NATAŠA MILADINOVIĆ-RADMILOVIĆ
Institute of Archaeology, Belgrade

EXOSTOSES OF THE EXTERNAL AUDITORY CANAL

UDC: 904:572.02(497.113)"01/02" ; 902.2(497.113)"1996"
DOI: 10.2298/STA1060137M
Original research article

e-mail: miladinovic.radmilovic@gmail.com

Received: October 01, 2010
Accepted: November 30, 2010

Abstract. – The direct motive for this study was the find of exostoses of the external auditory canal on three skulls from ancient period (2nd–3rd century) which were excavated on site No. 80 in 1996 in Sremska Mitrovica (*Sirmium*). Among 37 buried individuals, only nine of them had temporal bones preserved. According to archaeological documentation they were probably part of the urban poor, slaves or freedmen manual laborers. In any case they belonged to the lowest social status of ancient Sirmium, which was confirmed by anthropological analysis. Auditory exostoses are bone masses located in the external auditory canal. Most researches agree that the environment (especially water temperature, but also water salinity, atmospheric temperature and wind action) plays a significant role in the development of this trait.

Key words. – Ancient *Sirmium*, auditory exostoses, low social status.

This benign lesion (i. e. auditory torus, *torus auditivus*, aural exostosis, ear exostosis, auditory exostosis, external auditory exostosis, exostosis of the external auditory meatus, *torus acusticus*, *torus tympanicus*, etc.) is composed of a skin–covered, circumscribed mass of dense bone located at the meatus or within the external auditory canal (Fig. 1).[1]

The exostoses in the external auditory canal are generally found on the posterior wall.[2] They vary from compact bony tissue with some irregular Haversian canals to spongy-centred protuberances.[3] The size of these exostoses may vary from small corrugations to large prominences almost filling the meatus. This anomaly should not be confused with complete absence of the meatus which seems to be congenital.[4] It is recommended that the degree of canal occlusion should be estimated (auditory exostosis 1/3–2/3 canal occluded).[5] Lesions can be single or multiple.

[1] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 254.

[2] About 70% of the lesions are found on the posterior wall (Roche 1964; Gregg & Bass 1970; DiBartolomeo 1979; Gregg & Gregg 1987). Most report a high frequency of bilateral lesions (DiBartolomeo 1979, 62%), but Gregg and Gregg (1987, 90, table 4.7) found that only 58% of their upper Missouri river archaeological skulls of Native Americans were bilateral. Of the unilateral lesions, 75% were on the left side. All of DiBartolomeo's clinical cases revealed more than one lesion/meatus (Aufderheide, Rodríguez-Martín and Langsjoen 1998, 255).

[3] Broek 1943.

[4] Hrdlička 1935; Risdon 1939.

[5] Buikstra and Ubelaker 1994, 91. Auditory torus was included by Berry and Berry (1967), and scored as auditory torus present. Mann (1984) proposed a superficial (osteoma) and a deep meatal type (exostosis). According to Mann only the deep meatal type is caused by cold water while swimming, and he denied any genetic predisposition, which he thinks refers only to the superficial type which has no connection with irritation. Hauser and De Stefano recommended *three degrees of expression*: weak – a small nodule or ridge; strong

* The article results from the project: *Urbanization and Transformation of the City Centres of Civil, Military and Residential Character in the Region of the Roman Provinces Moesia, Pannonia, Dalmatia* (no 147001) funded by the Ministry of Science and Technological Development of the Republic of Serbia.

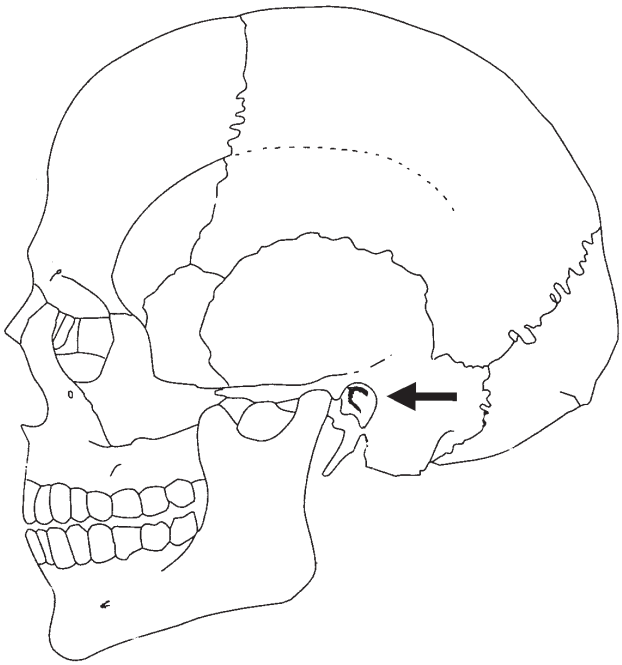

Fig. 1. Exostosis at external auditory canal meatus (after: Buikstra and Ubelaker 1994, 91, fig. 62)

Сл. 1. Егзостоза на спољашњем ушном каналу (према: Buikstra and Ubelaker 1994, 91, fig. 62)

Whether this lesion is a reactive change or a benign neoplasm is not at all clear. The very early literature refers to its as a benign neoplasm (*osteoma*) while the more recent articles favor the term »exostosis.«[6] Mingled within these are reports by several authors who feel that both occur and can be differentiated. The custom of reffering to these lesions as osteomas in the older literature appers to have evolved into terming them exostoses in more recent reports. There appears to be little sense of urgency to distinguish benign neoplasm from reactive exostosis today.[7]

Auditory exostoses have been recorded in skeletal remain worldwide from prehistory until recent history.[8] Today, this trait is common in individuals who practice aquatic sports, and prevalence of auditory exostoses and degree of canal obstruction are positively corelated with intensity and number of years involved in aquatic sports.[9]

All series identify a high male/female ratio varying from 6/1,[10] to 14/1.[11] Both archaeological studies,[12] and clinical studies,[13] identified either no or only an occasional such structure in individuals under age 20 years, strongly implying that this is an acquired condition.[14]

The older literature contains a generous quantity of speculation about the cause of these lesions. DiBartolomeo and Kennedy have collected these,[15] and helped Aufderheide *et al.* construct a table from their articles and some other sources.[16] Proposed etiology of external auditory canal exostoses (with references) from this table lists the following: alcoholism, genetic,[17] gout and/or rheumatism, ear piercing, cranial deformation, bathing, chronic infection, canal form, mastication stress, chronic irritation, swimming, and cold water. Racial affinity and »constitutional predisposition« are general terms that assume the effect of some type of genetic population difference leading to this condition, but its virtual absence under age 20 years suggests an environmental mechanism instead.[18]

– one or more well developed protrusions and excessive – the torus or tori are so big that they almost or totally occlude the meatus (1989, 187). It is assumed that the size is directly related to the time expenditure in the water (Standen, Arriaza and Santoro 1997, 126).

[6] »Another common type of tumor seen in archeological specimens is the small bony growth, which may partially to completely fill the external auditory meatus. Hrdlička (1935) was unable to reach any firm conclusion regarding the cause of these ear exostoses. He did not feel that they were the result of infectious or malignant diseases and suggested chemical or mechanical irritation as a possibility… His report of racial variation suggests a genetic component but environmental or cultural conditions cannot be ruled out« (Ortner and Putschar 1985, 379, 380).

[7] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 254.

[8] Hauser and De Stefano 1989, 187; Aufderheide, Rodríguez-Martín and Langsjoen 1998, 255.; Okumura, Boyadjian and Eggers 2007, 558.

[9] Kroon et al. 2002.

[10] Gregg and Gregg 1987.

[11] Roche 1964. Many authors agree with that (Manzi, Sperduti and Passarello 1991; Standen, Arriaza and Santoro 1997; Hanihara and Ishida 2001, 264; Okumura and Eggers 2005, 275).

[12] Hrdlicka 1935; DiBartolomeo 1979; Gregg and Gregg 1987; Manzi *et al.* 1991.

[13] Di Bartolomeo 1979; Gregg and Gregg 1987.

[14] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 255.

[15] DiBartolomeo (1979) and Kennedy (1986).

[16] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 255, Table 8.1.

[17] According to Hrdlicka (1935) auditory tori are caused by genetic derangement of neurovascular control of the parts involved, i.e. a changed hereditary endowment of the trophic nervous centres that control the normal status of the external bony meatus. The causes that trigger tumorigenesis may be either mechanical or chemical, leading to prolonged irritation, with consequent hyperaemia and inflammation. The opinion predominating in the literature thus favours prolonged irritation (e.g. through cold or salt water, Belgraver 1938, Van den Broek 1943). Likewise, Brothwell thinks that etiology of external auditory canal exostoses is associated with a hereditary neurovascular derangement (Brothwell 1981, 95).

[18] Aufderheide, Rodríguez-Martín and Langsjoen 1998, 255.

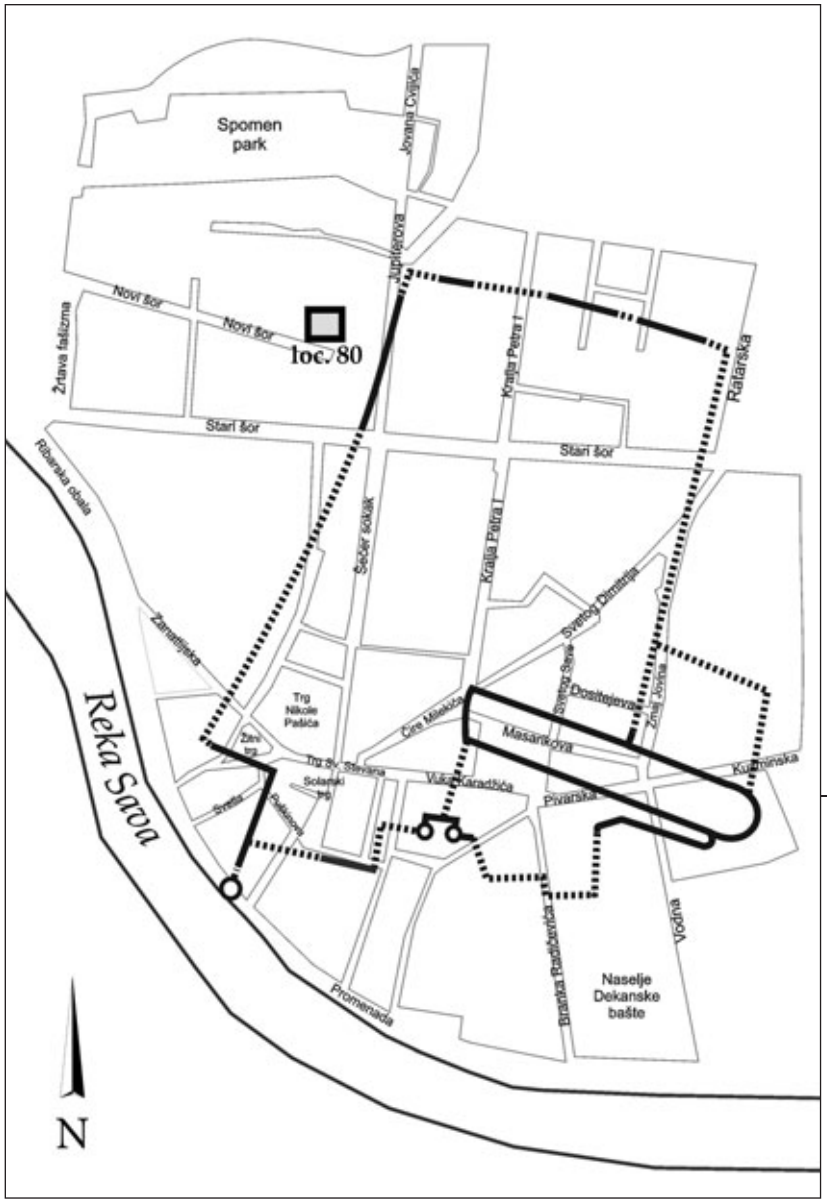

Fig. 2. Map of Sremska Mitrovica, site No. 80 (this map was originally made by M. Radmilović)

Сл. 2. Карта Сремске Митровице, локалитет 80 (карту је израдио М. Радмиловић)

Chronic infections involving the periosteum are known to provide a powerful stimulus to new bone formation;[19] however, DiBartolomeo found that while as many as 30% of his patients admitted to a history of an acute ear infection in childhood, none had chronic infections.[20]

From the 19th century until recently, the cause of auditory exostoses was thought to be genetic.[21] However, an exclusively genetic origin of this trait has recently been rejected because ancestry has not been shown to be significantly related to the prevalence of auditory exostoses. Furthermore, several researches who supported the genetic hypothesis have also cited chemical or mechanical stimuli that lead to irritation of the auditory canal as possible underlying causes of the development of auditory exostoses. Currently, most researches agree that auditory exostoses are probably caused by environmental factors, and genetic predisposition has only a minor role in the developmentof this trait.[22]

[19] Pérez, Gracia, Martínez and Arsuaga 1997, 411, 413.

[20] DiBartolomeo 1979.

[21] According to Ascenzi and Balistreri (1975) auditory tori are absent in fetal and newborn, and show a low frequency in children (Hrdlicka 1935). The incidence of the trait is highest in middle age (Hrdlicka 1935, Roche 1964).

[22] Okumura, Boyadjian and Eggers 2007, 558, 559.

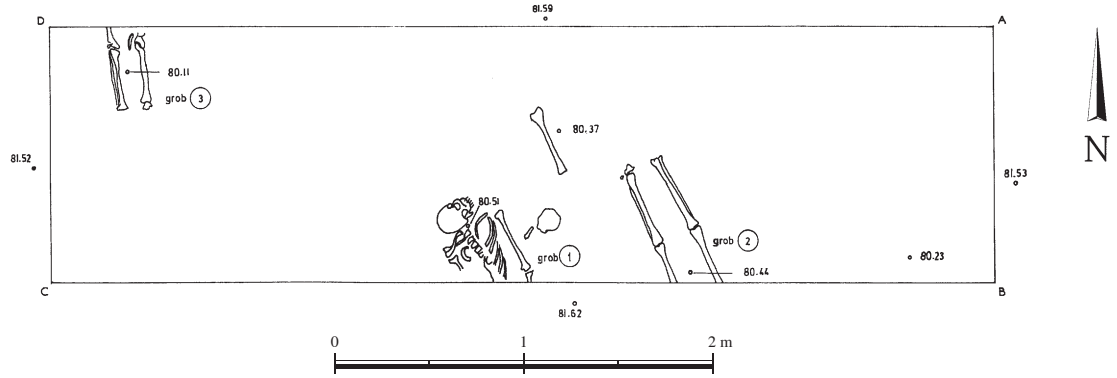

Fig. 3. Site No. 80, grave 1, situation plan
(Archaeological documentation of site No. 80 (1996) from Institute of Archaeology, Belgrade)

Сл. 3. Локалитет 80, гроб 1, ситуациони план
(Археолошка документација, локалитет 80, Археолошки институт у Београду)

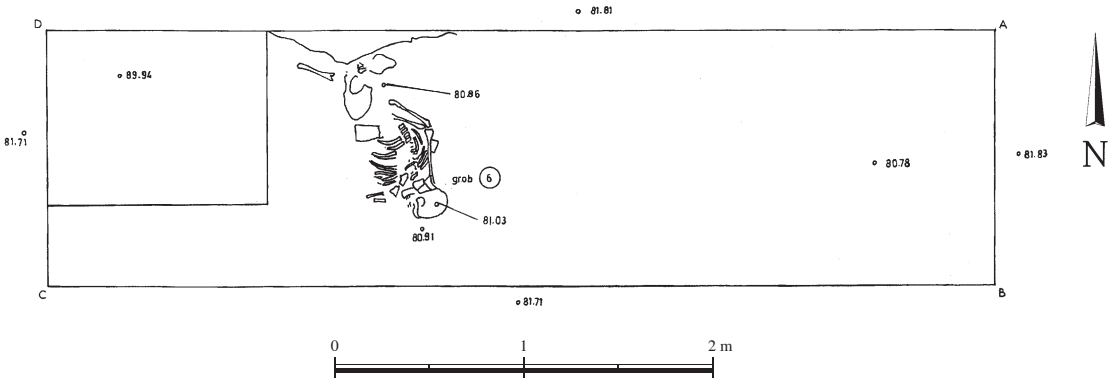

Fig. 4. Site No. 80, grave 6, situation plan
(Archaeological documentation of site No. 80 (1996) from Institute of Archaeology, Belgrade)

Сл. 4. Локалитет 80, гроб 6, ситуациони план
(Археолошка документација, локалитет 80, Археолошки институт у Београду)

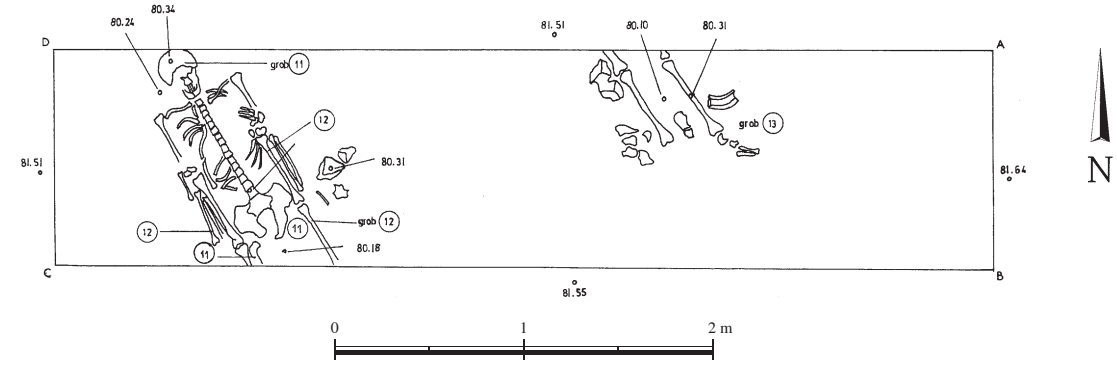

Fig. 5. Site No. 80, grave 11, situation plan
(Archaeological documentation of site No. 80 (1996) from Institute of Archaeology, Belgrade)

Сл. 5. Локалитет 80, гроб 11, ситуациони план
(Археолошка документација, локалитет 80, Археолошки институт у Београду)

Velasco-Vazquez *et al*. say that it is generally belived that habitual exposure of the ear canal to cold water triggers an imflammantory reaction in the soft tissue, ultimately leading to osteogenic activity, but the mechanism(s) by which bone formation takes place remains speculative. Using many other references, these authors explain that several cytokines and growth factors, such as interleukin 1 and 6, tumor necrosis factors α and β, transforming growth factor β, and interferon γ, among others, modulate the activity and function of osteoblasts and osteoclasts. In this sense, cytokines released by sensitized T-lymphocytes, macrophages, and epithelial cells are involved in the bone destruction observed in periodontal disease. Several growth factors, also released during the inflammantory response, counteract bone resorption and lead in fact to new bone formation, playing a key role in fracture repair. It is possible that an imbalance between the local effect of osteogenic growth factors and bone-resorptive cytokines during repeated episodes of otitis externa acquired during exposure to cold water may lead to the formation of auditory exostoses.[23]

The origin of this little bony projection has been discussed in detail by Kennedy.[24] She considered the supposed correlation between auditory exostoses and immersion in cold water in populations from different geographic regions.[25]

The skin in the ear canal is very thin, so the periosteum here is very near the surface. Irrigation of the ear canal with cold (below about 19°) water has been shown to cause prolonged local redness, blood congestion (*hyperaemia*) and inflammation which may traumatise the periosteum, stimulating it to lay down new bone. In this way auditory tori may be produced. Consistent with this, cases of auditory tori in man are generally associated with a history of cold water exposure over a long period of time, and auditory tori have been produced experimentally in guinea pigs by irrigating their ears with cold water.[26]

The Kennedy's hypothesis was that low frequencies would be expected in polar and subpolar areas (i.e. avoidance of cold water because of the potential problem of hypothermia) and the tropical latitudes, where people were accustomed to warmer water.[27] Higher frequencies were expected in people who exploited either marine or freshwater resources through diving.[28] In another words, she hypothesised that at low latitudes (30°S–30°N), where sea surface temperatures are rarely below about 21°C, the frequency of tori should be low, as the water would generally be insufficiently cold to produce them. At high latitudes (above about 45°N), water should be too cold for prolonged full body immersion so here too tori should be rare. However, between 30 and 45 degrees of latitude, water temperatures should be cold enough to have the potential to produce tori, but not so cold as rapidly to produce lethal hypothermia.[29] At middle latitudes we might expect auditory tori to be more frequent than as high or low latitudes if the cold-water-in-the-ears hypothesis is valid.[30] These hypotheses were substantiated and the genetic predisposition for these abnormalities could not be sustained.[31] In fact, it is now suggested that many of the non-metric, epigenetic skeletal traits described in the literature may be culturally and not genetically induced.[32] For example, auditory torus has already been used to give clues to ancient activity patterns.[33]

Building upon Kennedy's work, D. Frayer, studied auditory tori in a group of Mesolithic skeletons from Vlasac.[34] Vlasac lies on a terrace overlooking the river Danube. The skeletons from this site showed a high frequency of tori (34%) – similar to that observed by Kennedy in her Australian and Tasmanian groups known to dive for aquatic resources.[35] There was no difference between the sexes in terms of frequencies of exostoses, but the tori tended to be larger in males, perhaps indicating greater exposure to cold water.[36] Examination of the animal bones excavated from Vlasac, showed that

---

[23] Velasco-Vazquez, Betacor-Rodriguez, Arnay-de-la-Rosa and Gonzalez-Reimers 2000, 49, 50.

[24] Kennedy 1986.

[25] Many agree with that (Manzi, Sperduti and Passarello 1991; Standen, Arriaza and Santoro 1997; Aufderheide, Rodríguez-Martín and Langsjoen 1998, 255; Hanihara and Ishida 2001, 264; Okumura and Eggers 2005). Some suggest that they could be associated to low temperatures of the water – diving – or the air – exposure to strong cold winds, water salinity, etc. (Mendonça de Souza, Wesolowski and Rodrigues-Carvalho 2009, 34; Okumura, Boyadjian and Eggers 2007).

[26] Mays 1998, 119 and 120.

[27] Roberts and Manchester 1995, 113.

[28] Kennedy 1986, 407.

[29] One research indicates that external auditory exostosis was also present in lower latitudes (17° to 26 °south) (Standen, Arriaza and Santoro 1997, 125).

[30] Mays 1998, 120.

[31] Berry and Berry 1967.

[32] Saunders 1989.

[33] Mays 1998, 119.

[34] Frayer 1988.

[35] Kennedy 1986.

[36] In Australia, where data on tori are particularly plentiful, frequencies of tori in male skulls were high, but frequencies in females were low. On the other hand, in Tasmania ethnographic evidence shows that diving into the cold waters surrounding the island for shellfish was a female activity. In skulls from Tasmania, Kennedy found tori only in females (taken from Mays 1998, 121).

60% of the vertebrate fauna were fish.[37] Although a few fish spears were found among the artifacts from the site, there was no evidence for fish–hooks or other fishing equipment. Frayer suggests that the high prevalence of auditory tori may indicate that the fish were obtained by diving into the Danube, where the water would easily have been cold enough to elicit their formation. Another possible explanation for the tori is bathing, but Frayer points out that if bathing were a general cause of tori then they would be expected to occur regularly in European prehistoric skeletons, whereas in fact in most European collections they are rare.[38]

SKELETAL REMAINS FROM SITE NO. 80 IN SREMSKA MITROVICA (*SIRMIUM*)

During an archaeological excavation on site No. 80 in 1996, 37 individuals from the ancient period, dating 2nd–3rd century were excavated (Figs. 2–5). Considering all existing conditions such as the location of their burial (next to the marsh (Majurska bara) and city dump (many bones had traces of cut-marks); the way they were buried (some were just »thrown away«), paleodemographic situation (23 males, age between 25 and 50 years old), presence of bone injuries (two of them were fatal!), all kinds of fractures and bone splits, subperiostal and superiostal hematomas, unsuccessful attempts of manual strangulation, joint diseases (osteoarthritis), circulatory disorders, tumors, osteomyelitis, *sinusitis*, dental diseases and considerable traces of skeletal markers of occupational stress), one can conclude that people buried here didn't lead a wealthy life. They were probably part of urban poor, slaves or freedmen manual laborers.

EXOSTOSES OF THE EXTERNAL AUDITORY CANAL

Unfortunately, only nine of these 37 individuals had temporal bones preserved. The external auditory canal was examined with the naked eye, looking for the presence and location (superior, inferior, anterior wall, or posterior wall) of exostoses. Likewise, it was recorded whether these exostoses were uni- or bilateral, and to what extent they occluded the auditory canal (less than 1/3, 1/3–2/3, and more than 2/3).

Fig. 6. Grave 1, exostosis at external auditory canal meatus (right and left side); male, 35–45 years old

Сл. 6. Гроб 1, егзостоза на спољашњем ушном каналу (десна и лева страна); индивидуа мушког пола, стара 35–45 година

Auricular exostoses were discovered in three out of the nine individuals (30%). They were all males (35–45 years old; 35–45 years old; 20–25 years old). Exostoses appeared on the posterior walls, posteroinferior and on

[37] Bökönyi 1978.

[38] Mays 1998, 121.

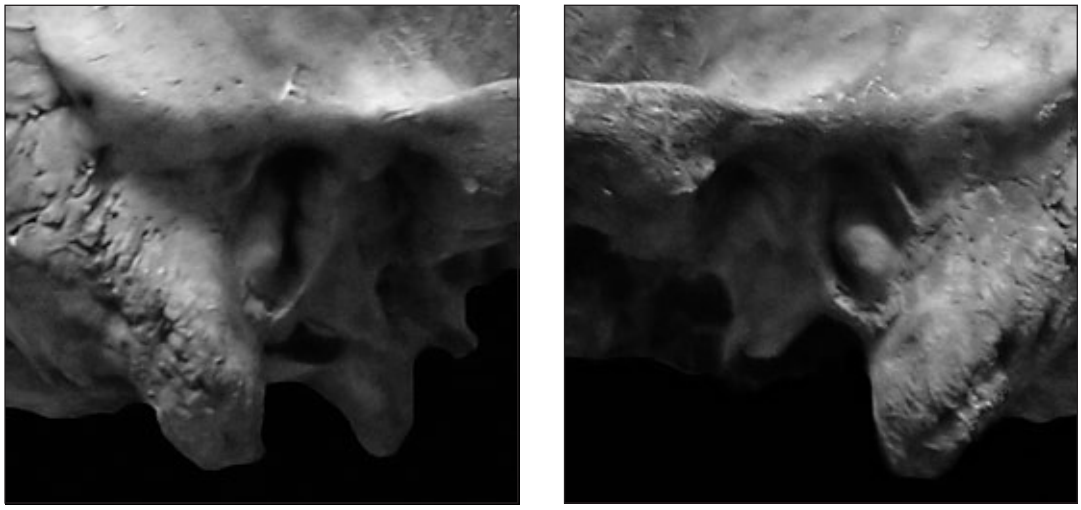

Fig 7. Grave 1, exostosis at external auditory canal meatus: a) right side (detail); b) left side (detail)

Сл. 7. Гроб 1, егзостоза на спољашњем ушном каналу: а) десна страна (детаљ); б) лева страна (детаљ)

anterior wall. They were bilateral and occluded 2/3 (on the left side) and more than 2/3 (on the right side) of the auditory canal in the case of individual from grave 1 (Figs. 6 and 7) – who possibly became deaf, and 1/3 of the auditory canal in the cases of individuals from grave 6 and 11.

CONCLUSION

Presence and features of auditory exostoses were investigated in nine individuals of Roman imperial age (2nd–3rd century A.D.) in *Sirmium* (site No. 80). The results shown a high frequency in the male sample (30%). Auditory exostoses are commonly recognized as localized hyperplastic growths of predominantly acquired origin. As mentioned before, several clinical and anthropological studies have pointed out close links between the occurrence of auditory exostoses and prolonged cold water exposure, generally due to the practice of aquatic sports, or to working activities involving water contact or diving. In this perspective, people that belonged to the lowest social status of ancient *Sirmium* in 2nd and 3rd century, had specific social habits; they worked vary hard.[39] In the 2nd century *Sirmium* was the seat of the river fleet command (*Classis prima Flavia Augusta*).[40] As an important communicative center, *Sirmium* had a port and bridges. These people could have worked in the port (or built bridges?), made breakwaters or joined ships, and could have been in direct contact with water. It is more likely, that they were included in making canals and draining marshes that Prob organized in this area in the 3rd century.[41]

[39] Recently a high frequency of exostoses found among wealthy, male, imperial Romans (in contrast to none in nearby slaves and laborers) was attributed to their use of daily baths and the absence of lesion in their women was associated with the men's traditional use of cold water baths in the frigidarium (Manzi *et al.* 1991).

[40] Вулић 1929, 154.

[41] Mirković 1971, 35.

BIBLIOGRAPHY:

Ascenzi and Balistreri 1975 – A. Ascenzi and P. Balistreri, Aural exostoses in a roman skull excavated at the »baths of the swimmer« in the ancient town of Ostia. *Journal of Human Evolution* 4, 579 – 584.

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.

Belgraver 1938 – P. Belgraver, *Over exostoses van de uitwendige gohoorgang.* Doc. Diss. Univ. Leiden.

Berry and Berry 1967 – A. C. Berry, and R. J. Berry, Epigenetic variation in the human cranium. *J. Anat.* 101 (2), 361–379.

Bökönyi 1978 – S. Bökönyi, The Vertebrate Fauna of Vlasac, pp. 35–65 in D. Srejović & Z. Letica (eds) *Vlasac: A Mesolithic Settlement in the Iron Gates.* Serbian Academy of Sciences, Belgrade.

Broek 1943 – A. J. P. van den Broek, On exostoses in the human skull. *Acta Neerl. Morph.* 5, 95–118, Utrecht.

Brothwell 1981 – D. R. Brothwell, *Digging up bones.* London: British Museum (Natural History) and Oxford: Oxford University Press, 1981.

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.

DiBartolomeo 1979 – J. R. DiBartolomeo, Exostoses of the external auditory canal. *Annals of Otology, Rhinology and Laryngology* 88(6) (Supplement 61), 2–20.

Frayer 1988 – D. W. Frayer, Auditory Exostoses and Evidence for Fishing at Vlasac. *Current Anthropology* 29, 346–349.

Gregg and Bass 1970 – J. B. Gregg and W. H. Bass, Exostoses in the external auditory canals. *Annals of Otology, Rhinology and Laryngology* 79, 834–839.

Gregg and Gregg 1987 – I. Gregg and P. Gregg, *Dry bones. Dakot Territory Reflected.* South Dakota: Sioux Printing Inc., Sioux Falls.

Hanihara and Ishida 2001 – T. Hanihara and H. Ishida, Frequency variations of discrete cranial traits in major human populations. III. Hyperostotic variations. *J. Anat.* 199, 251 – 272.

Hauser and De Stefano 1989 – G. Hauser and G. F. De Stefano, *Epigenetic Variants of Human Skull*. Stittgart: E. Schweizerbart'sche Verlagsbuchhandlung, 1989.

Hrdlička 1935 – A. Hrdlička, Ear exostoses. *American Journal of Physical Anthropology* 20, 489–490.

Kennedy 1986 – G. F. Kennedy, The relationship between auditory exostoses and cold water: a latitudinal analysis. *American Journal of Physical Anthropology* 71, 401–415.

Kroon, Lawson, Derkay, Hoffman and McCook 2002 – D. F. Kroon, M. L. Lawson, C. S. Derkay, K. Hoffman and J. McCook, Surfer's ear: external auditory exostoses are more prevalent in cold water surfers. *Otolaryngol Head Neck Surg.* 126, 499–504.

Mann 1984 – G. E. Mann, *The torus auditivus; a re-appraisal and its application to a series of ancient Egyptian Skulls.* M. Phill. Diss. Cambrigde University, 1984.

Manzi, Sperduti and Passarello 1991 – G. Manzi, A. Sperduti, and P. Passarello, Behavior–induced auditory exostoses in imperial Roman society: evidence from coeval urban and rural communities near Rome. *American Journal of Physical Anthropology* 85, 253–260.

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

Mendonça de Souza, Wesolowski and Rodrigues-Carvalho 2009 – S. Mendonça de Souza, V. Wesolowski and C. Rodrigues-Carvalho, Teeth, Nutrition, Anemia, Infection, Mortality: Costs of Lifestyle at the Coastal Brasilian Sombaquis. Human Evolution and Environment, C08 – Bioarchaeology from the Midst of Shells, International Union for Prehistoric and Protoistoric Sciences, Proceedings of the XV World Congress (Lisbon, 4–9 Septembre 2006), Series editor: L. Oosterbeek, Edited by: S. Mendonēa de Souza, E. Cunha and S. Eggers (C08), Vol. 22, 2009, 33–40.

Mirković 1971 – M. Mirković, Sirmium – its History from the I Century A. D. to 582 A. D. *Sirmium* I, 5–94.

Okumura and Eggers 2005 – M. M. M. Okumura and S. Eggers, The peple of Jabuticabeira II: reconstruction of the way of life a Brazilian shellmound. Homo – *Journal of Comparative Human Biology* 55, 263–281.

Okumura, Boyadjian and Eggers 2007 – M. M. M. Okumura, C. H. C. Boyadjian and S. Eggers, Auditory Eostoses as an Aquatic Activity Marker: A Comparison of Coastal and Inland Skeletal Remains From Tropic and Subtropical Regions of Brazil. *American Journal of Physical Anthropology* 132, 558–567.

Ortner and Putschar 1985 – D. J. Ortner and W. G. J. Putschar, *Identification of Pathological Conditions in Human Skeletal Remains*. Smithsonian contributions to anthropology, number 28. City of Washington: Smithsonian institution press 1985.

Pérez, Gracia, Martínez and Arsuaga 1997 – P-J. Pérez, A. Gracia, I. Martínez and J. L. Arsuaga, Paleopathological evidence of the cranial remains from the Sima de los Huesos Middle Pleistocene site (Sierra de Atapuerca, Spain). Description and preliminary inferences, *Journal of Human Evolution* 33, 409–421.

Risdon 1939 – D. L. Risdon, A study of the cranial and other human remains from Palestine excavated at Tell Duweir (Lachish) by the Wellcome – Marston Archaeological Research Expedition. *Biometrika*, Cambridge, 31, 99–166.

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

Roche 1964 – A. Roche, Aural exostoses in Australian Aboriginal skulls. *Ann. Otol. Rhinol. Laryngol.* 73, 82–91.

Saunders 1989 – S. R. Saunders, Non–metric skeletal variation, pp. 95–108 in M. Y. Iscan and K. A. R. Kennedy (eds), *Reconstruction of life from the skeleton.* New York, Alan Liss.

Standen, Arriaza and Santoro 1997 – V. G. Standen, B. T. Arraza and C. M. Santoro, External Auditory Exostosis in Prehistoric Chilean Populations: A Test of the Cold Water Hypothesis. *American Journal of Physical Anthropology* 103, 119–129..

Velasco-Vazquez, Betacor-Rodriguez, Arnay-de-la-Rosa and Gonzalez-Reimers 2000 – J. Velasco-Vazquez, A. Betacor-Rodriguez, M. Arnay-de-la-Rosa and E Gonzalez-Reimers, Auricular Exostoses in the Prihistoric Population of Gran Canaria. *American Journal of Physical Anthropology* 112, 49–55.

Вулић 1929 – Н. Вулић, Sirmium данашња Сремска Митровица. *Гласник историјског друштва* у Новом Саду, Сремски Карловци, II–2, 153–164.

Резиме: НАТАША МИЛАДИНОВИЋ-РАДМИЛОВИЋ, Археолошки институт, Београд

ЕГЗОСТОЗЕ У СПОЉАШЊЕМ УШНОМ КАНАЛУ

Кључне речи. – Антички Сирмијум, егзостозе на спољашњем ушном каналу, нижи социјални слој.

Од 19. века до данас научници су покушавали да објасне етиологију ових егзостоза у спољашњем ушном каналу. Тако су раније сматрали да их изазива алкохолизам, да су генетски условљене, да их изазива гихт и/или реуматизам, бушење ушију, деформација лобање, купање, хроничне инфекције, поремећај у жвакању, хроничне иритације, пливање и хладна вода. Најдуже се одржало мишљење да су генетски условљене. Међутим, такво тврђење је недавно одбачено. Чак су и поједини аутори који су подржавали ову хипотезу почели да је напуштају и да објашњење, за настанак егзостоза, траже у хемијским или механичким иритацијама. Коначно, данас се већина научника слаже да егзостозе у спољашњем ушном каналу изазивају спољашњи фактори (дуготрајно излагање хладној или сланој води, ниске температуре ваздуха и ветар), а да генетска предиспозиција има минорну улогу у стварању ових лезија. Дуготрајно излагање ушног канала хладној води иницира црвенило, затим хиперемију, а потом и запаљенски процес који озлеђујући периост. Тада, као и код прелома, започиње фаза регенерације и стварање новог коштаног ткива, у овом случају егзостозе (Сл. 1).

Године 1996. током археолошких ископавања на локалитету 80 у Сремској Митровици (Сирмијум) откривено је 37 индивидуа (2–3. век; Сл. 2–5). На основу: места на коме су сахрањени (поред Мајурске баре и недалеко од градске депоније – многе кости су имале трагове тзв. *cut-marks*); начина на који су сахрањени (неки су једноставно »били бачени«); палеодемографске ситуације (23 индивидуе мушког пола, старости између 25 и 50 година); присуства великог броја повреда (две су чак биле и фаталне!), свих могућих врста прелома и фисура костију, супериосталних и субпериосталних хематома, неуспешног покушаја дављења, болести зглобова, поремећаја у циркулацији, тумора, остеомијелитиса, синуситиса, денталних болести и веома изражених маркера окупационог стреса, стиче се утисак да су вероватно припадали градској сиротињи, робовима или ослобођеницима који су се бавили тешким физичким пословима. У сваком случају неко ко је припадао најнижим социјалним слојевима античког Сирмијума.

Нажалост, само су код 9 индивидуа биле очуване темпоралне кости. Егзостозе у спољашњем ушном каналу посматране су голим оком, испитивано је место на коме се налазе, да ли су уни- или билатералне и у којој мери су оклудирале ушни канал (мање од 1/3, 1/3–2/3, или више од 2/3).

Пронашли смо егзостозе код 3 индивидуе мушког пола (30%), старости 35–45 (две индивидуе) и 20–25 година. Егзостозе су налажене на постериорном, постероинферирорном и антериорном зиду. Биле су билатерално постављене и оклудирале су 2/3 (са леве стране) и више од 2/3 (са десне стране) слушног канала у случају индивидуе из гроба 1 (Сл. 6 и 7) – код ове индивидуе то је вероватно изазвало глувоћу, и 1/3 слушног канала у случају индивидуа из гроба 6 и 11.

Као што је већ истакнуто, више антрополошких и клиничких студија је потврдило блиску везу између егзостоза у спољашњем ушном каналу и дуготрајног излагања хладној води, било да су у питању водени спортови или коришћење фригидаријума (у случају средњих и богатих слојева становништва у римском периоду), било да су у питању послови који су у вези са водом (нпр. роњење, риболов, итд.). Имајући све то у виду, стиче се утисак да су припадници најнижих социјалних слојева античког Сирмијума у 2. и 3. веку, за разлику од осталих становника, морали тешко да раде. У 2. веку Сирмијум је био седиште команде речне флоте (*Classis prima Flavia Augusta*). Као важан комуникацијски центар Сирмијум је имао луку и мостове. Ови људи су могли да раде у луци (или да граде мостове?), да праве лукобране или везују бродове и тако да буду свакодневно у контакту са водом. Међутим, вероватно су били укључени у изградњу канала и дренажу мочвара које је у тој области у 3. веку организовао Проб.