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SKELETAL EVIDENCE FOR DISEASES IN THE NEOLITHIC OF MORAVIA

ABSTRACT: More than 30 sites and 122 skeletons in total from the whole of Moravia were included into the set of data. From this number 82 skeletons are from the Linear Pottery Culture (LBK, 5700–4900 BC); 13 skeletons from the Stroked Pottery Culture (STK, 4900–4700 BC) and 27 skeletons from the Moravian Painted Ware (Lengyel) Culture (LgK, 4700–4000 BC). The occurrence of infections was sporadic. Congenital deformities occurred in the Neolithic population in settlements usually within the region of vertebral column and mostly in LBK. In Neolithic population the frequency of cribra orbitalia occurred in descending line - LBK, LgK and STK, in both the right and left orbit. On the contrary, the rising frequency of the more complicated type 3 of cribra orbitalia occurred in LBK in 7% and in LgK in 25%. Porotic hyperostosis occurred on parietal and occipital bones and on the ribs. However, the symptoms of porosity were found only in LBK.
Among traumas a special group was formed by the injuries of cranial wall with impressive fractures and with penetrating injuries. In long bones there were fractures of individual long bones as well as multiple injuries.

KEY WORDS: Czech Republic – Moravia – Neolithic settlement – Skeletal evidence – Morbidity

INTRODUCTION

Our goal was to define a set of symptoms of diseases on the skeletal material. These would characterize the Neolithic population of Moravia in the period between 5700 and 4000 BC (Dočkalová, Čižmář 2007, 2008, Dočkalová 2008). We focused on the Linear Pottery culture in the Early Neolithic Period (LBK – Linear Pottery Culture, dated to 5700–4900 BC), Stroked Pottery culture in the Middle Neolithic Period (STK – Stroked Pottery Culture, 4900–4700 BC) and Moravian Painted Ware (Lengyel) culture in the Late Neolithic Period, whose later phase falls already within the Eneolithic Age (LgK – Moravian Painted Ware Culture 4700–4000 and/or 4500 BC).

MATERIAL AND METHODS

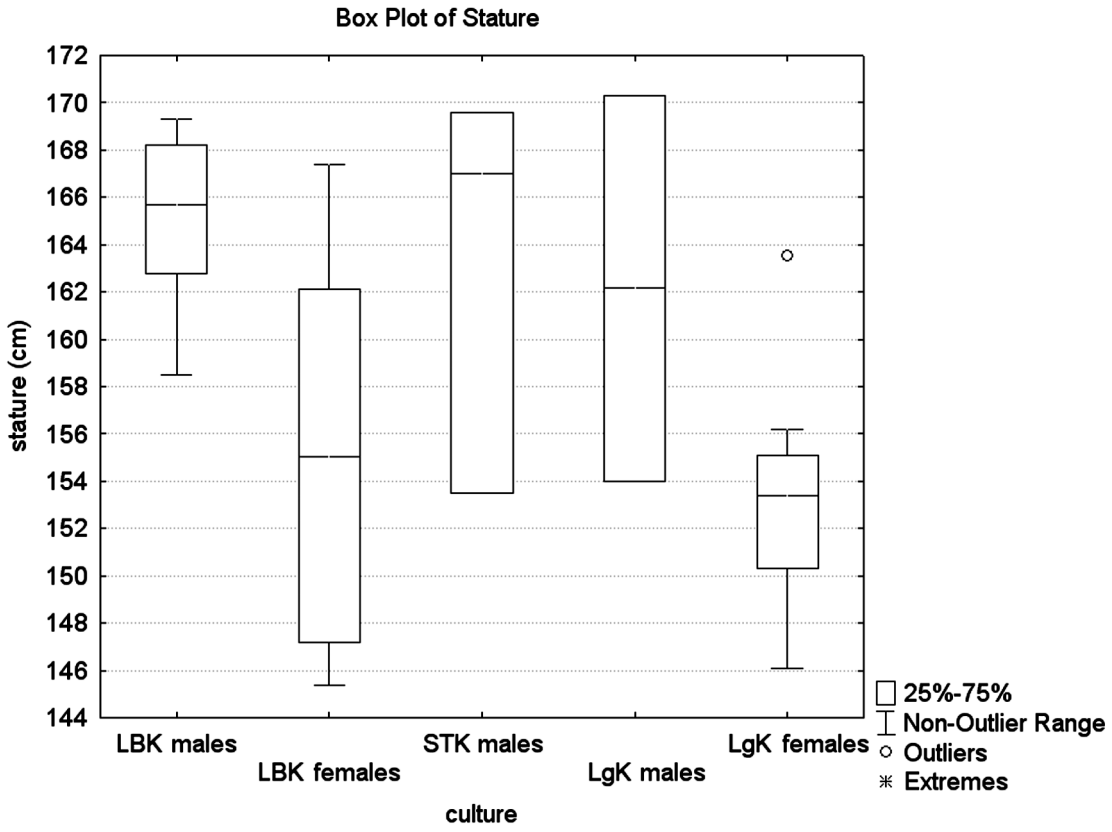
More than 30 sites and 122 skeletons in total from the whole of Moravia were included into the set of data (*Figure 1*). From this number 82 skeletons are from LBK (13 males, 19 females – 1 juvenile, 40 children, 9 unidentified adults), 13 skeletons from STK (3 males, 3 females, 2 children, 5 unidentified adults) and 27 skeletons from LgK (4 males, 10 females – 1 juvenile, 8 children, 4 unidentified adults).

The principal anthropological data – age, sex and height – were determined in every skeleton. The skeletons were macroscopically examined. The discovered pathological lesions were written down into tables. Radiographic examination was performed in the cases of traumatic lesions. Along with the description of pathology also the state of preservation of the bones was evaluated in which the pathological find was determined within the whole population. The frequency of the defect through the whole Neolithic population in settlements was calculated as well as the principal statistical parameters.

The height of an individual indirectly indicates the state of his health (*Table 1*). Meiklejohn *et al.* (1984) detected for the populations from the Upper Palaeolithic Age to the Neolithic Age a significant decrease in height. They found a

FIGURE 1. Map of the Czech Republic highlighting Neolithic settlement sites in Moravia.

TABLE 1. Graphic representation of body height in LBK, LgK and STK.



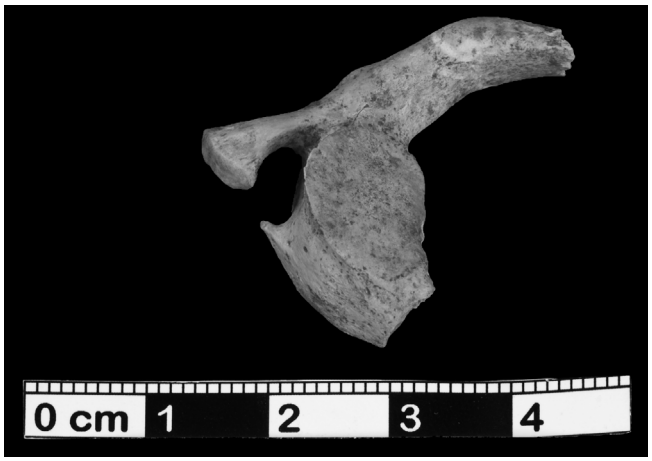
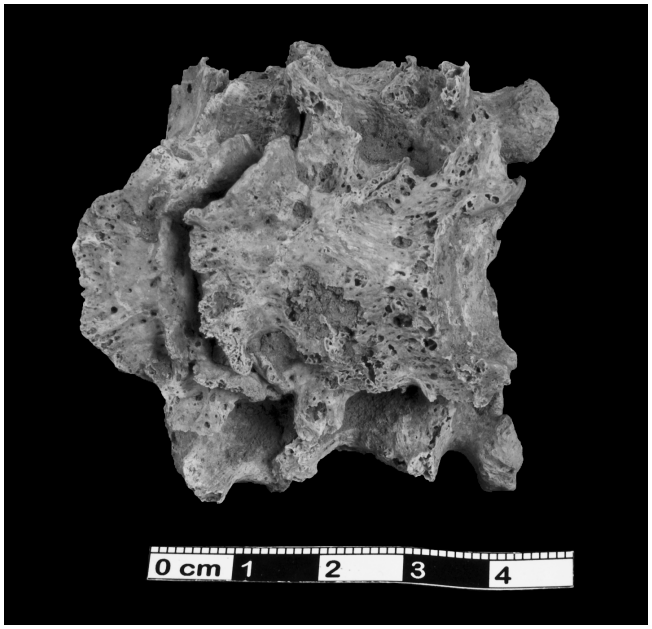


FIGURE 2a. Congenital deformation of the *atlas* in a five-year-old child (LBK, Žádovice 52/H1/1986).

FIGURE 2b. Fusion of the front parts of the bodies of C3–C5, five-year-old child (LBK, Žádovice 52/H1/1986).



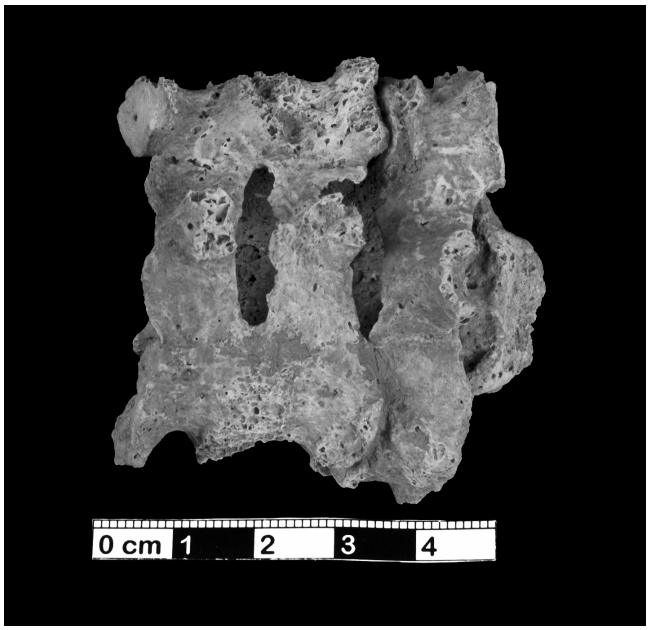


FIGURE 3a, b. Fusion of the front parts of the bodies of C3–C5, male 50-59 years old (LBK, Brno-Starý Lískovec K 806/Feature 7707/2008).

significant decrease in females from the Mesolithic to the Neolithic Ages. In our set (N21) the decrease in height was by 10 cm in males and by 5 cm in females in the course of the Neolithic Age (from LBK to LgK). The process of height decrease continued to the lowest values in females of LgK – 146 cm (Fojtová *et al.* 2008).

PALEOPATHOLOGICAL CHARACTERISTICS OF THE SAMPLES

Congenital defects

A widened *canalis incisivus* was found in a skull in Vedrovice, LBK– Grave 10/1974 in a male 40–49 years old with a frequency of 14% (N7 – examined).

Congenital defects Klippel

In the neck region of the vertebral column we found a congenital deformation (*Figures 2a, b*), of the atlas and a fusion of the axis with C3 in a five-year-old child from Žádovice, Grave 52/H1/1986 (Čižmář, Geislerová 1997) with a frequency of 15% (N13 of examined children).

In a male 50–59 years old, Brno-Starý Lískovec, Grave 806/LBK (Přichystal 2008) we found a fusion (*Figures 3a, b*) of the front parts of the bodies of C3 – C5 with a frequency of 16.7% (N6 of examined preserved male cervical parts of the vertebral column). The bone fusions within the neck region of the vertebral column are usually subsumed into the Klippel-Fail syndrome.

FIGURE 4a, b. *Spina bifida*, female 15–17 years old (LBK, Mašovice–"Pšeničné" H1/Feature 613/2003).

Canalis sacralis apertus

Within the upper part of the sacral vertebral column in a female 15–17 years old (*Figures 4a, b*) from Mašovice (LBK, Burial 1/Feature 613/2003) *spina bifida* was found with 20% frequency (N5 examined sacral vertebral columns of females).

In the lower part of the sacral vertebral column *canalis sacralis apertus* was found in a female 20–25 years old (LgK, Hnanice I at Znojmo) with 33% frequency (in N3 examined) .

LBK was the population most affected with congenital deformities and the vertebral column was the most affected part of the skeleton.

TRAUMAS

Multiple traumas were documented at the archaeological site Mašovice – "Pšeničné", Burial 2/Feature 705/2003, LgK in a 20–29 years old male (Dočkalová, Čižmář 2008).

On the borderline of the left temporal and parietal regions, to the left, there is an oval hole in the skull (2.2 × 1.8 cm) in cranial direction with perpendicular irregular edge, caudally bevelled inwards. The edges do not show traces of healing. In the edge of the hole, in occipital direction, there is a part 10 × 5 mm large, freely adjacent; it is possible that it was pressed to inside. Three fracture lines run sidewise from the hole; the lower two run to the *fossa temporalis* which is smashed into six fragments (*Figure 5)*. On the right clavicle, in the middle part, there is a fracture line running in mediolateral direction and with edges covered with sinter. The left clavicle remained undisturbed. On the right humerus there is a supratrochlear fracture with the fracture line closely above the *fossa oleocrani* running sidewards craniocaudally, in the *fossa oleocrani* there is a triangular, partially pressed inside, fragment 7 × 3 mm large (it could indicate an act of violence coming from dorsal direction).

On the borderline between the middle and distal thirds of the left humerus, there is a transversal fracture. It runs slightly sidewards, its fracture line being covered with sinter.

FIGURE 5. Perimortal trauma on the borderline between the left temporal and parietal regions, male 20–29 years old (LgK, Mašovice–"Pšeničné" H2/Feature 705/2003).

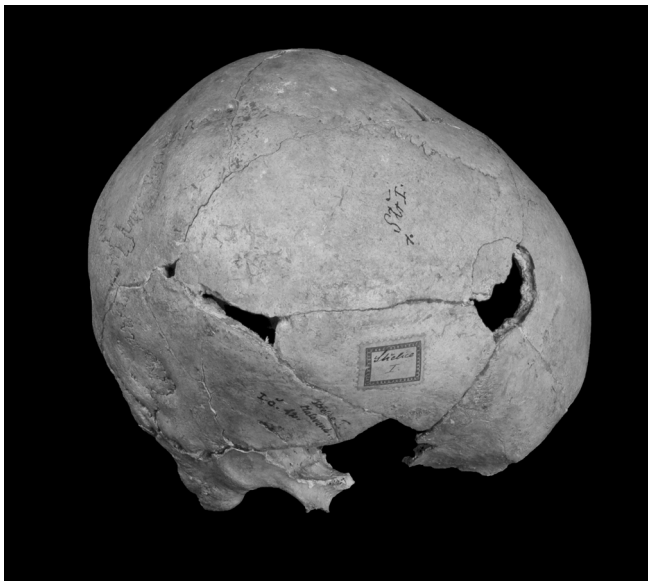


FIGURE 6. Perimortal fracture on the parietal bone, female 50–60 years old (LgK, Střelice H1/12).

Within the region of the left forearm, on the radius, in its middle third, there is broken out a central fragment 4 cm large, with horizontal fracture line running some 8 cm from the distal edge of the bone. On the ulna of the left forearm there is a transversal fracture in the distal third, 7 cm from the distal end of the bone. The distal fracture lines on the forearm are approximately at the same level. The bones of the right forearm are undisturbed. In the ribs at the angle of 4 ribs to the left and 5 ribs to the right there are fracture lines in the angles. These would suggest a serial fracture of the ribs due to pressure acting onto the chest from the sides.

In addition to the penetrating injury of the skull in Mašovice, there were further injuries, also in LgK. In a 50–60 years old female from Střelice (LgK, Burial 1/12), there is a perimortal fracture with a star-shaped fracture line, with a central rounded fragment, 30 mm in diameter, situated on the right side of the parietal bone (*Figure 6*).

In the right parietal region a depression 3 × 2 cm with rounded edges and prominence on the internal side of the skull was found in a female 40–50 years old (LgK) from Předmostí – Dluhonice (Schenk *et al*. 2007). This is a limit case to come out clinically.

VERTEBRAL OSTEOPHYTOSIS

In total 39 vertebral columns were examined in LBK (*Figure 7*), 16 in LgK and 3 in STK. Osteophytes were examined for each region of the vertebral column – for the neck region in 27 individuals of LBK, 12 individuals of LgK and 2 individuals of STK; for the thoracic region in 18 individuals of LBK, 9 individuals of LgK and 2 individuals of STK; for the lumbar region in 20 individuals of LBK, 9 individuals of LgK and 2 individuals of STK.

The osteophytes occurred most frequently in female skeletons in the thoracic spine (25% in the group with 2 osteophytes) and in lumbar spine (25% in the group with 3 osteophytes) of LBK culture.

PERIOSTITIS

We found osteoplastic changes of the periostitis-type in a 4–year-old child (*Figure 8*) from Vedrovice (LBK, H12/1996), in total only two cases of periostitis.

CRIBRA ORBITALIA

They represent bone reaction in the upper internal part of the orbit (*Figure 9*). According to Knip's scheme (Knip 1971) we distinguish 4 types of them.

In LBK some form of *cribra orbitalia* was found in 8 from 26 right orbits (30.7%) and in 14 from 28 left orbits (77.8%). In LgK some form of *cribra orbitalia* was found in 4 from 14 right orbits (25%) and in 5 from 12 left orbits (41%). In STK there was 1 from 6 right orbits (16.7%) and 1 from 5 left orbits (14.3%) with cribrifications.

Frequency of this pathological lesion is declining from LBK, LgK, STK (*Table 2*) in both the right orbit (LBK 30.7%; LgK 25%; STK 16.7%) and the left orbit (LBK 77.8%; LgK 41%; STK 14.3%).

On the contrary, frequency of occurrence of the more intricate type 3 is rising from 7% in LBK (2 from 28 left orbits) to 25% in LgK (3 from 12 left orbits).

POROTIC HYPEROSTOSIS

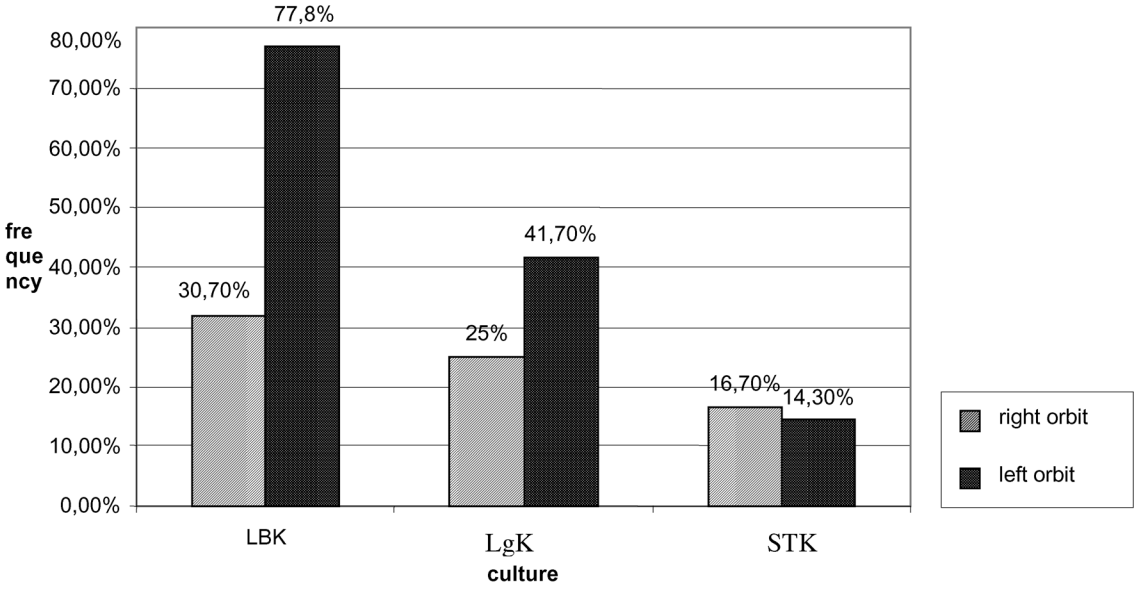
Porotic hyperostosis occurred in parietal bones, occipital bones (*Figure 10*) and on the ribs.

Parietal

We examined 41 left and 42 right parietal bones of both adults and children in the Linear Pottery culture (LBK), 18 left and 20 right parietal bones in the Moravian Painted Ware (Lengyel) culture (LgK) and 6 left and 7 right parietal bones in the Stroked Pottery culture (STK).

For LBK it was found in one left undetermined parietal bone (100%) and in two right undetermined parietal bones (50%).

TABLE 2. Occurrence of *cribra orbitalia* in total by culture.



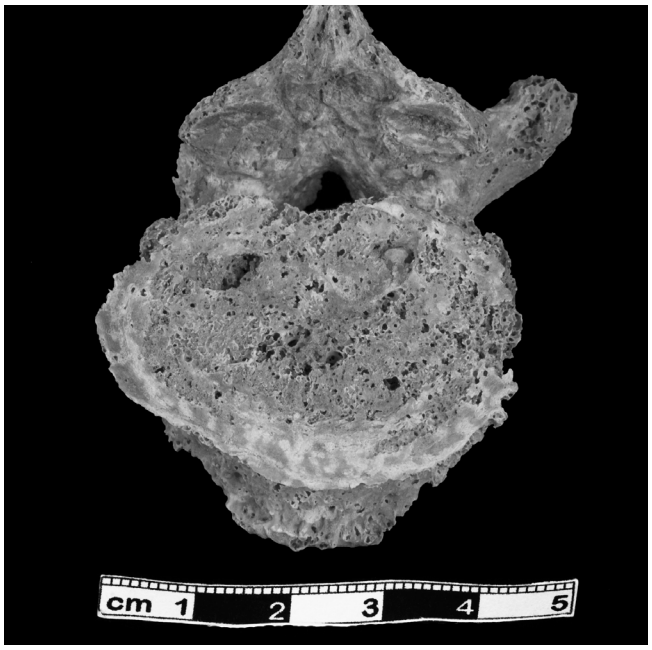


FIGURE 7. Deformative spondylosis, adult individual 40–50 years old (LBK, Určice-Alojzov Burial 1/K 529/1999).

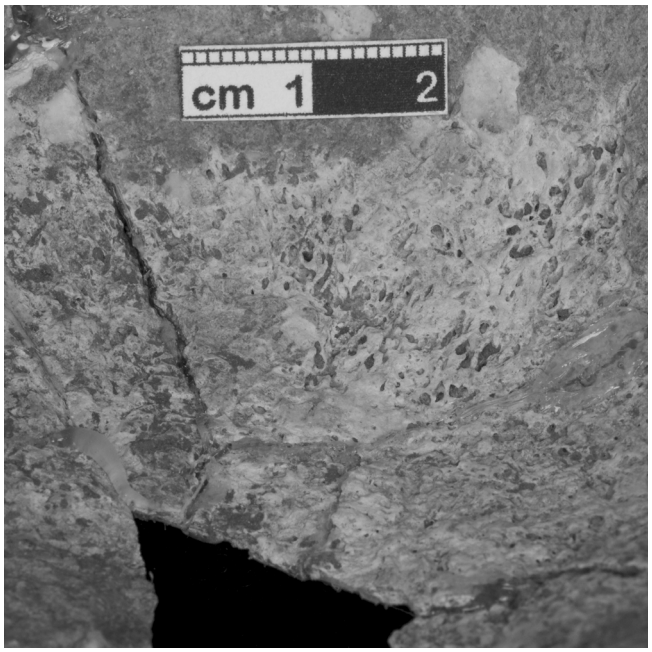


FIGURE 8. Periostitis on the right parietal bone, child 4 years old (LBK, Vedrovice H 12/1996).

Occipital
For LBK it was found in eight females (12.5%) and in one unidentified individual (50%).

Ribs
For LBK it was found in 1 of 8 males (12.5%) and 1 of 8 females (12.5%).

Vestiges of porosity were found only in LBK, they were not found in LgK and STK.

TUMOURS
From tumours we found only an incipient meningioma in 40–50 years old female from Těšetice – Kyjovice, Grave 11/1986 (Koštuřík, Lorencová 1989–1990). In her we found an increased vascularization around the left *arteria meningea media* (*Figure 11*).

PAGET'S DISEASE
A find of an unidentified individual from Støelice 9/15 (LgK, 30–40 years) points to this disease (*Figure 12a, b*). *Osteitis deformans Paget* is a bone dysplasia of unknown aetiology. It affects individuals more than 40 years old. From the morphological point of view the excessive bone remodelling is typical (Adler 2000). Diagnosis was formed on the basis of a thickened cranial wall 1–2 cm and a radiographical finding with enlarged, sclerotically altered

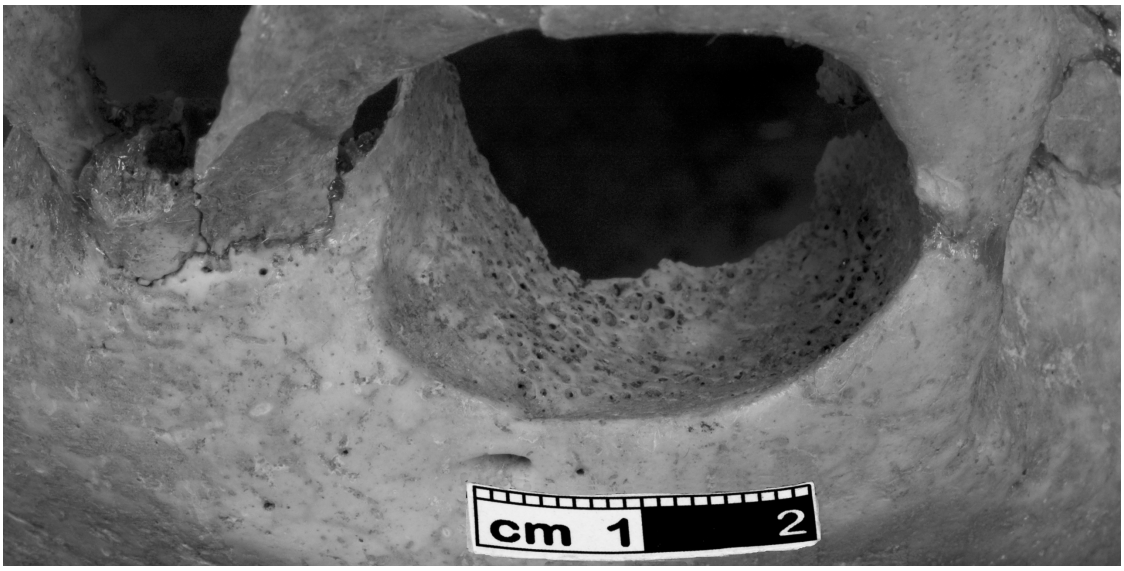


FIGURE 9. *Cribra orbitalia* in the right orbit, female 15–17 years old (LBK, Mašovice – "Pšeničné" H1/Feature 613/2003).

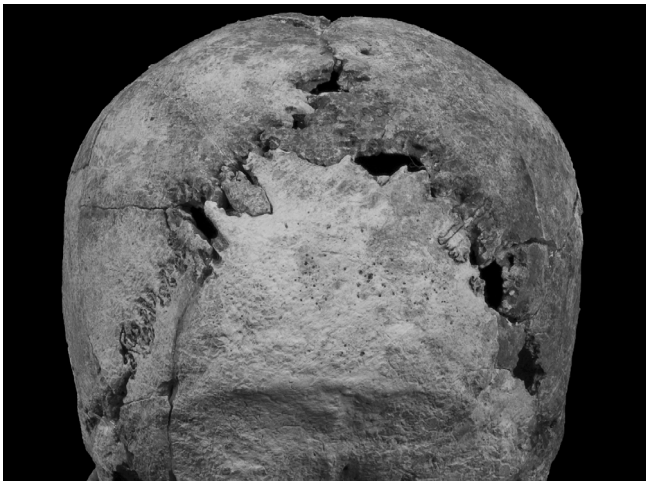


FIGURE 10. Porotic hyperostosis on the occipital bone, female 25–30 years old (LBK, Držovice 2/1989).

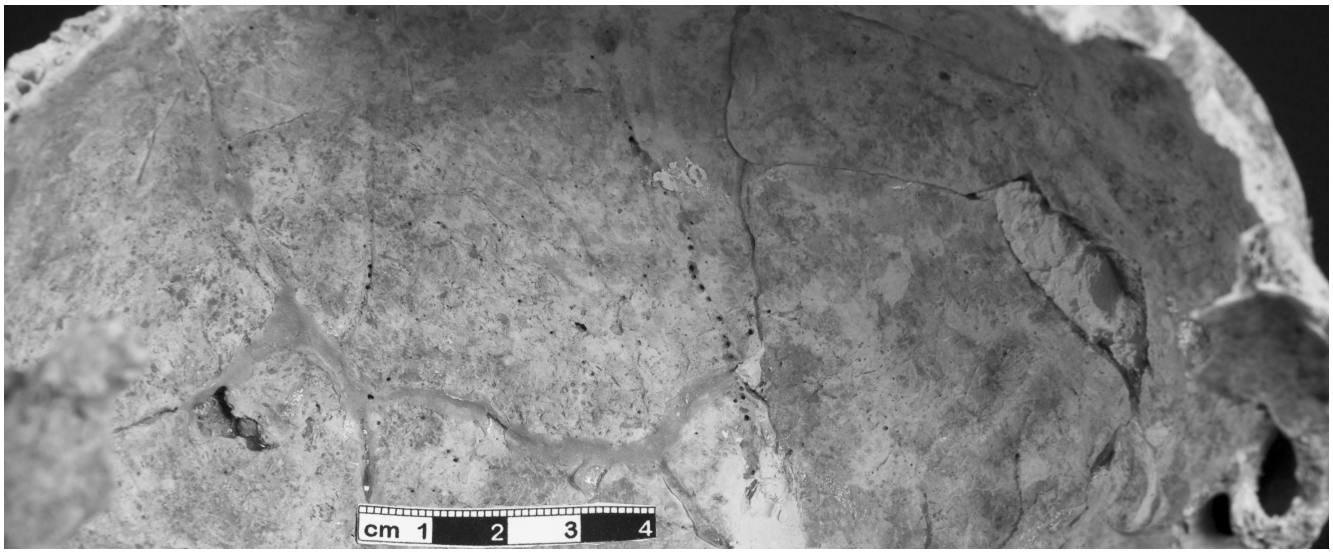


FIGURE 11. Meningioma manifested by increased vascularization around the left *arteria meningea media*, female 40–50 years old (LBK, Těšetice – Kyjovice H11/1986).

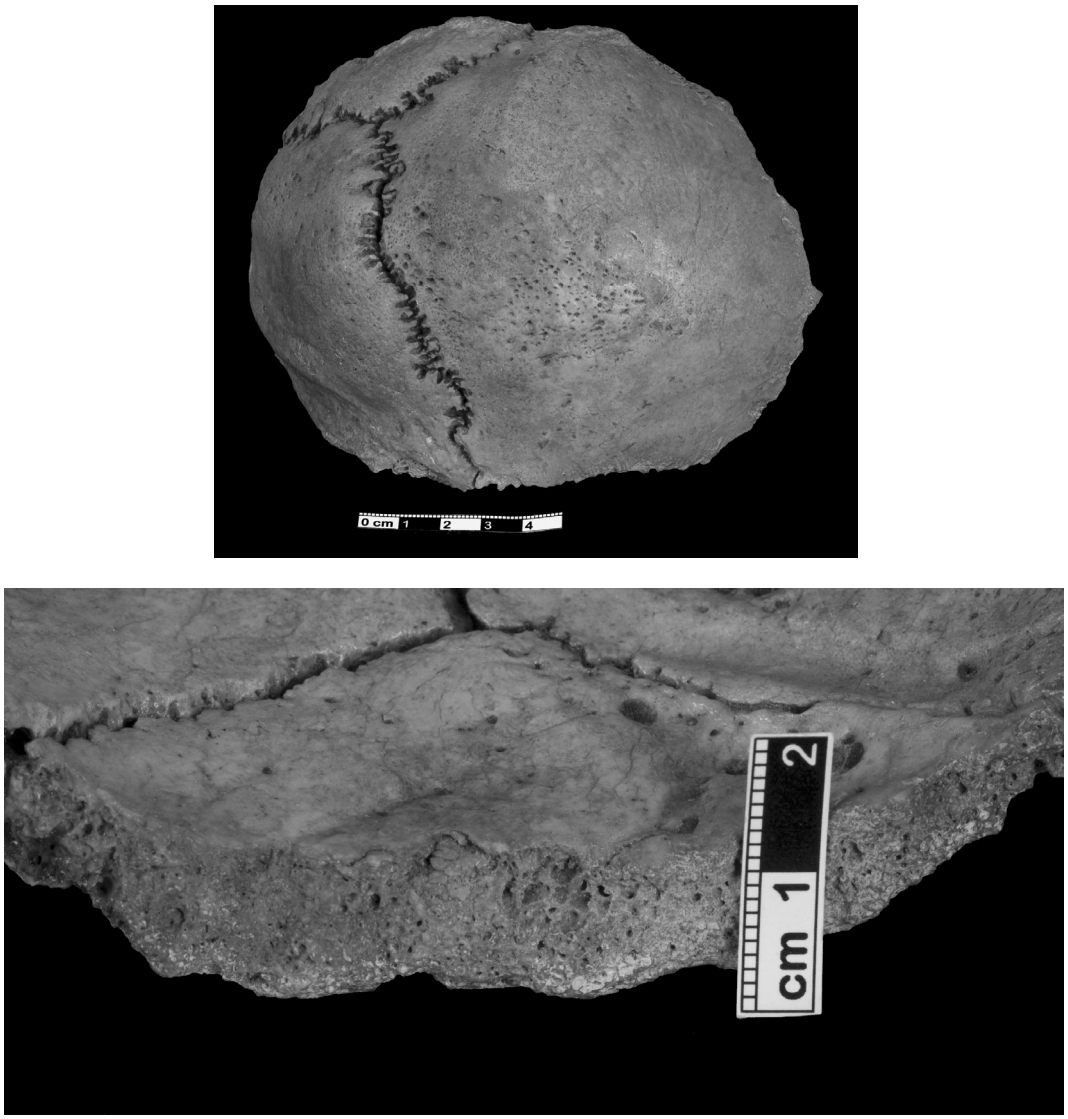


FIGURE 12a, b. Paget's disease, porous external lamina and thickened cranial wall, adult individual 30–40 years old (LgK, Střelice 9/15).

lamina interna, and thinned porous *lamina externa* as well as a cluster from osteosclerosis.

DISCUSSION

Cohen (1989) discusses the changes that occur with the adoption of agriculture, such as permanent housing, crop cultivation and domestication of animals, and the possibility of disease being passed from animals to humans, e.g. tuberculosis.

Compared with the other periods male and female stature remains the same, suggesting that agriculture had a great impact on the achieved stature (Smrčka 2005)

Evidence for increase in iron deficiency anaemia have been noted for agricultural communities in other parts of the world in the past (Cohen, Armelagos 1984) but this may not necessarily reflect a reduction in meat intake but rather the associated increase in infection disease as people start to settle down in larger communities and hygiene and sanitation standards are low.

CONCLUSIONS

Congenital deformities, symptoms of anaemia and traumas occurred in the survey of pathological findings on the skeletons of 122 individuals buried in the Neolithic Moravian settlements in the period of the Linear Pottery Culture (LBK, 5700–5000 BC), Stroked Pottery Culture (STK, 5000–4700 BC) and Moravian Painted Ware (Lengyel) Culture (LgK, 4700–4500 BC). The occurrence of infections was sporadic. Congenital deformities occurred in the Neolithic population in settlements usually within the region of vertebral column and mostly in LBK. In Neolithic population the frequency of *cribra orbitalia* occurred in descending line of LBK, LgK and STK, in both the right and the left orbit. On the contrary, the rising frequency of the

more complicated type 3 of *cribra orbitalia* occurred in LBK in 7% and in LgK in 25%. Porotic hyperostosis occurred on parietal and occipital bones and on the ribs. However, the symptoms of porosity were found only in LBK.

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