

Book of abstracts



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rice agriculture (with domesticated animals) was becoming increasingly relied upon in China. Osteolytic lesions of the metaphyses of the appendicular bones, primarily of the upper limb, were observed in 22.2% (n=22/99) of individuals. Macroscopically many of the lesions had small external openings with remodelled margins but radiography revealed a narrow canal of osteolysis with sclerotic walls tracking to the metaphysis and loculated destruction of this region. In some cases no external lesion was observed and the metaphyseal changes were only revealed with radiography. In one individual with osteolytic lesions an ellipsoid shaped calcified cyst was also found. Differential diagnosis of the skeletal lesions includes carcinoma, tuberculosis, a haemoglobinopathy associated osteomyelitis, and *Echinococcus granulosus* (cystic *Echinococcus*). Based on the type and pattern of skeletal lesions, and the presence of the calcified cyst, a possible cause is *Echinococcus granulosus* or hydatids disease. The implications of the presence of this disease which is usually associated with pastoralism in a pre-farming prehistoric Asian context is discussed.

THE FRUIT OF THE LOOM. PALEOPATHOLOGICAL RESULTS ABOUT ACTIVITIES RELATED TO SPINNING AND WEAVING IN ROMAN TIME

Allesandro CANCI, Anita RADINI, Cecilia ROSSI

Textile production in Roman times was an economic activity of paramount importance in many regions. The ancient Venetia (North-Eastern Italy), in particular, was one of the best cloth suppliers in the empire. From the late Republican age onwards, the large scale of production was ensured by workshops where both male and female workers were employed. From the first treatment of raw materials to the manufacturing of finished cloths, each step of the production chain was carried out manually, with a great expenditure of time. Posture, gesture and working conditions, including air quality, were comparable to those still existing in some parts of the modern world, and can seriously impact health. Prolonged and strenuous physical activities can cause modifications recognizable on bones, known as musculoskeletal stress markers or enthesal changes. In addition, the prevalence of injuries secondary to biomechanical stress resulting in trauma/degenerative diseases of the vertebral column is a useful tool to reconstruct working activities in the past. Repeated inhalation of dust containing textile fibres at the workplace, joined with poor hygiene and scarce ventilation, exposes the workers to severe impairment of respiratory breathing. The resulting pulmonary disease can be recognized in the skeletal remains, providing further indications about the health conditions of workers involved in textile manufacturing. Microscopic particles of dust generated by such activity can accidentally become entombed in tartar (mineralised dental plaque). The analysis of such particulate matter can also provide important evidence of the quality of the environment as well as potentially support the 'identification' of textile workers in the archaeological record, where populations are available for analysis. By combining palaeopathological evidence with preliminary results of the analysis of tartar, this paper proposes a novel integrated bioarchaeological approach to the study of textile manufacturing in Roman North-Eastern Italy and its impact on health.

THREE BRONZE AGE TREPANATIONS FROM CROATIA

Mario CARIĆ, Dinko TRESIĆ PAVIČIĆ, Ilija MIKIĆ, Ivor JANKOVIĆ, Mislav ČAVKA, Mario NOVAK

Trepanation is probably one of the most interesting intentional interventions observed on human skeletal remains. Cases of trepanation are documented in the archaeological record since Neolithic times and from all around the world. Here we present possible cases of trepanation recorded on crania from three Bronze Age (BA) sites in Croatia. We performed a comprehensive macroscopic analysis as well as radiographic imaging (X-ray and CT scanning) of the skulls. The first case is that of an adult male from the Cetina site dated to the Early BA culture. The second case is found on a juvenile from the Jagodnjak site, a biritual necropolis dated to the transition between the Early and the Middle BA and to the Middle BA Encrusted Pottery culture. The third

trepanation is observed on an adult female from Bezdanjača Cave, dated to the Middle and the transition to the Late BA. All three cases exhibit numerous similarities: (i) all are located on the right side of the frontal bone; (ii) all three are oval or round-shaped with an approximate diameter of 10 mm; (iii) in all cases all three layers of *calvarium* were breached and the edges around the openings are smooth, remodeled and of uniform thickness. Our analysis suggest that in all three cases the procedure was most likely conducted by scraping technique.

INTRABONE STABLE ISOTOPE VARIATION IN SKELETONS WITH PATHOLOGICAL LESIONS

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Pathologies can significantly change isotopic compositions of human tissues and diseases that affect the metabolism may affect stable isotope ratios and not necessarily be linked to diet. While isotopic data have been compared between bone sites with fracture traumas, periostitis and osteomyelitis, and without such lesions, stable isotope ratios have not yet been evaluated on lesions with different healing stages (active and healed). Carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) data from 31 individuals (11th–17th centuries, Portugal) with skeletal lesions compatible with infectious diseases and/or healed fractures were analysed. Samples were collected from the same bone (intrabone): cortical bone (non-lesion) to estimate the individuals' average diet and pathological bone growth (lesions) to estimate diet and/or metabolism during the disease. Lesion samples included: active lesions (long bones $n=14$; ribs $n=4$), healed lesions (long bones $n=10$; ribs $n=9$) and fracture callus (long bones $n=9$; ribs $n=3$). In long bones the correlation between non-lesion and lesion sites is statistically significant for $\delta^{15}\text{N}$ in active lesions (0.78, $p<0.00$) and $\delta^{13}\text{C}$ in healed lesions (0.79, $p<0.01$). Bone segments with active lesions ($\delta^{15}\text{N}=11.1\pm0.9\text{‰}$) had higher $\delta^{15}\text{N}$ than those without lesions ($\delta^{15}\text{N}=10.7\pm0.7\text{‰}$); a statistically significant increase of 0.4‰ , $t(13)=-2.58$, $p=0.02$. In ribs the correlation between non-lesion and lesion is statistically significant for $\delta^{13}\text{C}$ in healed lesions (0.91, $p=0.05$). The increase in $\delta^{15}\text{N}$ seen in long bones with active lesions, when compared with $\delta^{15}\text{N}$ from non-lesion sites, are compatible with data from patients suffering from starvation. The $\delta^{15}\text{N}$ decrease in long bones with healed lesions is compatible with data from individuals recovering from starvation. This study suggests that isotopic data can help better understand diseases in the past, as well as the individuals' response to diseases in the absence of modern medicine.

MICROBIOLOGICAL ANALYSIS OF A CHILD MUMMY FROM ZAGREB CATHEDRAL

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Introduction: Paleoradiological analysis of a Christian mummified child relic, kept in Zagreb Cathedral, was planned in University Hospital "Dubrava". As X-ray unit, CT and MRI scanner are used in clinical settings, microbiological analysis was necessary prior to scans in hospital.

Methods and materials: Swabs were taken from the skull, orbital cavity, teeth, ear, neck, arm, thoracic and pelvic cavity and from the surrounding fabric. The standard microbiological analysis (cultivation, isolation and identification) was done at Department for Clinical Microbiology and Hospital Infections at the University Hospital Dubrava. Samples were inoculated on different nutrient media; Blood agar bases supplemented with 5–10% sheep blood; Mac-Conkey agar; Brain Heart Infusion Agar with vitamin K and hemin for the enrichment of anaerobes and Sabouraud glucose agar with chloramphenicol for fungal isolation.

Results and conclusion: Bacterial organisms found belong to the *Bacillus* genera (we excluded *B. anthracis*) which all are saprophytic and therefore all radiological analysis were possible to be carried on in hospital settings. These results correspond to our other investigations on ancient mummified samples, which always have to be checked for pathogenic potential as they could be dangerous for medical staff later on for hospital patients.

THREE BRONZE AGE TREPANATIONS FROM CROATIA

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INTRODUCTION

Trepanation is probably one of the most interesting and well-studied intentional interventions seen on human skeletal remains (Arnot, 2003). Cases of trepanation in archaeological record are documented from Neolithic times and from all around the world. So far, there are six documented cases from Croatia (Malez and Nikolić, 1975; Mikić, 1986; Marović, 1990; Novak et al., 2013; Boljunčić and Hat, 2015; Premužić and Šikanjić, 2016; Bedić et al., 2016), three of which are discussed in this presentation.

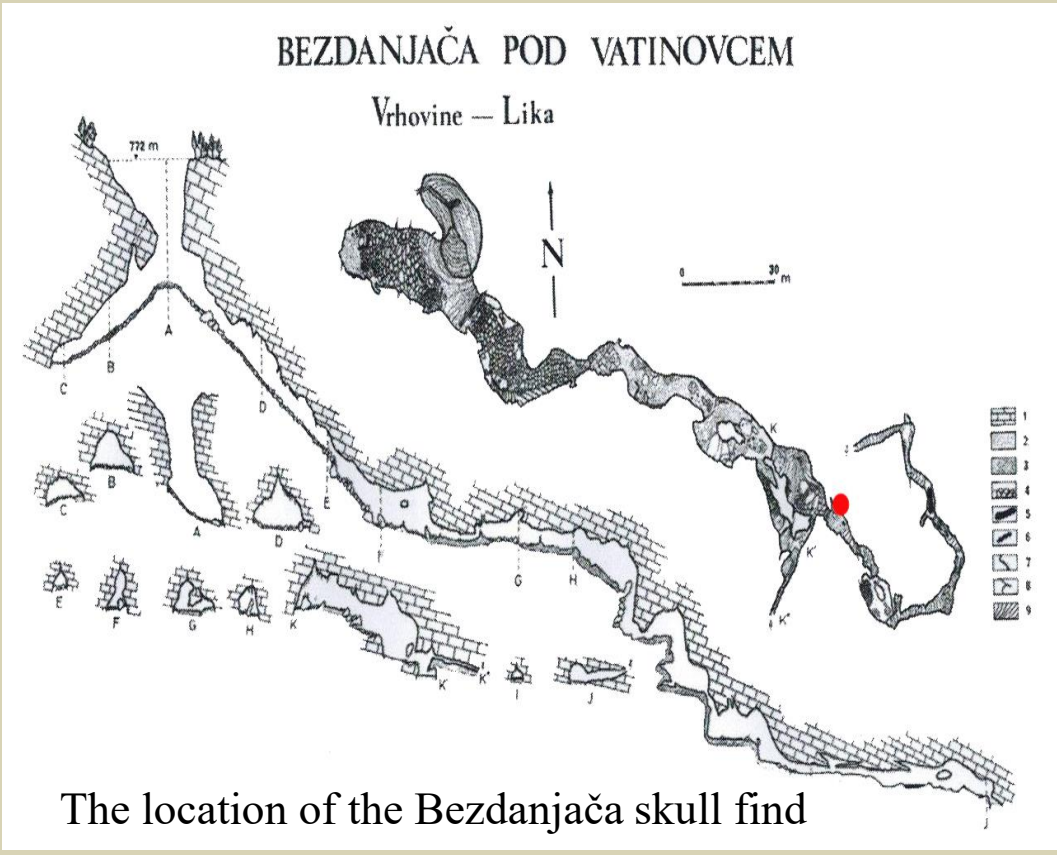
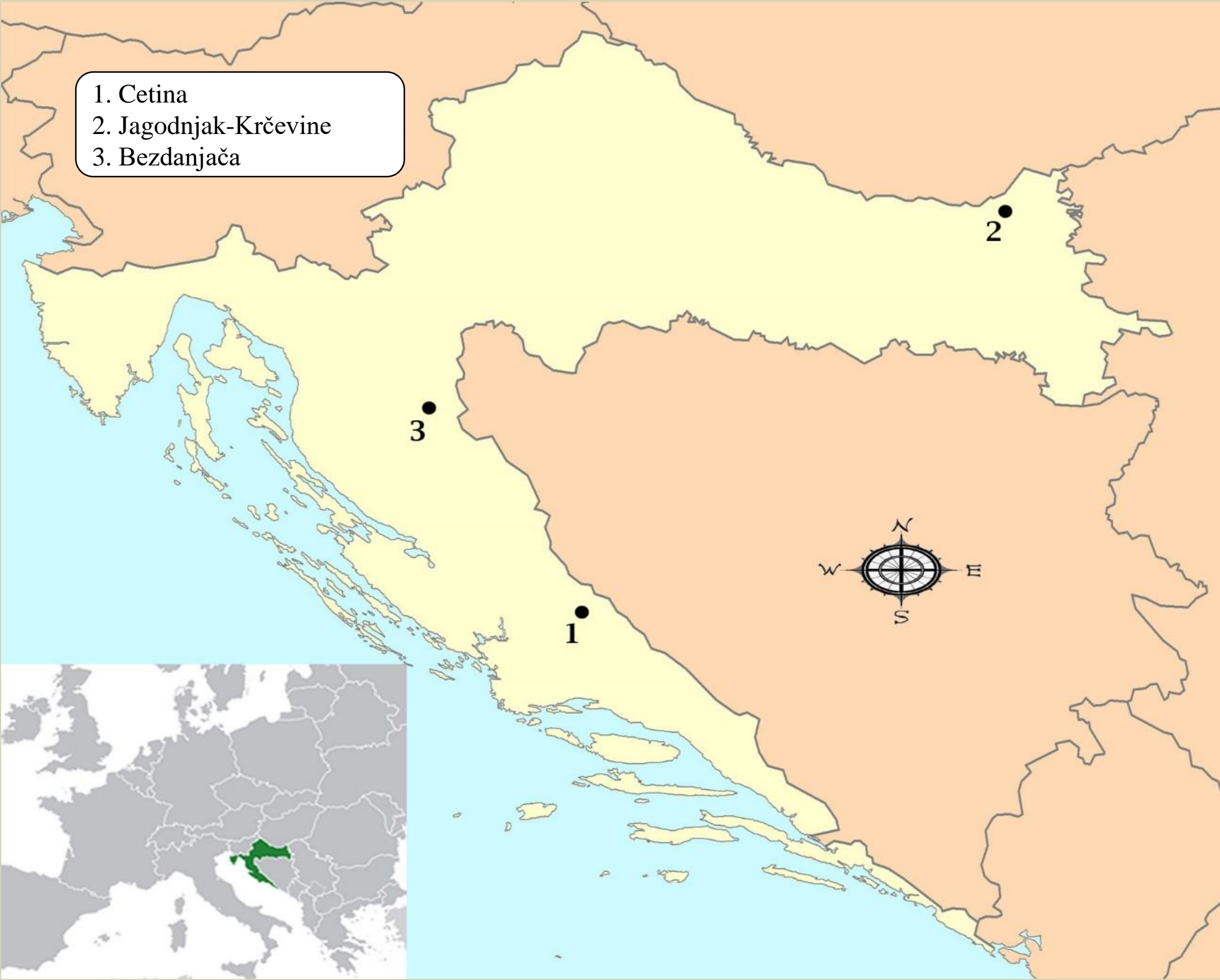
MATERIALS AND METHODS

Conventional bioarcheological macroscopic analysis was conducted at the Institute for Anthropological Research in Zagreb. This included sex and age assessment as well as paleopathological analysis based on the standards proposed by Buikstra and Ubelaker (1994). Radiographic imaging of the skulls was performed at the Department of Diagnostic and Interventional Radiology of the University Hospital Centre Zagreb. X-ray and CT scanning were done utilizing a Multidetector computerized tomography (MDCT) unit (Emotion 16, Siemens AG Medical Solutions).

The first case (Mikić, 1986; Marović, 1991), dated to the Early Bronze Age (approximately 1900 to 1600 BCE), comes from the site of Rudine in Dalmatian hinterland. Although grave goods are absent, it is likely that we can ascribe this burial to the Cetina culture. Only cranium from this burial was available for analysis.

The second case was found during the rescue excavations at the Jagodnjak-Krčevine site, located in the Osijek-Baranja County. This is a biritual cemetery dated to the transition between the Early and the Middle Bronze Age Encrusted Pottery culture (approximately 1600 to 1300 BCE). The whole skeleton was preserved, with some cortical damage due to post-mortem erosion and weathering.

The third case comes from the Bezdanjača cave in Lika (Malez and Nikolić, 1975). Based on material remains from the cave, a period between Middle and Late Bronze Age (approximately 1300 to 750 BCE) has been suggested for human remains (Drechsler-Bižić, 1979). A series of samples from the cave have been sent for radiocarbon dating.



DISCUSSION

Trepanations may vary in terms of the methods used. Today, at least four types of trepanation can be recognized on skeletal material from archaeological contexts (Aufderheide and Rodríguez-Martín, 1998; Brothwell, 1994): 1) scraping - a sharp-edged tool is repeatedly scraped over a designated portion of the bone until the vault wears away and oval or round-shaped perforation is complete with the edges that have a broad shallow bevel; 2) chiseling - a round/oval groove, usually with serrated, steeply beveled edges is made with a pointed instrument; 3) linear grooving - a sharp-edged tool is applied at right angle to the vault surface and moved back and forth until a linear groove penetrates the skull (three more grooves are necessary to produce a rectangular shape); 4) joining of adjacent burr holes - a circle of small holes are drilled through the skull vault, the bridges broken, and the enclosed bone removed.

The morphology and thickness of the edges as well as their incline in all three prehistoric trepanations from Croatia strongly indicates that the scraping technique was used, although it is also possible that the chiseling was used in the case from Cetina.

Reasons for the practice of trepanations are another matter of interest. The available data from geographically widespread cases suggest two main causes: medical and symbolic. According to some authors (e.g. Lisowski, 1967; Ortner, 2003) ritual or symbolic trepanations in prehistory were not uncommon, and were usually done to obtain rondelles (round bone discs) or bone powder for healing potions or as magical amulets. Such practices were mostly conducted post-mortem. Since the presented trepanations show clear signs of healing, the procedures in all three cases were conducted ante-mortem, suggesting medicinal reasons for trepanations.

Advanced healing and bone remodeling are present in both Cetina and Bezdanjača skulls, clearly documenting that the individuals survived the procedure. Nerlich et al. (2003) conducted a study on dry bone samples obtained from individuals who had suffered intravital trepanation for medical reasons in recent times and survived from a few minutes up to 34 years after the procedure was conducted. The degree of healing of the Cetina and Bezdanjača trepanations is almost identical to those patients who lived between four and 34 years after the operation. Unfortunately, in the case of the Jagodnjak trepanation extensive post-mortem cortical damage around the edges prevents a detailed analysis into post-procedural survival of the individual.

Previous researchers (Malez and Nikolić, 1975; Šlaus, 2002) suggested blunt force trauma as etiology of the aperture on the Bezdanjača skull. However, this is highly unlikely since no radial (micro) fractures were observed on the skull under the magnifying glass or the CT scans. Furthermore, on a more macroscopic level, traces of scraping are clearly visible around the edges of the opening.



RESULTS

The Cetina skull belongs to an adult male of about 35 to 45 years at the time of death. The cranium exhibits an oval-shaped aperture on the right side of the frontal bone, three millimeters anterior to the coronal suture. The dimensions of the trepanation on the ectocranial side are 20x14 mm, and on the endocranial side 10x8 mm. All three layers of the *calvarium* were breached, and *dura mater* was most certainly exposed. The edges on both endocranial and ectocranial side are remodeled and of uniform thickness. They slope toward the opening, with a more pronounced incline on the lateral side. A barely noticeable trace of infection is present in the form of porosity on the ectocranial side of the aperture.

The cranium from Jagodnjak belongs to a juvenile of about 11 to 13 years of age. On the right side of the frontal bone, 17 mm anterior of the coronal suture, a jagged round-shaped aperture 10x8 in dimension is present. Again, the cranial vault was completely breached. Due to the poorly preserved cortex it was not possible to register any signs of infection.

The Bezdanjača cranium belongs to an adult female of about 20 to 30 years of age. The oval-shaped aperture with dimensions of 13x10 mm is located three millimeters anterior of the coronal suture on the right side of the frontal bone. The edges of the lesion are smooth, remodeled, and of uniform thickness. On the endocranial side, a bone rondelle 1 mm thick is fused with the left edge of the aperture, taking almost its entire left portion. No signs of infection are present.

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