

# QUESTIONABLE SKULL TREPANATIONS IN ARCHAEOLOGICAL COLLECTIONS OF HUMAN SKELETAL REMAINS FROM SLOVAKIA

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The aetiology of openings in the skull can be of different origin. Apart from disease, they can be associated with intentional surgical interventions, accidents, or violent encounters. It is not easy to distinguish between individual types of openings, especially if showing signs of healing. In general, it seems that especially the re-evaluation of skull openings labelled as ‘trepanations’ is required, as most of the lesions seem to have been insufficiently documented and/or may have been misdiagnosed, as demonstrated in this article on the example of cases from Slovakia. By providing detailed description of skull perforations caused by trepanation and those caused by injury, the author of the article discusses the allegedly trepanned Early Bronze Age skulls from Slovakia, pointing to the need of proper documentation and anthropological evaluation of the perforated skulls in general.

## SKULL OPENINGS, A COMPLICATED MATTER

Openings (holes) in cranial vaults are rather common in archaeological assemblages of skeletal remains. The aetiology of the openings can, however, be of different origin. Apart from disease, they could only be created from the outside of the skull, i.e., extradurally (Weber/Wahl 2006), either as a part of intentional surgical intervention, accident, or violent encounter. In the case of head injuries, comminuted fractures of flat bones are usually observed, with skull fragments being often pushed intracranially (Jakab 1999). Such traumas represent common skull penetrations, commonly accompanied by compressive fractures (Březinová/Jakab/Vladár 2012), and are also called “penetrating head injuries” (Gross 2003). They were often fatal injuries (caused, for instance, by the heads of axe-hammers), as they are frequently accompanied by intracranial bleeding and increased intracranial pressure (Martin 2003). In more extensive head injuries, brain can be bruised and cerebrospinal fluid may leak. Sometimes, epidural hematomas have to be drained as well (Verano 2003). Another cause of perforations observed in cranial vault may be trepanation. In 2000, an international colloquium on trepanation of human skulls was held in Birmingham, providing extensive testimony about trepanations, including the opinions of the participants. Papers from the colloquium were published in a book (Arnott/Finger/Smith 2003) with a comprehensive, interdisciplinary overview, contributing to still hotly debated topic of human skull trepanation. The need for re-evaluation of perforated skulls has thus been discussed for some time. J. Likovský and D. Malyková (2004) drew attention to the revision of skulls in Bohemia. P. Bennike (2003) pointed to incorrectly diagnosed cranial openings in Denmark. B. O’Donabháin (2003) reported on erroneous evaluations of skull perforations that were caused by taphonomic and pathological processes rather than trepanations in Ireland. In Slovakia, it is still the opinion of J. Filip (1969) that prevails, stating that trepanation is a “planned, deliberate intervention to a completely intact, healthy skull of a living person”. However, perforations with traces of intentional mechanical interventions such as medical (surgical) removal of the damaged bone around the skull injury, observed on the edges, are often considered to be trepanations as well (Kaufman/Whittaker/McTavish 1997). In general, it seems that re-evaluation of skull openings labelled as ‘trepanations’ is required, as most of the lesions seem to have been insufficiently documented and may have been misdiagnosed (see also Bereczki *et al.* 2010).



Fig. 1. Abrahám-Komárov vřšok, grave 100 – male, adultus I. 1 – outer plate of a parietal bone fragment; 2 – fragment of the parietal bone with the preserved margin of the perforation recorded on the frontal bone, outer plate; 3 – detailed view of the inner margin of the perforation on the frontal bone; 4 – isolated skull fragment with preserved part of the edge of the perforation, outer plate; 5 – detailed view of the isolated skull fragment, outer plate; 6 – isolated skull fragment with preserved part of the edge of the perforation, inner plate; 7 – detailed view of the isolated skull fragment, inner plate. Scale: a – 1, 2; b – 3–7. Author J. Jakab.

## PERFORATIONS OF THE SKULLS FROM SLOVAK SKELETAL ASSEMBLAGES AND THEIR POSSIBLE MISINTERPRETATIONS

At the Archaeological Institute of the Slovak Academy of Sciences in Nitra, skulls with cranial perforations were evaluated as a part of anthropological analysis, much of the preserved skeletal material being evaluated by the author of this article. Skulls showing cranial perforations, found at the burial grounds of Pobeďim-Hradištia (9<sup>th</sup> c.; *Jakab 2021*), Svodín-Várhegy (Neolithic; unpublished), Nitra-Mlynárce (Eneolithic; *Kuzma/Jakab/Kopčeková 2010*), Ludanice-Mýtňa Nová Ves, position Mrtvice (Early Bronze Age; unpublished), Abrahám (Early Bronze Age; unpublished), represent important collection when it comes to comparison of individual types of skull openings.

So far, in Slovakia, only one prehistoric skull with healed trepanation (Fig. 3–5) has been confirmed by anthropological analysis – the skull from the site of Voderady (location Dialnica/Zeleneč; unpublished research). Skulls with artificial openings are rarely found in Slovak archaeological collections, there is no record of their number, and none of the Slovak anthropologists has yet addressed this issue. Yet, claims about trepanned skulls in local archaeological finds have appeared (*Vladár/Bátora 2004*), even though the holes in the skulls were not subjected to any anthropological study nor adequate documentation. The only documentation is represented by a photograph of the lesion in the grave and dating of the skeletons by archaeologists (based on archaeological context and related artifacts). In his comprehensive study summarising finds from the Early Bronze Age in Slovakia, *J. Bátora (2018)* mentions two trepanned skulls from Slovak sites of Abrahám and Ludanice, skeletal material being analysed by the author of the presented article. However, the claimed cases were not consistent with trepanations, as the contours do not correspond with those observed in any of the trepanation techniques (*Malyková 2002*), with the diameters of the openings being usually larger on the outer cranial plates than on inner plates (*Szathmáry 1982*).

In Abrahám-Komárov vŕšok, where 181 Early Bronze Age graves have been excavated under the leadership of B. Chropovský (*Benkovsky-Pivoovarová/Chropovský 2015*) in 1954–1955, an almost complete skeleton of a 20 to 30 year old male from grave 100 (skeleton A) was discovered. The skeletons were analysed by the author of the presented article (unpublished), paying attention also to differentiation between peri-mortem and post-mortem bone fractures (*Jakab 2013*). The fragments of the cranium of the individual 100A represented few very eroded pieces. The biggest skull fragment is represented by a piece of the cranial vault (Fig. 1: 1; 2), consisting of the anterior half of the parietal bones (*ossa parietalia*) and the majority of the frontal bone (*os frontalis*). On the fragments, traces of one, possibly as many as four peri-mortem holes were visible. Although no complete opening could be reconstructed, a crucial part of the peri-mortem inflicted perforation can be observed on a skull fragment (probably the right side of the frontal bone; Fig. 1: 4–7). The shape of the opening was apparently circular, having a diameter of about 33 mm. The contour was regular, located on damaged outer plate. Spongy layer (*diploë*) of the fragment was also exposed (due to surface damage). Outlines of the upper and lower plates differ, the latter being more irregular with significantly larger diameter. On the right side of the frontal bone, indications of another opening were observed in the much eroded spongy layer and inner plate (*lamina interna*; Fig. 1: 2, 3). It is estimated that the diameter of the outer plate of this opening could have been 30 to 35 mm. On the much damaged, unreconstructable fragments of the posterior half of the left parietal bone, signs of the edges of two more perforations were recorded. On these fragments, the spongy bone as well as the inner plate were completely resorbed. No traces of bone remodelling were discovered neither on the edges nor the plates of any of the openings. The young male buried in grave 100 most probably died of a fatal head injury, as suggested by at least the preserved part of the perforation on the frontal bone (Fig. 1: 4–7). None of the peri-mortem afflicted lesions can thus be associated with trepanation.

The second “trepanation” was allegedly recorded on a male skeleton from grave 564 from Ludanice-Mýtňa Nová Ves, position Mrtvice (*Bátora 2018*). In Ludanice, the majority of the graves were dated to the Nitra and the Únětice culture periods. Peri-mortem cranial perforations were reported in both cultures, in the graves of male individuals of different ages, e.g., graves 29 (skeleton B); 132; 199 (skeleton C); 226; 262; 564; 566; 587 and 597. Most of the openings were oval or circular in shape, with the walls widening towards the inner plate, so the contours of the holes are located on the outer plates, not consistent with any trepanation technique. The only case that could be associated with a probably unfinished and unsuccessful trepanation is represented by the skull of a female from Ludanice-Mýtňa Nová Ves, grave 342. There, on the right parietal bone, an irregular polygon had been scratched around the healed



Fig. 2. Ludanice-Mýtina Nová Ves, grave 564 – male, adultus I. 1 – incomplete cranium from the outer side, superior view; 2 – incomplete cranium from the inner side, inferior view; 3 – detailed view of the peri-mortem perforation observed on the frontal bone, inner plate; 4 – detailed view of the peri-mortem perforation observed on the parietal bone, inner plate. Scale: a – 1, 2; b – 3, 4. Author J. Jakab.

compression fracture of the cranium. Yet, on the skeleton 564, with presumed trepanation (Bátora 2018), only slightly eroded and post-mortem damaged fragments were preserved from the skull, and the only part that could be re-constructed was a part of the cranium (Fig. 2: 1, 2). There, two large separate perforations and a sharp-force trauma were, indeed, recorded. The edges of the openings, as well as the cut and the rest of the skull fragments indicated perimortem damage (Fig. 2: 1, 2; 3: 2, 3). The dimensions



Fig. 3. 1–3 – Ludanice-Mýtina Nová Ves, grave 564 – male, adultus I; 4, 5 – Voderady-Diaľnica/Zeleneč, location 3/76, skeleton 1. 1 – detailed view of the cut observed on the parietal bone; 2 – detailed view of the peri-mortem fracture observed on the base of the mandibular condyle; 3 – detailed view of the margins of the peri-mortem fracture observed on the mandibular ramus; 4 – skull with a trepanation observed on the left parietal bone, superior view; 5 – detailed view of the walls and the contour of the trepanation, superior view. Scale: a – 1–3, 5; b – 4. Author J. Jakab.

of the perforations were measured on the outer plate (ectocranium). The first opening (Fig. 2: 1–3) was located on the left side of the frontal bone (*os frontalis*), at the coronal suture (*sutura coronalis*). The fragment of the cranium located at the coronal suture was missing, and so the length of the opening is only an estimation (ca. 32–35? mm). Second perforation (Fig. 2: 1, 2, 4) was located almost exclusively on the right parietal bone (*os parietalis lat. dx.*). Due to the absence of adjoining fragment, the longer dimension had to be estimated again (dimensions of approx. 38 × 53? mm). A small part of the perforation (about 14 × 51 mm) went as far as the left parietal bone (*os parietalis lat. sin.*), so it crosses the sagittal suture (*sutura sagittalis*) at a length of about 25 mm. The opening probably extended as far as to the tip (apex) and both sides of the lambdoid suture (*sutura lambdoidea*). On the outer plate, the circumferences of the contours of both openings are regular. The margins of the holes descend towards the inner plate, on which the circumferences are irregular (Fig. 2: 3, 4). The peri-mortem sharp-force trauma was located at the back of

the right parietal bone (length: 22–25 mm; Fig. 3: 1). As suggested by the edges of the perforations and the lack of bone remodelling, the openings were more probably caused by fatal head injuries afflicted in the peri-mortem period (unpublished). The male hence died because of fatal head injuries, as indicated also by numerous peri-mortem fractures of the bones of the face and the occipital bone (Fig. 2: 1, 2; 3: 1), not a trepanation. Numerous peri-mortem fractures of skulls and postcranial skeletons from Ludanice-Mýtina Nová Ves (position Mrtvice) suggest that the amount of interpersonal violence was rather high in the Early Bronze Age. All in all, the results of the anthropological analysis, performed by the author of this article, did not confirm trepanation in individuals from Ludanice either.

## CONCLUDING NOTES

In archaeological finds, untreated and treated holes caused by head injuries differ significantly from trepanations, the deliberate, planned procedures performed on the skull of a living person. They can be easily misinterpreted, and still are, especially in Slovak region, as shown by the above-mentioned cases. It may be very misleading when all mechanically treated cranial injuries (such as removal of bone fragments along injuries, or modification of the edges of injuries) are described and mentioned in archaeological sources as trepanations. For objectivity, descriptions and documentation of the holes are important – their location, shape, the description of the contours on the outer and inner plates, the edges and walls, documenting traces of mechanical interventions, new bone formation (degrees of healing), and also taphonomy must be considered.

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## Otázne trepanácie lebiek v archeologických zbierkach ľudských kostrových pozostatkov z územia Slovenska

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### Súhrn

Otvory v lebečných klenbách sú v archeologických súboroch kostrových pozostatkov pomerne bežné. Je však nevyhnutné rozlišovať medzi jednotlivými otvormi v lebkách, keďže je niekoľko spôsobov, ktorými mohli vzniknúť. Okrem patologických príčin mohol otvor v lebkách vytvoriť iba človek z vonkajšej strany ako dôsledok zranenia, alebo intencionálneho chirurgického zákroku (trepanácie). Nie je ale jednoduché rozlíšiť jednotlivé typy otvorov, najmä ak vykazujú známky hojenia. Podrobným popisom perforácií lebky spôsobených trepanáciou a perforácií spôsobených poranením rozoberáme možné nesprávne interpretované prípady údajne trepanovaných lebiek zo staršej doby bronzovej zo Slovenska, pričom poukazujeme na potrebu náležitej dokumentácie a antropologického hodnotenia perforovaných lebiek.

Na Slovensku sú lebky s otvormi v archeologických zbierkach zriedkavé. Po poraneniach hláv sa úlomky z miest prerazení lebiek väčšinou nezachovali. V sporadických tvrdeniach o prítomnosti trepanácie lebiek (napr. z lokalít Abrahám a Ludanice) chýba adekvátna dokumentácia jednotlivých otvorov. Tá sa obmedzila na fotografiu začistenej lebky s otvorom v hrobe a opis nahradilo tvrdenie o trepanácii. Výsledky antropologickej analýzy kostrových súborov z lokalít Abrahám a Ludanice zo staršej doby bronzovej nepotvrdili žiadnu lebku s trepanáciou. Antropologická analýza preukázala, že lebky z hrobu 100 v Abraháme, ani z hrobu 564 v Ludaniciach nemali v klenbách otvory po trepanáciách, ale po poraneniach z perimortálneho obdobia. Stopy po mechanických zásahoch neboli zistené na obrysoch ani na stenách otvorov. Na kostiach lebky z Ludanic sa okrem otvorov zistila aj stopa po záseku a početné zlomeniny kostí tváre a záhlavia z perimortálneho obdobia. Ak otvory vznikli na hlavách živých ľudí, tak na lebkách obidvoch mužov išlo jednoznačne o smrteľné poranenia, zrejme po brutálnom interpersonálnom násilí. Možno teda konštatovať, že v slovenskom prostredí v staršej dobe bronzovej doteraz absentuje nález trepanácie lebky.

Ako uvádzame v diskusnom príspevku, termín „trepanácia lebky“ je vhodné používať len v prípadoch otvorov, vytvorených človekom chirurgickými/lekárskymi zákrokmi na intaktných hlavách živých ľudí. Je teda nutné rozlišovať zlomeniny kostí z postmortálnych období od zlomenín z perimortálnych období, opísať a dokumentovať miesta, tvary, obrysy na vonkajších a vnútorných platniach, okraje a steny otvorov, ako aj stopy po mechanických zákrokoch a stupne novotvorby kostnej hmoty „stupne hojenia“ či vplyvy tafonómie. Vo všeobecnosti sa zdá, že aj v prípade slovenských zbierok je potrebné prehodnotenie lebečných otvorov označených ako „trepanácie“, pretože väčšina lézií sa zdá byť nedostatočne zdokumentovaná alebo mohla byť nesprávne diagnostikovaná.

Obr. 1. Abrahám-Komárov vršok, hrob 100 – muž, adultus I. 1 – fragment z temena lebky z vonkajšej strany; 2 – fragment z temena lebky so zachovanou časťou okraja otvoru na čelovej kosti z vnútornej strany; 3 – detail časti okraja

otvoru na čelovej kosti z vnútornej strany; 4 – izolovaný (nerekonštruovateľný) fragment so zachovanou časťou okraja otvoru z vonkajšej strany; 5 – detail časti okraja otvoru na izolovanom fragmente z vonkajšej strany; 6 – izolovaný fragment so zachovanou časťou okraja otvoru z vnútornej strany; 7 – detail časti okraja otvoru na izolovanom fragmente z vnútornej strany. Mierka: a – 1, 2; b – 3–7. Autor J. Jakab.

Obr. 2. Ludanice-Mýtina Nová Ves, hrob 564 – muž, adultus I. 1 – neúplná klenba lebky z vonkajšej strany (zhora); 2 – neúplná klenba lebky z vnútornej strany (zdola); 3 – detail otvoru z perimortálneho obdobia v čelovej kosti z vnútornej strany; 4 – detail otvoru z perimortálneho obdobia v temennej kosti z vnútornej strany. Mierka: a – 1, 2; b – 3, 4. Autor J. Jakab.

Obr. 3. 1–3 – Ludanice-Mýtina Nová Ves, hrob 564 – muž, adultus I; 4, 5 – Voderady-Diaľnica/Zeleneč, okr. Trnava, obj. 3/76, kostra 1. 1 – detail záseku na temennej kosti; 2 – detail lomnej plochy z perimortálneho obdobia na báze kĺbového výbežku sánky; 3 – detail časti okrajov lomnej plochy z perimortálneho obdobia na ramene sánky; 4 – lebka s trepanáciou na ľavej temennej kosti z hornej strany; 5 – detail stien a obrysu trepanácie z hornej strany. Mierka: a – 1–3, 5; b – 4. Autor J. Jakab.

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