ANTHROPOLOGIE • XLIII/2–3 • pp. 295–304 • 2005

MARTA DOČKALOVÁ, VÁCLAV VANČATA

GRAVETTIAN HUMAN REMAINS BRNO II: POSTCRANIAL SKELETON

ABSTRACT: The discovery of human fossil remains from Francouzská Street in Brno, described as Brno II skeleton, was made as early as in 1891. In 1959 Jan Jelínek revised the whole Upper Paleolithic Brno II for the first time. The present study provides a brief summary of the historical background of the adult male skeleton burial discovery. The main goal of the contribution, however, is to present new data and analyses of the robust Gravettian skeleton Brno II. A complete metrical description of the Brno II postcranial remains (femora, humerus, ulna and clavicle) is provided, and their comparison with other Gravettian postcranial remains (Dolní Věstonice, Pavlov, Sunghir, etc.), as well as a reconstruction of femoral length and body size of the Brno II male. Preliminary paleopathological analysis has shown a possibility of tumour or inflammatory disorder in the Brno II male skeleton, which should be examined in more detail in the future. Changes of compact bone on femora are to be supposed on the basis of metrical comparison of subtrochanteric and midshaft femoral regions. The body size is fully in the range of Central and Eastern European Gravettian males. However, the character of postcranial bones of Brno II skeleton, and some other Gravettian individuals as well, shows the importance of the problem of stress factors acting on Gravettian human populations, like relatively rapid and marked changes of climate and food resources. Such factors could cause long-term stress with marked influence on the organism, which should be examined much more in depth.

KEY WORDS: Upper Paleolithic – Homo sapiens sapiens *– Brno II postcranial remains – Moravian Gravettian – Czech Republic – Metric analysis of postcrania – Body size reconstruction*

INTRODUCTION

Historical background

The postcranial skeleton Brno II had been discovered in 1891 during drainage ground works on Francouzská Street in Brno in assemblages of animal bones (mammoth and rhino bones). The workers picked up a part of human postcrania from the site. However, individual human bones were incomplete and very damaged. During subsequent probe excavations in 1892, A. Makowsky discovered the Paleolithic burial Brno II, located in red coloured loess in 4.5-meter depth (Makowsky 1892).

There is no detailed description of the position of the human skeleton in the grave. Professor Makowsky had excavated a one-meter long mammoth tusk (it fell into pieces) and a mammoth scapula (not preserved at all) and later, close to it, a red coloured human skull (Brno II) and parts of red coloured human bones. The following items were excavated from the red loess bed: various animal bones (cranium and ribs of a rhino, horse teeth, reindeer antler – Jelínek 1959, 1991) and various accompanying objects, like two stone discs from claystone (14 and 15 cm in diameter, respectively), 600 pieces of denalia (mollusc shells of 2–3 cm in length), 14 tiny discs made of various materials and a human statue carved out of mammoth tusk (Makowsky 1892).

The first revision research of the excavation conditions has been made in 1956 (Pelíšek 1959, Valoch 1959) and the revision of finds by A. Makowsky, mainly of human skeletal remains, was published by Jan Jelínek (1959). Jan Jelínek studied in detail Makowsky's find known from publications as the male burial Brno II. In those times, unfortunately, it was impossible to reconstruct stratigraphically the age of the whole fossil find on the basis of Makowsky's reports. The age could approximately be estimated on the basis of faunal remains found in situ, on the basis of the shape of archaeological objects and morphology of the skeleton. The burial had been preliminarily classified to the last glaciation period (Würm II). A recent radio-carbon dating has enabled to estimate the age of Brno II burial to 23,680±200 years BP, making it most probably belong to the period of Moravian Gravettian (Pettitt, Trinkaus 2000). A summary and interpretation of the excavation conditions together with a detailed inventory of all finds have been recently published by Oliva (1996).

Brno II cranium

Among the preserved Brno II human remains Jan Jelínek had paid special attention to the Brno II cranium. The original reconstruction made by Makowsky was rather distorted and due to this the cranium was designated as postmortally deformed. Jan Jelínek prepared a new and much more precise reconstruction which has proved that the cranium was not deformed postmortally, but due to imprecise reconstruction. The neurocranium originally consisted of two parts of frontal bones, two parietal bones, the squamous part of occipital bone (lacking opisthion), a part of the left temporal bone with *processus mastoideus*, a zygomatic arch and a part of temporal squama. On the right side of the neurocranium only a part of the temporal bone has been preserved with a *processus mastoideus*, a part of the zygomatic arch with *crista supramastoidea*. Only the right zygomatic bone, fragments of alveolar and palatal processes of the maxilla with five teeth, and an incomplete left part of the mandible with *processus mentalis* have been preserved on the splanchnocranium. The overall cranial shape reconstructed by Jelínek was conspicuously long – dolichocranic – a long ellipsoid with a marked postorbital constriction and prominent supraorbital arches. Jan Jelínek had summarised that Brno II human skeletal remains belong to a strong male, morphologically and metrically similar to the French fossil skeleton of Combe Capelle. The Brno II male skeleton represents a more powerful individual with a robust skeleton with pronounced muscle insertions, larger supraorbital torus and more pronounced *protuberantia occipitalis externa*. The endocast of the cranium bears clearly *Homo sapiens* features corresponding to endocasts of other Upper Paleolithic individuals (Jelínek 1959).

For the documentation of the first revision made by Jan Jelínek (1959), his list and basic description of Brno II postcranial human remains follows:

1. A robust fragment of the middle part of a right clavicle diaphysis, 6 cm long.
2. Approximately 5 cm long fragment of a rib without any special features on the surface.
3. 9 cm long distal part of a very robust right humerus with marked muscle insertions and a missing epiphysis.
4. Middle part of the diaphysis of a robust left ulna, approximately 10 cm in length.
5. One fragment of the left femur and one fragment of the right femur, identified correctly only by Jan Jelínek. A. Makowsky (1892) erroneously described these fragments as a 32 cm long part of femur broken into two fragments. Jelínek has also recorded strongly developed *crista femoris* (he probably meant *linea aspera*) and *tuberositas glutea*, and he also recognised traces of strong hits on the surface of the bones that originated during the bones excavation. A marked bending of the femoral diaphyses of Brno II reminded him of the femoral traits described in classic Western-European Neanderthals. Measurements published by Jelínek (1959) are reviewed in *Table 1.*

MATERIAL

Our contribution focuses on the revision of Brno II human postcranial skeletal remains, except for the 5 cm long rib fragment, already described in the original excavations report in 1891–1892. The following skeletal material of Brno II burial has been examined in the present study:

1. Left clavicular diaphysis (*Figure 1a*).
2. Distal part of the right humerus (*Figures 2a*).
3. Left ulna – middle part of a diaphysis (*Figure 3a*).
4. Right femur upper proximal diaphysis with the lower part of the proximal epiphysis broken at the *trochanter minor* lower border (*Figure 4a*).
5. Left femur – middle and upper parts of femoral diaphysis (*Figure 6a*).

The right and left femoral shafts are the best-preserved parts of the sample. A short fragment of the distal epiphysis of the right humerus basically lacks both condyles and a part of epicondyles, therefore its morphological interpretation is rather difficult. Remains of the left ulna represent

TABLE 1. Measurements of excavated parts of femur according to J. Jelínek (1959).

	Right femur	Left femur
Subtrochanteric AP diameter (M10)	28	28.7
Subtrochanteric LM diameter (M 9)	36.5	34.5
Platymeric index	76.71	83.18
Midshaft AP diameter (M6)	37	36
Midshaft ML diameter (M 7)	29	29
Pilastric index	78.37	80.55

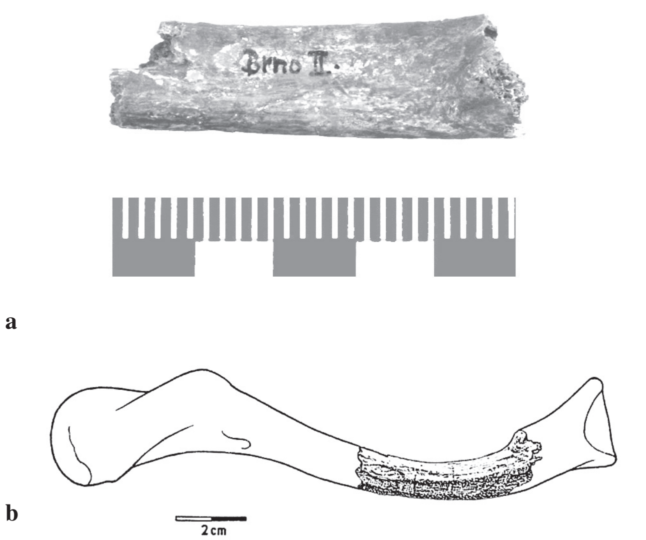

FIGURE 1. a – left clavicle – diaphysis, back view, b – anatomical reconstruction of a part of the left clavicle (drawing by L. Píchová).

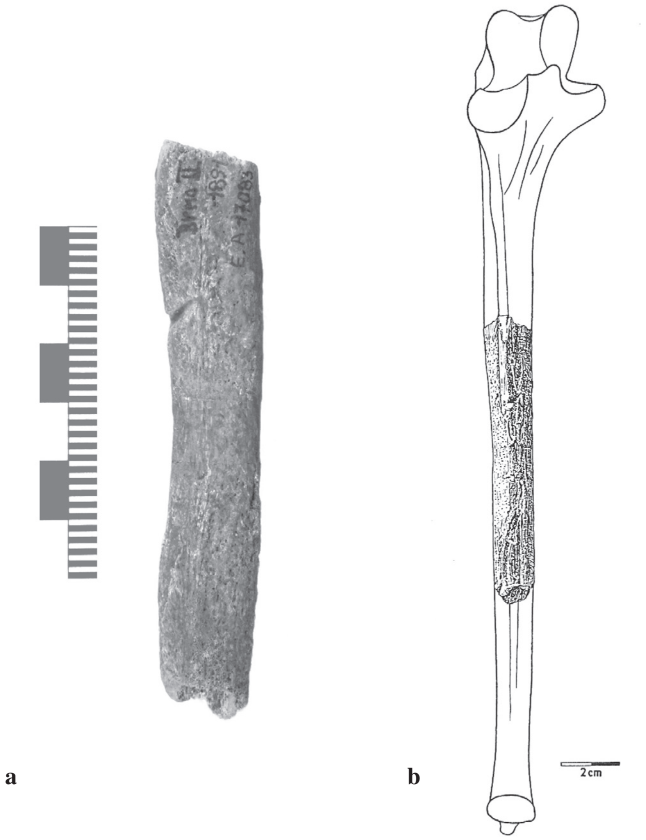

FIGURE 3. a – left ulna – middle part of diaphysis – medial view, b – anatomical reconstruction of the right ulna (drawing by L. Píchová).

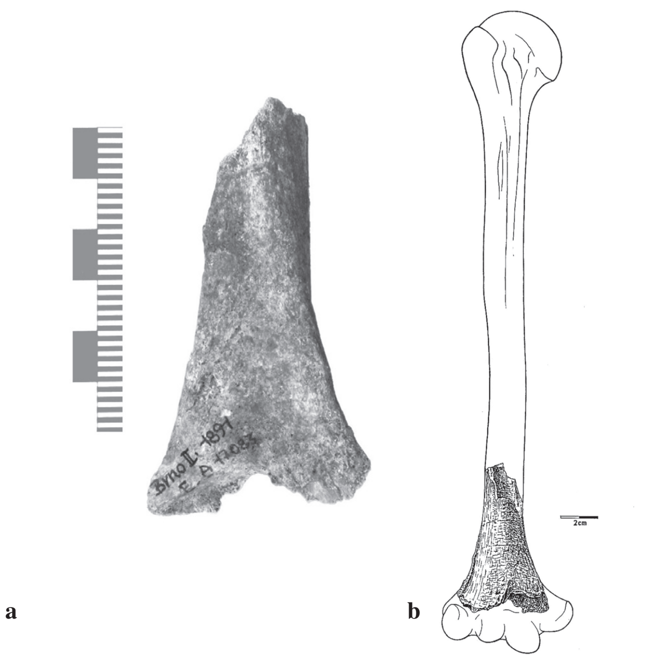

FIGURE 2. a – distal part of the right humerus, back view, b – anatomical reconstruction of a distal part of the right humerus (drawing by L. Píchová).

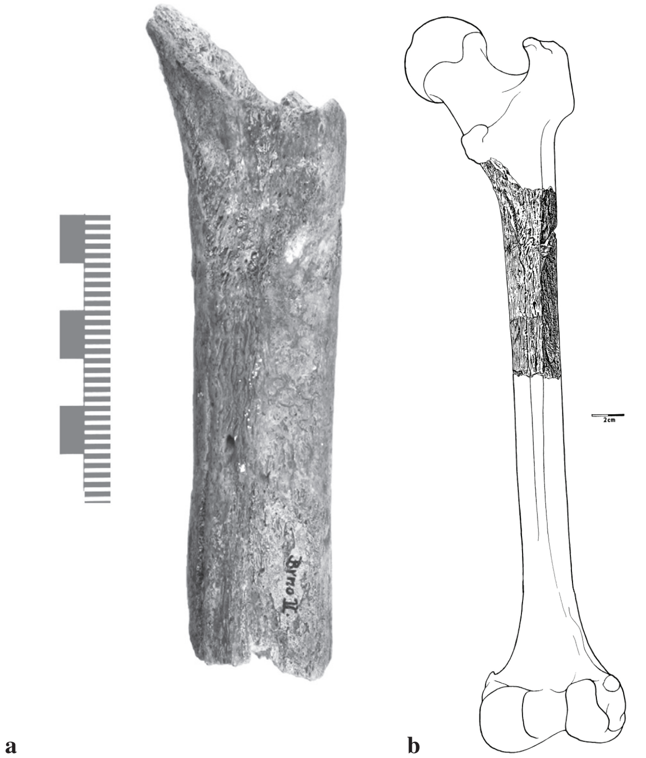

FIGURE 4. a – right femur – proximal part, back view, b – anatomical reconstruction of the right femur (drawing by L. Píchová).

a relatively short fragment from the mid-part of ulnar diaphysis. A short part of the right clavicle diaphysis is the last fragment of the skeleton. All the bones have thick or even very thick compact bone. Femoral fragments appear to be the most valuable parts of the Brno II postcranial skeleton, while the clavicle and humerus are so heavily damaged that their study could only be of little use.

For comparative purposes the present authors have studied altogether 28 individuals from the Gravettian period of the Upper Paleolithic (Vančata 2003) and unpublished data. Morphology and morphometry of five of the six

TABLE 2. Clavicular, humeral and ulnar measurements.

	Clavicle max.	Clavicle min.	Ulna max.	Ulna min.	Ulnar midshaft max.	Ulnar midshaft min.	Ulnar distal AP	Ulnar distal ML	Humerus max.	Humerus min.	Supraepicondylar AP	Supraepicondylar ML	Epiphyseal width	Epiphyseal width
Brno II left			98	89	17.5	14	15	13.5						
Brno II right	51.5	37							83	45.5	20.5	36.5	45.5	19

	Clavicular midshaf vertical-M4			Clavicular midshaf sagittal-M5			Humeral midshaft AP-M6c			Humeral midshaft ML-M6d			Ulnar midshaft AP-M11			Ulnar midshaft ML-M12		
	Mean	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**
Moravian males	12.4	6	0.92	12.2	6	0.46	21.5	8	1.87	21.6	8	1.70	17.2	6	1.32	14.3	6	1.54
Mediterranean males	12.0	2	0.71	14.5	2	2.12		0			0		16.0	4	1.15	21.5	4	0.58
Brno II left	14.0	1	0.00	12.5	1	0.00	***22.5***	1	0.00	***20.0***	1	0.00	16.5	1	0.00	17.5	1	0.00
Brno II right	14.0	1	0.00	12.5	1	0.00	22.5	1	0.00	20.0	1	0.00	16.5	1	0.00	17.5	1	0.00
Moravian females	14.6	1	0.00	14.4	1	0.00	20.0	1	0.00	24.0	1	0.00	12.5	1	0.00	14.3	1	0.00
Mediterranean females		0.0			0.0			0.0			0.0			0.0			0.0	

TABLE 3. Femoral measurements.

	Femur max.	Femur min.	Subtrochanteric max.	Subtrochanteric min.	Femoral midshaft max.	Femoral midshaft min.	Cortex med.	Cortex lat.	Cortex aspera	Cortex anter.
Brno II left	176	134	33.5	26.5	32.5	27.5	***6***	***6.5***	***10.5***	***5***
Brno II right	138	111	34	28.5	36	29	7.5	8.5	13	6

	Femoral length			Subtrochanteric AP			Subtrochanteric ML			Femoral midshaft AP			Femoral midshaft ML		
	Mean	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**
Moravian males	468.7	18	23.18	26.3	14	3.23	35.1	14	2.09	30.4	15	2.74	27.6	15	1.97
Mediterranean males	495.7	9	30.32	29.7	5	1.64	38.3	5	2.17	37.1	4	0.25	29.1	5	1.75
Brno II left	***473.0***	1	0.00	30.5	1	0.00	32.5	1	0.00	32.5	1	0.00	29.0	1	0.00
Brno II right	***472.0***	1	0.00	28.5	1	0.00	33.5	1	0.00	35.5	1	0.00	29.0	1	0.00
Moravian females	405.8	11	17.21	23.3	11	3.22	31.3	11	3.57	26.1	11	2.78	24.7	11	3.11
Mediterranean females	432.3	7	21.35	27.7	3	1.21	30.4	3	1.82	29.4	3	1.15	26.8	3	0.25

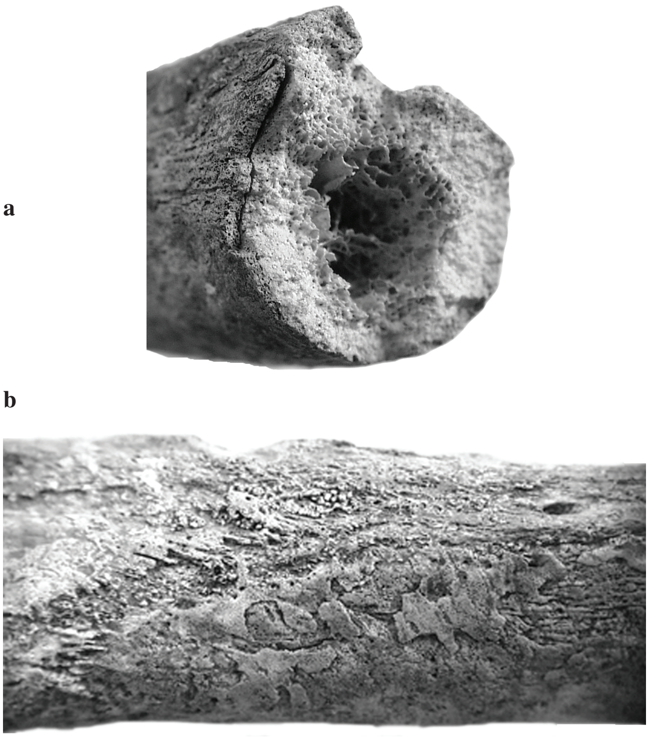

FIGURE 5. a – right femur – distal part – bone cross-section, b – right femur – proximal part – spongious bony surface.

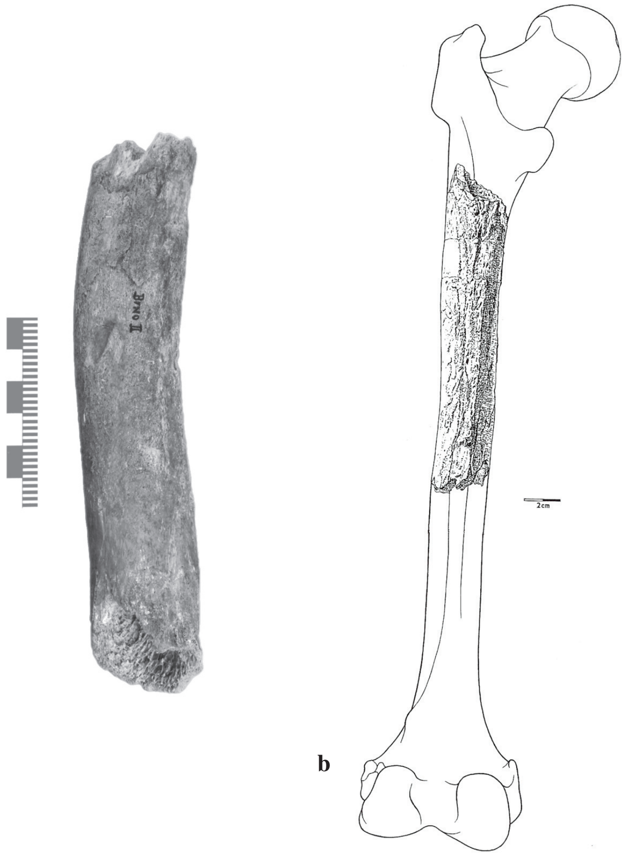

FIGURE 6. a – left femur – proximal diaphysis, back view, b – anatomical reconstruction of the left femur (drawing by L. Píchová).

Pavlovian skeletons (DV 13, DV 14, DV 15, DV 16 and Pavlov) were examined on the original skeletons in Dolní Věstonice, data on DV 3 were taken from literature. Most important measurements on the postcranial skeleton, taken independently by several persons, were revised by Trinkaus (1999).

Three skeletons from Sunghir were studied several times on the original material including reconstruction of long bones of the two subadult individuals, the Sunghir 2 boy and the Sunghir 3 girl (Vančata 1997, 2003). Combe Capelle and La Rochette were available as casts only (Vančata 1988, 1993). Data on Předmostí were taken from the monograph on Předmostí skeletons written by Matiegka (1938). Special attention was paid to the photographs and comments on morphology and measurements in the text.

The rest of the studied individuals were not available for study and measurements were taken from literature (Formicolla 1988, Holliday 1995).

All the measurements used in this study have been published earlier by Vančata (1988, 1991, 1993, 1994, 1997), Trinkaus (Trinkaus, Jelínek 1997, Ruff *et al.,* 1997) and Holliday (1995, 1997) and recently revised by Trinkaus (1999).

METHODS

Brno II postcranial fossil bones are very fragmentary. Consequently only basic morphological description has been made together with the analysis of specific morphological features, for instance pathologies and stress markers.

The Brno II metrical traits have been studied as well. The fragmentary nature of the Brno II skeleton has not made it possible to take most of the measurements usually studied for the reconstruction of body size and proportions (Vančata 2003). For this reason, besides standard measurements (Vančata 1997, 2003, Vančata, Charvátová 2001, Piontek, Vančata 2002), all possible measurements have been taken, including maximal and minimal diameters of bone diaphysis, maximal and minimal lengths of fragments and, in the case of the femur, also four cortex thicknesses measured in antero-posterior and medio-lateral planes.

Especially the length of bones was missing; however, we have reconstructed the length of both femora by both anatomical estimate and on the basis of regression equations computed from the Gravettian male femoral sample.

Equations used for the estimate of femoral length:
Length of femur = 6.426*SUBTROAP + 306.5
Length of femur = 9.630*SUBTROML + 135.89
Length of femur = 5.447*DIAMDLAP + 305.6
Length of femur = 8.884*DIAMDLML + 231.95
Length of femur = 4.294*SUBTROAP + 7.371*SUBTROML + 100.7

TABLE 4. Femoral products and indexes.

	Midshaft product			Subtrochanteric product			Subtrochanteric index			Femoral midshaft index		
	Mean	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**
Moravian males	840.06	15	118.113	924.22	14	131.657	0.751	14	0.096	1.103	15	0.093
Mediterranean males	1076.75	4	76.826	1140.30	5	124.223	0.776	4	0.010	1.285	4	0.092
Brno II left	942.50	1	0.000	991.25	1	0.000	0.938	1	0.000	1.121	1	0.000
Brno II right	1029.50	1	0.000	954.75	1	0.000	0.851	1	0.000	1.224	1	0.000
Moravian females	651.77	11	134.110	732.69	11	155.634	0.746	11	0.090	1.064	11	0.102
Mediterranean females	786.92	3	31.042	843.49	3	87.466	0.912	3	0.020	1.098	3	0.045

TABLE 5. Body size parameters (cf. Vančata 2003).

	Body height			Body mass			Body mass index			Rohrer's index		
	Mean	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**	**Mean**	**N**	**SD**
Moravian males	176.34	18	8.027	65.11	20	7.015	20.829	18	1.801	1.185	18	0.128
Mediterranean males	182.68	11	10.413	71.58	13	11.698	21.682	11	1.093	1.190	11	0.077
Brno II left	***176.98***	1	0.000	***67.17***	1	0.000	***21.446***	1	0.000	***1.212***	1	0.000
Brno II right	***176.64***	1	0.000	***66.50***	1	0.000	***21.312***	1	0.000	***1.206***	1	0.000
Moravian females	155.75	11	4.978	53.11	11	4.042	21.971	11	2.431	1.415	11	0.197
Mediterranean females	161.86	8	7.098	57.41	8	8.743	21.842	8	2.318	1.351	8	0.147

The length of bones and selected metrical traits and indexes on the femur, tibia, humerus and radius were examined (see Vančata 1988, 1991, 1997, Knussmann 1988, Holliday 1995 for the definition of measurements, *Tables 2, 3, 4*) and the body height, body mass and skeletal ponderal indexes were computed (Vančata 1996, 1997).

Body height and body mass was computed for each examined individual by various regression equations, published earlier by several authors (e.g. Feldesman *et al.* 1990, Sjøvold 1990, McHenry 1992, Ruff, Walker 1993, cf. Vančata 2003).

Body height has been computed by MA and RMA formulas (*Table 3*) published by Feldesman *et al.* (Feldesman *et al.* 1989, 1990, Feldesman, Fountain 1996), Jungers (1988), Olivier (1976) and Sjøvold (1990). We computed mean values from six equations based on the femoral length.

We have also used a calibration method for the method confidence estimate for body height computing as a mean of eight regression equations. On the basis of the longitudinal growth study from Poznań (Cieslik *et al.* 1994) we have estimated that body height can also be computed like the sum of femoral, tibial, humeral and radial lengths plus 20% of the sum that should roughly represent height of foot and head and length of the neck.

The body mass was computed by 4 formulas from the subtrochanteric product (McHenry 1988, 1991, 1992). In addition, 4 formulas based on body height estimate (Jungers, Stern 1983, Ruff, Walker 1993, Wolpoff 1983) were also included to decrease the influence of random errors resulting from possible unusual morphology of individual epiphyses of the long bones. The Brno II male body mass is then an average value of the 8 equations.

Ponderal indexes have been computed from the estimated body height and body mass. They can be taken as integral parameters expressing relations of body linearity, body volume, body mass and general body shape (Vančata 1996, 1997). For this study skeletal Body mass index and skeletal Rohrer's index were computed (s-BMI=body mass [g]/height [cm]^2, s-Rohrer=body mass [g]/height [cm]^3) for all the studied Upper Paleolithic individuals.

RESULTS

Left clavicle

A part of a left clavicle has been identified during anatomical reconstruction (*Figure 1b*) as a bone broken in the middle of the clavicular body (*corpus claviculae).* The part of clavicle facing the sternum – *externitas sternalis* – has been preserved. The joint surface in medial part – *facies articularis sternalis* – is missing. A part of clavicular rugosity for the clavicle joint with the sternal bone – *impressio ligamenti costoclavicularis* – has been preserved at the breaking place of the bone. There are no porous changes on the clavicle surface which has a marked ochre colouring in its medial part. Metric traits taken on the clavicle are in *Table 2*. The clavicle does not differ metrically from other Gravettian fossil finds (*Table 2*).

Right humerus

The distal part of a robust humerus (*Figures 2a, 2b)* is proximally broken by a step-like fracture and both parts of the humeral joint surface, *capitulum humeri* and *trochlea* *humeri*, are missing. A small portion of the upper part of *fossa coronoidea* is preserved (transversal diameter approx. 6.8 mm). The anterior part of bony tissue (*substantia compacta*) of the medial epicondyle is broken off and only spongious bone (*subsatantia spongiosa*) is preserved with irregular breaks. On the humeral posterior side, only the medial upper part of joint fossa, *fossa olecrani*, is preserved, some 7.8 mm in transversal diameter. The lateral epicondyle lateral edge is broken off. The bone surface is smooth and also porous, there is a marked ochre colour. On the medial part (*margo medialis*) there is a visible compact bone breaking off, some 5.7 mm in length at the place of a sharp edge. All measurements taken on the humerus are in *Table 2*. The humerus does not differ metrically from other known Gravettian male skeletons (*Table 2*).

Right ulna

The medial part of a right ulna (*Figures 3a, b)* is broken proximally by a smooth fracture at the anterior edge – *margo anterior,* where the sharp edge gradually disappears. There is an evident cutting (*Figure 3a)* 6.2 mm long and 1.5 mm deep. The featureless smooth bony surface in the middle part of the ulnar fragment differs very much from that of the distal part which bears marked morphological changes. The bone surface on the distal part is porous and also corrugative with irregular prominences originated as results of pathological changes (Schultz, Nováček 2005). The distal part of the ulna has been broken off by an irregular fracture. All metric traits measured on the ulna are in *Table 2*. The ulna is metrically quite similar to other known Gravettian male skeletons (*Table 2*).

Right femur

The proximal part of the right femur diaphysis (*Figure 4a)* has been broken off on the medial side just bellow, or even besides, *trochanter minor* (*Figure 4b)*. This part of the femur has a preserved part of compact bone with *linea aspera*. The proximal part might perhaps include also a small portion of the femoral neck (*Figure 5b*) in the case of high or upper lateral position of *trochanter minor*. Below the bony edge there is spongious bone (*Figure 5a)*. On the lateral surface a tuberosity (*tuberositas glutaea)* can be found that proceeds proximolaterally into a marked *linea aspera*. There is a marked double line on the backside of the femur bordered by edges *labium laterale* and *labium mediale*. A large *foramen nutricium* (length 5.1 mm, width 2.2 mm) is preserved almost in the middle part of the femur, just below *linea aspera*. There is a marked longitudinal cutting (length 20.5 mm, width 4.3 mm) on the anterior side of the bone in its proximal part, at a distance of 23 mm, caused secondarily during the skeleton excavation. The anterior part of the femur has a lamellar surface with remains of ochre colour. The distal part of this robust femur is broken off by irregular fracture (*Figure 5a*). Porous bony matter, probably of tumour origin, can be recognised on the bone surface. Metric traits measured and computed parameters can be found in *Tables 3, 4*. The length of the right femur has been estimated to 472 mm as a mean of four regression equations and to 469 mm by anatomical reconstruction (supposedly some 10% less than one third of the bone length).

Left femur

The left femur proximal part has been broken off more distally from the *trochanter minor* than in the femoral diaphysis proximal part (*Figures 6a, b)*. A very marked bending can be found in the middle part of the diaphysis with a very high chord-like *linea aspera*. There are marked rugosities for muscle attachments at *linea aspera* with a very marked double edge (*labium laterale* and *labium mediale)*. A small *foramen nutricium* has been found in the middle part of the preserved femoral diaphysis along the *linea aspera* at *labium laterale* lateral edge. The bone surface is of multilayered character. Part of the bone surface preserves its original bone shape, while other parts show unstuck surface crust (*Figure 6a)*. The bone has been secondarily damaged by spade impact during the skeleton excavation. The first damage is a hole on the medial side (15.3 mm long, 11.5 mm wide) at a distance of 67 mm from the bone distal edge and cutting off *linea aspera,* totally missing distally at a length of 16.7 mm.

The metric traits measured and computed parameters can be found in *Tables 3, 4*. The length of the left femur has been estimated to approximately 473 mm as a mean of four regression equations and to 475 mm by anatomical reconstruction (supposedly one third and 40% of the bone length).

Special features on the femora

There is a very marked high *linea aspera* and also well developed gluteal tuberosity on the diaphyses of both the right and left femur. The preserved parts of diaphyses have a marked bending, most visible on the left femur that has an almost intact diaphysis middle part. This shape is comparable with some other Gravettian fossil finds, like DV–15 and Sunghir 3. The comparison with Neanderthals is misleading because of a very different femoral diaphyses morphology caused by the different way of locomotion of this human species. The bony surface and compact bone in individual bones are inflicted by a light form of osteoclastic resorption (Schultz, Nováček 2005).

In order to decide on the range and impact of the disease or metabolic disorder on the skeleton, it would be necessary to include a study of stress factors that could have resulted form extensive and very rapid climatic changes, typical for the Early and Middle Gravettian. These literally shocking changes like rapid and large-scale decrease or increase in temperature or changes in food resources could substantially influence human organism, its metabolism, physiology and adaptation abilities, as important stress factors. There is no precise information on what extent of defensive and adaptive mechanisms keeping organism homeostasis could be activated, and what could be side effects on organism tissues resulting among others in a possible forming of non-invasive tumour or unknown modifications of bones.

Body size reconstruction

The fragmentary nature of the bones does not permit precise estimates; however, it gives a possibility for rough estimates of body size parameters of the Brno II male (*Table 5*). The Brno II male body height has been estimated to approximately 177 cm and his body mass to 67 kg. So the male fits well to the Gravettian male sample (Vančata 2003), showing the males as relatively tall and slim. The values of skeletal BMI (approx. 21.4) and skeletal Rohrer's index (approx. 1.21) show that the Brno II male fits well into a range of variability of Gravettian males; perhaps he was a bit more robust than the average. However, the robusticity of the bones could be caused by disease or long permanent stress and body mass could be overestimated.

Burial rites in the Upper Paleolithic

All the skeletal remains, both postcrania and cranium as well as animal bones, from the Brno II Paleolithic burial are intensely coloured with red ochre pigment.

Many other Gravettian burials are comparable in this respect with the Brno II burial discovered on Francouzská Street by Makowsky (1892). Those are: Předmostí (Matiegka 1938), children's burial from Věstonice – Dolní Věstonice I (Absolon 1945), Dolní Věstonice II burial (Klíma 1995, Svoboda 1995), female burial from Věstonice – Dolní Věstonice III (Klíma 1950, Jelínek 1954, Trinkaus, Jelínek 1997), triple burial from Dolní Věstonice – Dolní Věstonice XIII, XIV, XV (Klíma 1987, Jelínek 1987, 1992, Vančata 1994) and Pavlov burial (Klíma 1959, 1963, 1991). The burials were covered with a mammoth scapula, as in the case of the DV 3 female and Pavlov I male burials.

The common grave of 20 individuals from Předmostí has been surrounded by mammoth jaws and scapulas (accompanied by irregular grooves at the bottom). We can speculate that also in the case of Brno II burial a mammoth scapula could cover the grave. The question of the potential role of mammoth tusks in the grave construction remains unanswered.

Repeated colouring of grave inventory occurs very frequently in the Paleolithic, and even in the Neolithic, as observed in graves in Moravia but also, for example, in Russia (e.g. Kostienki, Kostienki – Markina Gora, Sunghir, Malta). A larger amount of red pigment obtained by pulverisation of iron ores is he most usual evidence about the burial importance. In 1927, a crumbled mammoth scapula was found, overlapping fragments of a child's skull covered with red pigment (Absolon 1929). In 1947 two mammoth scapulas have been found together with soil largely mixed with red pigment. The female skeleton Dolní Věstonice III lied in a crouching position, covered by a red pigment namely on the skull and on the upper part of the body; red pigment was also found in the surrounding loess layer (Klíma 1950, 1963, 1990).

In 1986 a triple burial (DV XIII, XIV, XV) had been discovered in Dolní Věstonice. There was a remarkable concentration of red powder pigment composing a solid crust with the presence of drilled animal teeth (Klíma 1987). In the case of the Dolní Věstonice triple burial and DV XVI burial, there might have existed a grave construction, which could be evidenced by the occurrence of carbonated wood remains (roundlog) around the graves (Svoboda 2003).

CONCLUSIONS

Despite their fragmentary nature the Brno II postcranial remains provide some important information broadening the knowledge on Gravettian human population. It has been confirmed that robust bones with marked muscle insertions were typical for these human populations; however, males were tall and relatively slim. It has also shown that these humans manifest very specific morphological changes and unexpected morphological variability, caused perhaps by strong environmental pressures including extensive and rapid climatic changes and oscillation of food resources in both quality and quantity. The analysis of Brno II postcranial skeletal remains has re-opened some important questions about the pathology and morphological variability in the Upper Paleolithic human populations and their genetic and environmental background.

ACKNOWLEDGEMENTS

The work was financially supported with an Institutional Grant of the Ministry of Culture of the Czech Republic No. 00009486201.

REFERENCES

ABSOLON K., 1929: New find of fossil human skeleton in Moravia. *Anthropologie*, Praha, 7 (1–2): 79–89.

ABSOLON K., 1945: Výzkum diluviální stanice lovců mamutů v Dolních Věstonicích na Pavlovských kopcích na Moravě. Paleontologická série (Brno) 7: 1–252.

CIESLIK J., KACZMAREK M., KALISZEWSKA-DROZDOWSKA M. D., 1994: *Dziecko Poznańskie '90*. Bogucki, Wydawnictwo naukowe, Poznań.

FELDESMAN M. R., FOUNTAIN R. L., 1996: "Race" specifity and the femur stature ratio. *Amer. J. of Phys. Anthrop.* 100: 207–224.

FELDESMAN M. R., KLECKNER J. G., LUNDY J. K., 1990: The femur/stature ratio estimates of stature in mid- and late-Pleistocene fossil hominids. *Amer. J. of Phys. Anthrop.* 83: 359–372.

FELDESMAN M. R., LUNDY J. K., KLECKNER J. G., 1989: The femur/stature ratio estimates of stature in mid- and late-Pleistocene fossil hominids. *Amer. J. of Phys. Anthrop.* 78: 219–220.

FORMICOLLA V., 1988: The triple burial of Barma Grande. *Homo* 39: 130–143.

HOLLIDAY T. W., 1995: *Body Size and Proportions in the Late Pleistocene Western Old World and the Origins of Modern Humans.* Ph.D. thesis. University of New Mexico, Albuquerque.

HOLLIDAY T. W., 1997: Body proportions in Late Pleistocene Europe and modern human origins. *J. of Hum. Evol.* 32: 423–447.

JELÍNEK J., 1954: Nález fosilního člověka Dolní Věstonice III. *Anthropozoikum* 3: 37–92.

JELÍNEK J., 1959: Der fossile Mensch Brno II: Bestattung und Skelettmaterial. *Anthropos (Brno)* 9: 17–22.

JELÍNEK J., 1987: A new palaeolithic triple burial find. *Anthropologie (Brno)* 25: 189–190.

JELÍNEK J., 1991: Découvertes d'ossements de la population Gravéttienne de Moravie. *L'Anthropologie* (Paris) 95, 1: 137–154.

JELÍNEK J., 1992: New Upper Palaeolithic burials from Dolní Věstonice. In: M. Toussaint (Ed.): L'Aventure humaine: 5 millions d'années. *Études et Recherches Archéologiques de l'Université de Liège* 56: 207–228.

JUNGERS W. L., 1988: New estimates of body size in australopithecines. In: F. E. Grine (Ed.): *Evolutionary History of the "Robust" Australopithecines.* Pp. 115–125. Aldine de Gruyter, New York.

JUNGERS W. L., STERN J. T., 1983: Body proportions, skeletal allometry and locomotion in the Hadar hominids: a reply to Wolpoff. *J. of Hum. Evol.* 12: 673–684.

KLÍMA B., 1950: Objev diluviálního hrobu v Dolních Věstonicích. *Časopis Moravského muzea* 35: 216–232.

KLÍMA B., 1959: Objev paleolitického pohřbu v Pavlově. *Archeologické rozhledy* 39: 241–254.

KLÍMA B., 1963: Dolní Věstonice, výsledky výzkumu tábořiště lovců mamutů v letech 1947–1952. *Monumenta Archaeologica. Acta praehistorica et historica, Institut archaeologici Academiae scientiarum bohemoslovenicae,* Praha, 11: 9–427.

KLÍMA B., 1987: Mladopaleolitický trojhrob v Dolních Věstonicích. *Archeologické rozhledy* 39: 353–357.

KLÍMA B., 1990: Der pleistozäne Mensch aus Dolní Věstonice. *Památky archeologické* 81: 5–16.

KLÍMA B., 1991: Die jungpalāolithischen Mammuutjāger-Siedlungen Dolní Věstonice und Pavlov in Sűdmähren – ČSFR. *Archäologie und Museum* 23: 1–30.

KLÍMA B., 1995: Dolní Věstonice II. Ein Mammutjägerrastplatz und seine Bestattungen. *Etudes et Recherches Archéologiques de l'Université de Liège* 73. *The Dolní Věstonice Studies* 3: 1–183.

KNUSSMAN R., 1988: *Anthropologie. Handbuch de vergleichenden Biologie des Menschen. Band 1: Wesen und Methoden der Anthropologie.* Gustav Ficher Verlag, Stuttgart, New York. 742 p.

MAKOWSKY A., 1892: Der diluviale Mensch im Löss von Brünn. *Mitt. Anthropol. Gesell. Wien.* 22: 73–84.

MATIEGKA J., 1938: *Homo předmostensis: Fosilní člověk z Předmostí na Moravě. II. Ostatní části kostrové*. Česká akademie věd a umění, Praha. 91 pp.

McHENRY H. M., 1988: New estimates of body weight in early hominids and their significance to encephalization and megadontia in "robust" australopithecines. In: F. E. Grine (Ed.): *Evolutionary History of the "Robust" Australopithecines.* Pp. 133–148. Aldine de Gruyter, New York.

McHENRY H. M., 1991: Sexual dimorphism in *Australopithecus afarensis*. *J. of Hum. Evol.* 20: 21–32.

McHENRY H. M., 1992: Body size and proportions in early hominids. *Amer. J. of Phys. Anthrop.* 87: 407–431.

OLIVA M., 1996: Mladopaleolitický hrob Brno II jako příspěvek k počátkům šamanismu. *Archeologické rozhledy* 48: 353–384, 537–542.

OLIVIER G., 1976: The stature of australopithecines. *J. of Hum. Evol.* 5: 529–534.

PETTITT P. B., TRINKAUS E., 2000: Direct radiocarbon dating of the Brno 2 Gravettian Human Remains. *Anthropologie* XXXVIII, 2: 149–150.

PELÍŠEK J., 1959: Der fossile Mensch Brno II: Die geologisch-petrographischen verhältnisse. *Anthropos (Brno)* 9: 23–30.

PIONTEK J., VANČATA V., 2002: Transition to agriculture in Europe: Evolutionary trends in body size and body shape. In: P. Bennike, E. Bodzsar, C. Susanne (Eds.): *Ecological Aspects of Past Human Settlements in Europe*. Biennial Books of EAA, Vol. 2. Pp. 61–92. Eötvös University Press, Budapest.

RUFF C. B., TRINKAUS E., HOLLIDAY T. F., 1997: Body mass and encephalisation in Pleistocene Homo. *Nature* 387: 173–175. (Database *supp.xls* "Body Mass and Encephalization in Pleistocene Homo"; C. B. Ruff, corresponding author; ms #R 10108HG/jw)

RUFF C. B., WALKER A., 1993: Body size and body shape. In: A. Walker, R. E. Leakey (Eds.): *The Nariokotome Homo erectus Skeleton:* Pp. 234–265. Harvard University Press, Cambridge, MA.

SCHULTZ M., NOVÁČEK J., 2005: Vorläufige Ergebnisse paläopathologischer Untersuchungen an den postcranialen Skelettresten des paläolithischen Menschen von Brno II: *Anthropologie* XLIII, 2–3: 305–313.

SJØVOLD T., 1990: Estimation of stature from long bones utilising the line of organic correlation. *Hum. Evol.* 5: 431–447.

SVOBODA J., 1991: Dolní Věstonice II Western Slope. *Etudes et Recherches Archéologiques de l'Université de Liège* 54: 1–60.

SVOBODA J., 2003: Paleolit a mezolit: Pohřební ritus. In: J. Malina (Ed.): *Panoráma biologické a sociokulturní antropologie: Modulové učební texty pro studenty antropologie a "příbuzných" oborů.* 19. svazek. Nadace Universitas Masarykiana – Akademické nakladatelství CERM – Masarykova universita – Nakladatelství a vydavatelství NAUMA, Brno. 128 pp.

TRINKAUS E., JELÍNEK J., 1997: Human remains from the Moravian Gravettian: The Dolní Věstonice 3 postcrania. *J. of Hum. Evol.* 33: 33–82.

TRINKAUS E., 1999: *Osteometrics, diaphyseal cross-sectional geometric properties and discrete traits of the Dolní Věstonice and Pavlov human appendicular remains*. Published as web page: http://www.artsci.wustl.edu/~anthro/blurb/dv-metrics.html

VALOCH K., 1959: Der fossile Mensch Brno II: Die Grabbeigraben. *Anthropos (Brno)* 9: 23–30.

VANČATA V., 1988: Ecological aspects of skeletal sexual dimorphism in microevolution of Homo sapiens. *Anthropologie* XXVI: 83–92.

VANČATA V., 1991: Evolution of higher primate femur and tibia: Adaptive morphological patterns and phylogenetic diversity. *Hum. Evol.* 6: 1–47.

VANČATA V., 1993: Evolution of hominid femur and tibia: A morphometric approach to the evolutionary research in anthropology. *Hum. Evol.* 8, 2: 65–79.

VANČATA V., 1994: Základní metrické znaky a proporce dlouhých kostí dolní končetiny nálezu čtyř jedinců (DV–XIII, DV–IV, DV–XV, DV–XVI) ze svrchně paleolitického naleziště Dolní Věstonice. *Časopis Národního musea – řada přírodovědná* 159: 144–155.

VANČATA V., 1996: Major patterns of early hominid evolution: Body size, proportions, encephalisation and sexual dimorphism. *Anthropologie* XXXIV, 3: 313–328.

VANČATA V., 1997: *Body Size and Shape as an Indicator of Important Evolutionary Changes in Hominoid Phylogeny (in Czech)*. Habilitation thesis. Charles University, Prague. 157 pp.

VANČATA V., 2003: Sexual dimorphism in body size and shape in Pavlovian Upper Paleolithic group: A population approach. *Anthropologie* XLI, 3: 213–240.

VANČATA V., CHARVÁTOVÁ M., 2000: Post-Paleolithic Homo sapiens evolution in Central Europe: Changes in body size and proportions in Neolithic and early Bronze age. *Anthropologie* XXXIX, 2–3: 133–152.

WOLPOFF M. H., 1983: Lucy's little legs. *J. of Hum. Evol.* 12: 443–453.

Marta Dočkalová
Anthropos Institute
Moravian Museum
Zelný trh 6
659 37 Brno, Czech Republic
E-mail: mdockalova@mzm.cz

Václav Vančata
Department of Biology and Ecological Education
Faculty of Education
Charles University in Prague
M. D. Rettigové 4
116 39 Praha 1, Czech Republic
E-mail: Vaclav.Vancata@pedf.cuni.cz