



MARKÉTA PECHNÍKOVÁ, EVA DROZDOVÁ, ZDENĚK ČIŽMÁŘ

DECAPITATIONS IN THE MEDIEVAL HOSPITAL CEMETERY FROM ZNOJMO, CZECH REPUBLIC

ABSTRACT: *The rescue archaeological research of a defunct hospital cemetery in Znojmo uncovered 147 graves with 149 individuals dated into 13th–16th century. In exhumed skeletal collection were, besides a large number of skeletons affected by diseases, four men and one woman with cut marks on cervical vertebrae caused probably by decapitation were revealed. The bodies of three males were buried in single graves, young female and older male were found in double grave. The positions of the bodies in graves were almost uniform but the location of the heads varied. Basic osteological examination was made to determine sex, age and stature of these individuals and detailed paleopathological analysis was undertaken with focus target on pathological changes in vertebrae. Lesions were located in lower part of cervical spine. All vertebrae show similar cut marks made by sharp and heavy instrument, probably sword. The reason of beheading seems to be judicial execution*

KEY WORDS: *Decapitation – Middle Age – Znojmo – Cut marks*

INTRODUCTION

During anthropological examination of medieval skeleton collection excavated in Znojmo, Czech Republic, five cases of decapitation were recognized. The collection comes from rescue archaeological research of a defunct hospital church and cemetery that took place in years 2006 and 2007 (Čižmář 2008).

Hospital on Upper Square was found by rich citizen in the first half of 14th century. First written comment about hospital comes from 1363. The medical care was taken by Beguines. Hospital building was situated close to hospital church of St. Elizabeth known from 1391. The hospital was working almost until 1600 and the reason of its closing was seediness and inability to compete with new modern hospital which originated on Lower suburb. During the beleaguerment by Swedish in 1645 Znojmo was occupied and destitute buildings of hospital and church were destroyed (Kacetyl 2008).

The research uncovered ground plan of the church and the burial place in outer space with 149 skeletons or their

parts and plenty of dislocated bones (dated into 13th–16th century). The state of preservation is not very high, just 15% of skeletons are complete, 44% incomplete and 41% of the samples are fragmental. The skulls mostly fragmental were found in 17% of graves, (Pechníková 2008).

The majority of skeletons were supine and extended, most often with the hands laid or crossed on the chest or abdomen, fewer with hands edging to the pelvis or parallel to the body. One young male was crouched; one juvenile was buried prone face down, young male was deposited supine on the left side of his body and adult male was in supine position but with the hands and legs outspread. As a grave goods very often animal bones (in 42 graves), metal pieces, especially nails (in 28 cases), ceramic fragments (23 graves) and less commonly bronze (next 14 individuals) were found. The admixture of dislocated human bones in graves was very frequent (Pechníková 2008).

Five individuals in the cemetery, four males and one female, pointed to probable decapitation. These cases were identified because of the unusual position of the skull in grave and for cut marks found on the cervical vertebrae.

The decapitation could have occurred for several motives: as a consequence of the armed confrontation (to disable or kill an enemy), as a trophy of armed confrontation, as a form of relic collection, like bloodletting, as a result of a mismanaged hanging or as a form of corporal punishment. The beheading, as kind of execution, was in medieval Moravia used very often. However, the evidences of decapitation on urban cemeteries are rarely found.

MATERIALS AND METHODS

Upon osteological examination, it was possible to identify a minimum of 149 individuals more or less preserved. They included 76 males, 17 females, 16 children or juveniles and 40 individuals of indeterminate sex with poor state of preservation (Pechníková 2008).

The sex determination was made on the basis of sexual dimorphism of pelvis (Brůžek *et al.* 2005, Novotný 1986) and skull (Acsádi, Nemeskéri 1970), talus (Novotný, Malinovský 1985) and long bones measurements (Černý, Komenda 1980).

The age at death was assessed according to phylogenetic modifications of pelvis surfaces (Lovejoy *et al.* 1985a), the state of dental abrasion (Lovejoy *et al.* 1985b), the degree of epiphysis fusion and total skeletal maturity (Ferembach *et al.* 1979). Subadult skeletons were aged using dental development (Ubelaker 1978), diaphyseal length (Stloukal, Hanáková 1978) and stage of ossification centres. Average age at death of males was 36.0 years, of females 33.5 years and of immature individuals was 13.5 years.

The stature was assigned from long bones length by Sjøvold (1990) method. The average stature of the collection was 168.5 cm for adult males and 157.2 cm for adult females.

Beside the usual anthropological evaluations, a detailed paleopathological analysis was undertaken (Horáčková *et al.* 2004, Smrčka *et al.* 2009). The focus was targeted on pathological changes in vertebrae. The lesions on vertebrae were studied macroscopically and with assistance of hand-lens. The cut marks were consulted with legal doctors from Institute of Forensic Medicine of St. Anne's University Hospital Brno.

RESULTS

The bodies of three males were buried in single graves, in double grave young female and older male were found. All these decapitated individuals were adults in age range from 20 to 40 years. The positions of the bodies in graves were almost uniform, but the location of their heads varied. The skulls were found more or less in anatomical position in individuals No. 59 and No. 135. In double grave (individual No. 125 and No. 126) the skulls were placed near legs. Just skull and cervical vertebrae of the last decapitated individual (No. 76) were discovered. Four of these graves were located in the direct proximity of other non-decapitated

individuals, just the double grave was situated on the border of investigated area but not far from the church wall. The decapitation marks are in all cases carried by cervical vertebra C5, C6 or C7.

Case 1: individual No. 59

The skeleton of a 30–35-year-old male was found in usual extend and supine position with the hands fold on the abdomen. The skull which appeared to be in anatomical position isn't in extension of body but perpendicular to the spinal column. The body height was calculated as 172 ± 4.5 cm. The state of bone preservation was good. Seven iron nails and two small bronze objects were also found around the body. Distal half of left radius and ulna, distal third of right radius and the bodies of fourth and fifth lumbar vertebrae were green coloured which indicate the presence of other bigger bronze objects. Observed pathology included dental enamel *hypoplasia* and *spina bifida* of the first sacral vertebra.

All of the seven *cervical vertebrae* were discovered and studied. The cut marks were found on the inferior surface of 5th vertebra and on the superior surface of 6th cervical vertebra. From the 5th vertebra (*Figure 1*) the half of right inferior articular process and vertebra's body, deeper on the right side, was chopped off. The left inferior articular process, spinous process as well as the small part of the inferior body surface weren't hit. Both transverse processes were damaged by tafonomic process. From the 6th vertebra (*Figure 2*) the articular facet of left superior articular process and left part of body surface (*uncinate process – uncus*) was cut off. The rest of body surface, arch and *spinous process* were without harm. Tafonomic processes damaged the right part of the superior body surface (*uncus*) and right superior articular process.

Both lesions display a smooth cut surface with well-defined edges. The affected parts are in one inclined plane. One clean cut between these two vertebrae appear to have been made with some thin, sharp and heavy instrument. It seems that the stroke was performed from left lateral and dorsal side of the neck and the tool was going forward, to the right and upward. The omission of both spinous processes signifies that the head of stricken person was bent to the chest and the neck was exposed.

Case 2: individual No. 56

The skull, mandible and seven cervical vertebrae of a 30–39-year-old male were found between other graves without any other postcranial bones. The skull was laid on left lateral side with mandible still articulated. The vertebrae were little deviated from anatomical position, they start under mandible and continue down and backwards. On the internal surface of frontal bone the *arachnoidal granulations* were diagnosed. Teeth showed marks of *hypoplasia*. Together with the bones a small piece metal and animal tooth were unearthed.

The gash mark is visible on the 7th cervical vertebra (*Figure 3*). The gash destroyed the lower surface of the vertebral body on its dorsal and lateral part, all facet of right inferior articular process and inferior part of right pedicle.

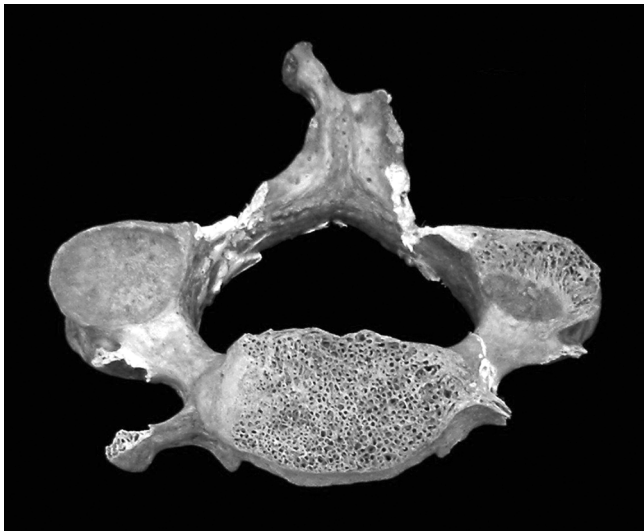


FIGURE 1. lower surface of 5th cervical vertebra showing cut marks on the body and half of right inferior articular process (No. 59).



FIGURE 2. superior surface of 6th cervical vertebra with cut marks of left articular facet and left part of superior body surface (No. 59).

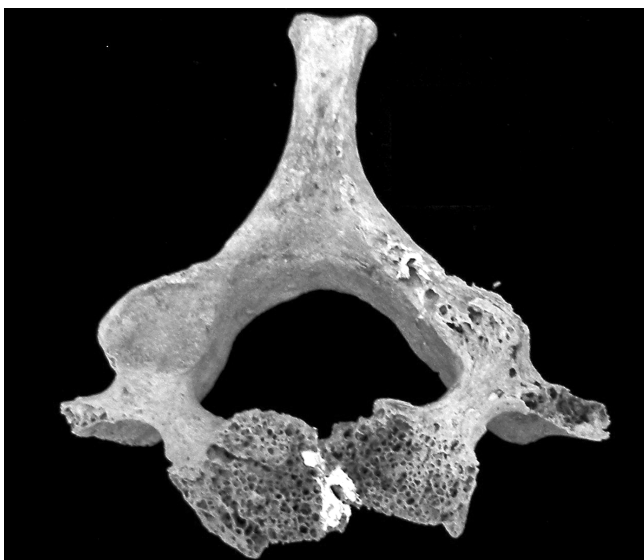


FIGURE 3. gash mark visible on the 7th cervical vertebra with destroyed lower surface of body and right inferior articular facet (No. 76).

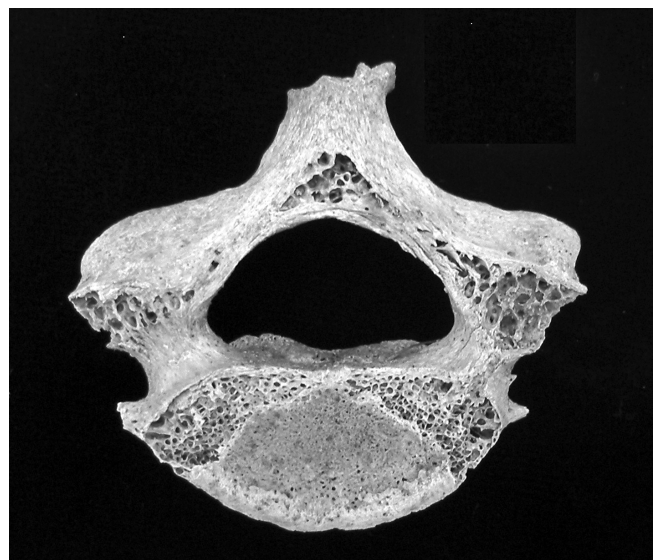


FIGURE 4. traces of cut located on the superior surface of 6th cervical vertebral body and both auricular process (No. 125).

Ventral and central part of the vertebral body as well as transverse process from both sides was destroyed by tafonomic process.

The lesion has straight and precise margins in one plain. The damage was probably caused by one single stroke made by sharp and thin instrument, most likely sword, going from down, back and right side forward, up and to the left. The position of the head and neck is hardly determinable because the consequential first thoracic vertebra isn't at the disposal. But unaffected spinous process of 7th cervical vertebra gives priority to flexed neck.

Case 3: individual No. 125

In the double grave on its left side 20–25 years old female was found in extend and supine position with right hand crooked and fingers converges on right shoulder and left

hand traversed the chest. The skull was placed in non-anatomical position behind the feet. The estimated body height is 159 ± 4.5 cm. This woman has several carries and enamel *hypoplasia*. The pelvis shows expressive postauricular sulcus and slight preauricular sulcus which could be testimony of childbirth or pelvic injury. Both tibias have enhanced diaphyseal curvature what could indicate a slight rachitis/*osteomalacia* or result of malnutrition during the gravidity. The ending part of spinous process of 7th cervical vertebra is missing and the process finishes with irregular rugged facet covered with compact bone which could be result of earlier fracture or developmental defect. Similar case was found at Saxon cemetery at St. Kilian in Hörter by Teege and Schultz (2003).

All the *cervical vertebrae* were available for study. The traces of cut were located on the superior surface of 6th

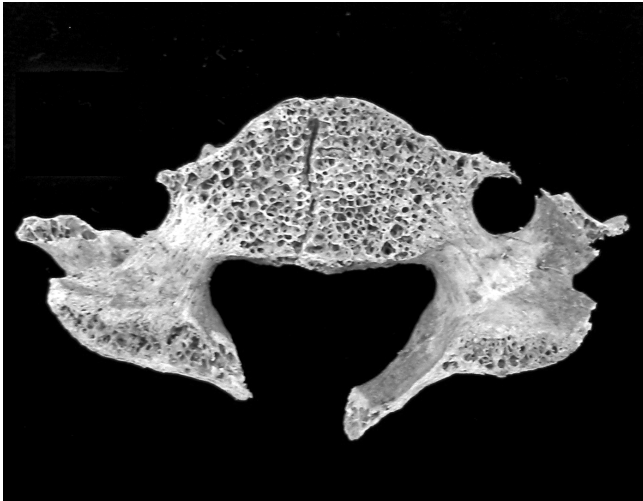


FIGURE 5. 6th cervical vertebra with lesion on the inferior body surface, left articular facet and part of arch on the left side (No. 126)

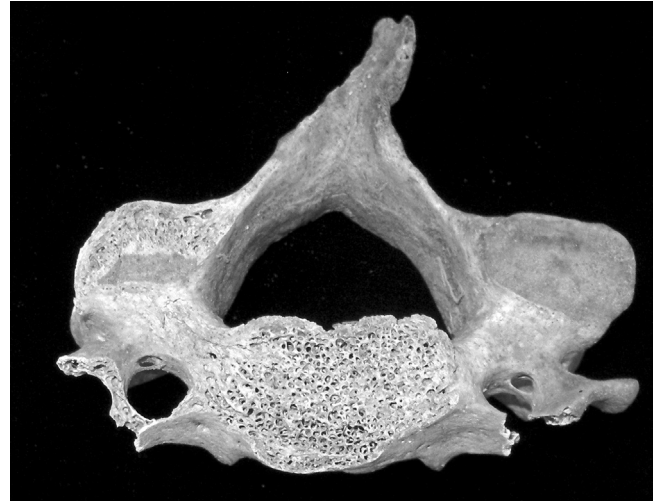


FIGURE 6. lesion caused by cutting weapon on lower body surface of 5th vertebra and left articular facet (No. 135)

cervical vertebra (Figure 4) whereas the inferior surface of 5th vertebra was intact. The uncus of vertebral body, dorsal part of superior body surface, left and right superior auricular processes and superior surface of vertebral arch were chopped away. Inceptive segment of spinous process as well as ventral part of superior surface of vertebral body were not afflicted. Transverse process from both sides was destroyed by tafonomic actions.

The involved areas are flattened in one horizontal plain with disclosed *cancellous trabeculae*. The infliction was made by one single blow which could have been performed in two different ways: either the sharp instrument comes from the high vertically downward to the neck laying in horizontal position on the block or from the side absolutely horizontally to the neck in upright posture.

Case 4: individual No. 126

An adult male aged 35–40 years with a body height of 167 ± 4.5 cm is a fourth case with cut marks on cervical vertebrae. He was buried in double grave together with woman (Case 3), in extend and supine position with the hands going to the pelvis and crossed wrists. Like the individual No 125, the skull was placed in non-anatomical position, between the tibias just below the knees and covered with two extraneous human bones – radius and tibia. Three ceramic potsherds and animal bone were also found near the body.

Similarly to Case 3, the 6th cervical vertebra (Figure 5) display definite weapon injury. A sharp instrument cut through the upper half of vertebral body and gashed off the inferior surface and major part of vertebral body, half of facet on left inferior articular process and 6 mm long part of vertebral arch on the left side. The spongy bone in the middle of the body, in spinous and transverse processes were destroyed after interment. The following 7th vertebra wasn't found in the grave.

One stroke was probably performed by heavy and sharp weapon from down and left side going forward and up or

vice versa. The position of the victim's head and trunk isn't obvious because of a bad preservation of the affected vertebra and absence of the following one.

Case 5: individual No. 135

The latest decapitated male was 20–25-year old and 179 ± 4.5 cm high. His body was also found extend and supine with hands leading to the pelvis region. The skull was located in approximately anatomic position close to right shoulder. Not only the body, but also two animal bones were unearthed from the grave pit.

Five cranial cervical vertebrae are in good condition, from the rest two of them just their bodies are conserved. The lesion caused by cutting weapon shows the 5th vertebra (Figure 6) on its lower surface. A large part of the left inferior articular facet and all inferior surface of the body was cut away and removed with a thin blade. The lesion has cut surface with well-defined margins, while the inferior surface of left pedicle and left transverse process are rugged and irregular. Left part of spinous process was damaged by tafonomic process.

The cut surface of vertebral body and left inferior joint process are in one down and backward sloping plane, the spinous process wasn't hit as well as superior body surface of following 6th cervical vertebra. These facts suggest that the blow was accomplished by sharp instrument coming from back, down and left side going forward, up and to the right when the neck of victim was flexed.

DISCUSSION

According to the range of lesions described above and non-anatomical position of the skulls in graves we could presume that the complete decapitation was made and that the heads were severed by one blow. But it is necessary to say that it is impossible to distinguish between a blow causing death by decapitation and a blow that removes the head shortly after

death. Other facts such as the postures of the bodies in the graves or the ways of cuts are important for right interpretation.

In the presented cases, the lesions of all affected vertebrae show very similar characteristics: smooth cut surface, exposed spongy bone trabeculae, sharp and well-defined edges. Smooth polished surfaces of the lesions indicate that the collagen content was normal and that the decapitation occurred during the life or shortly after death (Anderson 2001).

Each time (except the individual No. 125) the body and just one articular process were hit what could be explained by reflectoric tilt. When the instrument hit the neck (e.g.) from back and left side and gash left articular process, the head ducks owing to the impact on the left side so the vertebral body leans and the right articular process goes up and out of the stroke way.

No marks of contusion were found around the clear cut which indicates that a sharp instrument might have been applied. From the type of cut marks could also be derived type of that instrument. The knife was used hardly likely because it is not enough storming and has small cutting surface. Moreover, it needs to shift the knife many times for complete beheading so additional cuts on the vertebrae should be present. For these reasons we suggested that the used instrument was heavier with larger blade probably on gash principle.

The sword and the hatchet were considered. The inflections were not found anywhere else than in the single cutting area. The vertebrae of individual No. 57 show that there is no widening of the cut which is typical for more devastating hatchet injury whereas the cut was clean and the cutting area between affected vertebral bodies was thin. Use of hatchet disagrees also with position of flexed neck during the stroke and the direction of impact from behind and from the side. When the hatchet is used, the stroke goes perpendicularly to the extended neck. This way might be possible just in case 3 (No. 125). It seems that the other individuals were probably beheaded by sword. Historical sources support this theory too. In Moravia the sword came into use from 10th century and from 13th century predominated in fights as well as during executions while the hatchet dominated in earlier times till 9th century and to the 13th century almost faded away.

When we compare the direction of stroke and the location of lesions on the decapitated vertebrae we ascertain some similarities. Three individuals (No. 59, 126 and 135) were beheaded with the chop coming from below, back and left side and intervened the juncture between 5th and 6th vertebra in two cases (No. 59 and 135) and the juncture between 6th and 7th vertebra in the case 4 (No. 126). The juncture between 5th and 6th vertebra was also found in individual No. 125 where the stroke passed cleanly and horizontally through. Isolated case in our collection (No. 76) is slashed from right side to the region of 7th cervical and first thoracic vertebra. This low localisation is less common.

Vertebrae between the second cervical and the first thoracic are usually affected but the mid-cervical region appears to be most common. The Manchester (1983) argued

that the use of a block in decapitation invariably leads to a cut at mid-neck level. However two cases of decapitation from Avar times (Wiltshcke-Schrotta, Stadler 2005) are known. These were probably made by axe and using the block nevertheless the 6th and 7th cervical vertebrae were affected.

On Romano-British Cemetery at Baldock (McKinley 1993) was detected decapitation afflicted 2nd cervical vertebra. The group of high-neck decapitations fills in two cases from Roman Towcester (Anderson 2001) where the cut marks were found on first and second cervical vertebrae. Twelve cases of beheading from Bedford were described by Boylston *et al.* (2000). The strokes impacted four times 5th cervical vertebra, threefold 3rd and once 2nd, 4th and 7th vertebrae. From these examples result large variability of stroke site which also shows that the decapitation in low part of the neck is not unusual.

From the direction of stroke and the location of lesions on vertebrae, position of the body, head and neck during the decapitation could be deduced. Just a woman from the grave No. 125 is exceptional where the body and neck position is difficult to differentiate. In other four cases the body and one of articular process were hit whereas the vertebral arch and spinous process were intact. It seems that the body of victims were probably erect, neck flexed and head stoop down.

Such position of the victim is peculiar to decapitation as a form of corporal punishment. Also the traumatic lesions of vertebrae with chop marks delivered from the posterior to anterior would be expected in case of beheading as a type of execution (Boylston *et al.* 2000). The manner of judicial execution at medieval Moravia is known from historical sources. There were three types of decapitation using sword: 1) the convict kneels and lays the turned head on block (analogous to hatchet) with the hands tied behind back; 2) the victim kneels erect or sit on his heels with the head in one axis with body, chin on the chest and hands tied in front of the body; 3) defendant is standing with head erect. The victim could usually choose if he wants blindfold or not but in case of aggravated punishment it was prescribed (Monestier 1999).

According to the position of head and flexed neck our individuals were (except No. 125) most likely decapitated by second manner. First way could be used in case of woman No. 125, but she could be also beheaded like others using second way if the sword passed through in horizontal plane. The third manner was rarely used, mostly just for noblemen, because of its demand factor and impend of head or shoulder injury.

The sword execution was common and modest capital punishment at medieval Moravia and one of the most widespread manners in Europe during Middle Ages. We could find many instances of executions by sword in Czech history. The well known are aristocrat Závř from Falkštejn, priest Jan Želivský, knight and aristocrat Dalibor from Kozojedy or 27 Bohemian Lords executed on Old Town Square in Prague in 1621 (Monestier 1999).

Decapitation was a punishment for homicide, robbery, lechery, incest or infanticide and it was the only punishment

applied to both sexes (van Dülmen 2001). Condemned women were sometimes allowed to sit in a chair during the beheading (Wiltshke-Schrotta, Stadler 2005). After the convict occupied a position for execution his hands were bind and the neck exposed. The ketch was standing at the back and gashed from behind with the sword specially made for executions (van Dülmen 2001). That sword for execution is characterized by medium length, tip, width and heavy blade with groove for blood drain. Sword was usually two-handed with constant proportions, usually 83–87 cm long and maximum 7 cm wide (Barring 2008, Francek 1999).

Judicial execution is just one reason of beheading. There existed other various explanations for the rite of decapitations which need to be put forward. An armed confrontation is another reliable possibility. Usually in such instance would be except other evidence of weapon trauma to another part of the body, often in the form of defence injuries to the forearms and hands (Boylston *et al.* 2000) so different cut marks would be seen on the bones. Beheading as a final act of a fight shows an irregular form of decapitation often with the skull base and the lower jaw involved (Wiltshke-Schrotta, Stadler 2005). The position of cut marks differed in presented cases where the lower part of the neck was hit and also multiple cuts to the body and the head are not seen. Moreover one of the decapitated individual was young woman. For these reasons the motives for beheading as a result of an armed confrontation might be excluded.

The motivation could be also trophy or relic collection. Retention of body parts as relics was common practice in High and Late Medieval periods (Boylston 2000) but these motives may be also dismissed for the presented cases because the instrument used for separation of the heads from bodies would be smaller than sword such as knife which marks different and multiple cuts on the vertebrae. Also the presence of the heads in graves is atypical for trophy or relic collection.

Other rare motive could be bloodletting. It was believed that fresh blood from decapitated individual helps against falling sickness and the blood of virgin or youths were the most appreciated (Drahota 2008). During the blood taking was not usually made deep cuts into the vertebrae which are relatively far from big blood vessels, therefore decapitation for this reason seems unlikely as well.

Last reason of decapitation discussed in literature is mismanaged hanging. The most frequent skeletal lesion resulting from hanging is a fracture through the vertebral pedicle (James, Nasmyth-Jones 1992). Presented vertebrae show no fractures but smooth cut areas. The motivation of mismanaged hanging may be ruled out too. In addition, such separation of the head from body happens very rarely.

In discussion of those reasons of decapitation, the type and surface of lesions, body and head position during the stroke, documented frequency of beheading in Middle Ages in Moravia and its applying on both sexes leads to the conclusion that studied individuals were convicts executed by ketch. This idea is also supported by fact that execution by decapitation in medieval Moravia did not have to mean

exclusion of burial into sacred cemetery land (Unger 2002) where the individuals were found. Decapitated persons as well as studied individuals were usually inhumed according to preponderant rite, just the position of the skulls in that graves were sometimes specific. The placement of the severed skull and vertebrae towards the foot-end of the grave was sometimes interpreted as anti-vampire arrangement. However, the translocation of the skull into non-anatomical position is just one of these arrangements which usually occur together with other anti-vampire interventions so we could exclude it in presented cases.

The executed convicts were usually buried on dedicated area of graveyard or on the specific cemetery. As we mentioned above, studied skeletons were found on hospital cemetery close to the hospital church of St. Elizabeth. This place could be chosen for its character of hospice where sick or poor people and persons with low social status were buried or because of its proximity to execution place.

CONCLUSION

Five skeletons with clear decapitation marks were investigated. Beheaded individuals were four men and one woman in age range of 20–40 years. In three cases the skulls were found more or less in anatomical position, in double grave near feet. The decapitation marks were in all cases carried by 5th, 6th or 7th cervical vertebra. All vertebrae show similar cut marks with smooth surface and well-defined edges made by sharp and heavy instrument, probably sword. The beheading seems to be made for reason of execution.

ACKNOWLEDGEMENTS

Many thanks to Markéta Zachová for arrangement of consultation and to the legal doctors Michal Zelený and Milan Votava from Institute of Forensic Medicine of St. Anne's University Hospital Brno for medico-judicial expertise of decapitation marks on vertebrae. Thanks to my colleague Kateřina Konášová for helping with the paleopathological descriptions and interpretation.

REFERENCES

- ACSÁDI G., NEMESKÉRI J., 1970: History of human life span and mortality. In: Stloukal M., Dobisíková M., Kuželka V., Stránská P., Velemínský P., Vyhnánek L., Zvára K., 1999: *Antropologie. Příručka pro studium kostry*. Národní muzeum, Praha. p. 173.
- ANDERSON T., 2001: Two Decapitations from Roman Towcester. *Internat. J. of Osteoarchaeology* 11: 400–405.
- BARRING L., 2008: *Trest smrti v dějinách lidstva*. Naše vojsko s.r.o., Praha. 167 pp.
- BOYLSTON A., KNÜSEL C. J., ROBERTS C. A., 2000: Investigation of Romano-British Rural Ritual in Bedford, England. *J. of Archaeological Science* 27: 241–254.

- BRŮŽEK J., CUNHA E., HOUËT F., MURAIL P., 2005: DSP: a tool for probabilistic sex diagnosis using worldwide variability in hip bone measurements. *Bulletins et Mémoires de la Société d'Anthropologie de Paris* 17: 167–176.
- ČERNÝ M., KOMENDA S., 1980: Sexual diagnosis by the measurements of humerus and femur. *Sborník prací pedagogické fakulty Univerzity Palackého v Olomouci: Biologie* 2: 146–176.
- ČIŽMÁŘ Z., 2008: Nám. Svobody – výstavba polyfunkčního domu. *Nálezová zpráva ÚAPP Brno*. (in press).
- DRAHOTA L., 2008: Naše šibenice 4: <http://www.moskyt.net/view.php?cislocclanku=2008040001>, download 10.11.2009
- VAN DÜLMEN R., 2001: *Divadlo hrůzy: Soudní praxe a trestní rituály v raném novověku*. Rybka Publishers, Praha. 230 pp.
- FEREMBACH D., SCHWIDETZKY I., STLOUKAL M., 1979: Empfehlungen für die Alters- und Geschlechtsdiagnose am Skelett. *Homo* 30: 1–32.
- FRANCEK J., 1999: *Zločin a trest v českých dějinách*. Rybka Publishers, Praha. 544 pp.
- HORÁČKOVÁ L., STROUHAL E., VARGOVÁ L., 2004: *Základy paleopatologie*. Akademické nakladatelství CERM, Masarykova univerzita, Brno. 262 pp.
- JAMES R., NASMYTH-JONES R., 1992: The occurrence of cervical fractures in victims of judicial hanging. *Forensic Science International* 54, 1: 81–91.
- KACETL J., 2008: *Historie měšťanského špitálu s kostelem sv. Alžběty, později sv. Kateřiny na Horním předměstí Znojma*. (in press).
- LOVEJOY O. C., MEINDL R. S., MENSFORTH R. P., BARTON T. J., 1985b: Multifactorial determination of skeletal age at death: a method and blind tests of its accuracy. *Amer. J. Phys. Anthropol.* 68, 1: 1–14.
- LOVEJOY O. C., MEINDL R. S., PRYZBECK T. R., MENSFORTH R. P., 1985a: Chronological Metamorphosis of the Auricular Surface of the Ilium: A New Method for the Determination of Adult Skeletal Age at Death. *Amer. J. Phys. Anthropol.* 68, 1: 15–28.
- MANCHESTER K., 1983: *Archaeology of Disease*. University of Bradford, Bradford. 91 pp.
- McKINLEY J., 1993: A Decapitation from the Romano-British Cemetery at Baldock, Hertfordshire. *International Journal of Osteoarchaeology* 3: 41–44.
- MONESTIER M., 1999: *Historie trestu smrti*. Rybka Publishers, Praha. 408 pp.
- NOVOTNÝ V., 1986: Sex determination of the pelvic bone: A system approach. *Anthropologie* XXIV, 2–3: 197–206.
- NOVOTNÝ V., MALINOVSKÝ L., 1985: Determination of sex from talus and calcaneus. *Scripta Medica* 58/7: 437.
- PECHNÍKOVÁ M., 2008: Antropologická analýza kosterních pozůstatků ze Znojma – nám. Svobody (in Czech). *Unpublished dissertation thesis*, Masarykova univerzita, Brno.
- SJØVOLD T., 1990: Estimation of stature from long bones utilizing the line of organic correlation. *Human Evolution* 5: 431–447.
- SMRČKA V., KUŽELKA V., POVÝŠIL C., 2009: *Atlas chorob na kostních preparátech: Horní a dolní končetiny*. Academia, Praha. 616 pp.
- STLOUKAL M., DOBISÍKOVÁ M., KUŽELKA V., STRÁNSKÁ P., VELEMÍNSKÝ P., VYHNÁNEK L., ZVÁRA K., 1999: *Antropologie. Příručka pro studium kostry*. Národní muzeum, Praha. 509 pp.
- STLOUKAL M., HANÁKOVÁ H., 1978: Die Länge der Längsknochen altslawischer Bevölkerungen unter Besonderer Berücksichtigung von Waschtumsfragen. *Homo* 29, 1: 53–69.
- TEEGEN W.-R., SCHULTZ M., 2003: Eine Schipperfraktur aus dem sächsischen Gräberfeld um St. Kilian in Höxter (8. Jh.). *Leipziger Forschungen zur Ur- und Frühgeschichtlichen Archäologie* 4: 1–8.
- UBELAKER D. H., 1978: Human Skeletal Remains. Excavation, analysis, interpretation. In: Knussmann R., 1988: *Anthropologie, Handbuch der vergleichenden Biologie des Menschen* (4. Auflage des Lehrbuchs der Anthropologie begründet von Rudolf Martin), Band I und II. Gustav Fischer, Verlag, Stuttgart, Jena, New York.
- UNGER J., 2002: *Pohřební ritus a zacházení s těly zemřelých v českých zemích (s analogiemi i jinde v Evropě) v 1.–16. století*. Nadace Universitas Masarykiana, Brno. 151 pp.
- WILTSCHKE-SCHROTTA K., STADLER P., 2005: Beheading in Avar times (630–800 A.D.). *Acta Medica Lituanica* 12, 1: 58–64.

Markéta Pechníková
Eva Drozdová
Department of experimental Biology,
Masaryk University, Brno, Czech Republic
Laboratory of Biological
and Molecular Anthropology
Faculty of Science
Masaryk University Brno
Czech Republic
E-mail: 109015@mail.muni.cz
drozdova@sci.muni.cz

Zdeněk Čižmář
Department of development, Municipality
of Znojmo
Czech Republic
Tel: +420 515 216 236
E-mail: cizmar@muznojmo.cz