 ($T_{7A,}$ G_2)

These remains are represented by an incomplete *cranium* which necessitated restoration and by a fragmented postcranial skeleton having about 75% of its components. The skeleton is extremely robust, maybe the most robust of the entire series. The extremely well developed bone relief is clearly visible on both skull and postcranial bones. This skeleton, showing archaic characters, belongs to a ***male*** subject with the age at death of 45-50 years (***maturus*** category). Some of the osteological remains have reddish (ochre) traces on the external bone wall, non-uniformly distributed on the right temporal bone, occipital bone, zygomatic bones, right humerus, left ulna and right fibula.

The neuroskull (table 1). Viewed in *norma verticalis*, the shape of the neurocranium is ovoid while in *norma occipitalis* is of "house"-type. The vertical contour indicates a leaned forehead, a long and slightly arched line of the crown and a moderately high, curved and convex occipital bone. Considering its width, the occipital bone belongs to the large/big category. The bone relief is well-developed on the frontal bone (supraorbital 2), moderately on the occipital bone (3) and very pronounced on the mastoid process (4-5). The places of nuchal musculature insertion on the occipital bone are very well evidenced (fig. 25). Probably, this man used his head to carry very heavy burdens on it.

The facial skeleton (table 1). The zygomatic bones have medium to large size, and a well developed relief. Advanced fragmentation prevented any other observations.

The mandible (table 1) is typically masculine, very robust, with considerable width and reduced depth. The horizontal ramus is moderately high and very thick, the vertical one is short and very large, the mentonier region has a prominent pyramidal aspect, while the goniac relief is extremely well-outlined, exceeding by far the plane of the horizontal ramus. The index of robustness takes very high value.

Dentition is strongly affected by the pedological factors. The teeth still present in the alveolus appear only as radicular remnants, a situation caused by neither dental wear nor caries, but by the action of the soil which, practically, consumed and fragilized them, making them very sensitive to any manoeuvre. However, a few observations could be made. Apparently, this subject had no caries and no calculus, and suffered no *in vivo* dental losses and no other infectious processes (for example, granulomas). Dental wear could not be appreciated, because of the extreme fragmentation of the crowns. Even if highly altered by the soil, the massiveness of the teeth may still be deduced.

[43] Lamb 1890, 159-174.

[44] Singhal, Rao, *op. cit.*; Mahajan, *op. cit.*

The postcranial skeleton (table 2), quite well preserved, is extremely robust and massive. The right humerus, the only measurable piece, may belong (when considering the diaphyseal section index) to the platybrachic category. It shows an extremely well marked deltoidian relief.

Pathologies, anomalies, epigenetic traits

In the vicinity of the sagittal suture, at small distance from the *lambda* point, the right parietal bone shows a ***parietal foramen***. The right mastoid process shows an ***exsutural foramen***. The left zygomatic bone has two ***zygomaticofacial foramina***. The right supraorbital region is provided with a ***supraorbitary notch***. These four traits are useful in genetic studies for establishing the degree of endogamy. They are also markers of the environmental conditions under which the individual had lived (a cold and humid one)[45].

The external auricular regions show auditory ***exostoses*** (bone excrescences on the inferior wall of the auditory orifice (fig. 26), a characteristic with a special genetic determinism[46] and/or a marker of the aquatic (cold water) activities[47].

The atlas (the first cervical vertebra) is provided, bilaterally, with ***retroarticular spurs*** (fig. 27). Also defined as bridges, these formations belong to the group of non-metric vertebral traits, being used as instruments for detecting endogamy in genetic studies[48].

Cervical vertebrae nos. 3 and 4 have an ***accessory transverse foramina*** (fig. 28), which represents a non-metric vertebral trait acting as a possible marker of the high extent of endogamy[49].

In the postcranial segment, the skeleton of this 45-50 year-old man presents numerous indications attesting the presence of ***degenerative osteoarthritis***, a disease of joints associated with advanced age and with the hard labour that constantly involves the back bones and muscles. In this case, the disease affected the entire spine. The presence of corrosion/porosity and of marginal osteophytes may be observed on the cervical vertebral bodies (fig. 28). The thoracic and the lumbar vertebral bodies show Schmorl's nodes (vertical intervertebral hernia) and marginal osteophytes (fig. 29). The phenomenon is a response to the various forms of stress/pressure exercised upon the back bones, and maintained for a long time

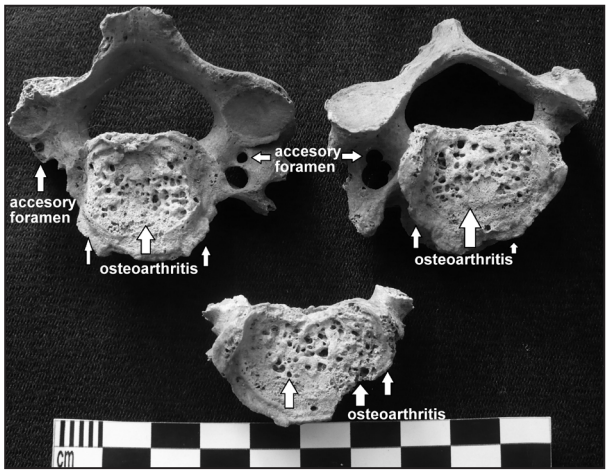

Fig. 28. T_{7A}, G_2, ♂, 45-50 Y. O. Cervical vertebrae showing accessory transverse foramina and affected by osteoarthritis.

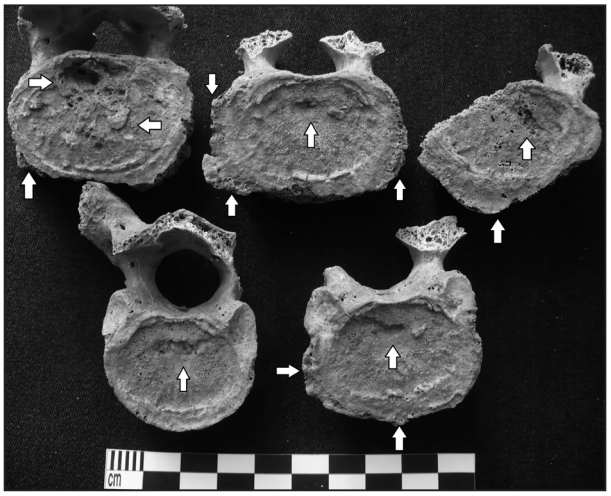

Fig. 29. T_{7A}, G_2, ♂, 45-50 Y. O. Thoracic and lumbar vertebrae affected by osteoarthritis.

period. On the bones of the members, in the area of muscular insertion, enthesophytes (bone excrescences resulted from ligaments' ossification) occurred, which a sign of the continuous physical effort is made by this person for a long time.

Tumulus no. 7A – Grave no. 3 ($T_{7A,}$ G_3)

The skeletal remains of this individual, well conserved, are represented only by postcranial bones, namely: four cervical vertebrae, all thoracic and lumbar vertebrae, non-ossified sacral vertebrae, coxal bones, the right clavicle, scapulae, ribs, femora, tibiae, the right (?) fibula, humeri, radii and the left (?) ulna. The diaphyses of the long bones show non-ossified epiphyses. As to the cranial skeleton, it is wholly absent (the superior and inferior maxillary included) so that the age at death could be established only from the size of the postcranial bones.

We could measure the length of three complete long bones (measured without epiphyses): the

[45] Tomaszewska *et al.*, *op. cit.*

[46] Berry, Berry, *op. cit.*

[47] Hutchinson *et al., op. cit.*; Özbek, *op. cit.*

[48] Manjunath 2001, 488-490.

[49] Sharma *et al.* 2010, 229-231.

right femur, the left femur and the right humerus. The diaphysis of the right humerus is 202 mm long, a value indicating an age around 7 years. The diaphyses of the femora, slightly asymmetrical, have lengths of 275 mm (the right one) and 277 mm (the left one), which indicates an age of about 6-7 years. The skeleton belonged to a child with the age at death of about 6-7 years (***infans I*** category), probably male (a quite reserved appreciation, based on the characters of the pelvic girdle).

The low conservation extent of the subadults and the fact that some anomalies are manifested only later during lifetime permit the observation that this child has no anomalies, pathologies or non-metric characteristics that are macroscopically visible.

Tumulus no. 7B – Grave no. 1 ($T_{7B,}$ G_1)

This skeleton, even if fragmented, is relatively well preserved. The cranial portion is represented by the following pieces: the frontal bone, the parietal bones, fragments of the temporal bones and of the occipital one, and the left portion of the mandible (without the dental alveolus). The postcranial skeleton is represented by six fragments from the vertebral apophyses, 23 rib fragments, pieces of the right femur, of the humeri, of the right (?) radius and right (?) ulna.

The age at death was approximated from the size of the frontal bone chord (straight line distance)[50]: minimum width of the forehead (*ft-ft*) – 95 mm, maximum width of the frontal bone (*co-co*) – 114 mm, maximum length of the frontal bone (*n-b*) – 106 mm. The skeleton belonged to a child that died at the age of around 1.5-2 years (***infans I*** category), of indeterminate sex.

Certain skeletal remains of this child show reddish traces (ochre), unevenly distributed on the external bone wall. As to the skull, the ochre traces are intense on the frontal and parietal bones and more attenuated on the occipital one while, in the postcranial portion, the ochre occurs on the diaphyses of the femora, humeri, radii and ulnae.

Tumulus no. 7B – Grave no. 2 ($T_{7B,}$ G_2)

This skeleton is represented by only a few extremely fragmented postcranial remains, as follows: the superior third of the diaphysis of the right femur, the middle third of the diaphysis of the left femur, the diaphysis of the right tibia, and fragments from the diaphyses of the right radius and right talus. Even if in a state of precarious conservation caused by the action of the pedological factors, the massiveness and robustness of the skeleton can be still deduced. It belonged to a ***male*** subject with an age at death of 35-40 years (***maturus*** category).

The postcranial skeleton (table 2). From the perspective of the platymeric index, the femora are asymmetrical: the right femur is of platimer type, the left one is hyperplatimer. The index of pilaster was calculated only for the right femur, and gave the highest value of the whole series. The subtrochanterian relief is moderate, and represented on both femora by fossa and crest. All these three characters are markers/indicators of equestrian activities (horseback riding)[51]. The right tibia is platycnemic, at the inferior limit of the category. Another observation regarding the right tibia concerns the aspect of saber shin (hiperplatycnemia), feature possibly caused by diseases such as, treponematosis, Paget's disease, vitamin D deficiency or Weismann-Netter syndrome[52]. The final diagnosis is still uncertain as in this case, a detailed analysis on the probable causes of hyperplatycnemia was not possible.

Pathologies, anomalies, epigenetic traits

Apart from a subtrochanteric moderate ditch and fossa, the femora show a pronounced pilaster, the ***linia aspera***, also defined as femoral crest, being extremely well evidenced. A prominent and rugous *linia aspera* indicates overstressing of the group of muscles inserted in such places and, as previously mentioned, equestrian activities. The role of this group of muscles is of extending the inferior member, of adduction, flexion and external rotation of the hip, extension of hip and flexion of the knee, abduction and lateral rotation of the inferior member. As a result of the overstress, the tendons of these muscles get ossified, thus causing formation of enthesophytes (bone outgrowths) disclosing the extreme physical effort made by this man.

Anthropometric analysis

The absolute (measurements) and relative (indices) anthropometric values of the skeletal remains exhumed from the tumular necropolis of Cernavodă, listed in table 1 for the cephalo-facial segment and in table 2 for the postcranial segment, show, as expected, slightly different metric and conformative characteristics in the two sexes.

For the male group of subjects (five individuals), the following characteristics may be mentioned:

[50] Young 1957, 367-386.

[51] Blondiaux 1994, *op. cit.*; Molleson, Blondiaux 1994, *op. cit.*

[52] White *et al.*, 2012, 261.

length of the neurocranium (*g-op*) – big; width of the neurocranium (*eu-eu*) – medium; height of the neurocranium (*po-b*) – big towards very big; cranial index (*eu-eu/g-op*) – mesochranic; minimum width of the forehead (*ft-ft*) – medium; maximum width of the forehead (*co-co*) – small; the frontal-transversal index (*ft-ft/co-co*) – oval forehead, of intermediary type; the frontal-parietal index (*ft-ft/eu-eu*) – metriometopic; the width of the occipital (*ast-ast*) – medium; the parietal-occipital index (*ast-ast/eu-eu*) – medium; maximum facial width (*zy-zy*) – extremely big; orbitary height – small; orbitary width (*mf-ek*) – medium; orbitary index – mesoconch; nasal width (*al-al*) – big; width of the mandible in the goniac region (*go-go*) – very big; width of the mandible in the area of contact with the skull (*kdl-kdl)* – big towards very big; index of mandibular robustness ($69_3/69_1$) – high value; humeri – eurybrachic; tibiae – platycnemic; femora – hyperplatimere, with pilaster and sometimes with an additional trochanter; stature – tall; skeletal robustness – extremely high.

For the female group of subjects (three individuals), the observed characteristics are as follows: minimum width of the forehead (*ft-ft*) – big; maximum width of the forehead (*co-co*) – big; the frontal-transversal index (*ft-ft/co-co*) shows an oval forehead, of intermediary type; the palatal index (enm_2-enm_2/*ol-st*) – mesostaphyline; length of the mandible in the goniac region (*go-go*) – small; width of the mandible in the area of contact with the skull (*kdl-kdl)* – very small; the index of mandibular robustness ($69_3/69_1$) – small value; humeri – eurybrachic; tibiae – platycnemic towards mesocnemic; femora – platimere or even hyperplatimere, with a weak pilaster or without it; skeletal robustness – moderate.

Paleodemographic analysis

The osteological series exhumed from the tumular necropolis of Cernavodă (tumuli nos. 7, 7A and 7B) is represented by 10 human skeletons: five males, three females and two subjects with undeterminable age (*infans I*). One of the five men died at adolescent age, namely in the 14-20 years interval. Out of these 10 skeletons, three individuals did not exceed the subadult age (*infans I*, *infans II* and *juvenis*), while the other seven (four men and three women) lived more than 20 years (*adultus*, *maturus*). Infant mortality rate (0-14 years) records a value of 20%, while that of the juvenile segment (14-20 years), when the human organism is considered to have been made a successful biological adaptation, is of 10%. Consequently, mortality in the segment of population with ages at death between 0-20 years registers quite a high value – 30%, which means than one third of the population did not live until adulthood. For the 20-x years interval, most of the deaths appear in the *maturus* category (70%), no decease being recorded for the *adultus* category (20-30 years). None of them reached old age (60-x years).

The important observation to be made is that, in the population under investigation, the period of maximum mortality corresponded to the *maturus* interval. As this interval is extended over 30 years (between the ages of 30 and 60), while that of early childhood lasts only seven years (between birth at the age of 7), the 20% mortality registered for the *infans I* interval permits the assertion that the maximum risk of mortality in this population occurred during early childhood. The high infantile mortality may be caused by the concentration of the dwellings around a central nucleus, a phenomenon characteristic for the tribal communities of the Bronze Age, which means a higher density of the population, viewed as a major risk factor of contamination and spreading of epidemics, especially among babies and children[53].

Table 3 illustrates the structure, by sex and age groups, of the population exhumed from tumuli nos. 7, 7A and 7B, compared with the contemporary population from the same tumular complex of Cernavodă, namely the series from tumulus no. 3[54]. A first important observation of such a comparative analysis is that infantile mortality (*infans I* and *infans II*) is higher in the series analyzed here, compared with the one from tumulus no. 3 (20% *versus* 14.3%). For the *juvenis* category of age (14-20 years), the situation is reversed, the percentage of adolescents in tumulus no. 3 being at least two times higher than the value recorded for tumuli nos. 7, 7A and 7B. However, summing up the values of *infans* with those of the juvenile subjects, one may observe that the percentage of subadults takes quite similar values in the two comparative series. In the *adultus* category of age, mortality in tumulus 3 is 14.3%, while in the series analyzed here, no *adultus* have been registered. Surprising is the situation recorded for the *maturus*

[53] Florescu 1964, 105-125; Miu 1999, 92-98.

[54] Schuster *et al.*, *op. cit.*, 17-51. The demographic data, obtained from statistical calculations performed by the authors of the present study, were based on the anthropological study of the 21 individuals excavated from tumulus no. 3, found on the Cernavodă-Medgidia route A2 highway. The determinations considered here, referring to sex and age at death, have been made by Alexandra Comşa – anthropologist at the "Vasile Pârvan" Institute of Archaeology in Bucureşti and co-author of the volume on the results of the archaeological excavations performed at tumulus no. 3.

category of age (30-60 years): while in the case of tumulus 3 only 19% died at this age, in the case of tumuli 7, 7A and 7B the percentage is more than three times higher (70%). None of the persons in the four tumuli (T3 or T7, T7A, T7B) reached old age (60-x years).

Is it possible that, in the population of tumulus no. 3, so few members of the community exceeded the age of 30 years? Or this impression may be created by the six individuals of that burial mound, whose age could not be determined? Even if the six skeletons from tumulus no. 3 might have belonged to the *maturus* category of age (30-60 years), the percentage of matures in the two compared skeletal series would not agree, which urges us to consider that the only possible explanation is the non-uniform structure of the investigated group (tumuli nos. 7, 7A and 7B), implicitly, the very small number of individuals (only 10).

Sex ratio or *the masculinity index* in the population from tumuli nos. 7, 7A and 7B is supraunitary, indicating a higher number of male skeletons, compared to the female ones (5 men/3 women = 1.66) and, consequently, a dominant presence of men. The same situation, yet much more pronounced, characterizes tumulus no. 3, where the ration between sexes is of 10 men/2 women (*sex ratio* = 5.0). Naturally, in the last population (tumulus no. 3) one should also consider the six individuals of undetermined sex, which might modify the registered ratio in favour of one sex or another. Worth mentioning is, nevertheless, the fact that a high value of the masculinity index may suggest that the investigated population used to live peacefully, without being involved in possible intra- or inter-tribal conflicts – events which, once produced, would have undoubtedly caused a subunitary masculinity index. On the other side, the fact that the three female subjects exhumed from tumuli nos. 7, 7A and 7B died after the age of 30 shows that the women of this population exceeded the adult age. As known, during adulthood (between ages of 20 and 30), in prehistory (and not only) the risk of death among women was quite high, many of them not living until maturity. This interval of age includes the period of maximum fertility, the frequency of deaths at childbirth and especially during the postnatal period being quite high, as a result of the numerous infections, complications, high risk of contagion, and poor hygiene conditions. The fact that a number of women succeeded in living beyond this critical moment of their life, reaching adulthood, shows that the social conditions that might have caused a high decease ratio among female adult populations were not as precarious as imagined. Obviously, this is only a supposition, as the number of skeletons exhumed from tumuli nos. 7, 7A and 7B is very low, including only three female subjects.

Life expectancy at birth (table 4), calculated for the whole population exhumed from tumuli nos. 7, 7A and 7B, is of 33.0 years, while, for the population from tumulus no. 3 is of 26.73 years. Thus, the difference observed between the two contemporary populations is negligible, of only 3-4 years. For the adult segment of the population from tumuli nos. 7, 7A and 7B, namely for the subjects older than 20 years, the life expectancy, calculated for each sex group, was of 21.25 years for men and of 25.83 years for women, that, on the average, women used to live 4-5 years more than men. As to tumulus no. 3, life expectancy after the age of 20, which could be calculated only for males, was of 18.33 years, almost three years lower than that of the men from tumuli nos. 7, 7A and 7B. The two females from tumulus no. 3 provided no information for determining their age at death, so that they could not be included in the calculation of life expectancy.

Analysis of pathologies, anomalies and epigenetic / non-metric traits

The presence of pathologies, anomalies and of the epigenetic traits in the skeletal series of Cernavodă exhumed from tumuli nos. 7, 7A and 7B is listed in table 5, both separately per sex groups (five men and three women), and for the whole adult group (eight individuals). No pathologies or bone anomalies were recorded at children (two subjects). However in these two cases, the conservation degree is low.

At cranial level, the most frequent pathologies are located on the dental arcades: *in vivo* tooth losses (two cases) and supragingival calculus (two cases). Less frequent pathologies (one case each) include osteoid osteoma[55] and osteoarthritis. Among the cranial epigenetic features, the highest value is recorded for the supraorbital notch (five cases), followed by the complete supraorbital foramen (four cases) and by the exsutural mastoid foramen (three cases). Other six non-metric cranial traits show a somehow lower, but significant presence: the parietal foramen, the zygomaticofacial double/multiple foramen and the auditory exostoses (two cases each), followed by the mandibular torus, the Wormian bones[56] and metopism[57] (one case each).

[55] Ruggieri *et al.*, *op. cit*. The osteoma is a small-sized benign tumoral formation, frequently occurring in children, adolescents and young adults.

[56] Jeanty *et al.* 2000, 862-869. The Wormian bones, representing anomalies from the normal pattern of bone fusion, have a high heritability. When occurring as a variant to normality, they are small-sized and hardly numerous. Possible causes: artificial cranial deformations, hydrocephalus, metabolic disorders, and metopism.

[57] Castilho *et al.*, *op. cit.* Metopism – *i.e.*, persistence of the suture uniting the two halves of the frontal bone – may be the

At the postcranial level, the most frequent pathology observed is osteoarthritis, present in three quarters of the analyzed population (six cases). The subjects affected by osteoarthritis are mature persons, five males and only one female. A more reduced, yet significant presence is recorded for the Harris lines, appearing, according to the radiographies, at two male individuals. As to the postcranial epigenetic traits, significant percentages have been registered for those included in the category of occupational markers (mechanical enthesopathies), namely the humeral supratrochlear foramen and the squatting facets on the tibiotalar joint (three cases each). The preauricular[58] sulcus is present in two cases (one male, and one female). The lowest presence has been recorded for the following non-metric traits, also belonging to the group of occupational markers: talar extension, the additional femoral trochanter and the costoclavicular sulcus (one case each). The same reduced presence (one case each) is registered by some anomalies, hardly occurring in the anthropological collections: the retroarticular spur on the atlas, the accessory transverse cervical foramen, the sternal hypoplasia and the congenital rib fusion[59].

An especially important observation is the absence of dental caries, which is quite expected when considering the high presence of supragingival calculus[60]. This does not mean that, in the analyzed population, teeth were caries-free – see the *in vivo* dental losses mentioned in one quarter of the subjects. The falling teeth, or those voluntarily extracted have necessarily certain pathology, most often caries, their occurrence being directly related to alimentation. The fact that the subjects analysed here have caries-free maxillaries, yet with *in vivo* dental losses, may have different causes. Possibly, the members of this community were more concerned with their oral hygiene, which made them extract immediately the affected painful teeth. On the other side, the absence of caries and the high prevalence of dental calculus were observed by other authors, too, in nomad or semi-nomad communities of shepherds. A possible cause for this situation could be a local technique of food preparation and the high consumption of dairy products and meat[61].

As to the presence of osteopathies as signs of possible anaemia, deficiencies or diseases the series recorded two cases of Harris lines – a proof of bone growth interruption during childhood. Mention should be made of the fact that in neither of the cases the Harris lines were associated with dental hypoplasia or with cranial porosities. The very presence of the Harris lines, whichever their location, or association with related pathologies, may be a sign of physiological stress episodes during childhood: malnutrition, subnutrition, acute diseases, infections, deficiencies, intoxications, and hypocaloric or hypoproteic diet[62]. The prevalence of this pathology represents a useful instrument for the appraisal of the health of the infantile population.

As expected, the most frequent pathology is osteoarthritis, a degenerative joint disease, which advances slowly, causing in its final stages the total loss of joints' function and deformations of the joints. The responsible factors are: age, genetic predisposition, sex, race, obesity, traumatisms and movement, the last one being a compulsory condition for the installation of osteoarthritis[63]. The presence of osteophytes, of Schmorl's nodes and of corrosion on the spine, of osteophytes on other joints, as well as of enthesophytes in the places of muscular insertion indicates polyarthritic and, sometimes, rheumatic diseases in various stages of manifestation[64]. In the population exhumed from tumuli nos. 7, 7A and 7B, osteoarthritis is more frequent in males, comparatively with females. All five male skeletons are affected with osteoarthritis, especially at the level of vertebral column and superior and inferior members. It is only one female skeleton showing traces of this pathology.

In old populations, undoubtedly in the one of Cernavodă, too, a very important role in the development of enthesopathies was played by certain physical activities and specific occupations, which, according to the intensity of the physical

consequence of growth and development interruption, of hydrocephalus, of some sexual or hormonal dysfunctions; also included in the group of atavisms. Most frequently, the cause is the genetic factor.

[58] Houghton 1974, 81-390; Kurihara *et al.*, *op. cit.* In recent years, several authors discussed the correlations between the aspect of the feminine sulcus and the number of children born to a woman, the researches being also extended to modern populations by means of X ray investigations. The observation made was that some multiparous women show no preauricular sulcus of "pregnancy"-type. Such characteristic was also noticed on some male skeletons, especially in those with pronounced muscular insertions; in these cases, the sulcus had a different form from the one indicating parity in women.

[59] Barnes, *op. cit.* Rib fusion is a rare congenital anomaly, present in about 0.3% of the members of a population.

[60] Slootweg, *op. cit.* The dental caries and the supragingival calculus/tartar are reciprocally incompatible processes; the caries are developed in an acid medium, while the calculus – in an alkaline one.

[61] Lukacs 1989, 261-286.

[62] Papageorgopoulou *et al.*, *op. cit.*

[63] Nevitt *et al.* 2006; Waldron, *op. cit.*

[64] Schmorl, Junghanns 1971.

effort made left traces on the bones. Study on the morphology of the areas of muscle and ligament insertion on the bones may provide interesting information. It goes without saying that such phenomena have been also recorded in the skeletal series of Cernavodă. The muscular impressions left on the bone components of the scapular girdle indicate activities involving carrying of heavy burdens or handling of rudimentary tools. The impressions while observed on the bones of the superior members indicate repeated movements of arm extension and stretching, namely flexion-extension movements. The traces left on the femora indicate equestrian activities (horseback riding). Other traces left on the bones of the inferior members, together with bone remodelling (mainly in the ankle zone) indicate forced maintenance of the body in vertical position, with overburdens carried on the back, accompanied by marching for long distances on uneven ground. In the case of such osteolytic traces, sexual dimorphism is extremely pronounced, women being much less marked by these signs than men.

As to the epigenetic traits, in the population of Cernavodă, nine features have been identified on the skull and 10 on the postcranial skeleton, which might disclose that, potentially, the community was demographically closed, with a high extent of endogamy. On the other side, a series of epigenetic characteristics (the supraorbital notch, the complete supraorbital foramen, the parietal foramen, the exsutural mastoid foramen and the zygomaticofacial one) suggest the climatic conditions in which the community used to live – a cold and humid climate. These foramens get enlarged or multiplied as an adaptive response of the organism through thermoregulation to the low environmental temperatures, for preventing the heat losses through the neurovascular package, which becomes thicker and is more profoundly located in the bone structures[65]. The auditory exostoses, present in two male subjects, may also offer indications upon the climatic conditions (low temperatures, cold wind, humidity), and also upon some preoccupations, such as prolonged and repeated activities in an aquatic environment, especially in cold water. In bioarchaeological studies this character is considered a marker of aquatic activities[66].

Some explanations should be provided on the humeral supratrochlear foramen, the additional femoral trochanter, the additional tibiotalar joint facets (squatting facets) and the rugous *linia aspera*. In the present study, based on the recommendations made by specialists, these four peculiarities have been included in the category of epigenetic characters[67]. However, they may also be the result of bone remodelling caused by certain activities characteristic for subjects, style of life. For example, the humeral supratrochlear foramen is induced by the bone atrophy occurring after ossification; as a result of mechanical pressure exercised upon the olecranon fossa when the arm is repeatedly stretched-extended (repeated flexion-extension movement)[68]. Clumsiness may also provoke mechanical pressure, being therefore considered as one of the factors inducing the development of the humeral supratrochlear foramen. Some authors include the septal humeral foramen in the category of atavisms[69]. The additional facets on the tibiotalar joint (squatting facets) may be caused by the mechanical stress exercised upon the joint surfaces - a consequence of the crouched/squatting position, accompanied by toilsome physical activities[70]. This allows drawing of conclusions on the movements and positions of the inferior members preferred during daily activities. The additional tibiotalar joint facets actually indicate the intensity or regularity of the crouched posture during either labour or rest – hyperdorsiflexion – a constant habit in prehistory, gradually abandoned after diversification of the life styles. Another hypothesis, still vividly denied even today, pleads for the genetic inheritance of this characteristic[71]. The additional femoral trochanter along with the rugous *linia aspera* may be interpreted as directly related with the intense activity of the groups of muscles inserted in these places, correlated with horseback riding, once again indicating over-stressing daily activities[72].

Conclusions

The anthropological study of the osteological remains exhumed from tumuli nos. 7, 7A and 7B at Cernavodă (the Early Bronze Age) provides precious information for the region to which these funeral complexes belong, and also for the historical moment they illustrate. The extremely interesting results obtained led to important conclusions on the life style of those times, while also permitting a *post mortem* demographic representation of the population group studied here.

[65] Tomaszewska *et al.*, *op. cit.*

[66] Hutchinson *et al.*, *op. cit.*; Özbek, *op. cit.*

[67] Sjøvold, *op. cit.*; Bergmann, Hauser, *op. cit.*

[68] Lamb, *op. cit.*

[69] Singhal, Rao, *op.cit.*; Mahajan, *op. cit.*; Benfer, Tappen 1968, 19-28.

[70] Boulle 2001, 50-56; *idem*, 2001, 345-349.

[71] Satinoff, *op. cit.*

[72] Blondiaux 1994, *op. cit.*; Molleson, Blondiaux 1994, *op. cit.*

The degree of conservation of the 10 skeletons (five males, three females and two children) is satisfactory. Apart from the high degree of robustness and high stature, the skeletons – mainly the male ones – also show numerous archaic characteristics. Four skeletons (two men, one woman and one child) show reddish traces of ochre, which means a 40% weight in the population buried in the three tumuli. In three of the cases, the traces of ochre are nonuniform distributed, appearing as uniform in only one case. Most often, they are located on the skull (frontal, parietal, occipital and zygomatic bones), as well as on the bones of the superior (humeri, radii and ulnae) and inferior (femora and fibulae) members.

As a result of the high infant mortality rate, one third of the population did not attain adulthood. The highest mortality risk is during the period of early childhood (0-7 years). The highest degree of mortality was recorded for the *maturus* interval (30-60 years). There were no deaths recorded for the *adultus* (20-30 years) and *senilis* (60-x years) age groups. The masculinity index is supraunitary, which attests the dominant presence of men. At the level of the whole population under investigation (0-x years), the average life span (life expectancy at birth) is of 33.0 years. For the subjects older than 20 years, life expectancy is of 21.25 years for men and of 25.83 years for women.

The observations on the osteopathies, correlated with the paleodemographic parameters, may provide valuable information on the living environment and socio-economic conditions under which this community performed its daily activities. The osteoarthritic problems discovered in three quarters of the population confirm the climatic conditions characteristic for the respective geographical area (cold and humid climate), which favoured the installation of rheumatismal affections. However, the extended presence of osteoarthritis in a population, especially in at young individuals may indicate the difficult living conditions they had to face on a daily basis. The young persons suffering of osteoarthritis used to overstress and stretch their supporting joints during hard and intense physical activities, such as lifting of heavy burdens and frequent carrying of loads on their back, repeated flexion-extension arm movements, the physical effort made in crouched position, marching on uneven terrain and on long distances with overburdens on the back.

Another important conclusion of the analysis of enthesopathies is the habit of practising aquatic and equestrian activities. The aquatic activities are sustained by the presence of the auditory exostoses (two men), while the equestrian ones (horse riding) – by the presence of the additional femoral trochanter (two men), of the femoral pilaster (two men and one woman) and of the enthesophytes developed on the femoral crest (three men).

As clues for the health condition, two cases of Harris lines, both at male individuals, suggest the presence, inside the community, of episodes of physiological stress during childhood (malnutrition, subnutrition, acute diseases, infections, alimentary deficit or intoxications).

Worth mentioning is the total absence of the dental caries, and the considerable presence of supragingival calculus/tartar, indicating an excessive consumption of dairy products and of a hyperproteic diet. This is consistent with the general diet of a population of fishermen and shepherds, and not farmers.

No traumatism has been observed on the bone system and no indications on the possible cause of death.

Interesting results have been also offered by the epigenetic traits, the population of Cernavodă being quite obviously “marked” in this respect. Nine epigenetic traits have been identified on the skull and 10 on the postcranial skeleton, which indicates a close community, with a high degree of endogamy. The fact that the importance of the non-metric (epigenetic) traits is based on the hypothesis that some of them show a high heritability degree, being therefore useful in the analysis of the biological distance between the extinct human populations.

The final conclusion of the complex anthropological study performed on the 10 human skeletons exhumed from tumuli nos. 7, 7A and 7B of Cernavodă is that the necropolis was used by peaceful people (no trauma related to battles) of the local community – a close, possible endogamic, pathologically “charged” community, whose members showed archaic characters and special robustness, performed physically difficult daily activities, including aquatic and equestrian jobs, and lived in a cold and humid climate, under harsh living conditions.

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Table 1. Statistic values of the main, absolute (in mm) and relative (indices)[73], cephalo-facial dimensions

Martin No.	Character	MALES						FEMALES				UNDETERMINABLE		General average
		T_7, G_3	T_7, G_4	T_7, G_5	T_{7A}, G_2	T_{7B}, G_2	Male average	T_7, G_1	T_7, G_2	T_{7A}, G_1	Female average	T_{7A}, G_3	T_{7B}, G_1	
		18/20 years	35/40 years	40/45 years	45/50 years	35/40 years		40/45 years	55/60 years	35/40 years		6/7 years	1,5/2 years	
1	g-op	191	188	-	-	-	189.5	-	-	-	-	-	-	189.5
5	n-ba	130	-	-	-	-	130.0	-	-	-	-	-	-	130.0
7	ba-o	35	-	-	-	-	35.0	-	-	-	-	-	-	35.0
8	eu-eu	143	141	-	-	-	142.0	-	-	-	-	-	-	142.0
9	ft-ft	100	95	-	-	-	97.5	-	91	104	97.5	-	-	97.5
10	co-co	121	110	-	-	-	115.5	-	-	116	116.0	-	-	115.8
12	ast-ast	106	105	-	116	-	109.0	-	-	-	-	-	-	109.0
16	for. magn. breadth	26	-	-	-	-	26.0	-	-	-	-	-	-	26.0
17	ba-b	-	-	-	-	-	-	-	-	-	-	-	-	-
20	po-b	120	-	-	-	-	120.0	-	-	-	-	-	-	120.0
40	ba-pr	-	-	-	-	-	-	-	-	-	-	-	-	-
43	fmt-fmt	109	111	-	-	-	110.0	-	99	100	99.5	-	-	104.8
$43_{(1)}$	fmo-fmo	97	104	-	-	-	100.5	-	90	92	91.0	-	-	95.8
44	ek-ek	-	-	-	-	-	-	-	-	-	-	-	-	-
45	zy-zy	144	-	-	-	-	144.0	-	-	-	-	-	-	144.0
46	zm-zm	-	-	-	-	-	-	-	-	-	-	-	-	-
47	n-gn	-	-	-	-	-	-	-	-	-	-	-	-	-
48	n-pr	-	-	-	-	-	-	-	-	-	-	-	-	-
50	mf-mf	-	-	-	-	-	-	-	23	-	23.0	-	-	23.0
51	mf-ek	-	41	-	-	-	41.0	-	-	-	-	-	-	41.0
52	orbital breadth height	-	33	-	-	-	33.0	-	-	-	-	-	-	33.0
54	al-al	-	28	-	-	-	28.0	-	-	-	-	-	-	28.0
55	n-ns	-	-	-	-	-	-	-	-	-	-	-	-	-
62	ol-sta	-	-	-	-	-	-	-	-	47	47.0	-	-	47.0
63	enm_2-enm_2	-	-	-	-	-	-	-	-	39	39.0	-	-	39.0
65	kdl-kdl	-	-	-	127	-	127.0	-	97	108	102.5	-	-	114.8
66	go-go	99	-	-	122	-	110.5	-	88	84	86.0	-	-	98.3
68	depth of the mandible	75	79	-	73	-	75.7	-	69	68	68.5	-	-	72.1
69	id-gn	29	29	-	29	-	29.0	-	31	27	29.0	-	-	29.0
$69_{(1)}$	height at the n. f. level	29	31	-	30	-	30.0	-	28	27	27.5	-	-	28.8
$69_{(3)}$	thickness at the n. f. level	13	11	11	14	-	12.2	-	9.5	11.5	9.5	-	-	10.9
70	height of the vertical mandibular ramus	66	70	-	69	-	68.3	-	62	68.5	62.0	-	-	65.2
$70_{(3)}$	height of the mandibular notch	12	-	-	14	-	13.0	-	11	14	12.5	-	-	12.8
71	breadth of the vertical mandibular ramus	32	34	42	35	-	35.7	-	29	33	31.0	-	-	33.4
$71_{(1)}$	breadth of the mandibular notch	31	-	-	37	-	34.0	-	34	33	33.5	-	-	33.8

[73] Martin 1928.

Table 1 (continued)

Martin No.	Character	MALES						FEMALES				UNDETERMINABLE		General average
		T_7, G_3	T_7, G_4	T_7, G_5	T_{7A}, G_2	T_{7B}, G_2	Male average	T_7, G_1	T_7, G_2	T_{7A}, G_1	Female average	T_{7A}, G_3	T_{7B}, G_1	
		18/20 years	35/40 years	40/45 years	45/50 years	35/40 years		40/45 years	55/60 years	35/40 years		6/7 years	1,5/2 years	
8/1	cranial index	74.9	75.0	-	-	-	75.0	-	-	-	-	-	-	75.0
17/1	cranial lenght-height index	-	-	-	-	-	-	-	-	-	-	-	-	-
17/8	cranial height-breadth index	-	-	-	-	-	-	-	-	-	-	-	-	-
20/1	auricular-long. index	62.8	-	-	-	-	62.8	-	-	-	-	-	-	62.8
20/8	auricular-transv. index	83.9	-	-	-	-	83.9	-	-	-	-	-	-	83.9
9/10	frontal-transversal index	82.6	86.4	-	-	-	84.5	-	-	89.6	89.6	-	-	87.1
9/8	frontal- parietal index	69.9	67.4	-	-	-	68.7	-	-	-	-	-	-	68.7
12/8	parietal-occipital index	74.1	74.5	-	-	-	74.3	-	-	-	-	-	-	74.3
16/7	occipital foramen index	74.3	-	-	-	-	74.3	-	-	-	-	-	-	74.3
40/5	gnathic index	-	-	-	-	-	-	-	-	-	-	-	-	-
47/45	total facial index	-	-	-	-	-	-	-	-	-	-	-	-	-
47/46	facial zygomatic index	-	-	-	-	-	-	-	-	-	-	-	-	-
48/45	facial superior index	-	-	-	-	-	-	-	-	-	-	-	-	-
52/51	orbitary index	-	80.5	-	-	-	80.5	-	-	-	-	-	-	80.5
50/44	interorbital index	-	-	-	-	-	-	-	-	-	-	-	-	-
54/55	nazal index	-	-	-	-	-	-	-	-	-	-	-	-	-
63/62	palatal index	-	-	-	-	-	-	-	-	82.9	82.9	-	-	82.9
45/8	cranial-facial transv. index	100.7	-	-	-	-	100.7	-	-	-	-	-	-	100.7
9/43	fronto-parietal index	91.7	85.6	-	-	-	88.7	-	91.9	104.0	98.0	-	-	93.4
9/45	jugo-frontal index	69.4	-	-	-	-	69.4	-	-	-	-	-	-	69.4
66/45	jugo-mandibular index	68.7	-	-	-	-	68.7	-	-	-	-	-	-	68.7
66/65	breadth mandibular index	-	-	-	96.1	-	96.1	-	90.7	77.8	84.3	-	-	90.2
66/9	gomo-frontal index	99.0	-	-	-	-	99.0	-	96.7	80.8	88.8	-	-	93.9
71/70	vertical ramus index	48.5	48.6	-	50.7	-	49.3	-	46.8	48.2	47.5	-	-	48.4
$69_{(3)}/69_{(1)}$	mandibular robustness index	44.8	35.5	-	46.7	-	42.3	-	33.9	42.6	38.3	-	-	40.3
66/68	lenght-depth mandibular index	132.0	-	-	167.12	-	149.6	-	127.5	123.5	125.5	-	-	137.6
$70_{(3)}/71_{(1)}$	mandibular notch index	38.7	-	-	37.8	-	38.3	-	32.3	42.4	37.4	-	-	37.9

Table 2. Statistic values of the main, absolute (in mm) and relative (indices)[74] , postcranial dimensions

	Martin No.	Character	MALES						FEMALES				UNDETERMINABLE		General average
			T_7, G_3	T_7, G_4	T_7, G_5	T_{7A}, G_2	T_{7B}, G_2	Male average	T_7, G_1	T_7, G_2	T_{7A}, G_1	Female average	T_{7A}, G_3	T_{7B}, G_1	
			18/20 years	35/40 years	40/45 years	45/50 years	35/40 years		40/45 years	55/60 years	35/40 years		6/7 years	1,5/2 years	
			right/left	right/left	right/left	right/left	right/left	right/left	right/left	right/left	right/left	right/left	right/left	right/left	right/left
Humerus	1	max. length	-/307	356/-	-/-	-/-	-/-	356.0/307.0	-/-	-/-	-/-	-/-	202/-	-/-	356.0/307.0
	4	epic. breadth	63/63	69/72	-/-	-/-	-/-	66.0/67.5	-/-	-/-	-/-	-/-	-/-	-/-	66.0/67.5
	5	max. diam. midshaft	23/-	27/26	29/28	31/-	-/-	27.5/27.0	-/-	21/21	22.5/22	21.8/21.5	-/-	-/-	24.7/24.3
	6	min. diam. midshaft	19/-	20/19	24/24	23/-	-/-	21.5/21.5	-/-	17/16	16.5/17.5	16.8/16.8	-/-	-/-	19.2/19.2
	7	min. perimeter	60/56	66/66	76/74	82/-	-/-	71.0/65.3	-/-	58/56	54/57	56.0/56.5	-/-	-/-	63.5/60.9
	6/5	section index	82.6/-	74.1/73.1	82.7/85.7	74.2/-	-/-	78.4/79.4	-/-	80.9/76.2	73.3/79.5	77.1/77.9	-/-	-/-	77.8/79.4
	7/1	solidity index	18.2/-	18.5/-	-/-	-/-	-/-	18.4/-	-/-	-/-	-/-	-/-	-/-	-/-	18.4/-
Radius	1	max. length	249/-	275/277	-/-	-/-	-/-	262.0/277.0	-/-	-/-	-/-	-/-	-/-	-/-	262.0/277.0
	3	min. perimeter	42/-	44/44	-/-	-/-	-/-	43.0/44.0	-/-	-/40	-/-	-/-	-/-	-/-	43.0/44.0
	4	transv. diam. midshaft	15/-	16/17	20/-	-/-	-/-	17.0/17.0	-/-	13.5/14	-/-	13.5/14.0	-/-	-/-	15.3/15.5
	5	sagittal diam. midshaft	12/-	13/13	12/-	-/-	-/-	12.3/13.0	-/-	11/11	-/-	11.0/11.0	-/-	-/-	11.7/12.0
	3/1	robustness index	16.9/-	16.0/15.9	-/-	-/-	-/-	16.5/15.9	-/-	-/-	-/-	-/-	-/-	-/-	16.5/15.9
	5/4	section index	80.0/-	81.2/76.5	60.0/-	-/-	-/-	73.7/76.5	-/-	81.5/78.6	-/-	81.5/78.6	-/-	-/-	77.6/77.6
Ulna	1	max. length	275/272	302/292	-/-	-/-	-/-	288.5/282.0	-/-	-/-	-/-	-/-	-/-	-/-	288.5/282.0
	3	min. perimeter	40/38	41/41	-/-	-/-	-/-	40.5/39.5	-/-	38/35	-/-	38.0/35.0	-/-	-/-	39.3/37.3
	11	dorso-volar diam.	13/-	15/14	-/-	-/-	-/-	14.0/14.0	-/-	11.5/13	-/-	11.5/13.0	-/-	-/-	12.8/13.5
	12	transv. diam.	18/-	20/13	-/-	-/-	-/-	19.0/13.0	-/-	16/16	-/-	16.0/16.0	-/-	-/-	17.5/14.5
	3/1	robustness index	14.5/14.0	13.6/14.0	-/-	-/-	-/-	14.1/14.0	-/-	-/-	-/-	-/-	-/-	-/-	14.1/14.0
	11/12	section index	72.2/-	75.0/92.8	-/-	-/-	-/-	73.6/92.8	-/-	71.9/81.2	-/-	71.9/81.2	-/-	-/-	72.8/87.0
Femur	1	max. length	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	275/277	-/-	-/-
	2	max.morph.length	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	6	sagittal midshaft diameter	23/24	32/34	-/-	-/-	33/-	29.3/29.0	-/-	28/26	-/21.5	28.0/23.8	-/-	-/-	28.7/26.4
	7	transverse midshaft diameter	27/26	30/31	-/-	-/-	26.5/-	27.8/28.5	-/-	26/26	-/26	26.0/26.0	-/-	-/-	26.9/27.3
	8	midshaft circumf.	81/78	95/100	-/-	-/-	92/-	89.3/89.0	-/-	84/82	-/77	84.0/79.5	-/-	-/-	86.7/84.3
	9	transv. subtroch. diameter	-/33	38/39	-/-	-/-	35/37	36.5/36.3	-/-	31/32	-/31	31.0/31.5	-/-	-/-	33.8/33.9
	10	sagittal subtroch. diameter	-/25	26/25	-/-	-/-	27/26.5	26.5/25.5	-/-	25/23	-/21	25.0/22.0	-/-	-/-	25.8/23.8
	21	epicondyl. breadth	80/-	-/-	-/-	-/-	-/-	80.0/-	-/-	71/-	-/-	71.0/-	-/-	-/-	75.5/-
	(6+7)/2	massiveness index	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	8/2	solidity index	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	6/7	pilastric index	85.2/92.3	107/109	-/-	-/-	124/-	105.4/100.7	-/-	108/100	-/82.7	108.0/91.4	-/-	-/-	106.7/96.1
	10/9	platymetric index	-/75.7	68.4/64.1	-/-	-/-	77.1/71.6	72.8/70.5	-/-	80.6/71.9	-/67.7	80.6/69.8	-/-	-/-	76.7/70.2

[74] *Ibidem.*

Table 2. (continued)

	Martin No.	Character	MALES						FEMALES				UNDETERMINABLE		General average
			T_7, G_3	T_7, G_4	T_7, G_5	T_{7A}, G_2	T_{7B}, G_2	Male average	T_7, G_1	T_7, G_2	T_{7A}, G_1	Female average	T_{7A}, G_3	T_{7B}, G_1	
			18/20 years	35/40 years	40/45 years	45/50 years	35/40 years		40/45 years	55/60 years	35/40 years		6/7 years	1,5/2 years	
Tibia	1	length	363/-	-/408	-/-	-/-	-/-	363.0/408.0	-/-	-/-	-/-	-/-	-/-	-/-	363.0/408,0
	8	sagittal midshaft diam.	30/30	37/38	-/-	-/-	34/-	33.7/34.0	-/-	27/29	24/24	25.5/26.5	-/-	-/-	29.6/30,3
	9	transv. midshaft diam.	22/21	25/23	-/-	-/-	19/-	22.0/22.0	-/-	19/19	17/17	18.0/18.0	-/-	-/-	20.0/20,0
	8a	sagittal diam. nutr. foram.	31/33	43/41	-/-	-/-	39/-	37.7/37.0	-/-	31/32	29/-	30.0/32.0	-/-	-/-	33.9/34,5
	9a	transv. diam. nutr. foram.	21/21.5	24/21	-/-	-/-	21.5/-	22.2/21.3	-/-	21/21	19/-	20.0/21.0	-/-	-/-	21.1/21,2
	10b	min. circumf.	74/75	86/83	-/-	-/-	84/-	81.3/79.0	-/-	69/70	65/65	67.0/67.5	-/-	-/-	74.2/73,3
	10b/1	solidity index	20.4/-	-/20.3	-/-	-/-	-/-	20.4/20.3	-/-	-/-	-/-	-/-	-/-	-/-	20.4/20,3
	9/8	section index	73.3/70.0	67.5/60.5	-/-	-/-	55.9/-	65.6/65.3	-/-	70.4/65.5	70.8/70.8	70.6/68.1	-/-	-/-	68.1/66,7
	9a/8a	platycnemic index	67.7/65.1	55.8/51.2	-/-	-/-	55.1/-	59.5/58.2	-/-	67.7/65.6	65.5/-	66.6/65.6	-/-	-/-	63.1/61,9
Fibula	1	max. length	-/-	391/393	-/-	-/-	-/-	391.0/393.0	-/-	-/-	-/-	-/-	-/-	-/-	391.0/393,0
	2	sagittal midshaft diam.	11/-	15/16	-/-	20/-	-/-	15.3/16.0	-/-	12/11	11/11	11.5/11.0	-/-	-/-	13.4/13,5
	3	transv. midshaft diam.	14.5/-	14/12	-/-	14/-	-/-	14.2/12.0	-/-	15/14	13/13	14.0/13.5	-/-	-/-	14.1/12,8
	4a	min. circumf.	36/-	40/41	-/-	-/-	-/-	38.0/41.0	-/-	35/32	-/-	35.0/32.0	-/-	-/-	36.5/36,5
	4a/1	solidity index	-/-	10.2/10.4	-/-	-/-	-/-	10.2/10.4	-/-	-/-	-/-	-/-	-/-	-/-	10.2/10,4
Stature	Manouvrier		1652	1784	-	-	-	1718	-	-	-	-	-	-	1718
	Trotter-Glesser		1707	1811	-	-	-	1759	-	-	-	-	-	-	1759
	Bach-Breitinger		1685	1787	-	-	-	1736	-	-	-	-	-	-	1736
	Average stature		1681	1794	-	-	-	1737	-	-	-	-	-	-	1737

Table 3. Grouping of skeletons according to sex and age at death. Tumuli nos. 7, 7A, 7B (10 individuals) versus tumulus no. 3 (21 individuals)

Sex/age (years)	Males T_7, T_{7A}, T_{7B}		Males T_3		Females T_7, T_{7A}, T_{7B}		Females T_3		Undeterminable T_7, T_{7A}, T_{7B}		Undeterminable T_3		Total T_7, T_{7A}, T_{7B}		Total T_3	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Infans I (0-7)	-	-	-	-	-	-	-	-	2	20.0	1	4.8	2	20.0	1	4.8
Infans II (7-14)	-	-	-	-	-	-	-	-	-	-	2	9.5	-	-	2	9.5
Juvenis (14-20)	1	10.0	3	14.3	-	-	-	-	-	-	2	9.5	1	10.0	5	23.8
Adultus (20-30)	-	-	2	9.5	-	-	-	-	-	-	1	4.8	-	-	3	14.3
Maturus (30-60)	4	40.0	4	19.0	3	30.0	-	-	-	-	-	-	7	70.00	4	19.0
Senilis (60-x)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Undeterminable	-	-	1	4.8	-	-	2	9.5			3	14.3	-	-	6	28.6
Total	5	50.0	10	47.6	3	30.0	2	9.5	2	20.0	9	42.9	10	100.0	21	100.0

Table 4. Mortality and life expectancy. Tumuli nos. 7, 7A, 7B (10 individuals) versus tumulus no. 3 (13 individuals)

Age interval	Number of individuals (Dx)		Proportion of deaths, % (dx)		Survivorship (lx)		Probability of death (qx)		Average years per individual lived within age interval (Lx)		Sum of average years lived within current and remaining age intervals (Tx)		Average life expectancy (e°x)	
	T_7, T_{7A}, T_{7B}	T_3	T_7, T_{7A}, T_{7B}	T_3	T_7, T_{7A}, T_{7B}	T_3	T_7, T_{7A}, T_{7B}	T_3	T_7, T_{7A}, T_{7B}	T_3	T_7, T_{7A}, T_{7B}	T_3	T_7, T_{7A}, T_{7B}	T_3
0-4	1		10.00	0.00	100.00	100.00	0.1000	0.0000	475.00	500.00	3300.00	2673.07	33.00	26.73
5-9	1		10.00	0.00	90.00	100.00	0.1111	0.0000	425.00	500.00	2825.00	2173.07	31.39	21.73
10-14		2		15.38	80.00	100.00		0.1538	400.00	461.54	2400.00	1673.07	30.00	16.73
15-19	1	4	10.00	30.77	80.00	84.62	0.1250	0.3636	375.00	346.15	2000.00	1211.53	25.00	14.32
20-24		2		15.38	70.00	53.85		0.2857		230.77		865.38	23.21	16.07
25-29		1		7.69	70.00	38.46		0.2000		173.08		634.61	18.21	16.50
30-34				0.00	70.00	30.77		0.0000		153.85		461.53	13.21	15.00
35-39	3	1	30.00	7.69	70.00	30.77	0.4286	0.2500	275.00	134.62	575.00	307.69	8.21	10.00
40-44	2		20.00	0.00	40.00	23.08	0.5000	0.0000	150.00	115.38	300.00	173.07	7.50	7.50
45-49	1	3	10.00	23.08	20.00	23.08	0.5000	1.0000	75.00	57.69	150.00	57.69	7.50	2.50
50-54				0.00	10.00	0.00				0.00			7.50	
55-59	1		10.00	0.00	10.00	0.00	1.0000		25.00	0.00	25.00		2.50	
60-64				0.00		0.00				0.00				
65-69				0.00		0.00				0.00				
Total	10	13												

Table 5. The presence of anomalies, pathologies and epigenetic (non-metrical) traits

ANOMALIES/PATHOLOGIES/EPIGENETIC TRAITS			MALES (5 skeletons)		FEMALES (3 skeletons)		TOTAL (8 skeletons)	
			N	%	N	%	N	%
	pathologies	*in vivo* tooth loss	2/5	40.0	-	-	2/8	25.0
		dental supragingival calculus/tartar	1/5	20.0	1/3	33.3	2/8	25.0
		orbital osteoid osteoma	1/5	20.0	-	-	1/8	12.5
		osteoarthritis (osteophytes, enthesophytes)	1/5	20.0	-	-	1/8	12.5
	anomalies and epigenetic traits	metopism	1/5	20.0	-	-	1/8	12.5
		Wormian bones	1/5	20.0	-	-	1/8	12.5
		supraorbital complete foramen	2/5	40.0	2/3	66.7	4/8	50.0
		supraorbital notch	4/5	80.0	1/3	33.3	5/8	62.5
		exsutural mastoid foramen	2/5	40.0	1/3	33.3	3/8	37.5
		parietal foramen	2/5	40.0	-	-	2/8	25.0
		zygomaticofacial foramen (double/multiple)	2/5	40.0	-	-	2/8	25.0
		auditory torus	2/5	40.0	-	-	2/8	25.0
		mandibular torus	1/5	20.0	-	-	1/8	12.5
	pathologies	osteoarthritis (Schmorl's nodes, osteophytes, enthesophytes, corrosion, pronounced muscles insertion)	5/5	100.0	1/3	33.3	6/8	75.0
		Harris lines	2/5	40.0	-	-	2/8	25.0
	anomalies and epigenetic traits	retroarticular bridge/spur on the atlas	1/5	20.0	-	-	1/8	12.5
		accessory transverse cervical foramen	1/5	20.0	-	-	1/8	12.5
		sternal hypoplasia	1/5	20.0	-	-	1/8	12.5
		congenital rib fusion	1/5	20.0	-	-	1/8	12.5
		costoclavicular sulcus	1/5	20.0	-	-	1/8	12.5
		supratrochlear foramen of the humerus	1/5	20.0	2/3	66.7	3/8	37.5
		the third trochanter of the femur	1/5	20.0	-	-	1/8	12.5
		squatting facets on the tibia	2/5	40.0	1/3	33.3	3/8	37.5
		talar extension	1/5	20.0	-	-	1/8	12.5
		preauricular sulcus	1/5	20.0	1/3	33.3	2/8	25.0

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