LIMES XX

24TH INTERNATIONAL LIMES CONGRESS

PROCEEDINGS

of the 24th International Congress

of Roman Frontier Studies,

Belgrade – Viminacium, Serbia, 2nd September – 9th september 2018

VOLUME II

LIMES XXIIII

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VOLUME II

Belgrade 2023

MONOGRAPHIES VOLUME 81/2

These proceedings are dedicated to the memory of
C. Sebastian Sommer,
dear friend and colleague,
man who dedicated his entire life to the Roman limes.

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Published by
Institute of Archaeology, Belgrade

Translation of papers was provided by the authors themselves.
All the papers were subject to double-blind peer review.

Design
Davor Radulj
Nemanja Mrđić

Printed by
DigitalArt Beograd
Printed in
300 copies

Printed Edition
Monographies Volume 81/2
ISBN 978-86-6439-089-7 Volume II
ISBN 978-86-6439-090-3

Digital Edition
Monographies Volume 82
ISBN 978-86-6439-091-0

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Posters

Nataša Miladinović-Radmilović
Institute of Archaeology, Belgrade
Serbia
miladinovic.radmilovic@gmail.com

Ilija Mikić
Institute of Archaeology, Belgrade
Serbia

Dragana Vulović
Institute of Archaeology, Belgrade
Serbia

The appearance of ulcer on one skeleton from Viminacium and the possibility of its' treatment in antiquity

ABSTRACT

Viminacium (Stari Kostolac) was the largest and the most important city in *Moesia Superior* (Upper Moesia). It was the provincial capital, administrative, religious, military and trade centre. It was built on a strategic location at the confluence of the river Mlava and the Danube, on the crossroad of both land and river routes with large military and trade potential. In one of the necropoles of Viminacium, Pirivoj, in grave no. 325, skeletal remains of a juvenile female individual were discovered. The burial is dated into the first half of the 3rd century. The deceased juvenile was laid on the back with hands clasped on her stomach. The orientation of the grave was North–South. Anthropological analyses revealed traces of osteomyelitis or cancer with proliferative periostitis on the left tibia and left fibula. The source of infection was related to a large ulcer on the left tibia. The current appearance of the bone shows poor health treatment of the ulcer and active inflammation at the time of death. In this text, we will also focus on the ulcer aetiology and possibility of its' treatment in Antiquity. Treatments will also be briefly discussed, with preparations based on silver and lead, vinegar, honey, etc.[1]

Key Words: Roman necropolis, 3rd century, Ulcer, Osteomyelitis, Cancer, Medical treatment

[1]This text is a result of the projects *Viminacium, Roman city and military legion camp – research of the material and non material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalisation and 3D visualisation* (No 47018), *Romanization, urbanization and transformation of urban centres of civil, military and residential character in Roman provinces on the territory of Serbia* (No. 177007) and *Urbanization and development processes in the medieval society* (No. 177021), funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia. We express our gratitude to Mr M. Radmilović for the map of the site (Map 1.) and for post-production of all illustrations (Plates I–IV).

Viminacium (Stari Kostolac) was the largest and the most important city in *Moesia Superior* (Upper Moesia) (Map 1). It was the provincial capital, administrative, religious, military and trade centre. It was built on a strategic location at the confluence of the river Mlava and the Danube, on the crossroad of both land and river routes with large military and trade potential.

In one of the necropoles of *Viminacium*, Pirivoj, in grave no. 325, skeletal remains of a juvenile female individual were discovered. The burial is dated into the first half of the 3rd century. The deceased juvenile was laid on the back with hands clasped on her stomach. The orientation of the grave was North–South (Figs. 1 and 2).

The anthropological analysis was conducted at the Institute of Archaeology in Belgrade, and included the estimation of sex and age at the moment of death, paleopathological and dental analyses, and macroscopic examination of entheses.

Methodology framework

For sex determination on the skeletal material of this individual we adopted a combination of morphological and metrical methods. Specific attention was paid to morphological elements of the skull (*glabella, planum nuchale, processus mastoideus, arcus supercilialis, protuberantia occipitalis externa, os zygomaticum, tubera frontale et parietale,* inclination of *os frontale* and *margo supraorbitalis*) and pelvis (*sulcus praeauricularis, incisura ischiadica s. ischialis major, arc compose,* the appearance of *os coxae, crista iliaca, fossa iliaca*), and the method of operation was adopted from a group of European anthropologists,[2] and Buikstra and Ubelaker.[3] Morphological elements of the mandible were also analysed (general aspect of the mandible – *corpus mandibulae, ramus mandibulae* and *angulus mandibulae, mentum, angulus mandibulae* and *margo inferior*), on the basis of criteria established by Ferembach and his co-workers,[4] as well as the metrical

Map 1 - Location of Viminacium on the map, with the position of the Republic of Serbia in Europe (drawing by Miro Radmilović)

elements relevant for the gender determination of the skeleton.[5] Metrical elements obtained, as well as indexes calculated on that basis are shown in Table 3. Mesiodistal and vestibulolingual diameters were measured on teeth in the manner recommended by Hillson (Table 4).[6] Morphological and metric elements were observed during the analysis of other postcranial bones as well. The morphological elements that caught our attention most were the degrees of development of: *tuberositas deltoideae, tuberositas radii* and *margo interosseus* (of the radius), *tuberositas ulnae* and *margo interosseus* (of the ulna), *linea aspera* and *tuberositas tibiae.* Bone appearance, body curvature and *facies auricularis* were morphological elements observed in the sacrum.[7] Metric elements played a more signifi-

[2]Ferembach *et al.* 1980, 519–527.
[3]Buikstra, Ubelaker 1994, 15–21.
[4]Ferembach *et al.* 1980, 523–525.
[5]*Ibid.*; Bass 1995, 84–85.
[6]Hillson 1990, 240–242; *idem.* 1996, 80–82.
[7]Mikić 1978, 18, 19; Bass 1995, 114.

Fig. 1 - Viminacium, site of Pirivoj, Grave No. 325 (photo taken from Documentation Centre, Viminacium)

Fig. 2 - Viminacium, site of Pirivoj, Grave No. 325 (photo taken from Documentation Centre, Viminacium), detail

cant role in sex determination based on the postcranial skeleton, and were given additional attention. Metrical elements obtained, as well as indexes calculated on that basis, given separately for the right and the left side of the body, are shown Table 5.

Individual age was established based on: obliteration degree of cranial sutures;[8] changes on the maxillary and mandibular teeth (we compared the changes on the occlusal surface of the dental material with the numeric classification of the wear-out level of the upper (occlusal) surface of the molars according to the life age defined by Brothwell,[9] and changes on the occlusal surface of the dental material with the numeric classification of the wear-out level of the upper surface of all teeth according to the life age defined by Lovejoy);[10] degree of ossification of the epiphysis-diaphysis connections (table with time scales (in years) during which epiphysis-diaphysis connections ossificate);[11] morphological changes in sternal ends of ribs (metamorphoses of depth, joint cavities, shape, edges and ridge configuration were examined, together with overall state of bone, based on ten (0–8) phases of progression covering the period from 18 to over 70 years);[12] morphological changes on the medial end of the clavicle (in five progression phases, noted by Black and Sheueur, which comprehend the period from the age of 14 to the age of 29),[13] and phases (1–4) and age categories based on morphological changes on vertebral bodies.[14]

Stature was calculated using Trotter and Gleser's formulas (Table 2).[15]

Dental and paleopathological analyses were also conducted; epigenetic characteristics were noted as well (26 epigenetic variations were observed on the cranial and eleven on the postcranial part of the skeleton),[16] and also a macroscopic examination of entheses on muscle and ligament insertions was performed.

Results of the anthropological analysis

The anthropological analysis revealed that a female, aged about 20 (medium stature: 156 ± 4 cm) was buried in grave No. 325 (Plates I–IV; Tables 1–5).

The following paleopathological changes were noted: ulcer (size: 9.5 x 3.5 cm) followed by osteomyelitis (or cancer?) on the left tibia and osteomyelitis (or cancer?) that spread from the left tibia onto the left fibula (Figs.

[8]Vallois 1937; Meindl, Lovejoy 1985.
[9]Brothwell 1981, 72.
[10]Lovejoy 1985.
[11]From Ferembach *et al.* 1980, 531, Figure 6; after Haret, Dariaux, Quenu 1927; Rauber, Kopsch 1952; Wolff-Heidegger 1954; Brothwell 1965 and Gray's Anatomy 1967.
[12]Işcan *et al.* 1984a; *idem*. 1984b; *idem*. 1985.
[13]Black, Scheuer 1996: 428, 429, Figure 1.
[14]From Burns 2013: 83, Figure 5.10; after Albert, Maples 1995.
[15]Trotter, Gleser 1952.
[16]Hauser, De Stefano 1989; Ђурић-Срејић 1995, 238–260.

GRAVE 325					
CRANIAL SKELETON					
frontal bone	75–100%	sphenoid bone	25–50%		
right parietal b.	75–100%	mandible	100%		
left parietal b.	100%	right and left maxillae	75–100%		
occipital bone	100%	r. and l. zygomatic b.	100%		
right temporal b.	50–75%	8 fragments of skull	1.5–4.5 cm in length		
left temporal b.	75–100%	19 frag. of skull base	0.5–5.5 cm in length		
POSTCRANIAL SKELETON					
right humerus	P.E.	P1/3	M1/3	D1/3	D.E.
left humerus	P.E.	P1/3	M1/3	D1/3	D.E.
right radius	P.E.	P1/3	M1/3	D1/3	D.E.
left radius	P.E.	P1/3	M1/3	D1/3	D.E.
right ulna	P.E.	P1/3	M1/3	D1/3	D.E.
left ulna	P.E.	P1/3	M1/3	D1/3	D.E.
right femur	P.E.	P1/3	M1/3	D1/3	D.E.
left femur	P.E.	P1/3	M1/3	D1/3	D.E.
right tibia	P.E.	P1/3	M1/3	D1/3	D.E.
left tibia	P.E.	P1/3	M1/3	D1/3	-
right fibula	-	½ P1/3	M1/3	D1/3	D.E.
left fibula	-	P1/3	M1/3	D1/3	-
32 bone fragm. of postcr. skeleton	0.8–4 cm in length				
right and left clavicle	both 75–100%				
manubrium	25–50%				
corpus sterni	75–100%				
right and left scapula	25–50%				
sacrum	100%				
right iliac bone	100% dec.				
right pubic bone	75%				
left iliac bone	100% dec.				
left ischium bone	50%				
left pubic bone	<25%				
right patella	75%				
C1–C6; L1–L5; eight thoracic vertebrae, 4 body fragments and 12 fragment of processes of thoracic vertebrae					
56 ribs fragments	1.4–19.9 cm in length				
right os capitatum	100%				
I right and left os metacarpale	P.E.	P1/3	M1/3	D1/3	D.E.
II right and left os metacarpale	P.E.	P1/3	M1/3	D1/3	D.E.
III right and left os metacarpale	P.E.	P1/3	M1/3	D1/3	D.E.
IV left os metacarpale	P.E.	P1/3	M1/3	D1/3	D.E.
a phalanx of hand	8				
right and left talus	100% dec.				
right and left calcaneus	100% dec.				
right os naviculare	100%				
right *os cuneiforme mediale*	100%				
left *os cuneiforme mediale*	50–75%				
right *os cuneiforme intermedium*	75–100%				
left *os cuneiforme intermedium*	100%				
right *os cuneiforme laterale*	100%				

GRAVE 325					
left *os cuneiforme laterale*	75–100%				
right *os cuboideum*	100%				
I right *os metatarsale*	P.E.	P1/3	M1/3	D1/3	D.E.
I left *os metatarsale*	P.E.	P1/3	-	-	-
II right *os metatarsale*	P.E.	P1/3	M1/3	D1/3	D.E.
II left *os metatarsale*	P.E.	P1/3	M1/3	D1/3	-
III right *os metatarsale*	P.E.	P1/3	M1/3	D1/3	-
III left *os metatarsale*	P.E.	P1/3	M1/3	D1/3	-
IV right *os metatarsale*	P.E.	P1/3	M1/3	D1/3	-
IV left *os metatarsale*	P.E.	P1/3	M1/3	D1/3	D.E.
V right *os metatarsale*	P.E.	P1/3	M1/3	D1/3	D.E.
a phalanx of foot	12				

Table 1 - List of preserved bones

Stature (cm) – calculation based on the length of	GRAVE 325
Radius	156±4
Ulna	157±4
Femur	153±4
Tibia	156±4
Medium stature	156±4

Table 2 - Stature

1 and 2; Plate IV); injuries in the form of two shallow depressions (size: 1.5 cm), above and to the right of lambda (Plate I, 1); joint dislocation (shoulder, knee and ankle joints); bone deformation (curvatures of the ulnar body, especially of the left ulna) (Plate II, 3); *cribra humera* (on both humeri) (Plate II, 1); *cribra femora* (on both femurs (size on the right one: 2.3 x 2.7 cm; size on the left one: 2.6 x 1.7 cm; porous lesions can also be seen on the posterior side, above the lower ends of both femori) (Plate III). On the right and the left scapula, dislocations of glenoid cavities can be seen, beneath the very cavities, above *m. triceps brachii – Caput longum* (Plate II, 4). *Facies articularis talaris media* and *facies articularis talaris anterior* are separated at both calcanei.

Dental analysis has shown the presence of: enamel hypoplasia (considerable), parodontopathy (considerable), calculus (slight), abrasion of the 1st degree (on enamel), and caries on five teeth (in the form of spots) (Plate I, 2–6). When it comes to teeth and dental arch anomalies, only rotation (30°) was noted of teeth 12 and 22 (Plate I, 2). Occlusion: edge-to-edge.

Very prominent muscular, ligamentous and tendinous entheses were noted on the right and left clavicle (*m. deltoideus* (more prominent on the right one), *lig. trapezoideum, lig. conoideum*), on the right and left scapula, on ribs (*Mm. levatores costarum*), on the right and left humerus (*m. deltoideus* is in the shape of a crest), on the right and left radius (*m. biceps brachii* (it is less prominent on the left one)). Entheses were less prominent on the *femori*.

When it comes to epigenetic characteristics on the cranial part of the skeleton, we may note *sulci frontales* (two on the right, one on the left), *foramen zygomaticofaciale* (two on the left zygomatic bone), and on the postcranial skeleton – *foramen processus transversi bipartitum* (C5, on the right side; C6, on the right side) and *trochanter tertius* (both femurs).

Discussion

Ulcer

In the anthropological literature there are very few published cases of leg ulcer from the archaeological context.[17]

[17]Ortner 1979; Aufderheide, Rodríguez-Martín 1998; Ortner 2003; Boel, Ortner 2013; Миладиновић-Радмиловић, Капуран, Булатовић 2014, etc.

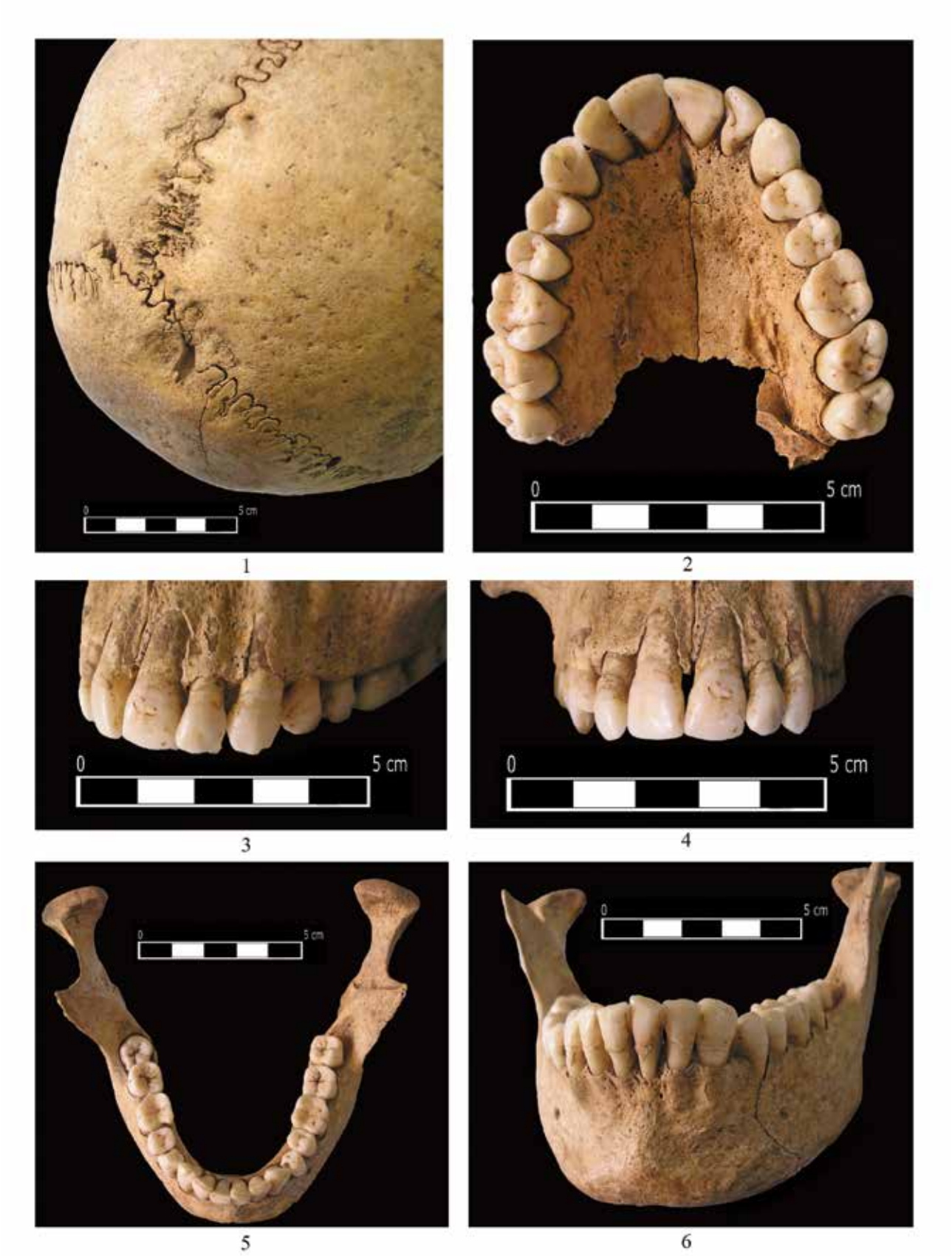

Plate I – 1) injuries in the form of two shallow depressions, above and to the right of lambda 2–4) enamel hypoplasia, parodontopathy, calculus, abrasion, caries and rotation of maxillary teeth; 5–6) enamel hypoplasia, parodontopathy, calculus, abrasion and caries of mandibular teeth (photo by Nataša Miladinović-Radmilović)

GRAVE 325			
CRANIAL SKELETON (CM)			
PRIMAL CRANIAL MEASURMENTS		PALATE	
Maximum cranial length (g-op)	17.00	Palatal length	3.60
Maximum cranial breadth (eu-eu)	13.60	MANDIBLE	
Basion/bregma height (ba-b)	12.30	Mandibular length	9.60
Cranial Index	80.00 hyperbrachycrany	Bicondylar breadth (cdl-cdl)	1.05
Cranial Length-Height Index	72.35 orthocrany	Bigonial breadth (go-go)	8.30
Cranial Breadth-Height Index	90.44 tapeinocrany	Height of ascending ramus	6.20
Mean Height Index	80.39 medium	Minimum breadth of ascending ramus	3.15
Approximate Cranial Size	14.30	Height mandibular symphysis (gn-idi)	2.75
Porion-bregma height	11.30	Thickness of mandibular body	1.00
Basion-porion height	1.50	Height of mandibular body	2.65
Mean Porion-Height Index	73.85 high	Mandibular Index	86.88
Index of Flatness of the Cranial Base	12.19 low	Mandibular Body Robusticity Index	37.73
Minimum frontal breadth (ft-ft)	9.40	Mandibular Ramus Index	50.80
Fronto-Parietal Index	69.12 metriometopic	Frontomandibular Index	85.07 leptomandibular
MAXILLA			
Maxilloalveolar breadth (palatal breadth) (ecm-ecm)	5.85		

Table 3 - Cranial measurements and indices

There are numerous disorders, i.e. variety of diseases and conditions that can lead to chronic ulcers: vascular disorders (venous insufficiency, arterial insufficiency);[18] neuropathy (diabetes, tabes, syringomyelia);[19] metabolic disturbances (diabetes, gout, prolidase deficiency);[20] haematological diseases

[18]Vascular insufficiency plays an important role among the elderly (Shami *et al*. 1992; Sarkar and Ballantyne 2000; Cunha *et al*. 2009; Boel and Ortner 2013: 303, 308; Agale 2013). It is interesting to say that Hippocrates was the first to note the association between varicose veins and ulceration (Hippocrates. De ulceribus and De carnibus (Adams (ed.) 1849)). Also, during Roman times, a number of physicians, including Galen, Celsus, Aetiusof Amida and Paulus Aegineta advised avulsion and cauterization for the treatment of varicose veins, and the use of bandages for the treatment of leg ulcers (Anning 1954).

[19]Sarkar, Ballantyne 2000.

[20]*Ibid.*

GRAVE 325					
ODONTOMETRIC DATA (CM)					
MAXILLARY TEETH			MANDIBULAR TEETH		
DIAMETER	M/L	VB/L	DIAMETER	M/L	VB/L
11	0.85	0.75	31	0.60	0.60
12	0.70	0.70	32	0.65	0.75
13	0.80	0.85	33	0.75	0.80
14	0.60	0.90	34	0.60	0.75
15	0.60	0.95	35	0.65	0.85
16	1.10	1.05	36	1.05	1.05
17	0.85	1.20	37	0.95	1.00
18	0.80	1.05	38	1.00	1.00
21	0.90	0.70	41	0.60	0.65
22	0.65	0.70	42	0.60	0.70
23	0.75	0.80	43	0.75	0.80
24	0.60	0.90	44	0.70	0.70
25	0.60	0.90	45	0.65	0.80
26	1.10	1.15	46	1.00	1.05
27	0.80	1.20	47	1.00	1.00
28	0.80	1.10	48	1.15	0.95

Table 4 - Odontometric data

Plate II – 1) cribra humera; 2) prominent muscular entheses on both humeri; 3) lateral curvatures of the body on both ulnae; 4) dislocation of the glenoid cavities on the both scapulas and prominent sulcuses beneath the very cavities (photo by Nataša Miladinović-Radmilović)

Plate III – 1–2) cribra femora (on both femurs); 3–4) porous lesions on the posterior side, above the lower ends of both femori) (photo by Nataša Miladinović-Radmilović)

GRAVE 325			
POSTCRANIAL SKELETON (CM)			
HUMERUS*		FEMUR*	
Maximum diameter midshaft (a/m pr.)	1.75 1.75	Maximum length	39.90 40.75
Minimum diameter midshaft	1.60 1.50	Bicondylar (physiological) length	39.60 40.00
Maximum diameter of the head	- 3.50	Subtrochanteric a-p diameter	2.20 2.30
Least circumference of the shaft	5.20 5.30	Subtrochanteric m-l diameter	2.70 2.90
Biepicondylar width	- 5.05	A-p mid-shaft diameter	2.80 2.75
Articular width	- 4.00	M-l mid-shaft diameter	2.10 2.30
Cross-Section Index	- 85.71	Maximum diameter of the head	3.65 3.65
RADIUS*		Circumference of the midshaft	7.80 7.80
Maximum length	21.50 21.00	Bicondylar width	6.80 6.75
Physiological length	20.40 20.10	Collo-diaphyseal angle (♂:130-144°; ♀:110°)	135º 130º
A-p mid-shaft diameter	1.00 1.00	Condylo-diaphyseal angle	80º 75º
M-l mid-shaft diameter	1.25 1.30	Robusticity Index	12.37 13.00
Least circumference of the shaft	3.70 3.50	Pilastric Index	81.48 79.31
Maximum distal breadth	2.80 2.70	Platymeric Index	133.33 stenomeric 119.57 stenomeric
The Length-Thickness Index	18.14 17.41	TIBIA*	
Cross-Section Index	4.90 4.97	Maximum length	32.40 -
The Length-Breadth Index	13.72 13.50	Physiological length	30.40 -
ULNA*		A-p diameter (nut. foramen)	2.95 3.00
Maximum length	23.30 22.40	M-l diameter (nut. foramen)	2.10 2.05
Physiological length	20.35 20.00	Circumference at the nutrient foramen	8.30 8.20
Least circumference of the shaft	3.00 2.80	Proximal breadth	6.45 5.75
Caliber Index	14.74 14.00	Distal breadth	4.15 -
CLAVICLE*		Least circumference of the shaft	6.60 -
Maximum length	- 12.70	The Length-Breadth Index	20.37 -

GRAVE 325			
Circumference at middle of bone	3.40 3.70	Platycnemic Index	71.19 eurycnemic 68.33 mesocnemic
Robustness Index	- 343.24	FIBULA*	
SCAPULA*		Least circumference of the shaft	- 2.60
Glenoid cavity length	3.20 3.15	SACRUM	
STERNUM		Maximum anterior breadth	10.90
Corpus sterni lenght	7.60	Maximum anterior high	10.50
Corpus sterni breadth	3.65	Sacral index	103.81
Width of III sternebra	2.65	Bones marked with * have two measurements, upper is for the right, and lower is for the left side of the body.	
Width of IV sternebra	3.30		

Table 5 - Measurments and indices of postcranial skeleton

(sickle cell disease, cryoglobulinemia);[21] trauma (pressure, injury, burns);[22] malignancy (basal cell carcinoma, squamous cell carcinoma);[23] insect bites;[24] infections (bacterial, fungal, protozoal;[25] the most common infectious pathogens: fusiform bacilli, spirochetes, streptococci, staphylococci and mycobacteria);[26] panniculitis (necrobiosis lipoidica, fat necrosis);[27] pyoderma (gangrenosum),[28] iatrogenic conditions, etc.[29] Unfortunately, anthropological analyzes are limited to bone observation only, so in many cases determination of the specific aetiology of a chronic ulcer is probably rarely possible in archaeological burials.[30]

Bone changes resulting from a skin ulcer, according to Boel and Ortner, "tend to have the following features: 1. the lesion usually occurs on the anterior and medial surface of the tibial diaphysis; 2. the margins of the lesion are usually sharply demarcated; 3. although the most typical bone response is the formation of an elevated, well-demarcated lesion, skin ulcers can stimulate a destructive response in which the margins may be less distinct, may never form or may be destroyed and 4. the bone lesion underlying the skin ulcer usually has a very porous surface, indicative of a chronic condition that was active at the time of death."[31]

It is also important to note that mistreatment and neglect of ulcer treatment can create additional complications that can cause osteomyelitis and even cancer.[32]

Skin ulcers most commonly affect the lower legs, especially the tibia. The localisation of skin ulcers at the anterior and medial surface of the tibia is usually explained by the fact that the skin is in very close contact with the periosteum, hence, skin trauma can easily transmit pathogens to the interior bone tissue.[33]

In our case from Viminacium, there is a large, circumscribed lesion of periosteal reactive bone on left tibia, as a reaction to an overlying skin ulcer. In addition, the

[21] *Ibid.*
[22] *Ibid.*
[23] *Ibid*.
[24] Brown, Middlemiss 1956, 213.
[25] Sarkar, Ballantyne 2000.
[26] The most common cause of this type of ulcer is caused by staphylococci (Boel, Ortner 2013: 303).
[27] Sarkar, Ballantyne 2000.
[28] *Ibid*.
[29] Boel, Ortner 2013: 303.
[30] *Ibid.,* 308.
[31] Boel, Ortner 2013, 304.
[32] *Ibid.,* 303.
[33] *Ibid.,* 306.

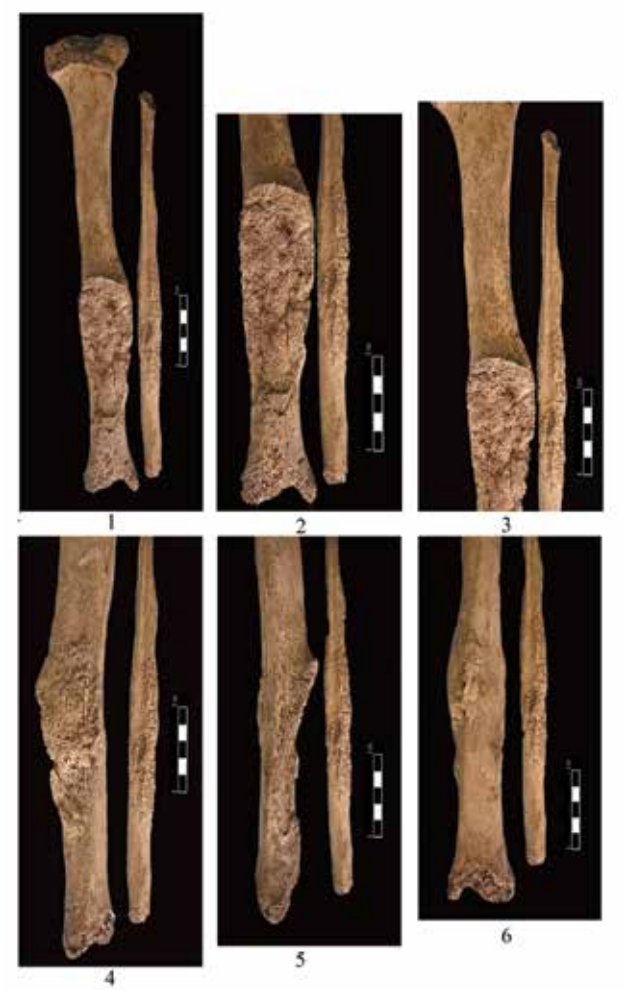

Plate IV – 1–6) ulcer followed by osteomyelitis on the left tibia and osteomyelitis that spread from the left tibia onto the left fibula (viewed from different angles) (photo by Nataša Miladinović-Radmilović)

left fibula show evidence of reactive bone suggestive of a disseminated osteomyelitis or cancer (Plate IV).[34]

Ulcer treatment in Antiquity

In this text, we will also focus on the possibility of ulcer treatment in Antiquity. Treatments will also be briefly discussed, with preparations based on: lentils, beets, vinegar, barley, lead and granulated sugar.

Lentils

Hippocrates recommends lentils as a cure for ulcers and haemorrhoids. Pliny recommends that the lentils, in combination with other ingredients such as beets, vinegar and barley, should be used to treat: abscesses, ulcers, gangrene, gout, and sore throat. He also warns that they should not be used for: ailments of the lungs, headaches, joints and insomnia.[35]

Lead

Although the poisonous effects of lead were known even in the ancient times, it was actually prescribed for different medical purposes. For example, Pliny describes several remedies which use lead: "for the removal of scars... and as an ingredient in plasters, for ulcers, and for the eyes etc."[36]

Granulated sugar

Sugar was used as a wound-dressing product in Ancient Egypt and Mesopotamia,[37] and in Ancient Greece and Rome. Galen reportedly used sugar as a wound care product and noted its' anti-putrefactive properties.[38] People used sugar as a wound care product also in the 17th[39] and 18th centuries.[40] Today, it is used as a wound dressing in many parts of the world.[41] Sugar has been observed to have antibacterial properties and that draws water from a wound into the dressing, probably through an osmotic effect that reduces the available

[34]In this chronic case, maybe long-standing case, we can assume that malignant changes may have developed on left tibia. If that's the case here, the change was epitheliomatous, and it became locally invasive, destroying the underlying bone. The bone gap thus produced is usually deeper and more irregular than the gap resulting from cortical sequestration. Pathological fracture may occur as well (Brown, Middlemiss 1956, 216, 217).

[35]Plinius HN 12.145–146, taken from Flint-Hamilton 1999.

[36]Pliny, *Natural History*, book XXXIV chapter 1 (cited Pulsifer 1888).

[37]Majno 1975, Selwyn, Durodie 1985.

[38]Petrosillo 2008.

[39]Pieper, Caliri 2003.

[40]Fischer 1885.

[41]Mphande, Kilowe, Phalira 2007; Chiwenga, Dowlen, Mannion 2009.

water on the wound surface.[42] Bacteria cannot survive without water, so applying sugar to a wound allows for the acceleration of the healing process.[43]

When it comes to sugar, there are records of knowledge of sugar among the ancient Greeks and Romans, but only as an imported medicine, and not as a food. For example, the Greek physician Dioscorides in the 1st century AD wrote: "There is a kind of coalesced honey called sakcharon (i.e. sugar) found in reeds in India and Eudaimon Arabia (i.e. Yemen) similar in consistency to salt and brittle enough to be broken between the teeth like salt. It is good dissolved in water for the intestines and stomach, and (can be) taken as a drink to help (relieve) a painful bladder and kidneys."[44] There is no evidence from Yemen itself that sugarcane was cultivated in Yemen before the start of the Islamic era, but there is plentiful evidence that Yemen imported goods from India in the pre-Islamic era. Therefore, historians today tend to believe that when Dioscorides was writing in the 1st century AD, Yemen imported sugar from India and exported in Greece.[45] Pliny the Elder, also described sugar as medicinal: "Sugar is made in Arabia as well, but Indian sugar is better. It is a kind of honey found in cane, white as gum, and it crunches between the teeth. It comes in lumps the size of a hazelnut. Sugar is used only for medical purposes."[46]

Conclusion

The anthropological analysis revealed a large, circumscribed lesion of periosteal reactive bone on left tibia, as a reaction to an overlying skin ulcer. In addition, the left fibula show evidence of reactive bone suggestive of a disseminated osteomyelitis or cancer. The current appearance of the bone shows poor health treatment of the ulcer and active inflammation at the time of death. We could see how doctors dealt with these bone lesions in the Late Roman period from the preserved ancient medical records. We can also see from these skeletal remains, based on very pronounced muscular, ligamentous and tendinous entheses noted on the right and left clavicle, on the right and left scapula, on ribs and bones of the upper extremities, as well as dislocation of the shoulder, knee and ankle joints, and curvature of both ulnae, that this person probably had difficulty in walking and relied on medical aid for a long time, that is, on crutches.

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[42]Knutson *et al.* 1981; Chirife, Herszage, Joseph 1993.
[43]Murandu 2016, 28.
[44]Galloway 1989, 24.
[45]*Ibid.*
[46]Faas 2003, 149.

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CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

94(37)(082)
904"652"(37)(082)

LIMES Congress (24 ; 2018)
Proceedings of the 24th International Congress of Roman Frontier Studies, Limes XXIIII, 2nd - 9th September 2018 Viminacium Belgrade, Serbia. Vol. 2 / [editor in chief Snežana Golubović]. - Belgrade : Institute of Archaeology, 2023 (Beograd : Digitalart). - 800 str. ; 30 cm. - (Monographies / [Institute of Archaeology] ; vol. 81/2)

Tiraž 300. - Napomene i bibliografske reference uz tekst. - Bibliografija uz svaki rad.

ISBN 978-86-6439-089-7
ISBN 978-86-6439-090-3 (niz)

а) Археолошка налазишта, римска -- Зборници б) Римска држава -- Лимес -- Зборници

COBISS.SR-ID 134945801