

Early Middle Age Surgeons – Two Trepanned Skulls from the Necropolis near the village Nedan, Bulgaria

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Archaeological excavations near the village Nedan, Pavlikeni district, Bulgaria, revealed Middle Age cemetery with 26 graves, dated from the 9th and first decades of the 10th c CE. Burial ritual, follows in generally Christian practice. However, many deviations from the strict ritual are registered – most of the complexes contain animal bones; present traces of burning; posthumous intervention in the anatomical skeleton position is observed. In the complexes are found various materials, some being parts of the clothing of the buried, other could have been laid as offerings. Skulls from graves # 7 (child ca. 3-4 years) and # 23 (female, ca. 50-60 up to 65 years) present specific defects. The one from grave # 23 identifies as survived cranial trepanation. The defects on the skull from grave # 7 are more complex for interpretation. Skulls or the postcranial skeletal fragments don't present clues for possible reasons for the performed intentional manipulations.

Key words: Early Middle Age, trepanation

During rescue archaeological excavations in the site “Kovanlaka”, near the village Nedan, Pavlikeni district, Bulgaria, a Middle Age cemetery with 26 graves is studied. Burials are performed by inhumation, burial ritual in generally follows Christian practice by laying the death in supine position, with orientation of West (head) to the East direction. In most cases, which allow registration, upper limbs had been laid on the chest or abdomen area. However many deviations from the strict Christian ritual are registered – most of the complexes contain animal bones; present traces of burning, possibly performed after the laying of the body, as the charcoal pieces are registered in the fill of the grave pits; in some cases, including one of the discussed

below, registers a posthumous intervention in the anatomical skeleton position, or ritual mutilations, connected in some periods with defusing a dangerous dead. In the complexes are found various materials, as glass beads, bronze and silver ear rings, buttons, some of which being parts of the clothing of the buried, other, after their location in the complexes, could have been laid as offerings during the burials [32]. Some planning of the necropolis is visible, in which graves of children present clustering. After the found material, which has vast dispersal in the territory of North and Central Bulgaria and North from the Danube River, the cemetery dates from the 9th and first decades of the 10th c CE, or it falls in the chronological and territorial limits of the First Bulgarian Kingdom [11, 21, 34]. No ceramic vessels, or coins are found. Even most of the graves present no tombstone markings, no super-positions are registered. It supposes relatively short period of functioning of the burial site, possibly of 40-50 years, in which light markings and memory had been active.

Material and Methods

The anthropological analysis of the material aimed registration of the skeletal remains on field and recognition of burial ritual and different practices on the area of the necropolis, identification of age, sex, anthropological features and signs of different pathological changes.

The osteometrical study is performed after the standard methods [19]. In achievement of age of buried are used scales for identification of dental development [33, 39], lengths of long bones, compared to the tables of Maresh [17], mean timings of epiphyseal fusion [4, 6, 31], results for cranial sutures' obliteration after the methods of Olivier-Simpson [5], simphyseal surface relief after Todd's scale [31]. The sex in adults is identified after the methods, summarized in Acsádi and Nemeskéri [3] with a priority of features of pelvic bones, after features on the cranial fragments [35] and the obtained measurements after a correlation to standard tables [4, 6, 16]. Stature reconstruction is performed using formulae of Pearson and Lee and Trotter and Gleser for Caucasian population [4].

Results

Still on field ascertains the presence of one individual in each grave complex, or in total, skeletal remains from 26 individuals are studied. In some complexes is observed an intentional disturbance of primary anatomical position of skeletons, performed some period after the burial, possibly after the decomposition of the soft tissue, most affected being the complexes with female skeletal identification. At the preliminary stage of investigation the age and sex identification is achieved, as well as recognition of some pathological changes on bone fragments. Absence of individuals under 2 – 3 years of age at death is visible in the age distribution of the material. It may be explained with discrimination in the burial ritual of these dead and their deposition in

a different place. There remains, however, a possibility the lack of these individuals to be caused by relatively small studied area of the necropolis, or by their destruction. Individuals in the age between 20 and 40 years of age prevail in the demographic distribution (**Table 1**). In sex distribution a prevalence of identified as females in comparison to males 7:10, respectively is registered.

Table 1. Age and sex distribution of buried. *Inf I* – infants, 0-6 years of age; *Inf II* – infants 7-14 years of age; *Ad* – adults, 18/20-40 years of age; *Mat* – matures, 40-60 years of age; *Sen* – elderly, over 60 years of age

Age	Inf I	Inf II	Ad		Mat		Sen	
Sex			M	F	M	F	F	Tt
N	7	2	4	6	3	3	1	26
%	26.92	7.69	15.38	23.08	11.54	11.54	3.85	100.00

On skulls from two individuals, from graves # 7, identified as a child at about 3-4 years at death, and # 23, a female, at about 50-60 up to 65 years at death are found specific defects. Skeleton from grave # 7 is highly fragmented. After the situation of the left femur, both tibiae and fibulae and remains from both iliac bones, found in initial position (**Fig. 1**) the body should have been laid on the back with extended lower limbs. From the skull, the mandible and fragments from skull vault remained in initial position. The other found skeletal parts are disturbed and moved from their primary anatomical position, most of the skeletal parts are missing. A fragment from the frontal bone, with a round perforation locates moved, near to the skull on the left side of the skeleton (**Fig. 1, arrow**). The age of this individual ascertains after the dental development of ca. 4 years at death. However the length of only measured femur (**Table 2**) is closer to the mean values for children at lower age of 3-3 ½ years after used methods.



Fig. 1. Grave # 7, situation on terrain. Position of the frontal bone fragment with trepanation, arrow; detail – fragment with trepanation B *in situ*

On a fragment from the frontal bone of the individual from grave # 7, on its left side, are found two defects. They are parts of two round openings, with reconstructed diameters of about 20÷25 mm (Fig. 2). The edge of both fragments presents slightly oblique walls, with inner diameter slightly smaller (at ca. 4 mm). While the better preserved part of the opening B (Fig. 2, arrow B) presents visible traces from a sharp pointed tool in radial direction (Figs. 2, 3, arrows), the small preserved detail of the other one presents smooth edge, but a thick layer of carbonate covers its surface (Fig. 2, A). On spots of the surface of the cut cranial bone on the place of better preserved opening (Fig. 2, B) are visible traces from the diploe layer, but the cuts from the used tool are smoothed. No other pathological changes are identified so far on the remaining bone fragments from the cranial vault and the postcranial skeleton of this individual.

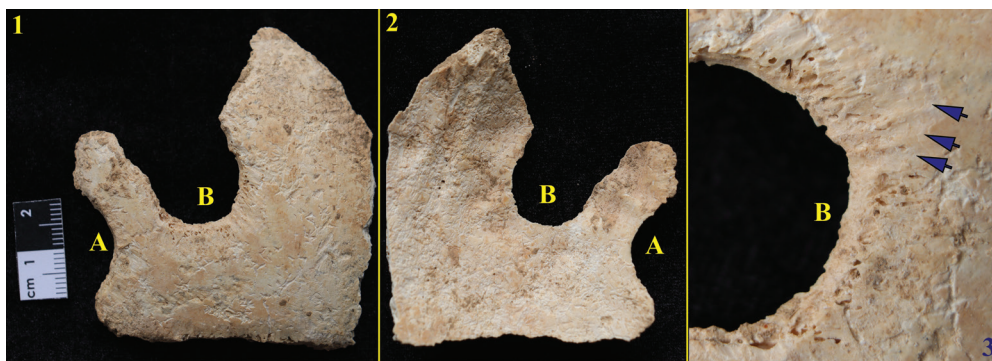


Fig. 2. Grave # 7, frontal bone fragment with trepanation defects, A and B. 2.1. Ectocranial surface (view of the outer table). 2.2. Endocranial surface (view from the inner table). 2.3. Defect B, detail, ectocranial surface; traces from tool, arrows

Table 2. Dimensions of long bones and stature reconstruction. Gr. # - grave number; D – diameter of the head; B – bi-condylar breadth; L – biggest length; T-G – reconstruction of stature in *cm* after the Trotter-Glaeser formula; P-L – reconstruction of stature in *cm* after the Pearson-Lee formula; dx – right; sn – left

Gr. #	Bone	D	B	L	T-G	P-L
7	<i>Femur sn</i>			20,2	-	-
23	<i>Femur dx</i>	4,15	6,94	40	152,65 (148,93÷156,37)	150,45
	<i>Femur sn</i>	4,15	6,81	39,8		

Skeletal remains from grave # 23 are in better preservation. On the field are observed no post-inhumation disturbances and some fragmentation and missing fragments are to be explained with natural destruction in the deposition

environment (**Fig. 3**). The cranial skeleton is disturbed and fragmented after the contemporary construction works. The body has been laid on the back with extended lower and upper limbs, from the latter the left one has been laid on the grave pit's floor near the body, while the remains from the right one are found on the right pelvic bone. The sex of the individual is achieved after the reconstructed pelvic girdle and confirmed after the achieved dimensions of limb bones (**Table 2**). The age identifies after the advanced obliteration of the cranial sutures in the end of the mature group and beginning of the senile age. The stature of the individual reconstructs to have reached 152.65 cm after the Trotter and Glaeser formula and 150.45 cm after the Pearson and Lee formula, or after both used methods it categorizes as short.

On a fragment from right parietal bone of the skull from grave # 23, located on its relative center, ascertains a defect, a pit, with irregular, rounded form and biggest diameter of ca. $4\div 4,5\text{ cm}$ (**Fig. 4.1**). On its relative center a perforation with irregular triangular form with bigger breadth of $2,2\text{ cm}$ and length of 4 cm is observed. The walls of the opening are in oblique direction to its center, from outer to inner table of the parietal bone. The diploe layer is well covered with callus bone formation with no exposition of diploe and smooth surface. No traces from the mechanical forces, or tool, which caused the opening are visible. At places of the opening is seen a post-mortual, taphonomical destruction.



Fig. 3. Grave # 23, situation on terrain.



Fig. 4. Grave # 23, right parietal bone trepanation defect in its approximate center. 4.1. Ectocranial surface (view of the outer table). 4.2. Endocranial surface (view of the perforation from the inner table).

Discussion

Both cases, the openings on the skulls from graves # 7 and 23, are to be interpreted as intentional manipulations on skulls. They present different situation on both individuals. In case of the child from the grave # 7 the round opening B had not been survived for long. The traces of the mechanical forces, observed on the preserved fragments present technique of their formation with a sharp, pointed tool, which had been used in radial direction to extract a relatively round bone fragment in the opening. The fragment from the opening A (**Fig. 2, A**) is smaller, and difficult for examination due to a thick layer of carbonate, which covers its surface. It could be supposed, that at the time of intentional disturbance of the skeletal remains of the child, after some period of time had elapsed after the inhumation, the manipulation on the skull had also happened, during which is extracted, a relatively square fragment, which preserves partially both openings, moved and left near to the skeletal remains. Skeletal remains don't present any clues about the cause of death of the individual, neither the cause of the posthumous treatment of the skull.

The skull from the female from grave # 23 presents a different situation. Walls of the opening present smooth undisturbed callus layer, proving long time of survival after the manipulation. The method used in obtaining the opening should be reconstructed as scrapping the bone plates, by use of sharp blade, resulting thinning of the bone up to 2 mm. In the relative center of the pit, on the thinnest bone, the perforation occurs as an irregular triangular opening. The very thin bone at place does not allow to be rejected also the hypothesis, that when performed, the whole retained a thin layer of bone and the perforation itself occurred post mortem. In concordance with the case from grave # 7, relatively completely preserved skeletal remains from the individual from grave # 23, do not present any data about the reason of performing the observed manipulation, neither the cause of death, a relatively long period after the manipulation took place.

Intentional manipulations on skull bones are evident on material from many cultures in vast territorial and chronological limits. From the anthropological material, studied from contemporary Bulgarian territory, such are known from the Eneolithic period [9, 16], during the sequent periods [8, 27] and in the Middle Ages [28, 29, 30, 37, 38, 15]. All these manipulations present different types, possible aims, and results for the individuals, whose skulls have been affected, during life or after death. Trepanations from Nedan are performed with the most often used methods in paleo populations – one by scraping a plate from outer cranial surface. In it with application of an oblique force, the performer aims a perforation of the cranial bone with maximal control, so not to harm the structures under the trepanned bone. The other technique aims to create a perforation by using consecutive oblique piercing forces in radial direction. Again, a high control on the force is looked for, in order to prevent disturbance of the structures under the cranial bones. Both techniques are used in the Middle ages, and even found consequently applied on one place, on a skull from Anhialos from 11th c. CE [28]. Here on the place of the manipulation (parietal bones, on the sagittal suture) first had been removed outer plate of the bone by scrapping from two opposite directions, performed with sharp blade, similar to the case of the skull from grave # 23, Nedan, and after it, perforation itself had been achieved by a radial forces with pointed tool. This operation had been survived from the individual, as the one observed on the skull from grave # 23, Nedan. Other skull from Anhialos presents a type of incomplete trepanation in which the skull bone is thinned at specific places without being perforated [28]. Most skulls with similar defects and case with most similar defects on one skull are found in the necropolis by the village of Odartsi, dated in the 11th c. CE [38]. For technique used in these cases is proposed cauterization, scrapping or combination of both. Defects, which could be connected with cauterization are smaller in diameter.

Some light on the practices of trepanation in Old world shed historical sources. This manipulation is described still in the “On Head Wounds” ascribed with some uncertainty to Hippocrates [12, 18, 24]. As the work title admits, the manipulation is recommended in the treatment of head injuries. In the ancient world the medical tradition is followed in works of Galen [26] and later from early medieval medicals

as Paul of Aegina and the Holy Abbas. Later the manipulation is accepted also in the Arab medical tradition in work of Avicenna (Ibn Sina), “Canon of Medicine” [1].

In spite of the historical evidences and recommendations of medical authors, evidences for the use of trepanation for purposes other than treatment of traumatic conditions in Roman Empire, and later, are evident in the anthropological investigations. In some of these cases the trepanation is used in treatment of evident pathological conditions, detected on the skeletal remains [10, 20]. Later sources describe cases of use of trepanation in medical conditions, described as neurological disturbances, as migraine and epilepsy. Such are used by crusaders, and later from the Ottoman medicals Ibrahim ibn Abdulah and Serefeddin Sabuncuoglu [2, 10, 13, 22] from 11-12th to the 15–16th c CE. The anthropological investigations of material from Roman period and Early Middle Ages from England and Germany in many cases finds big portion of cases of applied head trepanations on skeletal remains, which don't present any pathological changes, as the Bulgarian ones [23, 25, 36]. In England and Ireland most used technique is the scrapping [23, 25].

Cases of peri-mortem or posthumous manipulations on cranial bones, first ones, known as not survived trepanations, and the latter, as post-mortal trepanations are much rare finds in the discussed period. One case is a finding from Serdica, from Late Antiquity [8,], performed on an adult female, who is supposed to have died during the manipulation. The other case is with closer dating and cultural context to the studied from grave # 7, ascertained on a skull from the Middle Age necropolis # 2 near the village of Odartsi, dated in the 11th c CE [38]. Here the manipulation is also performed on a skull of a child, using similar technique. It is supposed that the child had not survived the manipulation. Most cases of posthumous manipulations, aiming the obtaining of a bone fragment, and artefacts made from human skulls, later preserved in settlement context are known from much earlier period in Bulgaria [7, 9, 14]. Nevertheless such are found again on vast territorial and temporal limits.

Conclusions

On both skulls, from graves # 7 and 23, are detected intentional manipulations. On the skull from the grave N 23 the manipulation is performed during life and survived long time before death. As in many other published findings from Ancient and Medieval Europe and Near East no medical reason for the manipulation is ascertained. Nevertheless the find falls in the group of similar evidences for medical skills and tradition, passed through long period of time between cultures from vast territory of the Eurasia. With the trepanation from grave # 23 from Medieval cemetery near village Nedan enlarges the source material for reconstruction of level of medical knowledge and religious believes of population of Medieval Bulgaria.

The case from the grave # 7 is more difficult for interpretation. The interpretation of the detail from opening A is difficult because of post-mortal destruction and carbonate layer. The opening B had not been survived for long. It is possible that one of the openings had been made short before death and the other peri-mortem

or after death. Clear evidence of posthumous disturbance on the skeleton, in which the skull had been also involved, and features of the opening detail and the skull fragment, render the possibility that the posthumous manipulation aimed obtaining of a bone fragment for some other purposes. It remains unclear if the missing skull fragments are taken away in this act with the bone plate, which left the opening on the frontal bone.

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