UDC 904:572.7(497.11)"2006"
904:726.8."653"(497.11)"2006"
904(363)"04"
DOI: 10.2298/STA0757325M

NATAŠA MILADINOVIĆ-RADMILOVIĆ
Institut of Archaeology, Belgrade

THE NEW NECROPOLIS OF THE GREAT MIGRATION FROM SINGIDUNUM ANTHROPOLOGICAL ANALYSIS

Abstract. – The aim of this study was the anthropological analysis of three German individuals from migration period which were excavated in new, fourth, necropolis in Belgrade. Although, skeletal remains were incomplete and fragmentary, we managed to determinate sex and age of each individual (two male and one female adults). To get a complete anthropological picture of buried individuals detailed descriptions of individual skeletal remains for each grave were given. The description comprehended: preservation and completeness of skeletal remains, sex and age estimation, stature estimation, dental record, paleopathological finds and skeletal markers of occupational stress. Dental analysis showed presence of caries, attrition, abscess cavities and periodontal disorders. A careful observation of skeletal remains demonstrated that these deceased suffered of bone injuries and fractures, joint diseases and circulatory disorders. The markers of occupational stress noticeable on the bones indicated that these two men were probably warriors (one of them was possibly even horseman).

Key words. – migration period, warriors, horseman, injuries, possible attempted manual strangulation.

During an archaeological excavation in 2006, three individuals from the migration period, dating in the middle of 5th century were excavated (V. Ivanišević, M. Kazanski, *Nouvelle nécropole des Grandes migrations de Singidunum*).[1] The anthropological analysis of each skeletons began with a description of the conditions of the find, establishment of the degree of preservation the bones and anthropometry on the spot. Only after that the skeletal remains were taken out, washed and dried, and than subjected to further anthropological study consisting of the identification of the sex, age and height of each of the skeletons, of morphological and metrical elements, of cranial and postcranial indices, dental and pathological analysis, observation of markers of occupational stress and other traits. Although the bones were in bad state of preservation, some were very fragmented, the examination of sex and age was very successfully. Anthropological metods used during the investigation of these remains were separated in two groups:

a) Metods for sex determination

Sex was determinated by using the combination of morphological and metrical metods. Special attention was attracted on morphological elements on skull and pelvis following the standards and criterias as outlined by European anthropologists,[2] Buikstra and Ubelaker.[3] Analysis of morphological elements on mandible was based on criteria established by Ferembach and his colleagues.[4] Metrical elements were studied how Ferembach and his colleagues[5] and Bass[6] recommended. Cranial and mandibular metrical elements and indices were presented in Tables 1 and 2 for each skeletons. During the analysis of postcranial bones morphological and metrical element were examinated too. Morphological elements such as degree of development of *tuberositas deltoideae, tuberositas radii and margo interosseus (of radius),*

[1] I am grateful to dr Vesna Bikić, director of the exploration, and dr Vujadin Ivanišević for help, discussions and access to osteological material and archaeological documentation.

[2] Ferembach, Schwidetzky and Stloukal 1980, 519–527.

[3] Buikstra and Ubelaker 1994, 15–21.

[4] Ferembach, Schwidetzky and Stloukal 1980, 523–525.

[5] Ferembach, Schwidetzky and Stloukal 1980, 519–527.

[6] Bass 1987, 80.

tuberositas ulnae and margo interosseus (of ulna), linea aspera and tuberositas tibiae were selected. On sacrum, morphological elements such as total aspect of the bone, flexion of the body and *facies auricularis* were observed.[7] Since the metrical elements on postcranial bones play the significant part in sex estimation all measurements of each skeleton were shown in Tables 3–5.

Table 1 Cranial measurments and indices

Табела 1 Мере и индекси на кранијалном скелеш̄у

CRANIAL SKELETON I (CM)	**GRAVE 1**	**GRAVE 2**	**DISLOCATED BONES I**
PRIMAL CRANIAL MEASUREMENTS			
Maximum cranial length (g-op)	20	about 22.5	-
Maximum cranial breadth (eu-eu)	about 14	-	-
Basion/bregma height (b-ba)	-	-	-
Cranial Index	70 dolichocrany	-	-
Cranial Length-Height Index	-	-	-
Cranial Breadth-Height Index	-	-	-
Porion-bregma height	12.7	-	-
Mean Porion-Height Index	74.7 high	-	-
Minimum frontal breadth (ft-ft)	-	-	-
Frontoparietal Index	-	-	-
FACIAL SKELETON			
Total facial height (n-gn)	12.4	12.8	-
Upper facial height (n-alveolare)	7.6	7.5	-
Facial width or bizygom. breadth (zy-zy)	-	-	-
Total Facial Index	-	-	-
Upper Facial Index	-	-	-
NOSE			
Nasal height (n-ns)	5.3	5.6	-
Nasal breadth (al-al)	2.5	2.6	-
Nasal Index	47.16 leptorrhiny	46.42 leptorrhiny	-

[7] Mikić 1978, 18–19; Bass 1987: 108.

Table 2 Cranial measurments and indices

Табела 2 Мере и индекси на кранијалном скелеīу

CRANIAL SKELETON II (CM)	GRAVE 1	GRAVE 2	DISLOCATED BONES I
ORBITS*[8]			
Orbital height	4.3 -	3.65 -	- -
Orbital breadth (mf-ec)	4 -	about 3.5 -	- -
Orbital Index	107.5 hypsiconchy -	104.28 hypsiconchy -	- -
PALATE			
Palatal length (pr-alv)	-	about 5.2	-
Palatal breadth (ecm-ecm)	-	5.7	-
Maxilloalveolar Index	-	109.61 dolichurany	-
MANDIBLE			
Bicondylar breadth (cdl-cdl)	13.3	about 12.7	12.30
Bigonial breadth (go-go)	10.1	about 11.1	8.80
Height of ascending ramus	6.8	7.15	6.25
Minimum breadth of ascending ramus	2.5	3.7	2.85
Height of mandibular symphysis (gn-idi)	3.05	3.3	2.7
Thickness of mandibular body	1.2	1.1	1.05
Height of mandibular body	2	3.5	2.4
Mandibular Body Robusticity Index	60	31.42	43.75
Mandibular Ramus Index	36.76	51.74	45.6
Frontomandibular Index	-	-	-

[8] Bones marked with * have two measurements – upper is for the right, and lower is for the left side of the body.

Table 3 Measurments and indices of postcranial skeletons

Табела 3 Мере и индекси на йосйкранијалном скелейу

POSTCRANIAL SKELETON I (CM)	GRAVE 1	GRAVE 2	DISLOCATED BONES I
SACRUM			
Maximum anterior height	-	-	-
Maximum anterior breadth	-	-	-
Sacral Index	-	-	-
STERNUM			
Manubrium height	-	5.1	-
Manubrium breadth	-	about 8	-
Mesosternum length	-	-	-
Mesosternum breadth	-	4	-
SCAPULA*			
Spine length	- -	- -	- -
Glenoid cavity length	- -	- -	- -
CLAVICLE*			
Maximum length	15 15	14.5 -	- -
Circumference at middle of bone	4 3.9	4.6 -	- -
Claviculohumeral Index	- -	- -	- -
Robustness Index	26.6 26	31.72 -	- -

On teeth mesiodistal and buccolingual diameters were measured like Hillson recommended (Table 6).[9] The differences in tooth size, through these diameters, were followed first on canines and then, if canines were not present, on molars, premolars and incisors[10] and

b) Metods for age determination.

Evaluation of age was established on the base of: *degee of suture closure*;[11] *changes on teeth* (correlation of age at death was compared with molar wear);[12] *morphological changes of sternal-end ossification of the ribs* (model standards of phases 0–8 (range 18–70 years) of sternal-end ossification of ribs was used);[13] *morphological changes of adjoining area of the pubic symphisis* (model standards of Todd's 10 typical phases of age (range 18–50x years) in the pubic

[9] Hillson 1990, 240–242; Hillson 1996, 80–82.

[10] Garn, Lewis and Kerewsky 1965, 439–441.

[11] Vallois 1937.

[12] Brothwell 1965, 69; Lovejoy, 1985.

[13] Iscan, Loth and Wright 1984a; Iscan, Loth and Wright 1984b; Iscan, Loth and Wright 1985.

Table 4 Measurments and indices of postcranial skeletons

Табела 4 Мере и индекси на йосйкранијалном скелейу

POSTCRANIAL SKELETON II (CM)	GRAVE 1	GRAVE 2	DISLOCATED BONES I
HUMERUS*			
Maximum length	- -	- -	- -
Maximum diameter midshaft	- -	2.4 2.39	- -
Minimum diameter midshaft	- -	2 1.85	- -
Maximum diameter of the head	- -	- -	- -
Least circumference of the shaft	- -	6.9 6.6	- -
Biepicondylar width	- -	- -	- -
Articular width	- -	- -	- -
Robusticity Index	- -	- -	- -
Radiohumeral Index	- -	- -	- -
RADIUS*			
Maximum length	- -	about 23 about 23	- -
ULNA*			
Maximum length	- -	- -	- -
Physiological length	- -	- -	- -
Least circumference of the shaft	- -	4.2 -	- -
Caliber Index	- -	- -	- -

symphisis was used)[14] and *morphological changes of the auricular surface* (where apex, superior demiface, inferior demiface, retroarticular area, billowing, granularity, density and porosity were analysed and compared with phases 1 – 8 (range 20 – 60+ years) recommanded by Lovejoy and his colleagues).[15]

[14] Todd 1920; Todd 1921a; Todd 1921b.

[15] Lovejoy *et al*. 1985; Meindl and Lovejoy 1989, 165.

Table 5 Measurments and indices of postcranial skeletons

Табела 5 Мере и индекси на йосйкранијалном скелейу

POSTCRANIAL SKELETON III (CM)	GRAVE 1	GRAVE 2	DISLOCATED BONES I
FEMUR*			
Maximum length	- -	- -	- -
Anterior-posterior diameter of the midshaft	- -	2.75 3.1	- -
Mediolateral diameter of the midshaft	- -	3 2.9	- -
Maximum diameter of the head	- -	- -	- -
Circumference of the midshaft	- -	9.1 9.3	- -
Bicondylar width	- -	- -	- -
TIBIA*			
Maximum length	- -	- -	- -
Anterior-posterior diameter at the nutrient foramen	- -	3.5 3.7	- -
Mediolateral diameter at the nutrient foramen	- -	2.6 -	- -
Circumference at the nutrient foramen	- -	10 9.8	- -
Proximal breadth	- -	- -	- -
Distal breadth	- -	- -	- -
Platycnemic Index	- -	74.28 eurycnemic -	- -
FIBULA*			
Maximum length	- -	- -	- -

Table 6 Odontometric examination of teeth

Табела 6 Одонтометријска испитивања

ODONTOMETRIC DATA (CM)	GRAVE 1	GRAVE 2	DISLOCATED BONES I
11 (MD / BL diameter)	- / -	- / 0.7	- / -
12 (MD / BL diameter)	- / -	- / 0.6	- / -
13 (MD / BL diameter)	- / -	- / 0.8	- / -
14 (MD / BL diameter)	- / -	0.6 / 0.8	- / -
15 (MD / BL diameter)	0.65 / 1	0.6 / 0.75	- / -
16 (MD / BL diameter)	1.1 / 1	0.9 / 1	- / -
17 (MD / BL diameter)	- / -	- / - (g. g. c.)	- / -
18 (MD / BL diameter)	- / -	- / -	- / -
21 (MD / BL diameter)	- / -	0.8 / 0.65	- / -
22 (MD / BL diameter)	- / -	0.6 / 0.65	- / -
23 (MD / BL diameter)	- / -	0.7 / 0.85	- / -
24 (MD / BL diameter)	- / -	0.55 / 0.8	- / -
25 (MD / BL diameter)	0.65 / 0.95	0.6 / 0.8	- / -
26 (MD / BL diameter)	- / -	- (abr.) / 1.05	- / -
27 (MD / BL diameter)	1.2 / 1	0.95 / 1.05	- / -
28 (MD / BL diameter)	0.9 / 1.3	0.8 / 0.9	- / -
31 (MD / BL diameter)	0.5 / 0.6	- / -	0.4 / 0.55
32 (MD / BL diameter)	0.6 / 0.65	- / -	0.5 / 0.6
33 (MD / BL diameter)	0.65 / 0.75	0.65 / 0.75	0.6 / 0.65
34 (MD / BL diameter)	- / -	0.6 / 0.7	0.65 / 0.7
35 (MD / BL diameter)	- / -	0.65 / 0.75	0.7 / 0.75
36 (MD / BL diameter)	- / -	0.95 / 1.05	- / -
37 (MD / BL diameter)	- / -	1 / 0.95	- / -
38 (MD / BL diameter)	- / -	0.95 / 0.85	- / -
41 (MD / BL diameter)	0.5 / 0.6	- / -	0.4 / 0.55
42 (MD / BL diameter)	0.55 / 0.65	- / -	0.45 / 0.6
43 (MD / BL diameter)	0.75 / 0.75	0.65 / 0.75	0.55 / 0.6
44 (MD / BL diameter)	0.75 / 0.75	0.6 / 0.7	0.6 / 0.7
45 (MD / BL diameter)	- / -	0.65 / 0.75	0.65 / 0.7
46 (MD / BL diameter)	- / -	1 / 1.05	- / -
47 (MD / BL diameter)	- / -	0.95 / 0.95	- / -
48 (MD / BL diameter)	1 / 0.95	0.9 / 0.85	- / -

PRESENTATION AND DISCUSION OF SKELETAL REMAINS

Grave 1

Preservation and completeness of skeletal remains:

Cranial skeleton: 2/3 of the frontal bone, almost completed right parietal bone, 2/3 of the left parietal bone, almost completed occipital bone, right mastoid process, 2/3 of the right temporal bone, right zygomatic bone, body of the hyoid bone, right lesser horn and 1/3 of the left greater horn, 50 bone fragments of the skull 0.5–4 cm in length, mandible and 2/3 of the maxilla (Fig. 1.; Table 1 and 2). Postcranial skeleton: 5 bone fragments of postcranial skeleton 0.5–6 cm in length, right clavicle, left clavicle with post mortem destruction of lateral end, 2/3 of spine of the left scapula and 6 more bone fragments 2–5.5 cm in length, vertebrae (5 cervical vertebrae, 3 thoracic vertebrae and 3 more bone fragments 2–4 cm in length) and ribs (Table 3–5).

Sex and age: male, 50–60 years (Table 8).

Dental analysis:

Presence of teeth: 11, 12, 13, 14, 15, 16, 21, 22, 23, 24, 25, 27, 28, 31, 32, 33, 41, 42, 43, 44, 45, 46 and 48 (Table 6).[16] Ante mortem loss of teeth: 34, 35, 36, 37, 38 and 47 (Pl. I – Figs. 1–3).[17] Post mortem loss of teeth: none.

Attrition: I degree (in enamel): 27, 28 and 48; II degree (bare dentin): 16 (on the limit towards III degree (bare dentin up to pulp cavity)); III degree (bare dentin up to pulp cavity): 15 (on the limit towards IV degree (open pulp cavity)), 25 (on the limit towards IV degree (open pulp cavity)), 32, 33, 41, 42, 43 and 44 (on the limit towards IV degree (open pulp cavity)); IV degree (open pulp cavity): 11, 12, 13, 14, 21, 22, 23, 24, 31, 45 and 46 (Pl. I – Figs. 3 and 4).

Dental diseases:

Caries: 15 (occlusal caries 0.2 cm in length); 16 (two occlusal carieses 0.2 cm in length); 25 (distal carious spot 0.2 cm in length); 27 (occlusal caries 0.2 cm in length; buccal carious spot 0.5 cm in length); 28 (mesial caries 0.3 cm in length; occlusal caries 0.2 cm in length); 43 (buccal caries 0.25 cm in length); 48 (two occlusal carieses 0.2 and 0.3 cm in length) (Pl. I – Figs. 1–4).

Abscess cavities (Cysts): 46 (occluso-buccal periapical abscess cavity 2 x 1 x 1 cm in size with softly demaged buccal edge 0.3 cm in lendth). It is possible that the process was primaly developed on buccal side of the tooth 47 and then spreaded further (Pl. I – Figs. 1 and 2).

Teeth shown considerable traces of periodontal disorders (Pl. I – Figs. 1–3), and slight traces of calculus formation.

Type of dental occlusion was edge-to-edge bite of the anterior teeth. Enamel hypoplasia and anomalies of the jaw were not found.

Paleopathological finds:

Bone injuries, fractures and bone splits: on the left side of the hyoid bone instead of lesser horn the trace of healed fracture of the bone was found (Pl. II – Fig. 1). In skeletal remains strangulation, hanging, or severe trauma to the neck (began with nudge or other type of stroke) may be revealed in fractures to the hyoid bone located in the neck region. Although hanging and strangulation are only two causes of death, the preservation and retrieval of the hyoid bone and neck cartilages may aid in reconstructing a little-known fact for archaeological populations, that is, causes of death.[19] The consequence of such injure or encounter is usually fatal but in this case the deceased was »lucky« and we could say that the fracture was probably began as an unsuccessfull attempted manual strangulation, i.e. unsuccessfull attempt of murder. If this was an attempt of strangulation the attacker was probably a left-handed man or during the encounter his left hand was weaponfree. The victim was probably complained of pain on speaking, on swallowing and on neck movements. External evidence of neck injury might be minimal.[20]

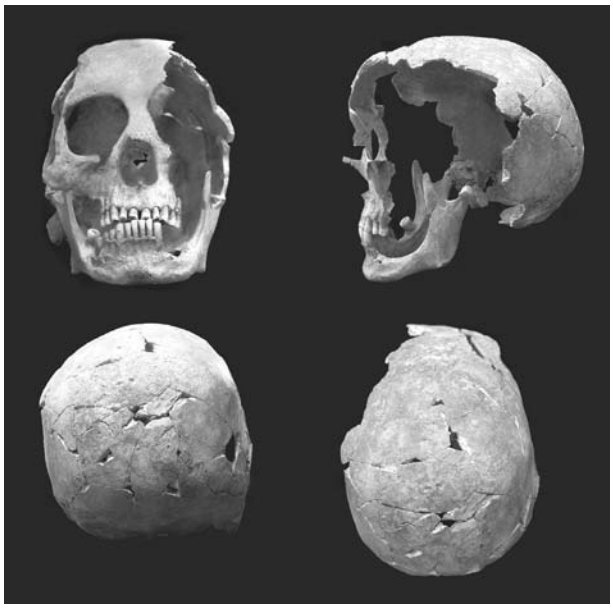


Fig. 1. Projections of the skull [18]

Сл. 1. Лобањске пројекције

Joint diseases: cervical and thoracic vertebrae shown severe osteoarthritis on their joint surfaces. Marginal osteophytes were present, accompanied by pitting and polishing of the joint surfaces. This type of

[16] Since parts of the maxilla with teeth 17, 18 and 26 were missing, we were not able to be precise in our conclusions about these teeth.

[17] This teeth were probably lost due to caries or periodontal disorders.

[18] All photographies, except Fig. 2 (Goran Ilijić), were taken by Stefan Pop-Lazić and technically adapted by Miro Radmilović. I shoud like to thank them here for that.

[19] Roberts and Manchester 1995, 86.

[20] Fineron, Turnbull and Busuttil 1995.

osteoarthritis some authors colled erosive arthritis (Pl. II – Figs. 2–4).[21] The same case were with the lateral and medial edges of the right clavicle and medial edge of the left clavicle (Pl. II – Fig. 5). Waldon and Rogers[22] recommended that, if eburnation is not present on the joint surface (a sure sign of oasteoarthritis) than two other features of osteoarthritis must be present, e.g. osteophytes and a porous joint surface. Otherwise, degenerative joint disease is a noninflammatory, chronic, progressive pathological condition characterized by the loss of joint cartilage and subsequent lesions resulting from direct interosseus contact within diarthrodial joints. Preconditions necessary to produce this disease are lesion affecting cartilage that exposes the bone surfaces, and joint mobility that permits bone--to-bone movement, causing the new bone formations that are the principal feature of degenerative joint disease. The disease is the most common form of joint pathology and is usually detectable during the fourth decade of life.[23] Osteoarthritis is multifactorial in its aetiology. Increasing age, a genetic predisposition, obesity (leading to stress on the joints), activity/ lifestyle and environmental factors such as climate may all contribute to its development. For example, shoulder osteoarthrithis, beside increasing age, usually follows severe trauma or is related to a specific activity.[24] Historical analysis of adult males in the Medieval skeletal series from Westerhus, Sweden suggests that the high frequency in the males reflects work and activity practices that are exclusive to men, including parrying in sword fighting, spear throwing, timber cutting, and other activities associated with repetitive, heavy loading of the shoulder joint (Fahlström,1981).

Skeletal markers of occupational stress were discovered on the ribs and on clavicles. These features included hyperthrophy (cortical defects) of muscle attachment sites for *m. pectoralis minor, m. pectoralis major, m. serratus anterior, Mm. levatores costarum brevis, Mm. levatore costarum longi* (ribs), *m. trapezius, m. deltoideus, m. pectoralis major, m. sternocleidomastoideus, lig. trapezoideum, lig. conoideum, m. subclavius and lig. costoclaviculare* (both clavicles) (Pl. II – Fig. 1–5). All these muscles play a very important part in shoulder movements. Although unfortunatelly, other bones of upper limbs, specially those involved in shoulder joint, were missing, we could assumed that they would had the same cortical changes. Eventually, here we had the same situation on the right and left shoulder, not pronounced right side asymmetry[25] – the muscles that were associated with overhand throwing motions. Since this person was the victim of martial attack and we had the evidence which confirmed the use of bow--and-arrow in German culture from migration period in Singidunum, we could say that he was a warrior, and that he probably used that kind of weapon in fight. Also, in the middle of the lower side of the right clavicle sulcus 0.4 x 1 cm in size was detected. This sulcus was probably formed due to frequent carrying heavily arms or burden.

Grave 2

Preservation and completeness of skeletal remains:

Cranial skeleton: 2/3 of the frontal bone, 1/3 of the right parietal bone and one more bone fragment 9 cm in length, 1/3 of the left parietal bone, 2/3 of the occipital bone, almost completed right and left mastoid processes, 1/3 of the right temporal bone, right zygomatic bone, 77 decomposed bone fragments of the skull 0.1–6 cm in length, 39 decomposed bone fragments of the skull base 1–4 cm in length, almost completed mandible, almost completed maxilla (Fig. 3.; Table 1 and 2).[26] Postcranial skeleton: right humerus without edges, 2/3 of the lower part of the body of the left humerus without edge, right ulna without edges, 2/3 of the upper part of the left ulna, right radius without lower edge, left radius damaged post mortem in the upper and lower 1/3 of the body, right femur without edges, left femur without edges, right tibia without upper and 1/3 of the lower edge, left tibia without edges, decomposed the central part of body of fibula (?), around 500 bone fragments of the postcranial skeleton 0.1–9 cm in length, almost completed right clavicle (around 1 cm of the bone from the anterior side in the middle of the bone was missing), 2/3 of the left clavicle (lateral edge was missing, and medial edge was decomposed), almost completed manubrium,

[21] Blondiaux 1997; Aufderheide, Rodríguez-Martín and Langsjoen 1998, 95.

[22] Waldon and Rogers 1991.

[23] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 93.

[24] Roberts and Manchester 1995, 106.

[25] Not pronounced right side asymmetry in both left and right arms and the elbow and shoulder joints are involved in the use of the bow-and-arrow (Angel 1966; Larsen 1997, 174).

[26] The whole skeleton of the deceased was demaged due to availability of water. The passage of water had almost completely leached out the bone mineral from most of the bones.

Fig. 2. Grave 2 – skeleton of the deceased

Сл. 2. Гроб 2 – скелеī ūокојника

2/3 of the upper part of the mesosternum, 14 bone fragments of scapulae 1–5.5 cm in length, 12 bone fragments of sacrum 2–5 cm in length, 2/3 of the left innominate (auricular surface, the ischium, and the pubis were missing) and 3 more bone fragments 3.5 –5.5 cm in length, 2/3 of the right patella (1/2 of the posterior side was damaged post mortem), left patella, vertebrae (1/3 of the atlas, 2/3 of the axis and other 5 decomposed cervical vertebrae; 5 decomposed thoracic vertebrae; 5 decomposed lumbar vertebrae and around 50 more bone fragments (mainly thoracic vertebrae) 1–3 cm in length), tarsal bones (right and left talus, right and left calcaneus, right and left first cuneiform, right second cuneiform, 2 bone fragments of cuboid (?), right and left navicular, 2 totally decomposed metacarpal bones (?), 10 metatarsal bones, phalanges (5 of the hands (first row), 3 of the feet and 5 more totally decomposed (?)), right and left first rib and 67 more bone fragments 3–9 cm in length (Table 3–5).[27]

Sex and age: male, around 30 years.

Stature: 167 ± 5 cm (Table 7 and 8).[28]

Dental analysis:

Presence of teeth: 11, 12, 13, 14, 15, 16, 17, 21 (ante mortem broken tooth on the buccal side), 22, 23, 24, 25, 26, 27, 28, 33, 34, 35, 36, 37, 38, 41 (post mortem broken tooth – only the top of the roof was preserved), 42 (post mortem broken tooth – only the top of the roof was preserved), 43 (post mortem broken tooth on the distal side), 44, 45, 46, 47 and 48 (Table 6). Ante mortem loss of teeth: 31 and 32 (Pl. III – Fig. 1).[29] Post mortem loss of teeth: 18 (Pl. III – Fig. 2).

Attrition: I degree (in enamel): 14, 24, 28 (on the limit towards II degree (bare dentin)), 34, 35 and 45; II degree (bare dentin): 15, 22, 25, 27, 38, 43 (on the limit towards III degree (bare dentin up to pulp cavity)), 47 and 48; III degree (bare dentin up to pulp cavity): 11 (on the limit towards IV degree (open pulp cavity)), 12 (on the limit towards IV degree (open pulp cavity)), 13 (on the limit towards IV degree (open pulp cavity)), 16, 21, 23, 33, 36, 37 and 46; IV degree (open pulp cavity): 26 (Pl. III – Figs. 1 and 2).

---

[27] Some bones (vertebrae, feet bones (Pl. III – Fig. 6), right radius, left femur and sacrum) had traces of green color on their surfaces, other (right humerus and left innominate) had brown (Pl. III – Fig. 5). The archaelogical artefacts which were found near the deceased left these characteristic colour marks.

[28] The stature of the skeleton was estimated using the formulae of Trotter and Gleser (1952) (table 7).

[29] This teeth were probably lost due to caries or periodontal disorders.

Fig. 3. Projections of the skull

Сл. 3. Лобањске пројекције

Dental diseases:

Caries: 13 (occlusal caries in the shape of dot); 17 (occluso-lingual, so-called gross-gross caries (even the buccal part of the roof was separated from the rest of the tooth)); 36 (occlusal caries 0.2 cm in length); 47 (buccal caries in the shape of dot; occlusal carious spot 0.1 cm in length); 48 (occlusal: two carieses 0.1 and 0.2 cm in length; two carious spots 0.1 and 0.05 cm in length and caries in the shape of dot) (Pl. III – Figs. 1–3).

Abscess cavities (Cysts): 17 (linguo-occluso--buccal abscess cavity 1 x 1 x 1 cm in size; fenestration 0.25 cm in diameter); 44 (buccal cyst 0.75 cm in diameter) (Pl. III – Figs. 2 and 3).

Teeth shown slight (on the limit towards medium) traces of enamel hypoplasia and calculus formation, and medium (on the limit towards considerable) traces of periodontal disorders (Pl. III – Fig. 3).

Fossa incisivum was 0.8 x 1.1 cm in size (Pl. III – Fig. 2).

Type of dental occlusion was edge-to-edge bite of the anterior teeth.

Paleopathological finds

Bone injuries, fractures and bone splits: over the upper edge of the right humerus, on the anterior side a fistula 0.65 x 0.4 cm, in size, was detected (Pl. III – Fig. 4). On the left radius in lower 1/3 of the body in the anterior-latero-posterior direction the trace of healed spiral fracture of the bone was found (Pl. IV – Figs. 1–7). On the smoth, well-remodelled calus there were two apertures (upper 0.5 x 1.1 cm in size and lower 0.3 x 0.5 cm in size). Spiral fractures generally results from twisting forces so it was probably sustained as a result of a severely twisted wrist.[30] On the right tibia, in the upper 1/3 of the body, on margo anterior cortical thickness was determinated (another fracture (?)). Unfortunately, due to decomposition it was not possible to be certain.

Joint diseases: slight traces of osteoarthritis were discovered on the right clavicle (Pl. V – Fig. 6), on vertebrae, on ribs and on metatarsal bones.[31] More prominent traces were on the posterior side of both patellae (Pl. VI – Fig. 4), on the left tibia and on feet bones (Pl. VI – Figs. 2 and 3). Eventually, significant traces of osteoarthritis were noticed on the right lateral side of manubrium. Since this person was around 30 years old and osteoarthritis was seen in a particularly high prevalence and specific patterning, it might be possible to suggest an occupationally induced osteoarthritis for this individual.

Circulatory disorders: on three metatarsal bones were detected traces of osteochondritis dissecans 0.5 cm in diameter (Pl. V – Figs. 4 and 5). Osteochondritis dissecans is a benign, noninflammatory condition of young adults characterized by the production of small, focal epiphyseal areas of necrosis on the convex surfaces of diarthrodial joints resulting in partial or complete detachment of a segment of the subchondral bone and articular cartilage.[32] Osteochondritis dissecans affects patients between the ages of 10–25 years most commonly. Degenerative joint disease may apper at the early age as a consequence of osteochondritis dissecans, and may be accelerated in the atletes[33] or persons which forces their bodies with hard phisical pressures and efforts.

---

[30] It was difficult to know if this fracture was associated with left ulna fracture because a huge part of this bone had not survived burial to be examined. Fractures to the radius, certainly, often may have been the result of falling on the outstretched hand. Fractures of both these bones are commonly identified in archaeological context.

[31] Extensive osteoarthritis of the first metatarsals is suggestive of mechanical stresses associated with the placement of the first toe into a leather thong stirrup (Reinhard *et al*., 1994).

[32] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 81.

[33] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 83.

Skeletal markers of occupational stress were discovered on the ribs (Pl. VI – Fig. 1), on clavicles (Pl. V – Fig. 6), on manubrium (Pl. VI – Figs. 2 and 3), on patellae (Pl. VI – Fig. 4), on the right and left radius and on the right and left femur (Pl. VI – Figs. 5 and 6). These features included hyperthrophy (cortical defects) of muscle attachment sites for *m. pectoralis minor, m. pectoralis major, m. serratus anterior, Mm. levatores costarum brevis, Mm. levatore costarum longi* (ribs), *m. trapezius, m. deltoideus, m. pectoralis major, m. sternocleidomastoideus, lig. trapezoideum, lig. conoideum, m. subclavius and lig. costoclaviculare* (both clavicles with pronounced right side asymmetry),[34] *lig. sternoclaviculare anterius, m. sternocleidomastoideus, m. pectoralis major, lig. sternoclaviculare posterior, m. sternohyoideus, m. sternothyroideus, m. transversus thoracis* (manubrium with pronounced right side asymmetry),[35] *m. biceps brachii* (right and left radius without pronounced right side asymmetry), *m. supinator* (right ulna),[36] *m. adductor magnus, m. adductor brevis, m. vastus lateralis and m. gastrocnemius – Caput laterale* (right and left femur).[37] All these muscles play a very important part in shoulders and elbows movements. Although unfortunatelly, bone parts of upper limbs, specially those involved in elbow joints, were decomposed, we could assumed that they would had the same cortical changes. Eventually, we had bones with pronounced right side asymmetry (clavicle, manubrium and ulna),[38] and bones with bilateral symmetry (right and left radius and right and left femur). It means that the markers of occupational stress noticeable on the bones may have been caused by the pressure of armour, use of weapons (sword, bow-and-arrow, etc.) and long rides.[39] This is not at all surprising since it is known that this individual was buried with complete armaments and other probably a warrior wearing armour and a horseman.

Dislocated bones I

Preservation and completeness of skeletal remains
Cranial skeleton: mandible (Table 2).

Sex and age: female, 40–50 years (Table 8).

Dental analysis:

Presence of teeth: 31, 32, 33, 34, 35, 41, 42, 43, 44 and 45 (Table 6). Ante mortem loss of teeth: 36, 37, 38, 46, 47 and 48 (Fig. 4.).[40] Post mortem loss of teeth: none.

Attrition: II degree (bare dentin): 34 and 35; III degree (bare dentin up to pulp cavity): 32, 33 (on the limit towards IV degree (open pulp cavity)), 43 (on the limit towards IV degree (open pulp cavity)), 44 and 45; IV degree (open pulp cavity): 31, 41 and 42 (Fig. 4.).

Dental disease:

Teeth shown slight traces of enamel hypoplasia, slight (on the limit towards medium) traces of calculus formation and considerable traces of periodontal disorders.

Type of dental occlusion couldn't be determinated.

Caries, abscess cavities (cysts) and anomalies of the jaw were not found.

Paleopathological finds

Joint diseases: osteoarthritis of temporomandibular joint was detected on both mandibular condyles (Fig. 4.). In older individuals the most common type of temporomandibular joint arthropathy is degenerative osteoarthritis associated with the age-related breakdown of the masticatory system. Antemortem teeth loss reduces masticatory function and creates further malfunction. In order to compensate for the lack of a stable centric position and to find new

---

[34] Impressio lig. costoclavikularis on the right clavicle was 2.5 x 1.8 cm, and on the left clavicle 2 x 1 cm in size.

[35] On right lateral side of manubrium presence of osteophytosis mainly 0.1–0.5 cm in length and trace of enthesophyte 0.5 x 0.9 in size were spoted. Enthesophytes usually develop at muscular attachments and produce degeneration of the joints. This means that if body is involved with a long-term repeated activity, in this case e.g. with use of sword or draws the bow, the skeleton will respond by becoming 'larger' (Roberts and Manchester 1995, 110). On the left lateral side a sulcus 1.8 x 0.5 cm in size was present too.

[36] Kennedy (1983) contends that well developed supinator crests reflect the heavy use of missile weapons (e. g., spears, bolas, slings, boomerangs). This type of throwing involves various movements that directly involve the supinator muscle.

[37] These patterns of markers of occupational stress are attributed to horseback riding (Reinhard et al., 1994).

[38] The bilateral asymmetry of defects reflects right hand dominance or other activities associated with military roles (Larsen 1997, 188).

[39] The similar results were obtained during the anthropological analysis in monastery Resava (Miladinović–Radmilović 2007, 31 and 32).

[40] This teeth were probably lost due to caries or periodontal disorders.

chewing surface the mandible must move into extreme lateral and protrusive positions that stress the temporomandibular joints. The deleterious effects of such parafunctional movements are reflected in the wear patterns of teeth and in the temporomandibular joints that are stressed by the repeated subluxation movements required to position condylar heads into nonphysiological relationship with temporal articular surfaces.[41]

Circulatory disorders: traces of osteochondritis dissecans were found on mandible condyles, two on the right 0.5 and 0.6 cm in diameter, and one on the left 0.5 cm in diameter (Fig. 4.). Osteochondritis dissecans is uncommom after the fourth decade of life, though recently an increasing number of cases have been observed in middle-aged or elderly women. Males are affected two to three times as frequently as females although the number in women rises after menopause.[42]

Fig. 4. Mandible – ante mortem loss of teeth, attrition, osteoarthritis and osteochondritis dissecans

Сл. 4. Мандибула – заживошан губишак зуба, абразија, осшеоарширишис и osteochondritis dissecans

Table 7 Stature

Табела 7 Телесна висина

STATURE (CM)	GRAVE 1	GRAVE 2	DISLOCATED BONES I
based on the lenght of humerus	-	-	-
based on the lenght of radius	-	167 ± 5	-
based on the lenght of ulna	-	-	-
based on the lenght of femur	-	-	-
based on the lenght of tibia	-	-	-
based on the lenght of fibula	-	-	-
mean stature	-	167 ± 5	-

[41] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 400.
[42] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 82.

Table 8 Sex and age distribution

Табела 8 Полна ӣрӣпадносӣ и индивидуална сӣаросӣ

GRAVE NUMBER	SEX	AGE
Grave1	Male	50-60 years
Grave 2	Male	around 30 years
Dislocated bones I	Female	40-50 years

CONCLUSION

The intent of this study was the anthropological analysis of three German individuals, two males and one female, from migration period which were buried in forth necropolis in Singidunum and excavated during archaeological investigation in 2006. Soon the results shown a significant similarity with skeletal remains from migration period in Sirmium.[43]

Dental analysis shown that from expected 80 teeth (female had only mandible preserved) 62 were present, 14 were ante mortem lost (mainly molars due to caries or periodontal disorders) and only one was post mortem lost. All four degrees of attrition were present. Dental diseases were found too. Both males had traces of cariouse features (from caries in the shape of dot to so-called gross-gross caries) and abscess cavities. Caries and abscess cavities were not found in female deseased. Traces of periodontal disorders were considerable in all three persons, like in Sirmium.[44] In distinction from attrition, caries, periodontal disorders and abscess cavities, traces of enamel hypoplasia and calculus formation were not as declared as in skeletal remains excavated in Singidunum during 1991–1993.[45]

Paleopathological finds, on males skeletons, specially the fractures of hyoid bone and osteoarthritic changes on certain parts of the bones, were also similar to those found in Sirmium.[46] Injuries, possible attempted manual strangulation, joint diseases and skeletal markers of occupational stress on both males shown that we were dealing with warriors and probably horsemen (since both of them were German warriors we could only assumed, even if the bones from postcranial skeleton of person in Grave 1 were missing, and so the evidence, that both of them were horsemen). The archaeological find in Grave 2 affirmed that. Since, not one of these pathological changes couldn't be the cause of death, we could say that they probably died from natural causes. At the other side in previous necropolis in Singidunum there were only one fractured bone among 84 individuals wich gives evidence of the very peaceful life of these people.[47]

It was only possible to estimate stature for individual from grave 2 (167 ± 5 cm) and calculate the cranial index for individual from grave 1 (dolichocrany). These data were far from being representative for this population. But, according to stature this male was much similar to those found in Sirmium (165 ± 5 cm),[48] then those found in Singidunum 1991–1993 (171.3 cm)[49] and Viminacium (172.2–175.6 cm).[50] Accoding to cranial indices this dolichrany skull was similar to skull from all three sites. However, such a small sample together with small number of measurements and indices was far from sufficient for more serious comparison. We hope that further archaeological and anthropological examinations of necropolis of the great migration will provide more perspicous picture of this period in our country.

---

43 Miladinović 2006.
44 Miladinović 2006, 421–422, Pl. III–IV.
45 Stefanović, Miladinović i Dimovski 2005, 163–164.
46 Miladinović 2006, 421, Pl. II–V.
47 Stefanović 2002, 173.
48 Miladinović 2006, 432.
49 Stefanović 2002, 176.
50 Mikić 1988, 82.

BIBLIOGRAPHY:

Angel 1966 – J. L. Angel, Early Skeletons from Tranquillity, California. *Smithsonian Contributions to Anthropology* 2 (1).

Aufderheide, Rodríguez-Martín and Langsjoen 1998 – A. C. Aufderheide, C. Rodríguez-Martín and O. Langsjoen, *The Cambridge Encyclopaedia of Human Paleopathology*, Cambridge: University Press 1998.

Bass 1987 – W. M., Bass, *Human Osteology, A Laboratory and Field Manual*, Columbia: Missouri Archaelogical Society 1987.

Blondiaux et al. 1997 – J. Blondiaux, A. Cotten, C. Fontaine, C. Hänni, A. Bera and R-M. Flipo, Two Roman and Medieval Cases of Symmetrical Erosive Polyarthropathy from Normandy: Anatomico-pathological and Radiological Evidence for Reumatoid Arthritis, *International Journal of Osteoarchaeology* 7, 451–466.

Brothwell 1965 – D. R. Brothwell, Digging up bones, Ithaca: Cornell University Press, 1965.

Buikstra and Ubelaker 1994 – J. E., Buikstra and D. H., Ubelaker, *Standards for data collection from human skeletal remains*. Arkansas Archeological Survey Research Series, No 44. Fayettville, Arkansas: Arkansas Archeological Survey 1994.

Fahlström 1981 – G. Fahlström, *The Glenohumeral Joint in Man: An Anatomic-Experimental and Archaeo-Osteological Study on Joint Function. Ossa*. Supplement 1.

Ferembach, Schwidetzky and Stloukal 1980 – D., Ferembach, I., Schwidetzky and M., Stloukal, Recommendations for age and sex diagnosis of skeletons. *Journal of Human Evolution* 7: 517–549.

Fineron, Turnbull and Busuttil 1995 – P. W. Fineron, J. A. Turnbull and A. Busuttil, Fracture of the hyoid bone in survivors of attempted manual strangulation, *Journal of Clinical Forensic Medicine* 2 (4): 195–197.

Garn, Lewis and Kerewsky 1965 – S. Garn, A. Lewis and R. Kerewsky, X – linked inheritance of teeth size, *Journal of Dental Research* 44: 439–441.

Hillson 1990 – S. Hillson, *Teeth*. Cambridge: Cambridge University Press 1990.

Hillson 1996 – S. Hillson, *Dental Anthropology*. Cambridge: Cambridge University Press 1996.

Işcan, Loth and Wright 1984a – M. Y. Iscan, S. R. Loth and R. K. Wright, Metamorphosis at the sternal rib: A new method to estimate age at death in males, *American Journal of Physical Anthropology* 65: 147–156.

Işcan, Loth and Wright 1984b – M. Y. Iscan, S. R. Loth and R. K. Wright, Age estimation from the rib by phase analysis: White males, *Journal of Forensic Sciences* 29: 1094–1104.

Işcan, Loth and Wright 1985 – M. Y. Iscan, S. R. Loth and R. K. Wright, Age estimation from the rib by phase analysis: White females, *Journal of Forensic Sciences* 30: 853–863.

Kennedy 1983 – K. A. R. Kennedy, Morphological variations in ulnar supinator crests and fossae as identifying markers of occupational stress, *Journal of Forensic Science* 28: 871–876.

Larsen 1997 – C. S. Larsen, *Bioarchaeology, Interpreting behavior from the human skeleton*, Cambridge: University Press.

Lovejoy 1985 – C. O. Lovejoy, Dental Wear in the Libben Population: Its functional pattern and role in the determination of adult skeletal age at death, *American Journal of Physical Anthropology* 68 (1): 47–56.

Lovejoy et al. 1985 – C. O. Lovejoy, R. S. Meindl, T. R. Pryzbeck and R. P. Mensforth, Chronological matamorphosis of the Auricular Surface of the Ilium: a new method for the determination of skeletal age at death, *American Journal of Physical Anthropology* 68 (1): 15–28.

Mays 1998 – S. Mays, *The Archaeology of Human Bone*. London and New York: Routledge 1998.

Meindl and Lovejoy 1989 – R. S. Meindl and C. O. Lovejoy, Age Changes in the Pelvis: Implications for Paleodemography, in M. Y. Işcan (ed.) *Age Markers in the Human Skeleton*, Charles C. Thomas, Springfield, Illinois 1989, 137–168.

Mikić 1978 – Ž. Mikić, *O antropološkoj metodologiji terenske obrade skeletnih nalaza*, Godišnjak 16, Centar za balkanološka ispitivanja knjiga 14, Sarajevo: Akademija nauka i umjetnosti Bosne i Hercegovine 1978.

Mikić 1988 – Ž. Mikić, *Antropološka struktura stanovništva Srbije*, Knjiga 4, Etnoantropološki problemi, Beograd: Odeljenje za etnologiju Filozofskog fakulteta u Beogradu 1988.

Миладиновић 2006 – Н. Миладиновић, Физичко-антрополошка анализа остеолошког материјала из германских гробова са локалитета 85 у Сремској Митровици, *ГСАД* 22: 409–434.

Миладиновић-Радмиловић 2007 – Н. Миладиновић-Радмиловић, Антрополошка анализа налаза из гробова у цркви манастира Ресаве, *Саопштења* 39: 25–62.

Reinhard *et al.*, 1994 – K. J., Reinhard, L. Tieszen, K. L. Sandness, L. M. Beiningen, E. Miller, A. M. Ghazi, C. E. Miewald and S. V. Barnum, Trade, contact, and female health in northeast Nebraska. *In the Wake of contact: Biological Responses to Conquest*, 63–74, ed. C. S., Larsen, and G. J. Milner, New York: Wiley-Liss.

Roberts and Manchester 1995 – C. Roberts and K. Manchester, The Archaeology of Disease, second edition, Ithaca, New York: Cornell University Press 1995.

Stefanović 2002 – S. Stefanović, The necropolis of great migration from Singidunum, *Singidunum* 3: 159–178.

Stefanović, Miladinović i Dimovski 2005 – S. Stefanović, N. Miladinović i N. Dimovski, Analiza dentalnog materijala nekropole Singidunum: Karijes tokom Velike seobe naroda, *Singidunum* 4: 147–169.

Todd 1920 – T. W. Todd, Age changes in the pubic bone: I The male white pubis, *American Journal of Physical Anthropology* 3:285–334.

Todd 1921a – T. W. Todd, Age changes in the pubic bone: II The pubis of the male Negro – white hybrid; III The pubis of the white female; IV The pubis of the female Negro – white hybrid, *American Journal of Physical Anthropology* 4: 1–70.

Todd 1921b – T. W. Todd, Age changes in the pubic bone: VI The interpretation of vriations in the symphyseal area, *American Journal of Physical Anthropology* 4: 407– 424.

Trotter and Gleser 1952 – M. Trotter and G. C. Gleser, Estimation of stature from long bones of American whites and Negroes, *American Journal of Physical Anthropology* 10: 463–514.

Vallois 1937 – H. W. Vallois, La Durre de la vie chez l'Homme fossile, *L'Anthropologie* 47: 499–532.

Waldon and Rogers 1991 – T. Waldon and J. Rogers, Inter-observer variation in coding osteoarthritis in human skeletal remains, *International Journal of Osteoarchaeology* 1: 49–56.

Резиме:

НАТАША МИЛАДИНОВИЋ-РАДМИЛОВИЋ
Археолошки институт, Београд

НОВА НЕКРОПОЛА СЕОБЕ НАРОДА ИЗ СИНГИДУНУМА АНТРОПОЛОШКА АНАЛИЗА

Током заштитних археолошких истраживања 2006. у Београду откривена је нова, четврта по реду, некропола Сеобе народа, датована у средину 5. века. Антрополошком анализом смо обухватили три особе које су припадале германском културном хоризонту (Сл. 2). У питању су две особе мушког и једна особа женског пола.

Поред описаних метода за утврђивање полне припадности и индивидуалне старости, дата је детаљна антрополошка анализа скелетних остатака, која је обухватала: степен очуваности костију, полну и старосну припадност (Табела 8), телесну висину (Табела 7), морфолошке и метричке елементе на кранијалном и посткранијалном скелету (Табеле 1–6), кранијалне индексе (Сл. 1 и 3; Табеле 1 и 2), анализу зуба (Сл. 4; Табла I–Сл. 1–4 и Табла III–Сл. 1–3), палеопатолошке налазе (Табла II–Сл. 1–5; Табла III–Сл.4; Табла IV и Табла V) и маркере окупационог стреса (Табла V–Сл. 6 и Табла VI).

Резултати антрополошке анализе се у великој мери поклапају са резултатима добијеним приликом испитивања скелетних остатака из германских гробова пронађених на некрополи у Сирмијуму (ископаване 2003–2005). Краниоскопске анализе потврдиле су сличност и са скелетима пронађеним на некрополи у Сингидунуму (ископаване 1991–1993) и Виминацијуму (ископаване 1979–1985).

Анализа зуба је показала присуство каријеса, абразије, цисти и пародонтопатије. На скелетним остацима уочени су трагови повреда, сраслих фрактура хиоидне кости (могући неуспели покушај дављења) и радијуса, болести зглобова и промена на костима узроковане поремећајима у циркулацији. Међутим, ниједна од ових болести, самостално, није могла да буде директан узрок смрти ових индивидуа. Посматрајући податке добијене антрополошком анализом, можемо једино да закључимо да су ове индивидуе вероватно умрле природном смрћу.

Палеопатолошки налази и маркери окупационог стреса потврдили су сумње археолога да су овде заиста сахрањена два германска ратника, а можда и два коњаника. За особу сахрањену у Гробу 2 имамо директну потврду на самом остеолошком материјалу да је била коњаник. Проблем је код друге индивидуе, из Гроба 1, којој недостају карличне кости и кости доњих екстремитета које су од непроцењиве вредности када се посматрају овакве активности код неке индивидуе. Међутим, то што ове кости у материјалу недостају, не значи да она, такође, није могла да буде коњаник, тим пре што је реч о два ратника која су живела у исто време и припадала истом културном хоризонту. На крају, остаје, једино нада, да ће нам наставак ископавања нових локалитета, на територији града Београда, Сремске Митровице, Костолца и шире, дати праву слику о периоду сеобе народа на територији Србије.

1 2

3

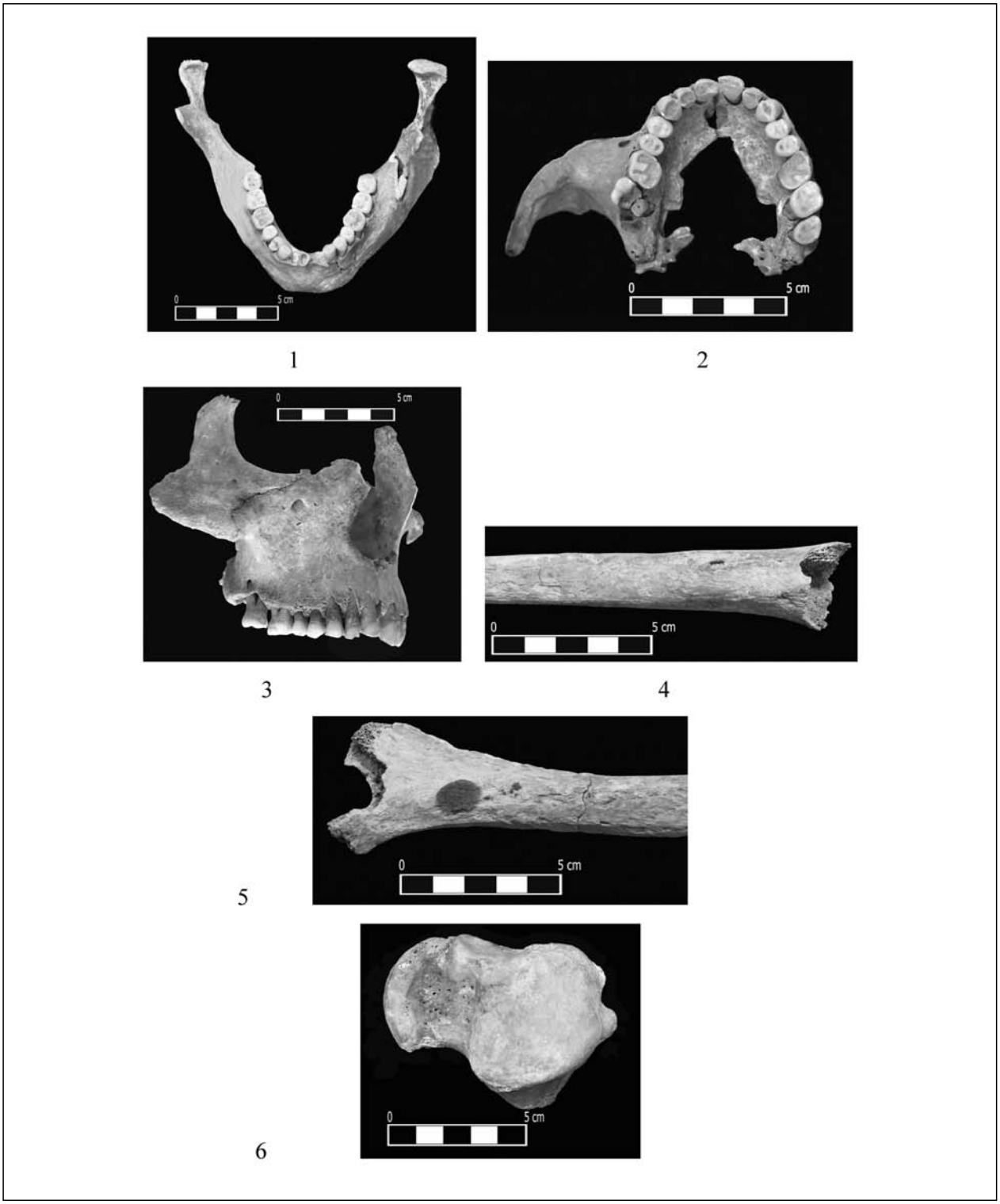
4

Pl. I – Fig. 1–4 (1 and 2 ante mortem loss of teeth, periodontal disorders, caries and abscess cavity; 3 ante mortem loss of teeth, attrition, periodontal disorders, caries and abscess cavity; 4 attrition, caries)

Таб. I – Сл. 1–4 (1 и 2 заживотан губитак зуба, пародонтопатија, кариjес, циста; 3 заживотан губитак зуба, абразија, пародонтопатија, кариjес, циста; 4 абразија, кариjес)

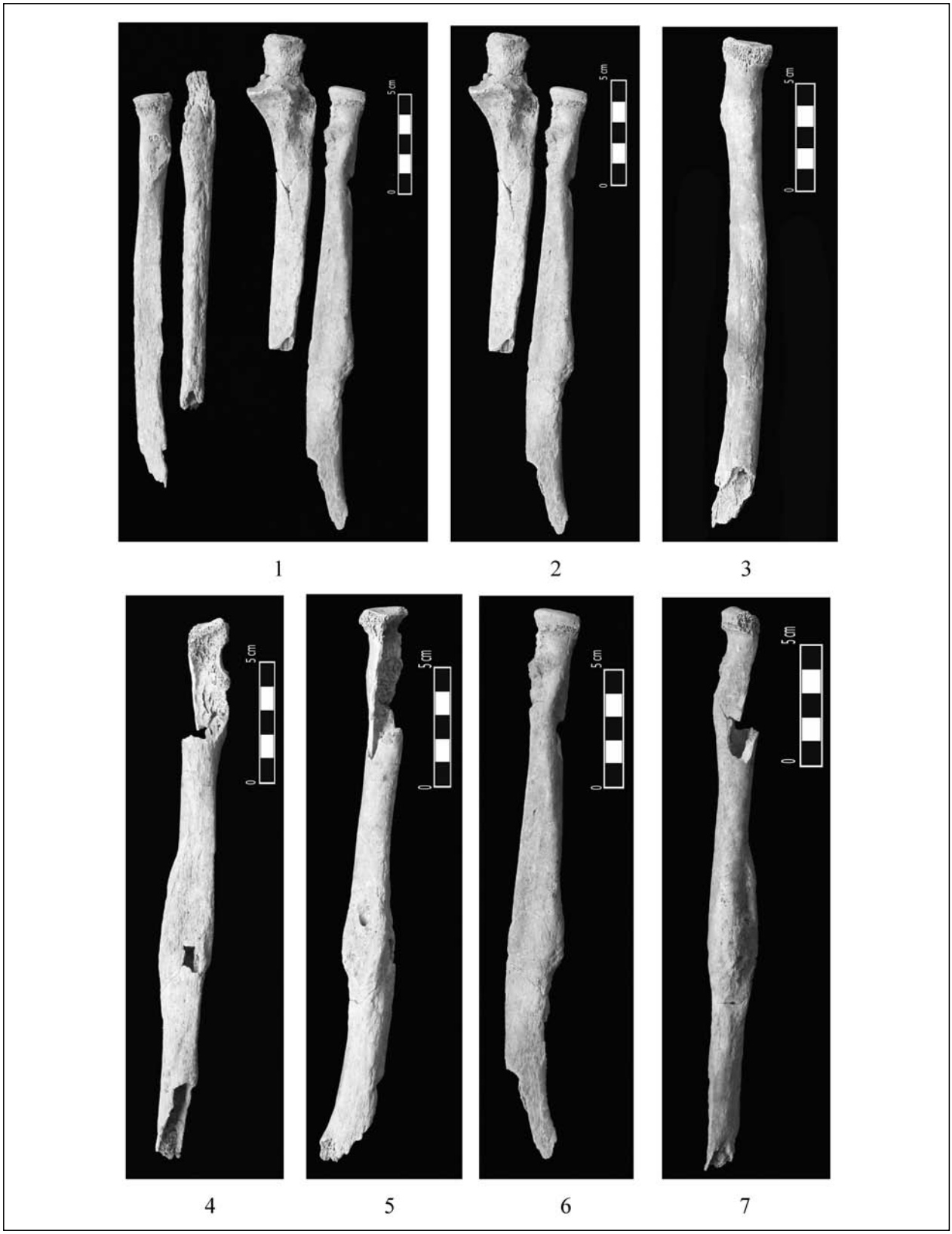
Pl. II – Fig. 1–5 (1healed fracture of hyoid bone; 2–4 osteoarthritis on vertebrae; 5 osteoarthritis on clavicles)

Таб. II – Сл. 1–5 (1 срастао прелом хиоидне кости; 2–4 остеоартритичне промене на пршљеновима; 5 остеоартритичне промене на клавикулама)



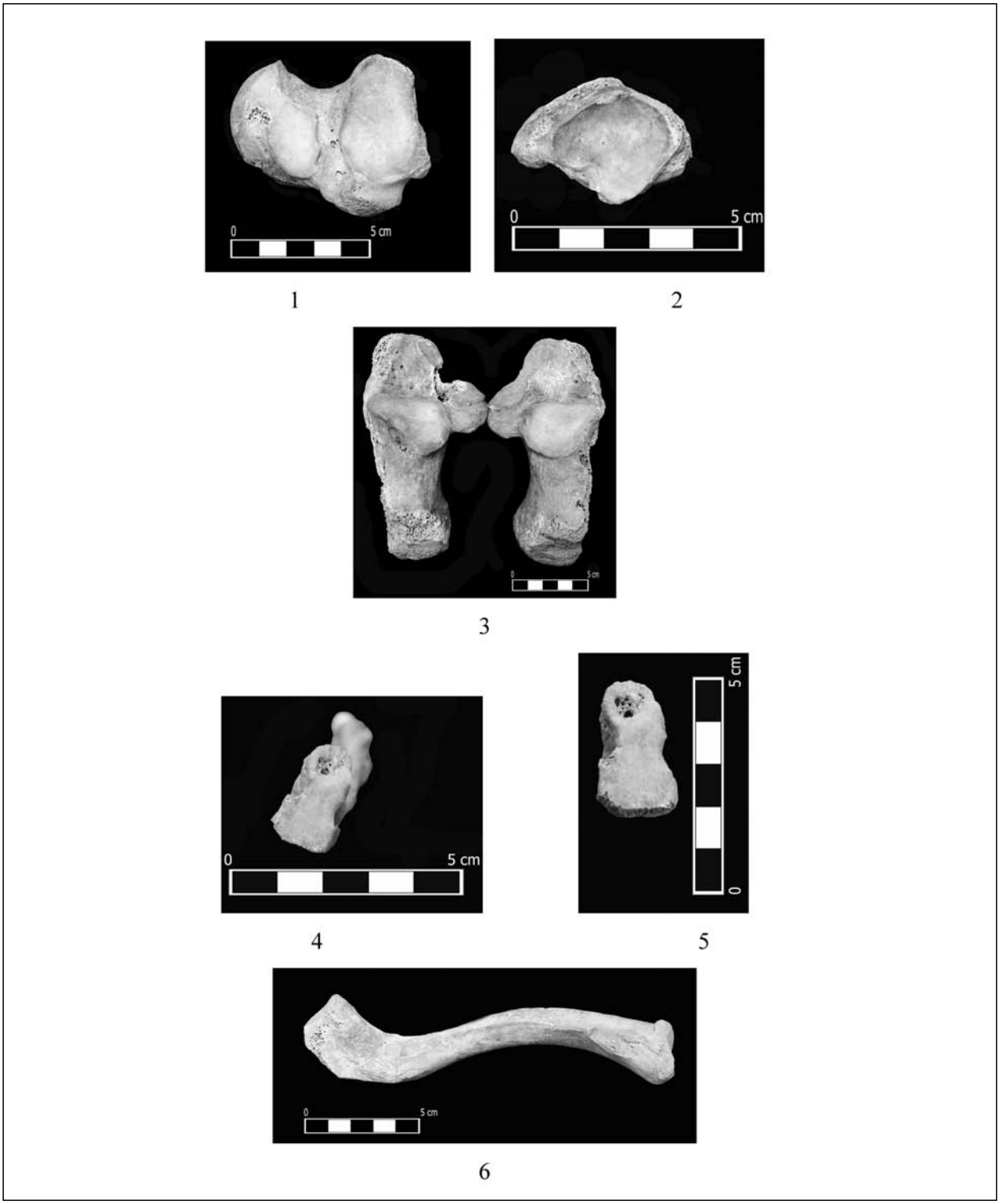
Pl. III – Fig. 1–6 (1ante mortem loss of teeth, attrition, caries; 2 post mortem loss of teeth, attrition, caries, abscess cavity; fossa incisivum; 3 caries, abscess cavity, periodontal disorders; 4 fistula on the right humerus; 5 traces of brown colour on the right humerus; 6 traces of green colour on the left talus)

Таб. III – Сл. 1–6 (1 заживотно изгубљени зуби, абразија, каријес; 2 постморталнo изгубљени зуби, абразија, каријес, циста, fossa incisivum; 3 каријес, циста, пародонтопатија; 4 фистула на десном хумерусу; 5 трагови браон боје на десном хумерусу; 6 трагови зелене боје на левој скочној кости)



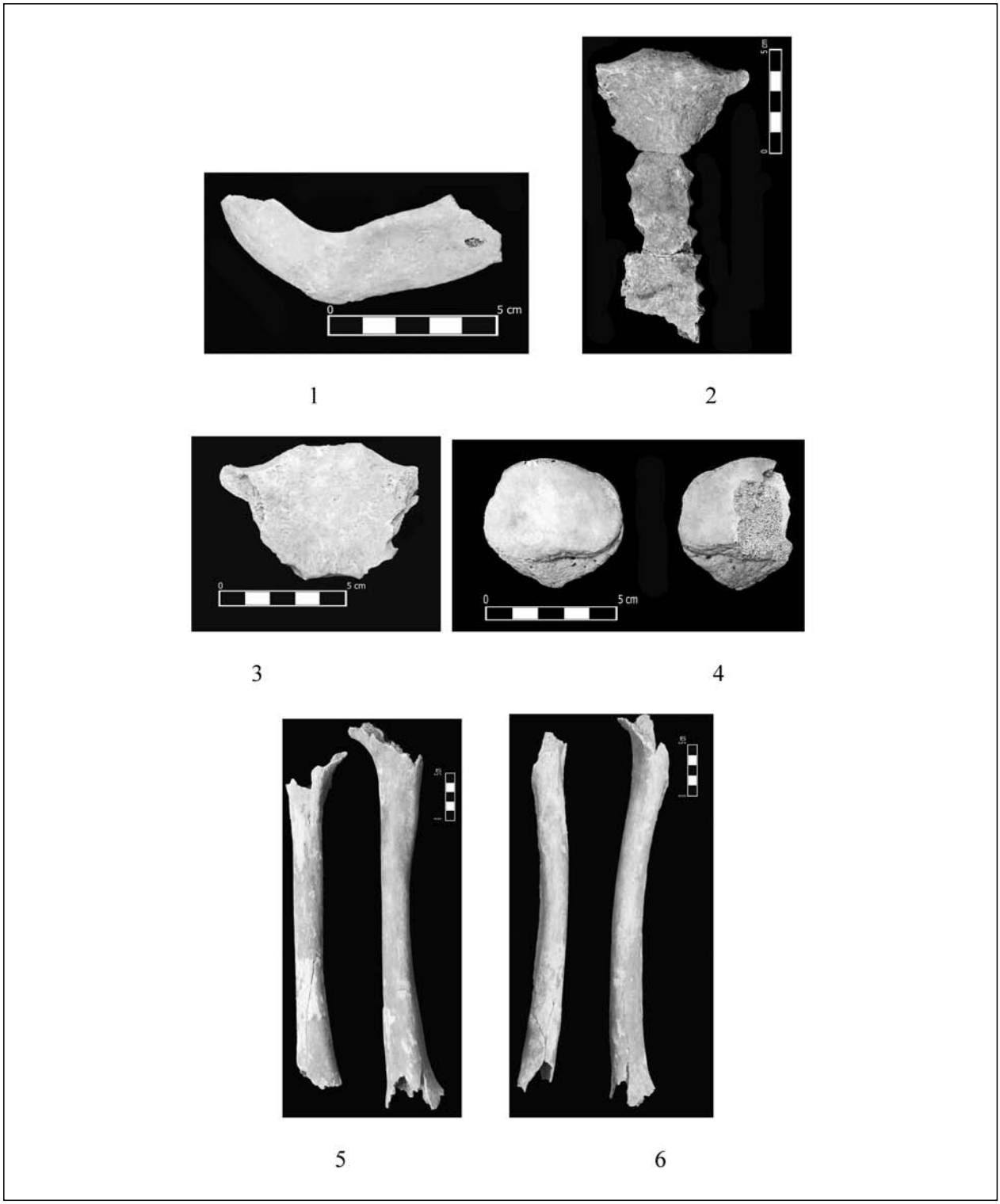
Pl. IV – Fig. 1–7 (1–7 healed spiral fracture of the left radius)

Таб. IV – Сл. 1–7 (1–7 срастао спирални прелом левог радијуса)



Pl. V – Fig. 1–6 (1osteoarthritis on the left talus; 2 osteoarthritis on the right navicular bone; 3 osteoarthritis on calcaneuses; 4–5 osteochondritis dissecans on metatarsal bones; 6 osteoarthritis and skeletal markers of occupational stress on the right clavicle)

Таб. V – Сл. 1–6 (1 остеоартритис на левој скочној кости; 2 остеоартритис на десној чунастој кости; 4–5 osteochondritis dissecans на метатарзалним костима; 6 остеоартритис и маркери окупационог стреса на десној клавикули)



Pl. VI – Fig. 1–6 (1 deformity and skeletal markers of occupational stress on the I rib; 2 and 3 osteoarthritis and skeletal markers of occupational stress on manubrium; 4 osteoarthritis and skeletal markers of occupational stress on patellae; 5 and 6 osteoarthritis and skeletal markers of occupational stress on femurs)

Таб. VI – Сл. 1–6 (1 деформисано I ребро са маркерима окупационог стреса; 2 и 3 остеоартритис и маркери окупационог стреса на манубриуму; 4 остеоартритис и маркери окупационог стреса на пателама; 5 и 6 остеоартритис и маркери окупационог стреса на фемурима)