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THE GREAT MORAVIAN CEMETERY AT JOSEFOV. BASIC ANTHROPOLOGICAL CHARACTERISTICS, POSSIBLE EXPRESSIONS OF PHYSIOLOGICAL AND PHYSICAL LOADS, STATE OF HEALTH

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Abstract. The anthropological analysis of the Great Moravian skeletal assemblage from Josefov with a view on a possible expressions of physiological and physical loads and on a state of health is given. This assemblage comprises important comparative material for that of the large Mikulčice assemblage. We evaluated the occurrence of Harris lines, of cribra orbitalia, of the degeneratively productive changes in the spine and in the major joint and the enthesopathy. The degree of asymmetry between sides in pairs of bones and of the sexual dimorphism besides the basic metric characteristics were determined also. The study of the state of dental health can bring important information about the state of health of the whole population. At the finish we are putting forward the specification of the paleopathological finds.

■ **Great Moravian Cemetery at Josefov, paleodemography, stature, sexual domorfismus, state of dental health, cribra orbitalia, Harris lines, degeneratively productive changes joints, enthesopathies, index platymericus and knemicus, pathological finds.**

INTRODUCTION

This paper concerns the anthropological evaluation of the skeletal assemblage from Josefov (Hodonín district), with particular emphasis on the expression of physiological and physical loads. This assemblage, together with the cemetery from Bulhary, comprises important comparative material for that of the large Mikulčice assemblage, both from the point of view of its similar historical level (second half of the 9th century) and its location within the Mikulčice hinterland (some 8 km from Mikulčice itself).

The archaeological investigation of this Slavic cemetery was conducted by Eva Šráčková of the Institute of Archaeology of the Czechoslovak Academy of Sciences in Brno between 1958 and 1961. In all 176 graves were exposed from the Great Moravian period (second half of the 9th century AD). Further rescue excavations were undertaken on the site in the first half of the 1960's by Vlasta Šikulová, resulting in the discovery of a further 9 graves. This relatively extensive assemblage was adjudged to stem from a rural population (e.g. Hanáková et Stloukal 1966). The boundary of the cemetery is defined on the eastern side by a typical 11th century cemetery, while to the west a rise was covered by a Větéřov culture settlement (Šráčková 1962). It is not clear from Eva Šráčková's report, however, how great a part of the Great Moravian cemetery was investigated. With the exception of five graves the skeletons were found supine on their backs, oriented in a west-east direction. The great majority of the graves contained only a single individual, but 8 cases of double burials were recorded (see Fig. 1).

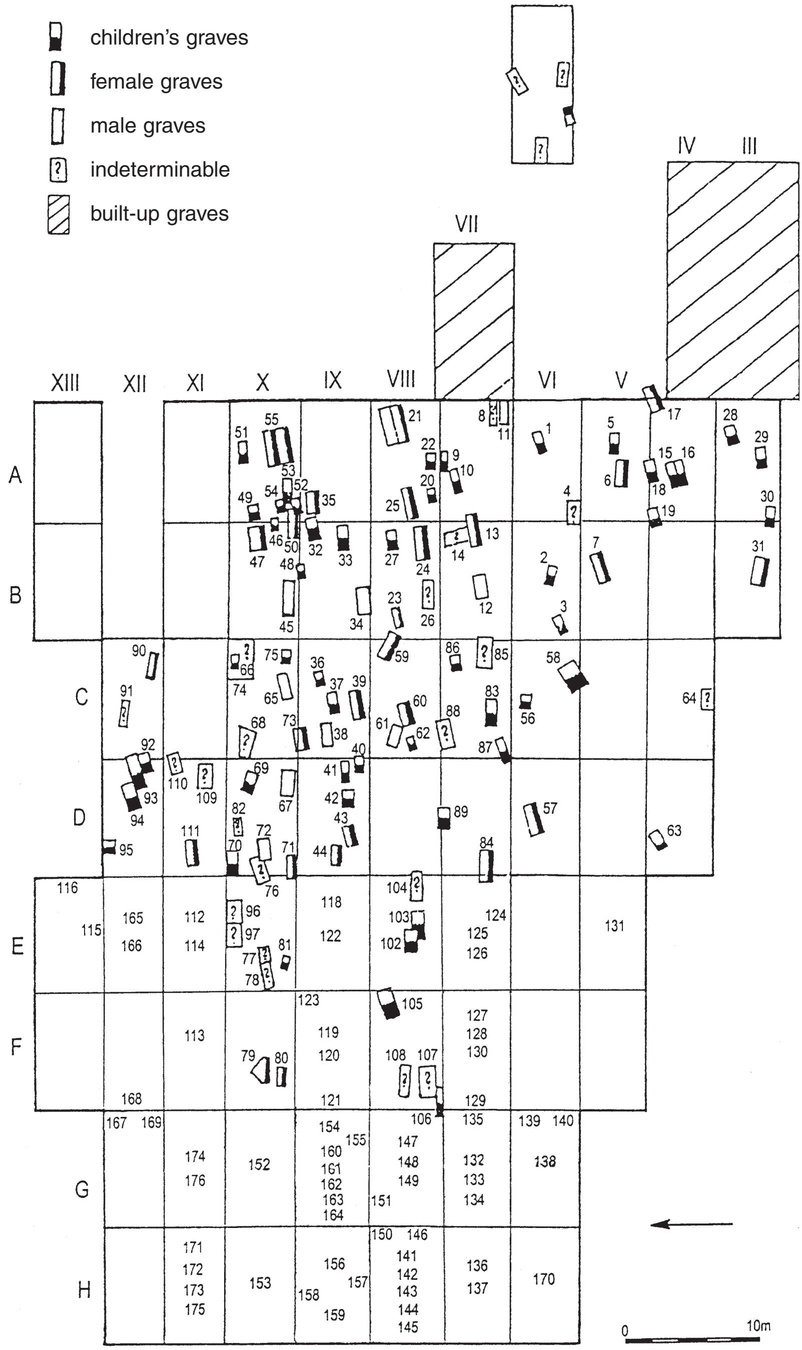


Fig. 1 The plan of the Great Moravian cemetery "Josefov" (Šráčková 1962). According to Eva Šráčková's report was orientationally sketched in the position of other graves (M. Cimflová, the Institute of Archaeology, Brno).

INVENTORY AND BASIC DATA OF THE SKELETONS RECOVERED

Table 1 (see Appendix) presents an inventory of the skeletal remains of all of the individuals subjected to detailed anthropological analysis. Where sex could not be determined on the basis of the pelvis it is shown with a question mark, and where there were few indices that could be used in gender specification this is moreover given in brackets. These cases are classed as "indeterminable" in the demographic analysis. Sex was not determined for children. Age is estimated in classic 10-year and 15-year intervals. Non-adult individuals were classed into three categories (infans I – 0– 6 years, infans II – 7–13 years and juvenis – 14–19 years). The state of preservation of the skeleton is expressed by the "cross" system used in the Department of Anthropology of the National Museum in Prague:

C+, P+ – only fragments of the skull (C) or post-cranial skeleton (P) survive

C++, P++ – the greater part of the skull (C) or post-cranial skeleton (P) survive

C+++, P+++ – almost completely preserved, practically undamaged skull (C) or other skeletal parts (P).

In the column showing corporeal height the number of bones used to calculate physical height in life is shown in brackets.

GRAVE GOODS, TOPOGRAPHY AND GRAVE GOODS, DEMOGRAPHY AND GRAVE GOODS

Graves were divided on the basis of their grave goods according to the five-stage classification of Hrubý (1955) and the more general two-stage classification of Stloukal (1970) into rich and poor (Tab. 1 – Appendix). Groups 1 and 2 of the Hrubý classification were taken as rich (Velemínský 2000). Ceramics, an iron knife or earrings (gilded or bronze) were common grave finds. In warrior graves spurs, buckles and iron axes were found. In female graves beads, bronze lunate pendants and tin rings were also deposited. Tools found included clay spindle whorls and iron sickles (Šráčková 1961).

From the topographic point of view the rich graves were unevenly distributed across the whole cemetery, so that no notable concentrations in particular parts of the cemetery were apparent.

In considering the relationship between demography and grave goods it was found that the somewhat "stricter" classification of Hrubý yielded 16 rich graves, of which 7 were male, 4 child, and 1 female, with the remaining 4 cases being burials of indeterminable individuals. The more general classification proposed by Stloukal yielded a further 14 female, 13 child and 6 indeterminate graves. This therefore created a series of 49 rich graves. The Hrubý classification, which separates out the truly richest graves, indicates the probably more significant position of men in the society.

PRESERVATION OF THE SKELETAL MATERIAL

The skeletal remains were relatively poorly preserved, the bones often with disturbed surfaces, the uppermost layer of the compact damaged. As a rule the bones were therefore difficult to evaluate, and often unmeasurable. Only in 14 cases was an undamaged skeleton recovered. In assessing degree of preservation an "index of preservation" (X) was calculated. The computation stems from evaluations of skulls and post-cranial skeletons (see above).

Table 2. Index of skeletal preservation.

	index of preservation		
	XC	XPS	XS
non-adults	1.3	1.1	1.2
adults	1.6	1.7	1.7
male	1.8	1.9	1.9
female	1.8	2.0	1.9

Table 3. Index of skeletal preservation in rich graves.

	index of preservation					
	-rich graves			-other graves		
	XC	XPS	XS	XC	XPS	XS
non-adults	1.4	1.5	1.5	1.3	1.4	1.4
adults	1.3	1.5	1.4			
male	1.6	1.3	1.5	2.3	2.2	2.3
female	1.8	1.8	1.8	1.8	2.0	1.9

XC – index of cranial preservation (XC = NC+++* 3 + NC++ * 2 + NC+ * 1 / NC+++ + NC++ + NC+ + N C=), XPS – index of post-cranial preservation, XS – index of skeletal preservation

From Tables 2 and 3 it can be seen that:

– the skeletons of children are more damaged and less complete than those of adult individuals.
– no differences in the preservation of male and female skeletons were observed.
– the preservation of skulls is slightly worse than that of the post-cranial skeletons.
– in rich male graves the skeletons were less well preserved, children's graves were slightly better, while in women's graves no differences were observed. This is apparently linked to the possible fact that people from the highest social strata (according to Hrubý's classification mainly men) were buried in graves of a construction that created a hollow space (a coffin, roofed pit or panelled pit with ceiling), which hastens both the putrefaction process in soft tissues and the intensity of bone erosion (see e.g. Velemínský 2000).
– the index values of the average state of preservation of bones in this cemetery are comparable to the values obtained at Kostelisko, particularly among non-adult individuals. The skeletal remains of adult individuals at Josefov survive in better condition than those at Mikulčice/Kostelisko. This result is influenced by the better state of preservation of the post-cranial skeletons of women in particular (Tab. 4).

Table 4. Index of skeletal preservation at Josefov and Kostelisko

	index of preservation – Josefov			index of preservation – Kostelisko		
	XC	XPS	XS	XC	XPS	XS
non-adults	1.3	1.1	1.2	1.3	1.1	1.2
adults	1.6	1.7	1.7	1.7	1.4	1.5
male	1.8	1.9	1.9	1.9	1.5	1.7
female	1.8	2.0	1.9	1.7	1.4	1.6

DEMOGRAPHIC ANALYSIS

The primary diagnosis of gender was made on the basis of the morphological characteristics of the pelvis (Brůžek 1991; Brůžek et Ferembach 1992), the shape of the pubis (Phenice 1969), and the general appearance of the pelvic bones (Ferembach et al. 1979); cranial morphological markers (Acsádi et Nemeskèri 1970; Solowiej 1982; Dobisíková 1999) were also employed. Given the insufficient development of sexually diagnostic features and the insufficient reliability of methods, no attempt was made to sex the non-adult skeletons.

Estimates of age at death for non-adults were made by assessing the state of dental cutting through (Ubelaker 1978), the length of the long bones (Stloukal et Hanáková 1978), and the degree of ossification of individual synostoses of skeletal parts (Blajerová 1970;

Table 5a. Representation of individuals of specific age categories (classic ten-years intervals).

	non-adults		male				female				indeterminable				together			
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
pre-natal	3	3.5																
newborns	14	16.3																
infans I	45	52.3																
infans II	16	18.6																
juvenis	8	9.3																
summary	86	100															86	
juv.-adult. I			-				-				-		1	4.0	-		1	1.2
adultus I			2	9.5			3	8.6			-	-			5	6.2		
adultus II			1	4.8	6	28.6	-	-	11	31.4	4	16.0	5	20.0	5	6.2	22	27.2
adultus			3	14.3			8	22.9			1	4.0			12	14.8		
adult.-mat.			-		2	9.5	-		3	8.6	-		2	8.0	-		7	8.6
maturus I			4	19.0			5	14.3			-	-			9	11.1		
maturus II			-	-	9	42.9	4	11.4	13	37.1	6	24.0	8	32.0	10	12.3	30	37.0
maturus			5	23.8			4	11.4			2	8.0			11	13.6		
mat II-sen			-		3	14.3	-		7	20.0	-		2	8.0	-		12	14.8
senilis			-		-	-	-		1	2.9	-		-	-	-		1	1.2
adults ?			-		1	4.8	-		-	-	-		7	28.0	-		8	9.9
summary adults					21	100			35	100			25	100			81	100
summary																	167	

Table 5b. Representation of adult individuals in 15-year intervals.

age	male			female			indeterminable			together adults		
	n	%	%	n	%	%	n	%	%	n	%	%
20-35	3	14.3	1.8	5	14.3	2.9	-		8	9.9	4.8	
35-50	9	42.9	5.4	14	40.0	8.4	7	28.0	4.2	30	37.0	17.8
50+ years	7	33.3	4.2	16	45.7	9.6	5	20.0	2.9	28	34.6	16.7
adults	2	9.5	1.2	-			13	52.0	7.8	15	18.5	8.9
summary	21	100% =21	100% =167	35	100% =35	100% =167	25	100% =25	100% =167	81	100% =81	100% =167

Ferembach et al. 1979; Schwartz 1995). Evaluation of the ages at death of adults is somewhat more problematic, particularly for individuals over 40 years of age. This led the authors to employ not only a classic division into 10-year intervals (adultus (I & II), maturus (I & II), senilis) but also a broader division into 15-year intervals (20–35 years, 35–50 years, above 50 years). The character of the symphyseal plane (Nemeskéri et al., 1960; McKern et Stewart, 1957; Buikstra et Ubelaker, 1994), the state of the facies auricularis on the pelvis (Lovejoy et al. 1985), the state of dental abrasion (Lovejoy 1985) and the character of the sternal ends of the clavicle (Szilvássy 1978) were assessed. Account was also taken of the degree of obliteration of the cranial suture (Ferembach et al. 1979) and the obliteration of specific points on the cranial suture (Meindl et Lovejoy 1985; Dobisíková 1999). Last but not least the overall state of the skeleton was considered, i. e. the degree of degeneratively productive changes in the spine and appendicular joints (Stloukal et Vyhnánek 1976).

From a total assemblage of 176 + 9 graves, 167 individuals were available for anthropological study. Table 5a,b show the basic demographic division of these individuals. Of the 167,86 (51.5 %) were non-adult and 81 (48.5 %) adult individuals. Of the latter, 21 (25.9 %) were male and 35 (43.3 %) female, while for the remaining 25 (30.8 %) it was not possible to determine even a probable sex. Among those of indeterminable gender two cases were borderline male while four were borderline female; in the main, however, this category comprised disturbed, fragmentary remains for which closer identification

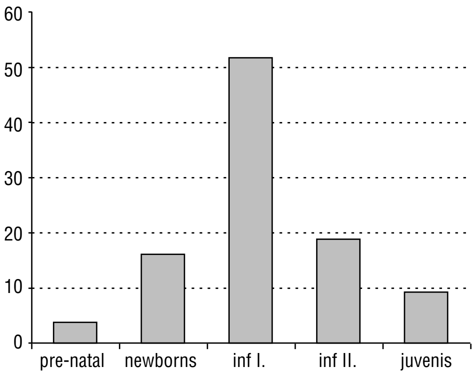


Fig. 2. Representation of non-adult individuals at Josefov

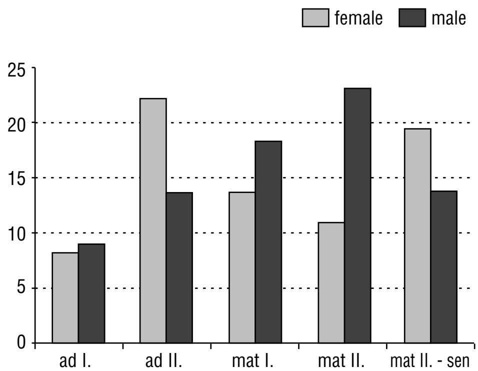


Fig. 3. Representation of adults in ten-years age categories

was practically impossible. Among the non-adults mortality peaked in the infans I stage (0– 6 years) (Fig. 2) – more than two-thirds of the non-adults died in this period. Three individuals were found in an advanced pre-natal state (9^{th} to 10^{th} lunar month). Mortality then declines fairly steeply through the infans II (7–14 years) period to juvenis (15–19 years). From the table it is clear that male mortality rises from the adultus I to maturus stages (the difference between the mature periods being little). Women have a greater mortality rate in the adultus II phase, while again the mature phases are similar in this respect (Fig. 3, 4). Division into broader intervals shows the lowest mortality in the 20–35 year band, while mortality rates in the 35–50 and over 50 intervals are equivalent. This assemblage thus contains an unusually high number of individuals (particularly women) dying at over 50 years of age.

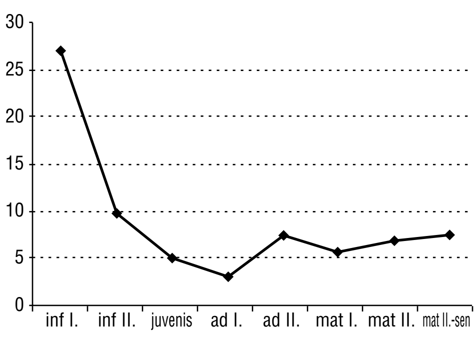


Fig. 4. Mortality curve for the assemblage from Josefov

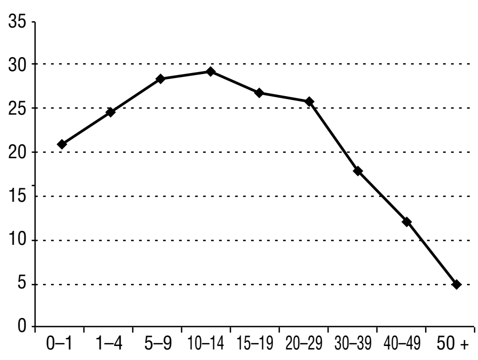


Fig. 5. Changes in the values of mean life expectancy with increasing age among adults

In calculating the size of the group buried in the cemetery the incompleteness of the known data is the first hurdle. Several variant calculations were therefore made. In terms of the size of the excavated area the possibility that 75 % or 50 % of the cemetery been investigated; it was not excavated in its entirety. Given that the assemblage is dated to the second half of the 9^{th} century, it is assumed to have been in use for 50–75 years. On the

Table 6. Mortality table.

age	D_x	d_x	l_x	q_x	L_x	T_x	e_x
0–1	26	18.6	100.0	18.6	90.7	2085.0	20.9
1–4	30	21.4	81.4	26.3	70.7	1994.3	24.5
5–9	15	10.7	60.0	17.8	54.7	1711.5	28.5
10–14	6	4.3	49.3	8.7	47.2	1438.0	29.2
15–19	9	6.4	45.0	14.2	41.8	1202.0	26.7
20–29	5	3.6	38.6	9.3	36.8	993.0	25.8
30–39	12	8.6	35.0	24.6	30.7	625.0	17.9
40–49	11	7.8	26.4	29.5	22.5	318.0	12.0
50 +	26	18.6	18.6	100.0	9.3	93.0	5.0
	140	100.0					
male							
20–29	2	12.5	100.0	12.5	93.8	2500.0	25.0
30–39	3	18.8	87.5	21.5	78.1	1562.0	17.9
40–49	4	25.0	68.7	36.4	56.2	781.0	11.4
50+	7	43.8	43.7	100.0	21.9	219.0	5.0
	16	100.0					
female							
20–29	3	10.0	100.0	10.0	95.0	2568.0	25.7
30–39	7	23.3	90.0	25.9	78.4	1618.0	18.0
40–49	5	16.7	66.7	25.0	58.4	834.0	12.5
50 +	15	50.0	50.0	100.0	25.0	250.0	5.0
	30	100.0					

basis of the all of these calculations it seems most likely that the cemetery served a population group of 90–110 individuals (Tab. 7).

Various other demographic data (taken e.g. from Neustupný 1983, Stloukal 1989, Velemínský 2000) are depicted in Tables 7 et 8. In calculating with these it is necessary to assume that the population was stationary, i. e. no account can be taken of migration, burial in other cemeteries etc. It is necessary to accept a series of compromises and gain merely an average value for the given indicators. For comparison data from the Mikulčice/Kostelisko and other Mikulčice cemeteries are also given (Tab. 8).

The most pronounced difference between Josefov and the other cemeteries can be seen in the dependency index, from which it is evident that the population contained a large

Table 7. Presumed size of the group buried at Josefov.

excavated area of the burial ground	duration of burial ground (years)	presumptive size of populational group		
		Acsadi et Nemeskéri	Gejvall	average size
100 % (=167 individuals)	75	54	44–55	40–55
	50	74	66–83	70–80
75 % (=223 individuals)	75	70	58–73	60–70
	50	98	90–113	90–110
50 % (=334 individuals)	75	101	90–113	90–110
	50	145	134–168	130–170

Table 8. Several further demographic characteristics at the Josefov and Mikulčice cemeteries.

	1	2	3	4
Josefov	2.5	0.4	47.8	1.3
Mikulčice-Kostelisko	4.1	0.33	43.5	0.46
Mikulčice “subcastle”	3	0.29	40.7	0.46
Mikulčice “castle”	2.5	0.21	35.7	0.61

1 – Mortality rate of children in age categories 5-9 and 10–14 years (D5–9/D10–14); 2 – Juvenile index, showing the representation of children aged 5–15 as a proportion of adults (d_5–1_5/d_{20}+); 3 – Crude fertility rate (MP=1/e0); 4 – Dependence index, the ratio of individuals of productive and non-productive age (d_5–d_{15} + d_{50}+/d_{15}–d_{50})

Table 9. Index of masculinity (IM) at the Josefov and Mikulčice cemeteries

burial ground	IM
Josefov	600.0
Mikulčice-Kostelisko	569.4
Mikulčice – "subcastle"	866.7
Mikulčice – "castle"	1243.4

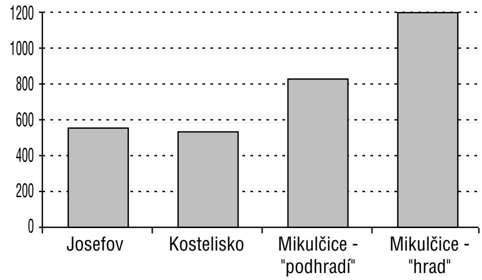


Fig. 6. Values of the masculinity index from the Josefov and Mikulčice cemeteries

proportion of individuals not of productive age, and especially aged over 50; the index value is double that arrived at elsewhere. Josefov also has the highest ratio of children aged 5–15 to adults, and the degree of fertility also attains its highest value here, although in this latter case the differences are not so conspicuous.

Another important indicator reflecting the composition of the population is the index of masculinity (Tab. 9, Fig. 6). At Josefov as at Kostelisko this has a low value. It cannot, of course, be ruled out that this value would increase were the whole cemetery to be excavated and/or the gender to be determined of those individuals where it has thus far been impossible to do so; no great change, however, is expected even in these circumstances. The value matches the character of the cemetery outside the Mikulčice stronghold at Kostelisko.

DEMOGRAPHY AND TOPOGRAPHY

No relationship was found between demography and the topography of the cemetery. Female, male and child graves were irregularly dispersed across the whole of the excavated area, and no group concentrated in a particular part of the cemetery. That said, the assemblage contains a high number of non-adult individuals, and complete excavation of the entire cemetery might show a concentration of child graves in precisely the area uncovered so far.

METRIC CHARACTERISTICS

In assessing the dimensions of the individual bones of the skeleton the authors worked from the definitions given in Kuželka (1999). The majority of the dimensions and indices (categories) were defined or presented by Martin et Saller (1957), and their nomenclature is respected.

Metric markers on the skull

Cranial metric data are taken from the work of Hanáková et Stloukal (1966). Data was obtained from 15 male and 29 female skulls, although in the majority not all dimensions could be measured. The authors employed a basic 17 measurements and 10 indices (Tab. 10, 11). In the post-cranial skeleton 65 dimensions were assessed, isolated on the left and right half of the body (Tab. 12, 13 are given in Appendix). Explanations of the individual measurements are given in the attachment.

Lateral Asymmetry

The evaluations concentrated on the degree of asymmetry between sides in pairs of bones. Verification of the significance of the differences was conducted using a paired t-

Table 10. Basic metric characteristics of male skulls.

Variable	N	Mean	Min.	Max.	Std.Dev.
M1	13	188.4	180	197	5.1
M5	10	105.6	99	111	4.1
M8	13	137.1	131	144	4.2
M9	13	99.2	92	108	4.5
M17	10	138.0	131	146	5.2
M23	13	527.5	512	543	9.9
M38	10	1481.8	1340	1665	99.5
M40	10	99.9	93	105	3.9
M45	11	133.5	128	138	3.4
M47	10	121.2	113	136	6.7
M48	11	71.9	66	81	4.6
M51	11	42.9	40	45	1.4
M52	11	33.1	30	35	1.6
M54	11	25.9	23	28	1.5
M55	11	51.5	46	58	3.7
M66	10	104.9	95	113	5.9
M69	11	35.9	30	43	3.9
I1	13	72.8	68.9	76.7	2.8
I2	10	73.5	68.0	77.6	2.9
I3	10	99.9	92.2	103.7	3.4
I13	13	72.4	67.6	82.4	4.0
I38	10	90.6	83.9	100.7	4.5
I39	11	53.9	50.8	60	3.2
I42	11	77.1	72.1	81.4	3.0
I48	11	50.4	46.4	57.1	3.8
I60	10	94.6	87.7	98.9	3.2

Table 11. Basic metric characteristics of female skulls.

Variable	N	Mean	Min.	Max.	Std.Dev.
M1	17	177.4	166	188	6.8
M5	10	96.5	92	101	3.2
M8	17	133.8	123	140	4.5
M9	22	94.3	85	101	4.4
M17	12	129.2	121	139	4.8
M23	14	504.4	486	530	15.7
M25	1	1340.0	1340	1340	--
M38	10	1283.4	1123	1434	95.2
M40	10	89.2	83	95	3.3
M45	16	123.8	115	130	3.9
M47	17	105.8	97	118	5.6
M48	18	63.2	58	73	3.4
M51	18	40.7	36	45	2.5
M52	18	32.2	29	35	1.6
M54	18	24.1	21	28	1.8
M55	18	46.7	40	53	3.0
M66	14	91.6	82	99	5.2
M69	15	29.1	27	33	1.7
I1	17	75.4	71.1	82.8	3.1
I2	11	72.9	67.7	78.5	3.2
I3	11	96.2	90.7	104.5	3.9
I13	17	69.8	64.9	75.9	2.4
I29	1	89.4	89.4	89.4	--
I38	16	85.9	80.4	96.7	4.1
I39	16	51.4	46.8	59.8	3.2
I42	18	117.0	70.7	752.6	158.7
I48	18	51.8	46	59.6	4.2
I60	10	92.4	87.4	95.6	2.5

Explanations of the individual measurements are given:
M1 – greatest skull length. M5 – length of skull base. M8 – greatest skull width. M9 – minimum forehead width. M17 – skull height. M23 – circumference of the skull. M38 – cranial capacity. M40 – face length. M45 – bizygomatic width. M47 – face height. M48 – height of the upper face. M51 – width of the eye socket.
M52 – height of the eye sockets. M54 – width of the nose. M55 – height of the nose. M66 – bigonial width. M69 – jawline height. I1 – length/width index. I2 – length/height index. I3 – width/height index. I13 – fronto-parietal index. I38 – face index. I39 – upper face index. I42 – eye socket index. I48 – nasal index. I60 – alveolar index.

test. Limiting factors included the insufficient quantity of data, particularly among men, and the poor state of preservation of the skeletal remains. In no case was the minimum statistical requirement of 30 cases (N) met. More statistically significant differences were found among women, where it was always the cases that the dimensions of the bones of the right side of the skeleton were greater than those of bones of the left side (Tab. 14, 15 are given in Appendix):

Men:

– the physiological length of the femur was greater on the right side
– the sagittal diameter of the tibia in the upper foramen nutricium was greater in the bones of the right side
– the greatest circumference of the humerus at the tuberositas deltoidea was in the bones of the left side
– the physiological length of the anklebone was greater on the left side

Women:
– the lower sagittal diameter of the diaphysis of the femur was greater on the left side
– the tibia of the left side had a greater length of central diaphysis and greater width of lower epiphysis
– the tibia of the right side, by contrast, was marked by the greater sagittal diameter of the linea musculi solei
– the humerus of the left side was larger in many measurements – maximum length, greatest circumference at the tuberositas deltoidea, the minimum circumference of the diaphysis, the greatest diameter of the central diaphysis, the smallest diameter of the central diaphysis, the width of the upper epiphysis
– the smallest circumference of the diaphysis of the radius was greatest on the left side
– the ulna of the left side had larger values of these dimensions – maximum length, circumference of the middle diaphysis, sagittal diameter of the diaphysis.

Given the low number of cases (N) only general conclusions can be drawn from the data. A regular cross asymmetry, with the right lower limbs associated with shorter left limbs and vice versa, was not decisively proven.

Sexual dimorphism

The majority of the metric data were also studied with a view of identifying differences between male and female skeletons. From the morphological perspective the male skeletons were medium robust to robust, while the female skeletons were gracile to medium robust in stature. Statistical processing showed pronounced sexual dimorphism. The extent of inter-sexual differences in the skull and post-cranial skeleton were ascertained separately for the left and right sides. To verify the level of significance of the differences t-tests were used. The results are shown in Tables 16, 17 and 18 are given in Appendix. For the cranial dimensions differences at various levels of significance (5 %, 1 % and 0. 1 %) were found in almost all dimensions except the height of the eye sockets (M52). Differences in the values of the index were not as conspicuous. Milder differences were identified in the length/width, width/height, fronto-parietal and facial indices (I1, I3, I13, I38).

The situation was similar in the post-cranial skeleton. The majority of the measurements showed statistically significant differences; exceptions were the clavicle length, the greatest transverse diameter of the head of the humerus and the width of the radial cervix on the left side, and the upper and lower transverse diameters of the femur shaft, the width of the lower tibial epiphysis and the width of the head of the ulna on the right side.

Table 19 shows the average index values obtained converted into categories (Hanáková et Stloukal, 1966), on the basis of which the average appearance of the men and women of Josefov can be characterised.

Men had long skulls (dolichocranial) of medium heigth given their length (orthocra-

Table 19. Diametrical skull characteristics.

index	MALE	FEMALE
I1 length/heigth	dolichocranial	mesocranial
I2 length/width	orthocranial	orthocranial
I3 width/heigth	acrocranial	metriocranial
I13 fronto-parietal	eurymetopic	eurymetopic
I38 face	leptoprosopic	mesoprosopic
I39 upper face	mesenic	mesenic
I42 eye socket	mesoconchial	mesoconchial
I48 nasal	mesorhinal	chamaerhinal

nial), but high given their height (acrocranial). The forehead was wider (eurymetopic), the face tall or of medium heigth (leptoprosopic, mesenic), the eye sockets of medium size (mesoconchial), and the nose medium broad (mesorhinal).

Female skulls were of medium length (mesocranial), of medium height given their length and width (orthocranial, metriocranial), with a wider forehead (eurymetopic), face of medium heigth (mesoprosopic, mesenic), eye sockets of medium heigth (mesoconchial) and with a broad nose (chamaerhinal).

Stature

In calculating the physical height the authors employed Breitinger's (1937) table for men and Bach's (1965) table for women. Heigth based on the length of the femur is regarded as being most authoritative; heights were also calculated on the basis of the humerus and tibia. The average stature extracted from the length values of all the named bones are also given. The values obtained are summarised in Table 20.

Table 20. Stature of men and women from Josefov.

	MALE				FEMALE			
	N	mean	min.	max.	N	mean	min.	max.
Fe. Hu. Ti	12	169.3	164.2	176.6	20	158.6	153.6	163.5
Fe	11	169.3	162.3	176.5	22	160.6	156.5	167.6

STATE OF DENTAL HEALTH

The mapping of the occurrence of dental caries, intra-vital loss and abscesses, the evaluation of degrees of dental polish and the identification of other pathological variations in the teeth or jaws (tartar, parodontitis, retraction of the alveolar arch, hypoplasia of the enamel etc.) can not only bring important information about the state of health of the whole population, but may reflect, e.g. the character of subsistence. The resulting values vary between the sexes and between social groups. Genetic predisposition, which influences the state of dentition to a considerable degree, cannot be perceived by sight, but the state of dental health may be evaluated in dependence on the living conditions and way of life of a particular population, which can be reconstructed or at least guessed at.

The authors concentrated on assessing the appearance of caries and intravital loss, which were evaluated in terms of gender, biological age, jaw type and the types of individual teeth. Information about caries comes from the index of caries frequency F-CE, which expresses the percentage of individuals (or studied skulls) which have dentition which includes at least one instance of decay or intravital loss. A second indicator of the total number of decayed teeth and of the number of alveolae healed after intravital loss is the index of caries intensity I-CE (e.g. Strouhal 1959; Stloukal et Vyhnánek 1976). In assessing the occurrence of intravital loss the third molar, the absence of which can virtually never be safely ascribed to retention or intravital loss.

From the results (Tab. 21, 22) it can be seen that:

- women are afflicted more often than men, which matches the results of other studies and relates particularly to the crisis periods of pregnancy and lactation (see e.g. Hanáková et Stloukal 1987, Stránská 2001);
- women are susceptible to caries and intravital loss even in early adulthood, i. e. between the ages of 20 and 35 years'

Table 21. Frequency of dental caries.

sex and age		n	caries (c)		intrav.loss (i.l.)		c+i.l.		F-CE
			n	%	n	%	n	%	
MALE	20–35	2	-	-	-	-	-	-	-
	35–50	7	-	-	-	-	3	42.9	42.9
	50+	7	-	-	2	28.6	5	71.4	100.0
in total		16	-	-	3	18.8	8	50.0	68.8
FEMALE	20–35	5	2	40.0	-	-	1	20.0	60.0
	35–50	12	1	8.3	2	16.7	5	41.7	66.7
	50+	15	1	6.7	9	60.0	5	33.3	100.0
in total		32	4	12.5	11	34.4	11	34.4	81.3
MALE et FEMALE	20–35	8	2	25.0	-	-	1	12.5	37.5
	35–50	24	1	4.2	4	16.7	8	33.3	54.2
	50+	28	1	3.6	14	50.0	11	39.3	92.9
?		3	-	-	1	33.3	-	-	33.3
in total		63	4	6.3	19	30.2	20	31.7	68.2

Table 22. Intensity of dental caries.

sex and age		preserved	n	c+i.l.	%	I-CE
MALE	20–35	teeth	55	-	-	
		alveolae	64	1	1.6	1.6
	35–50	teeth	99	4	4.0	
		alveolae	127	9	7.1	11.1
	50+	teeth	92	8	8.7	
		alveolae	188	53	28.2	36.9
in total		teeth	246	12	4.9	
		alveolae	379	63	16.7	21.6
FEMALE	20–35	teeth	100	4	4.0	
		alveolae	129	3	2.3	6.3
	35–50	teeth	179	8	4.5	
		alveolae	292	44	15.1	19.6
	50+	teeth	162	7	4.3	
		alveolae	353	113	32.0	36.3
in total		teeth	441	19	4.3	
		alveolae	774	160	20.7	25.0
MALE et FEMALE	20–35	teeth	166	4	2.4	
		alveolae	166	4	2.4	4.8
	35–50	teeth	377	12	3.2	
		alveolae	428	54	12.6	15.8
	50+	teeth	285	16	5.6	
		alveolae	597	196	32.8	38.4
?		teeth	32	-	-	
		alveolae	39	1	2.6	2.6
in total		teeth	860	32	3.7	
		alveolae	1230	255	20.7	24.4

– the frequency of afflicted individuals rises conspicuously with age. After 50 years caries or intravital loss was apparent in every evaluated man and woman (F-CE 100. 0)
– in young adulthood a greater number of teeth were afflicted (by both caries and intravital loss) among women, while among men decayed teeth appear more often after about the 35th year;
– after the 50th year the number of intravital losses rises noticeably, particularly among men (sixfold);
– overall women have more damaged teeth than men, particularly given greater numbers of intravital losses

In assessing inter-jaw differences the following conclusions were arrived at (Tab. 23):

– the maxilla was more often afflicted with dental caries, particularly among men;
– a greater susceptibility to intravital loss was, by contrast, exhibited in the mandible, particularly among women;
– overall, the mandible was afflicted more.

Evaluation of the individual teeth brought the expected results. The front teeth (incisors, canines) are afflicted by caries far less often that the back teeth (premolars, molars). This was true among both men and women (Tab. 23).

Table 23. Dental caries in individual teeth and the jaws.

	teeth	MALE			FEMALE			MALE+FEMALE+?		
		N	N*	%	N	N*	%	N	N*	%
maxilla	I1	19	1	5.3	25	0	0	53	1	1.9
	I2	14	0	0	32	0	0	59	0	0
	C	17	0	0	28	1	3.6	60	1	1.7
	P1	23	2	8.7	23	3	13	78	5	6.4
	P2	24	3	12.5	39	1	2.6	78	4	5.1
	M1	23	2	8.7	42	2	4.8	82	4	4.9
	M2	22	1	4.5	37	1	2.7	74	2	2.7
	M3	16	0	0	27	1	3.7	52	1	1.9
	in total	142	9	6.3	253	9	3.6	531	18	3.4
mandibulae	I1	14	0	0	37	0	0	64	0	0
	I2	16	0	0	36	0	0	62	0	0
	C	22	0	0	39	0	0	78	0	0
	P1	19	0	0	40	0	0	72	0	0
	P2	18	0	0	43	1	2.3	76	1	1.3
	M1	22	1	4.5	55	5	9.1	92	6	6.5
	M2	23	2	8.7	50	3	6	90	6	6.7
	M3	17	0	0	35	2	5.7	62	2	3.2
	in total	151	3	1.9	335	11	3.3	596	15	2.5
	alveolae	MALE			FEMALE			MALE+FEMALE+?		
		N	N**	%	N	N**	%	N	N**	%
maxilla	I1	27	0	0	49	3	6.1	90	4	4.4
	I2	23	0	0	48	2	4.2	88	4	4.5
	C	27	0	0	46	2	4.3	91	2	2.2
	P1	25	5	20	50	6	12	93	11	11.8
	P2	28	2	7.1	47	4	8.5	93	6	6.5
	M1	25	5	20	45	9	20	88	16	18.2
	M2	24	11	45.8	44	11	25	83	22	26.5
	in total	178	23	12.9	329	37	11.2	626	65	10.4
mandibulae	I1	21	0	0	58	4	6.9	94	8	8.5
	I2	20	0	0	58	2	3.4	94	4	4.3
	C	26	0	0	55	4	7.3	100	6	6
	P1	22	1	4.5	55	5	9.1	95	8	8.4
	P2	22	2	9.1	55	15	27.3	95	19	20
	M1	22	11	50	57	34	59.6	94	50	53.2
	M2	23	10	43.5	56	26	46.4	96	40	41.7
	in total	156	24	15.4	394	90	22.8	668	135	20.2

*teeth with car; ** intravial loos.

POSSIBLE EXPRESSION OF PHYSIOLOGICAL LOAD

Two characteristics were assessed in connection with the physiological stress on the organism – cribra orbitalia (eye sockets), hyperostosis porotica (the skull vault) and Harris lines.

Table 24. Occurence of cribra orbitalia.

		N	occurence	%	N	occurence	%
assemblage	occur./individual	96	20	20.8			
	occur./side	167	27	16.2			
sex		male			female		
	occur./individual	14	2	14.3	29	7	24.1
	occur./side	27	2	7.4	52	11	21.2
age	infans	44	7	15.9			
	juvenis	5	2	40			
	adultus	14	5	35.7			
	over 40 years	29	6	20.7			
		non-adults			adults		
		49	9	18.4	47	12	25.5
assymetry of occurence		dx			sin		
		87	16	18.4	80	11	13.8

Cribra orbitalia

These are spongy, mushroom-like areas on the roof of the eye socket. The majority of authors (e.g. Vyhnánek 1999) associate these with an insufficiency of red blood cells in the blood, anaemia. Hyperostosis porotica in the skull vault is similarly interpreted.

The assemblage studied included 96 individuals (greater than half the total) with at least one eye socket surviving. The results of analysis are summarised in Table 24. Cribrous changes were found in 20 individuals (20.8 %), in 7 of these cases (35 %) on both sides. In the expression of the differences related to aspect the frequency of cribra orbitalia was 16.2 %, with a slight prevalence on the right socket (dx. 18.4 %, sin. 13.8 %). The indicator occurs more frequently in women (men 14.3 %, women 24.1 %). It is likely that age leads to the remodelling of the indicator and may even cause the changes to disappear altogether. Earlier studies have as a rule shown a higher occurrence among children (non-adults), but in this assemblage it is greater among mature skeletons (non-adult 18.4 %, adults 25.5 %).

Harris lines

The so-called "Harris lines" are associated with physiological loads. These are transverse or obliquely oriented strengthened zones within the internal structure of the long bone shafts. They appear in the metaphyses, i. e. in the area where the bones grow longitudinally. In this regard they are most often interpreted as the result of short-term interruptions of cessations of growth. This marker was assessed in the tibia by way of X-ray photography (Rose et al. 1991, Vyhnánek et Stloukal 1991). In view of the state of preservation the situation could be assessed in only 27 individuals. A minimum of one Harris line appeared in four-fifths of these individuals, irrespective of the side to which the bone belonged. Lines were only occasionally formed asymmetrically. Statistically demonstrable differences appear when the presence of Harris lines on the proximal and distal parts of the tibia are compared; around three-quarters of the bones have Harris lines in their lower section, while Harris lines appear in the upper half in a quarter of the cases (Tab. 25).

The number of Harris lines corresponds to this (Grolleau-Raoux et al. 1997). In the upper half of the tibia Harris lines do not appear in two-thirds of cases, but where they are present there are never more than four. The situation was more or less the opposite in the lower half: not quite two-thirds of cases have at least one Harris line present, and more than four Harris lines were found in the lower tibia only in two non-adult individuals (Tab. 26).

Table 25. Appearance of Harris lines in the population groups from Josefov.

	N	HL	%		N	HL	%	chí-quadrat test	
χ^2								χ^2	p
HL/individ.	25	20	80.0						
Ti_{dx}	25	18	72.0	Ti_{sin}	27	19	70.4	0	0.9576
pd Ti_{dx}	24	6	25.0	dd. Ti_{dx}	25	18	72.0	*3.83*	0.0505
pd. Ti_{sin}	27	7	25.9	dd. Ti_{sin}	27	19	70.4	*3.82*	0.0505
pd. Ti_{dx+sin}	24	7	29.2	dd. Ti_{dx+sin}	25	20	80.0	*3.83*	0.0503

dx.sin= respectively the right (dexter) or left (sinister) tibia. pd = proximal part of the tibia shank. dd = distal part of the tibia shank. N = number of evaluated individuals or bones. HL = Harris lines present. % = percentage occurence. the last column verifies the differential occurence of Harris lines in the upper and lower tibia by means of a Chi-quadrat test. where p = level of significance and values in italics are statically significant

Table 26. Individual numbers of Harris lines in the proximal and distal parts of tibia.

		number of HL						
		group	0		1–4		over 5	
		N	N	%	N	%	N	%
dx	pd Ti	24	17	70.8	7	29.2	0	
	dd Ti	25	7	28.0	16	64.0	2	8.0
sin	pd Ti	26	19	73.1	7	26.9	0	
	dd Ti	25	7	28.0	16	64.0	2	8.0
individual	pd Ti	24	16	66.7	8	33.3	0	
	dd Ti	25	4	16.0	19	76.0	2	8.0
	the comparison of the frequencies HL in pd or dd	χ^2	5.61	χ^2	2.67	χ^2	0.41	
		p	0.0179	p	0.102	p	0.5237	
	the comparison of the group 2 and 3					χ^2	5.11	8.64
						p	0.0238	0.0033

See legend to table 25. the last row again shows the verification of the differential representation of Harris lines in the upper and lower parts of the tibia

Sexual differences in the occurrence of Harris lines are not pronounced (5 men, 7 women). Among men Harris lines are present only in the lower part of the tibia. The differential occurrence of Harris lines in particular age categories could not be evaluated. If the period of the appearance of Harris lines is considered (Byers 1991, Hanáková et Stloukal 1978), then it is apparent that no period exists in which the individuals were subjected to non-specific stress events (Tab. 27), unlike the case of dental hypoplastic defects which concentrate in the narrow period of childhood. The appearance of Harris lines occurs throughout ontogenesis. The greatest number of Harris lines appear between the 9th

Table 27. Division of Harris lines by the period of their appearance.

age	tibie	proximal part	distal part
untill 1 year	15	8	7
1–3	12	5	7
3–5	7	1	5
5–7	9	2	7
7–9	10	0	10
9–12	22	4	18
12–15	9	2	7
infans I	43	17	26
infans II	41	6	35

Table 28. Contemporaneus appearance of Harris lines on the proximal and distal parts of the tibia in children and adults.

	adults	children
agreement (+/+)	5	5
disagreement (-/+)	10	5
disagreement (+/-)	0	0

+/+ = Harris lines appear on both halves,
-/+ = Harris lines appear only on the distal part of the shank,
+/- = Harris lines appear only on the proximal part of the shank

and 20th year of life. On the other hand, stress events occur less frequently among children between their 3rd and 5th years. This situation may be affected by the “obliteration” of Harris lines. Hypoplasia of the enamel, by contrast, occurs most often in the first years of life (Trefný et Velemínský 2001).

Among those individuals who died in childhood the occurrence of Harris lines in both halves of the bone and their occurrence only in the lower tibia are represented evenly. Among adults Harris lines appear twice as often in the lower part of the tibia. There was no instance in which Harris lines had been created only in the proximal part of the tibia (Tab. 28). This more or less accords with the conclusions of research into the Mikulčice population groups (170 individuals), where the occurrence of Harris lines only in the lower bone among adults predominated while among children’s skeletons it was the concurrent appearance of Harris lines at both ends of the bone that was predominant (Velemínský 2000).

The interpretation of the results obtained from the skeletons buried at Josefov will, given their value as evidence, be undertaken within the framework of a summary processing of the Great Moravian series.

POSSIBLE EXPRESSIONS OF PHYSICAL LOAD

Three characteristics reflecting the locomotory system and the physical strains on the population group were considered. The degree of degeneratively productive changes in the spine and joints of the appendicular bones, as well as the development of particular areas of muscular or ligamentous attachment (entesopathy) were studied. The tow former indicators in particular correlate with age, which must be borne in mind during evaluation.

Degeneratively productive changes in the spine

The aim of evaluating spondylosis was to ascertain its frequency among the Josefov population, and to judge the correlation with age or greater physical loads on a particular part of the spine. At the same time inter-sexual differences were identified and the extent of affliction compared between groups of individuals from graves with a rich inventory and the rest of the population. Given the low representation of men, this was only possible for women.

The classification of Vyhnánek et Stloukal (1971) was used in the investigation. The upper and lower surfaces of the vertebrae were assessed separately. With a view to comparison, a “mean spondylosis value” was calculated. The results show a predominantly mild to medium degree of affliction of the vertebrae. The vertebrae of the lower pectoral and upper lumbar regions were most afflicted, with the third and fourth degrees of spondylotic change being encountered. Bridging osteophytes were not observed. There were no conspicuous differences between the sexes in the overall evaluation, but differences were found between different spinal sections. Men were most afflicted in the middle and lower parts of the cervical spine, with exceptions being the second cervical and first cruciform vertebrae. At the same time, the last two pectoral and first two lumbar vertebrae showed a high degree of affliction. Among women, on the other hand, affliction of the upper cervical and almost the whole pectoral spine predominated slightly, with more conspicuous differences recorded in the central and lower lumbar spine (Tab. 29). The correlation with age was confirmed. We cann’ t take into account the potential dissimilar age-structure of men and females because of lower number of evaluated individuals. It is known us that this informations can be misrepresent by this fact. . In early adulthood the

Table 29. Mean values of spondylosis in individual section of the spine among men and women.

	male	female	adults
C 1–3	1.22	1.28	1.20
C 4–6	1.30	1.09	1.15
C 7–Th 2	1.19	1.05	1.10
Th 3–Th 5	1.15	1.19	1.30
Th 6–Th 8	1.21	1.26	1.26
Th 9–Th 11	1.26	1.28	1.32
Th 12–L 2	1.29	1.19	1.38
L 3–L 5	1.41	1.58	1.58

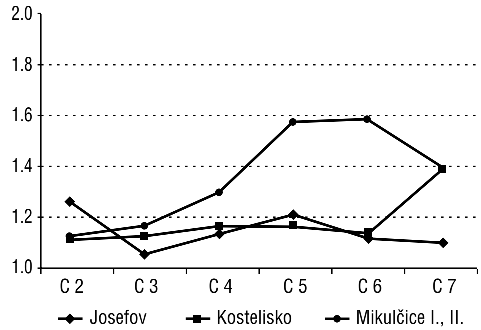


Fig. 7. Comparison of the occurence of spondylosis at various sites - neck region

affliction appeared only exceptionally, rising through the later age categories. These results more or less confirm the conclusion drawn by other studies (e.g. Vyhnánek et Stloukal 1976, Velemínský 2000) that degenerative changes appear as a rule after the 30th year of life has been attained. In the Josefov material the following years see a marked increase in affliction of the whole spine, particularly the lumbar and pectoral regions (see e.g. Stloukal et Vyhnánek 1976) (Tab. 30). While the authors wished to study whether there were differences in the individuals from rich graves, even using the criteria of Stloukal (1970) there were very few such “rich” graves. For men no such comparison could be undertaken. The women (N=7) from rich graves (Stloukal, 1970) are afflicted far less than women from other graves (Tab. 31).

Table 30. Mean values of spondylosis in individual vertebrae in various age categories (men and women taken together). For each vertebra. first row – superior surface, second row – inferior surface

	20–35 years		35–50 years		over 50 years			20–35 years		35–50 years		over 50 years	
	N	X	N	X	N	X		N	X	N	X	N	X
C 2	4	1.00	9	1.22	13	1.15	7	3	1.00	8	1.00	12	1.58
3	4	1.00	10	1.00	13	1.15		3	1.00	7	1.00	12	1.16
	4	1.00	10	1.10	13	1.07	8	3	1.00	8	1.12	12	1.41
4	4	1.00	12	1.25	15	1.26		3	1.00	7	1.28	12	1.41
	4	1.00	12	1.08	13	1.23	9	3	1.00	7	1.14	11	1.45
5	4	1.00	9	1.11	14	1.28		3	1.00	6	1.00	11	1.45
	4	1.00	12	1.08	14	1.42	10	3	1.00	6	1.00	11	1.54
6	3	1.00	9	1.00	13	1.30		3	1.00	6	1.00	10	1.30
	3	1.00	10	1.10	13	1.23	11	3	1.00	6	1.16	9	1.44
7	3	1.00	11	1.09	13	1.38		3	1.00	7	1.00	9	1.77
	3	1.00	10	1.00	14	1.14	12	3	1.00	9	1.00	11	1.72
Th 1	2	1.00	9	1.00	9	1.22		3	1.33	8	1.00	12	1.25
	2	1.00	10	1.10	10	1.10	L 1	3	1.33	9	1.00	11	1.45
2	2	1.00	10	1.00	12	1.16		3	1.00	8	1.00	11	1.36
	2	1.00	11	1.00	11	1.18	2	3	1.00	10	1.40	10	1.50
3	2	1.00	9	1.11	10	1.10		3	1.00	12	1.08	11	1.54
	2	1.00	11	1.00	11	1.45	3	2	1.00	10	1.20	13	1.76
4	2	1.00	8	1.00	11	1.27		2	1.00	10	1.00	14	1.42
	2	1.00	8	1.00	12	1.41	4	2	1.00	10	1.10	11	2.45
5	3	1.00	8	1.00	11	1.27		2	1.00	9	1.44	14	1.57
	3	1.00	9	1.11	12	1.50	5	2	1.00	9	1.33	13	1.76
6	3	1.00	7	1.00	12	1.25		1	1.00	9	1.44	12	1.83
	2	1.00	7	1.00	12	1.50	S 1	2	1.00	11	1.27	12	1.91

Table 31. Mean values of spondylosis in women from rich graves (RG) and other graves (OG)

	female	
	RG	OG
C 1–3	1.04	1.33
C 4–6	1.00	1.23
C 7–Th 2	1.00	1.10
Th 3–Th 5	1.09	1.28
Th 6–Th 8	1.10	1.18
Th 9–Th 11	1.23	1.31
Th 12–L 2	1.09	1.39
L 3–L 5	1.35	1.78

Table 32. Mean values of arthrosis (X) in individual joints among men and women.

		A	M	F
joint	side	$\bar{\chi}$	$\bar{\chi}$	$\bar{\chi}$
shoulder	dx	1.6	1.7	1.5
	sin	1.6	1.6	1.4
ulnar	dx	1.2	1.3	1.2
	sin	1.2	1.2	1.2
forearm	dx	1.3	1.1	1.3
	sin	1.2	1.2	1.2
forearm/wrist	dx	1.1	1.0	1.2
	sin	1.2	1.3	1.1
iliac	dx	1.7	1.8	1.7
	sin	1.7	1.8	1.6
knee	dx	1.1	1.1	1.1
	sin	1.1	1.1	1.2
crus/ metatarsus	dx	1.0	1.0	1.0
	sin	1.0	1.0	1.0
metatarsus calcan. /talus/navicul.	dx	1.1	1.1	1.1
	sin	1.2	1.3	1.0

From the point of view of the appearance of spondylosis the Josefov population was compared to those from the Mikulčice cemeteries (Fig. 7, 8, 9). The people buried at Josefov showed slightly greater spinal damage than those from the Mikulčice/Kostelisko cemetery, particular in the cervical section of the spine. At the other Mikulčice cemeteries (I et II) of course the skeletons had on average more pronounced degenerative changes to the spine. The population group from Josefov is thus in this sense closer to the Kostelisko cemetery.

Degeneratively productive changes in the major joints

The approach adopted to the evaluation of arthritic changes to the larger joints was similar to that adopted for spondylosis. A mean value of arthrosis was calculated and its values compared relative to age and gender. At the same time emphasis was placed on the variations in individuals with rich grave inventories. The method used was based on the classification of Stloukal et Vyhnánek (1975). Appendicular joints were not as a rule afflicted, and if so the arthrosis was mild. More pronounced arthritic changes (3rd and 4th degrees) were not observed. The shoulder and iliac joints were most often afflicted, while in men the mean value of arthrosis of slightly higher. As regards low quantity of men it wasn’t take into account the age distribution of both sexes (Tab. 32). Once again a positive correlation was confirmed between the presence (intensity) of degenerative changes

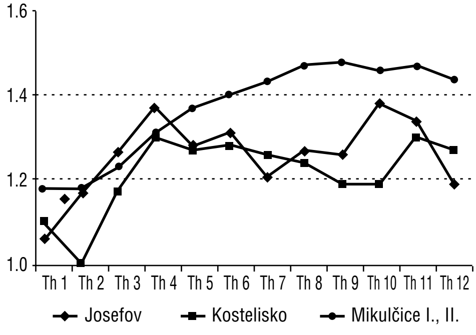


Fig. 8. Comparison of the occurence of spondylosis at various sites - pectoral region

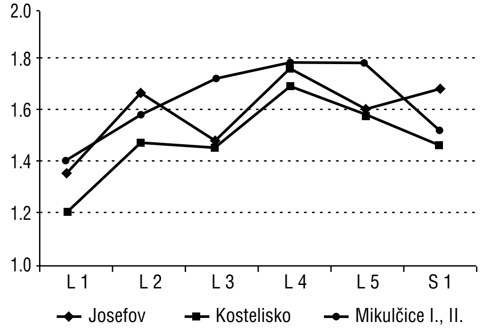


Fig. 9. Comparison of the occurence of spondylosis at various sites - lumbar region

and age. In younger individuals (20–35 years) arthritic changes appeared only occasionally, and then in the shoulder and iliac joints. Among older individuals (over 35 years) the affliction of other joints occurred, increasing with age.

In assessing the differences relative to the character of the grave inventories it was again necessary to work with small numbers. Differences, not especially pronounced, were found, in general in favour of those individuals from rich graves. An exception was the arthrosis of the ulnar joint and forearm, which were afflicted in a greater number of individuals from rich graves (Tab. 33).

Table 33. Mean values of arthrosis (X) for individuals from rich graves.

		rich graves						other graves					
			1		2				1		2		
joint	side	N	N	%	N	%	X	N	N	%	N	%	X
shoulder	dx	8	5	62.5	3	37.5	1.4	26	10	38.5	16	61.5	1.6
	sin	10	8	80.0	2	20.0	1.2	26	10	38.5	16	61.5	1.6
ulnar	dx	8	7	87.5	1	12.5	1.3	23	18	78.3	5	27.8	1.2
	sin	8	6	75.0	2	25.0	1.3	23	19	82.6	4	21.1	1.2
forearm	dx	8	5	62.5	3	37.5	1.8	20	16	80.0	4	20.0	1.2
	sin	7	6	85.7	1	14.3	1.3	22	17	77.3	5	22.7	1.6
forearm/wrist	dx	7	6	85.7	1	14.3	1.1	24	21	87.5	3	12.5	1.1
	sin	9	9	100			1.0	24	19	79.2	5	20.8	1.2
iliac	dx	16	7	43.8	9	56.3	1.6	25	5	20.0	20	80.0	1.8
	sin	12	6	50.0	6	50	1.5	27	5	18.5	22	81.5	1.7
knee	dx	14	13	92.9	1	7.1	1.1	25	21	84.0	4	16	1.2
	sin	11	10	90.9	1	9.1	1.1	26	23	88.5	3	11.5	1.1
crus/metatarsus	dx	12	12	100			1.0	24	24	100			1.0
	sin	12	12	100			1.0	21	21	100			1.0
metatarsus	dx	15	14	93.3	1	6.7	1.1	22	18	81.8	4	18.2	1.2
calc./tal/navic.	sin	16	16	100	0		1.0	24	17	70.8	7	29.2	1.3

Enthesopathy

In connection with long-term, excessive load on several parts of the locomotory system, “enthesopathies” (from enthesis – attachment) may appear on bones at the points of attachment of tendons, ligaments or articular sheaths. These are in the main bone lesions resulting from local insufficiencies of oxygenated blood supply, caused by the excess load on the attachment. Secondarily this may lead to an inflammatory process; healing follows and on the attachment point erosion and periostal apposition may occur. In addition to these primary, isolated enthesopathies, the appearance of which is determined by the aforementioned mechanical, usually repeated long term load on the muscle, there also exist secondary enthesopathies which are caused by inflammatory, rheumatic illnesses. The appearance of lesions may also be induced by traumatisation, or be associated with, for example, metabolic or endocrine disorders or degenerative changes in the joints (Trnavský et Kolařík 1997). In many cases the aforementioned changing age and genetic potential of individuals or population groups also plays a role. In the skeletons studied the character was considered of around 20 areas of muscular or ligamentous attachment:

– tuberculum infraglenoidale scapulae and olecranon ulnae (attachment area of the m. triceps brachii)
– tuberculum supraglenoidale scapulae and tuberositas radii (attachment area of the m. biceps brachii)

Table 34. The occurence of enthesopaties among adults at Josefov (Crubezy 1988).

	male									female									adults								
		1		2		3		4			1		2		3		4			1		2		3		4	
	N	N	%	N	%	N	%	N	%	N	N	%	N	%	N	%	N	%	N	N	%	N	%	N	%	N	%
tuberculum	8	1	12.5	1	12.5	6	75.0	-	-	15	1	6.7	8	53.3	5	33.3	1	6.7	24	2	8.3	10	41.7	11	45.8	1	4.2
infraglenoidale	11	1	9.1	6	54.5	4	36.4	-	-	13	1	7.7	10	76.9	2	15.4	-	-	25	2	8.0	17	68.0	6	24.0	-	-
olecranon	10	-	-	5	50.0	4	40.0	1	10.0	8	-	-	5	62.5	3	37.5	-	-	18	-	-	10	55.5	7	38.9	1	5.6
	10	-	-	6	60.0	3	30.0	1	10.0	13	2	15.4	6	46.2	4	30.8	1	7.7	24	2	8.3	12	50.0	8	33.3	2	8.3
tuberculum	11	8	72.7	3	27.3	-	-	-	-	21	15	71.4	6	28.6	-	-	-	-	33	23	69.7	10	30.3	-	-	-	-
supraglenoidale	11	5	45.5	6	54.5	-	-	-	-	15	8	53.3	7	46.7	-	-	-	-	27	13	48.1	14	51.9	-	-	-	-
tuberositas radii	9	-	-	4	44.4	4	44.4	1	11.1	15	3	20.0	5	33.3	5	33.3	2	13.3	26	3	11.5	10	38.5	10	38.5	3	11.5
	10	-	-	5	50.0	4	40.0	1	10.0	16	2	12.5	9	56.3	4	25	1	6.3	28	2	7.1	15	53.6	9	32.1	2	7.1
acromion-spina	6	-	-	2	33.3	4	66.7	-	-	9	2	22.2	5	55.6	2	22.2	-	-	16	2	12.5	8	50.0	6	37.5	-	-
scapulae	8	-	-	5	62.5	3	37.5	-	-	11	3	27.3	6	54.5	2	18.2	-	-	19	3	15.8	11	57.9	5	26.3	-	-
clavicula	11	-	-	4	36.4	6	54.5	1	12.5	20	2	10.0	12	60.0	6	30.0	-	-	32	2	6.3	16	50.0	13	40.6	1	3.1
	10	1	10.0	2	20.0	6	60.0	1	10.0	19	2	10.5	10	52.6	6	31.6	1	5.3	32	3	9.4	13	40.6	13	40.6	3	9.4
tuberositas deltoidea	10	2	20.0	4	40.0	3	30.0	1	10.0	25	6	24.0	16	64.0	2	8.0	1	4.0	36	8	22.2	21	58.3	5	13.9	2	5.6
	10	1	10.0	6	60.0	2	20.0	1	10.0	22	6	27.3	14	63.6	2	9.1	-	-	33	7	21.2	21	63.6	4	12.1	1	3.0
clavicula	10	2	20.0	7	70.0	1	10.0	-	-	22	7	31.8	15	68.2	-	-	-	-	34	9	26.5	24	70.6	1	2.9	-	-
	10	2	20.0	6	60.0	2	20.0	-	-	23	12	52.2	10	43.5	1	4.3	-	-	37	14	37.8	20	54.1	3	8.1	-	-
crista tuberculi	11	-	-	5	45.5	4	36.4	2	18.2	22	6	27.3	10	45.5	6	27.3	-	-	35	6	17.1	16	45.7	11	31.4	2	5.7
majoris	11	2	18.2	4	36.4	4	36.4	1	9.1	21	4	19.0	9	42.9	8	38.1	-	-	33	6	18.2	13	39.4	13	39.4	1	3.0
margo lateralis	6	-	-	1	16.7	2	33.3	3	50.0	10	2	20.0	4	40.0	4	40.0	-	-	18	2	11.1	6	33.3	7	38.9	3	9.1
	9	-	-	4	44.4	3	33.3	2	22.2	15	2	13.3	7	4/6.7	5	33.3	1	6.7	25	2	8.0	11	44.0	9	36.0	3	12.0
crista tuberculi	10	2	20.0	6	60.0	2	20.0	-	-	24	11	45.8	9	37.5	4	16.7	-	-	35	13	37.1	16	45.7	6	17.1	-	-
minoris	11	2	18.2	6	54.5	3	27.3	-	-	21	11	52.4	7	33.3	3	14.3	-	-	34	13	38.2	15	44.1	6	17.6	-	-
tuberositas ulnae	10	2	20.0	4	40.0	4	40.0	-	-	17	3	17.6	8	47.1	5	29.4	1	5.9	29	5	17.2	13	44.8	10	34.5	1	3.4
	12	1	8.3	7	58.3	4	33.3	-	-	17	3	17.6	9	52.9	4	23.5	1	5.9	31	4	12.9	18	58.1	8	25.8	1	3.2
crista m. supinatoris	10	-	-	5	50.0	5	50.0	-	-	14	3	21.4	6	42.9	5	35.7	-	-	26	3	11.5	12	46.2	11	42.3	-	-
	9	-	-	4	44.4	5	55.6	-	-	17	3	17.6	10	58.8	4	23.5	-	-	28	3	10.7	15	53.6	10	35.7	-	-
crista (fossa)	9	-	-	5	55.6	4	44.4	-	-	5	-	-	2	40.0	3	60.0	-	-	17	-	-	9	52.9	8	47.1	-	-
intertrochanterica	9	-	-	5	55.6	4	44.4	-	-	5	1	20.0	2	40.0	2	40.0	-	-	15	1	6.7	8	53.3	6	40.0	-	-
linea aspera	13	1	7.7	6	46.2	4	30.8	2	15.4	24	4	16.7	10	41.7	#	41.7	-	-	42	5	11.9	19	38.8	16	38.1	2	4.8
	13	3	23.1	4	30.8	5	38.5	1	7.7	24	5	20.8	14	58.3	5	20.8	-	-	43	8	18.6	21	48.8	13	30.2	1	2.3
crista	12	-	-	4	33.3	6	50.0	2	16.7	18	2	11.1	8	44.4	8	44.4	-	-	35	2	5.7	15	42.9	16	45.7	2	5.7
hypotrochanterica	12	-	-	6	50.0	3	25.0	3	25.0	23	6	26.1	8	34.8	9	39.1	-	-	37	6	16.2	15	40.5	13	35.1	3	8.1
tuberositas tibiae	10	2	20.0	5	50.0	3	30.0	-	-	20	5	25.0	12	60.0	3	15.0	-	-	31	7	22.6	18	58.1	6	19.4	-	-
	11	2	18.2	6	54.5	2	18.2	1	9.1	18	3	16.7	15	83.3	-	-	-	-	29	5	17.2	21	72.4	2	6.9	1	3.4
tendon quadricipitalis	10	2	20.0	4	40.0	1	10.0	1	10.0	18	5	27.8	9	50.0	1	5.6	3	15.0	26	7	26.9	13	50.0	2	7.7	4	15.4
	7	-	-	6	85.7	-	-	1	14.3	16	6	37.5	7	43.8	-	-	3	18.8	24	6	25.0	14	58.3	-	-	4	16.7

	male									female									adults								
		1		2		3		4			1		2		3		4			1		2		3		4	
	N	N	%	N	%	N	%	N	%	N	N	%	N	%	N	%	N	%	N	N	%	N	%	N	%	N	%
ala ossis ilium	9	-	-	6	66.6	2	22.2	1	11.1	15	1	6.7	11	73.3	3	20.0	-	-	26	1	3.8	19	73.0	5	19.2	1	3.8
	10	3	30.0	1	10.0	6	60.0	-	-	17	2	11.8	12	70.6	2	11.8	1	5.9	29	5	17.2	15	51.7	8	27.6	1	3.4
tuberositas glutea	11	1	9.1	4	36.4	5	45.5	1	9.1	14	1	7.1	6	42.9	7	50.0	-	-	27	2	7.4	12	44.4	12	44.4	1	3.7
	10	-	-	7	70.0	2	20.0	1	10.0	12	3	25.0	6	50.0	3	25.0	-	-	24	3	12.5	14	58.3	6	25.0	1	4.2
linea m.solei	9	-	-	7	77.8	5	55.6	-	-	22	4	18.2	12	54.5	6	27.3	-	-	38	4	10.5	21	55.3	13	34.2	-	-
	12	-	-	9	75.0	2	16.7	1	8.3	18	1	5.6	10	55.6	7	38.9	-	-	33	1	3.0	20	60.6	11	33.3	1	3.0
dist.part of the Fi	8	-	-	3	37.5	5	62.5	-	-	11	1	9.1	3	27.3	6	54.5	1	9.1	20	1	5.0	7	35.0	11	55.0	1	5.0
	7	-	-	4	57.1	2	28.6	1	14.3	10	1	10.0	3	30.0	5	50.0	1	10.0	17	1	5.9	7	41.2	7	41.5	2	11.8
tuber calcanei	8	-	-	2	25.0	2	25.0	4	50.0	13	1	7.7	6	46.2	6	46.2	-	-	22	1	4.5	9	40.9	8	36.4	4	18.2
	7	-	-	1	14.3	2	28.6	4	57.1	7	1	14.3	1	14.3	4	57.1	1	14.3	15	1	6.7	3	20.0	6	40.0	5	33.3

– acromion – spina scapulae, clavicula and tuberositas deltoidea (attachment area of the m. deltoideus)
– clavicula and crista tuberculi majoris (attachment area of the m. pectoralis major)
– margo lateralis scapulae and crista tuberculi minoris (attachment area of the m. teres minor)
– tuberositas ulnae (Ul) (attachment area of the m. brachialis)
– crista m. supinatoris (Ul) (attachment area of the m. supinatoris)
– linea aspera (Fe), crista hypotrochanterica (Fe), tuberositas tibiae (Ti), sulcus quadricipitalis (Ti) and tendo quadricipitalis (Pa) (attachment area of the m. quadriceps femoris)
– ala ossis ilium (Co) and tuberositas glutaea (Fe) (attachment area of the m. glutaeus maximus)
– linea m. solei (Ti) (attachment area of the m. soleus)
– the distal part of the shaft of the fibula (attachment area of the lig. tibiofibulare anterius et posterius)
– tuber calcanei (attachment area of the tendo Achillis, m. adductor hallucis)

Evaluation followed the four-stage classification of Crubèzy (1990); 1 – area without change; 2 – mild lesion (c. 1 mm); 3 – clear lesion (1–4 mm); 4 – extensive lesion (over 4 mm). The character of the changes in the related parts of the bone – representing individual stages – for the population group from Josefov is shown in Table 34. From the summary data it is clear that the assemblage is dominated by bones which have enthesopathies in the majority of the assessed areas. As a rule these are mild or clear lesions. No differences between sexes are obvious, and if they exist at all then generally it is male skeletons which bear the most obvious changes. This fact may also be influenced, however, by the low number of assessable skeletons. Some markers could be assessed in only a few individuals. For the same reason the appearance of enthesopathic changes by age group is not given, although a correlation between lesion development and increasing age seems likely. The areas in which the changes are generally most apparent are the tuberositas radii, the attachment area of the deltoid muscle on the clavicle, the crista tuberculi majoris on the humerus, the crista tuberculi supinatoris of the ulna, the linea aspera, the crista hypotrochanterica, the tuberositas glutea on the femur, the linea musculi solei on the tibia, and the lower part of the shank of the calf bone, to which the anterior and posterior suratibial muscles or tuber calcanei

Table 35. Diametrical characteristics of the femur.

categories	male		female		summary	
	N	%	N	%	N	%
hyperplatymeric	1	7.1	16	47.1	17	35.4
platymeric	8	57.1	17	50	25	52.1
eurymeric	6	42.9	1	2.9	7	14.6
stenomeric	-		-		-	
summary	14	100	34	100	48	100

attach. The sulcus quadricipitalis, which is joined to the attachment area of the four-headed femoral muscle on the tibia, occurred in 69 % of the individuals.

From the well developed muscular relief of the majority of adult skeletons it can be assumed that the people of Josefov had, as a rule, well developed muscular/locomotory systems. This may be linked to their performing physically demanding activities. The genetic basis of the population would also naturally play a role.

Index platymericus and knemicus

Excessive physical load on several muscle groups is associated with the flattening of the bodies of several bones (Turner 1887). The authors concentrated on assessing the femur and tibia. In the upper part of the femur are those muscles associated with pulling the thigh, while the upper third of the tibia is the attachment area of the peroneus muscle and several movers of the foot (Velemínský 2000). It is presumed that an increase in muscle load leads to an expansion of the attachment area.

The values of the sagittal flattening of the upper third of the femur were studied in 14 male bones and 34 female bones (left and right together). In both sexes the platymeric category predominated, in which the femur has clear sagittal flattening on the proximal part of the shaft. Among women, however, the hyperplatymeric category also appeared often, while a number of men had no demonstrable bone flattening – eurymeria (Tab. 35).

Similarly, a knemic index was also calculated. Among men mesoknemia (a slight flattening) predominated, while euryknemia (no demonstrable flattening) occurred often. Among women euryknemia predominated and mesoknemia was also frequent. In one case a strongly flattened tibia was identified (hyperplatyknemia) (Tab. 36).

PALAEOPATHOLOGICAL FINDS

Degeneratively productive changes to the spine of the highest degree were identified in the lumbar vertebrae of an old individual from grave 13 Z (Pl. I., fig. 1) and an older male from grave 170, and in the lumbosacral passage (L4-S1) of an old woman from grave 76 (Pl. I., figs 2a, b). Spondylolysis of the L4 vertebra was also identified in the skelet on from grave 13 Z (Pl. I., fig. 3). This anomaly also appears in the L5 vertebra of the adult woman from grave 79a (Pl. I., fig. 4). Porotic reduction was present in two unfortunately poorly preserved lumbar vertebrae of the older woman from grave 134. A compressive fracture of the L4 with subsequent adaptive deformation in the L5 vertebra was identified in the older man from grave 137.

Advanced arthritic changes to the joints of the limbs appear in only a few individuals. The arthrosis of both elbows is apparent in the old woman from grave 90. Arthritic changes to the joint surfaces of the proximal end of the ulna and the head of the radius on both sides were found in another older woman from grave 76, whose right radius had

Table 36. Diametrical characteristics of the tibia.

categories	male		female		summary	
	N	%	N	%	N	%
hyperplatyknemic	-	-	1	2.9	1	1.9
platyknemic	2	11.8	7	20.6	9	17.6
mesoknemic	9	52.9	12	35.3	21	41.2
euryknemic	6	35.3	14	41.2	20	39.2
summary	17		34		51	

moreover clearly been fractured in its lower third. Degenerative changes are also present in the joint surfaces of the distal end of the right humerus in this individual (Pl. I., fig. 5).

Synostosis of the os metatrsus I with the os cuneiforme mediale was found in an older male (grave 137).

Arthritic changes to the temporo-mandibular joint, particularly clear at the mandibular capitulum, occur in several individuals. In the older woman from grave 144 the changes are present on the left mandibular capitulum (with conspicuous osteophytes), while arthrosis of the temporo-mandibular joint is clear on the right side in the older woman from grave 163. Changes to the mandibular capitulum are present on both sides in the adult male from grave 78 (Pl. II., figs 6a, b, c) and the older male from grave 137.

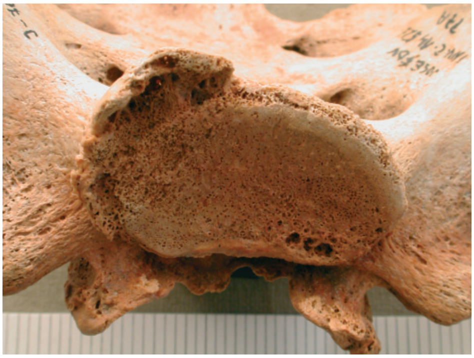
Changes in the character of periostitis are present on the inner surface of the brain case of the young woman from grave 83 on the eminentia cruciformis of the occipital bone and parasagittally on both parietal bones and on the os frontale (Pl. II., figs 7a, b). The left orbit of the young child (c. 1.5 years) from grave 124, which is somewhat smaller than that the right, shows inflammatory changes – this probably represents the state after loss of the eye, perhaps due to infection – with subsequent asymmetry of the growth of the eye sockets. Both parietal bones of this individual also show the presence of *hyperostosis porotica* (Pl. II., figs 8, 9).

A fractured rib was found in the adult male from grave 105. The older woman from grave 116 clearly had a fractured fifth right metacarpal, while the distal part of the right radius has fractured in the adult woman from grave 79a (Pl. II., fig. 10). The older man from grave 23 was recorded as having had a fractured right clavicle.

The skull of an older man from grave 34 clearly shows two, healed horizontal cutting injuries on the left of the os frontale. Equally, the skull of an adult male from grave 146 bore marks of cutting injuries on the right arcus superciliaris. A healed fracture of the distal third of the right crus of an adult male from grave 133 is interesting for its minimal axial dislocation – it is likely that this injury was well tended by splinting the damaged limb (Pl. III., fig. 11).

The skeleton of a young adult male from grave 136 is notable for the hypoplasia of the upper right limb, also expressed in the shoulder blade, while the muscle attachment areas are more pronounced on the right side than on the left. There is also an asymmetry of the femur heads – that on the right is somewhat smaller – despite the comparable lengths of the two bones. Both femurs are ventrally arched, while no pathology was identified on the tibiae. Of the bones of the feet, the calcaneum survives on both sides – differences are apparent in particular in the size of the joint surface. The skeleton as a whole is robust, even though belonging to an individual of relatively little growth; the thickness of the neurocranial bone in particular is striking. The sternum is not fused, and from the shape of the ribs the chest appears to have been barrel-shaped. These morphological changes most likely occurred on the basis of a thus far unidentified developmental defect (Pl. IV., fig. 12a, b, c, d).

1. Degeneratively productive changes in the lumbar vertebrae – grave 13 Z



2a. Degeneratively productive changes in the lumbosacral passage – woman, grave 76

2b. Degeneratively productive changes in the lumbosacral passage – woman, grave 76

3. Spondylolysis of the L4 – adult, grave 13 Z

4. Spondylolysis in the L5 – woman, grave 79a

5. Arthritic changes to the joint surfaces of the right elbow - the proximal end of the ulna, the head of the radius and the distal end of the humerus – woman, grave 76

6a 6b
6c

6a, b, c. Arthritic changes to the mandibular capitulum on both sides – man, grave 78

7a. Periostitis on the inner surface of the brain case – woman, grave 83

7b. Periostitis on the inner surface of the brain case – woman, grave 83

SUMMARY

This paper considers the anthropological processing of 167 skeletons from the Great Moravian cemetery at Josefov (Hodonín district) which, given its location in the hinterland of the Mikulčice settlement agglomeration provides valuable comparative material for the Mikulčice assemblage and in terms of the economic structure of the Great Moravian population. Emphasis was placed on the evaluation of marks that could be interpreted as possible manifestations of non-specific physiological and physical loads on the human organism.

The assemblage comprises the remains of 86 non-adult and 81 adult individual; of the latter 21 were male and 35 female, while in the remaining 25 the state of preservation did not allow gender to be determined. The demographic data point to a relatively high life expectancy among the Josefov group (45. 8 years (include the undeterminable individuals), for women 45. 7 years, for men 45 years) in comparison to the Mikulčice assemblages. The proportion of individuals of non-productive age (and in particular of individuals older than 50 years) is also high here. The marked preponderance of women, characterised by the low value of the index of masculinity, indicates the "general" character of the Josefov cemetery – it was not a cemetery set aside for a particular social group. The relationship between the demographic indicators and the character of the grave goods shows the more significant social position of males.

The results of metric analyses document the asymmetry in aspect of the skeletons both among men and women, and clear sexual dimorphism in the skeletons which, however, was not morphologically as apparent. Assessment of the state of dental health yielded the expected results: women were afflicted more often than men. The frequency of afflicted individuals increases with age. The back teeth were conspicuously more susceptible to caries and intravital loss than the front teeth. The mandible was afflicted more often. Cribra orbitalia appears in roughly every fifth studied individual; a higher occurrence was recorded in the adult segment of the population. Harris lines could be evaluated only in 27 individuals. A minimum of one line appeared in at least four-fifths of the individuals. Lines appeared primarily in the distal part of the tibia. Growth lesions or the appearance of Harris lines occurred most often between the ninth and twentieth year of ontogenesis. Evaluation of the degeneratively productive changes in the spine and the appendicular joints did not indicate any great physical load on the skeleton; weak (spine, joints) to medium (spine) loads were recorded in the main. Inter-sexual differences in the intensity of load were not identified, although differences between individual sections of the spine were apparent. A positive correlation between the occurrence and intensity of degenerative changes with age was confirmed. The characters of around twenty muscle and ligament attachment points were studies. The assemblage is dominated by skeletons which in the majority of the assessed points displayed mild or occasionally clear enthesopathic changes; no differences were evident between the sexes. From the well developed muscular relief of the majority of adult skeletons it can be assumed that the people of Josefov had, as a rule, well developed muscular/locomotory systems. The women as a rule displayed sagittal flattening (platymeria) of the upper part of the femur, while eurymeria and platymeria were represented almost equally among men. In cases of the flattening of the sides of the tibia mesoknemia and euryknemia were predominant in both sexes. This means that the flattening was generally mild, and in some cases non-existent.

Of the pathological findings reflecting injury and illness only a few need be mentioned. In several individuals changes were found indicative of bone fractures. A healed fracture of the distal third of the right crus of an adult male from grave 133 is interesting for its

minimal axial dislocation – it is likely that this injury was well tended by splinting the damaged limb. Two healed, horizontal cutting injuries to the frontal bone were found on the os frontale of the skull of an older man from grave 34. Marks of a cutting injury in the area of the right arcus superciliaris appear on the skull of an adult male from grave 146. Inflammatory changes were found in the area of the left orbit of a small child from grave 124 – perhaps the result of an infection – with subsequent asymmetry in the growth of the eye sockets. *Hyperostosis porotica* is present in both of this child's parietal bones. Finally, the skeleton of a young adult male from grave 136 is notable for the hypoplasia of the upper right limb, also expressed in the shoulder blade, while the muscle attachment areas are more pronounced on the right side than on the left. There is also an asymmetry of the femur heads – that on the right is somewhat smaller – despite the comparable lengths of the two bones. These morphological changes most likely occurred on the basis of a thus far unidentified developmental defect.

The processing of the Josefov cemetery took place within the framework of a project oriented towards the evaluation of markers that to a certain extent reflect the conditions in which the inhabitants of southern Moravia lived in the Middle "Hill-fort" period and their way of life.

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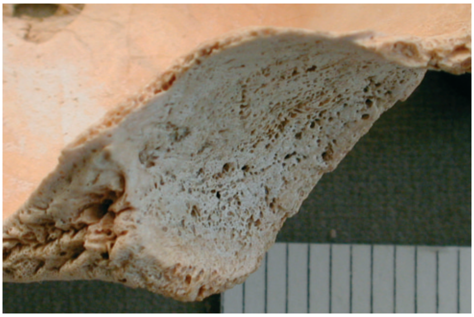

8. Inflammatory changes on the left orbita with subsequent assymetry of the growth of the eye sockets – child, grave 124

9. Hyperostosis porotica on both parietal bones – child, grave 124

10. Fractured the distal part of the right radius – woman, grave 79a

13. Flat osteom in the parietal region – man, grave 133

11. Heald fracture of the distal third of the right crus – man, grave 133

12a, b, c, d. Hypoplasia of the upper right limb, enthesopathy on tuberositas deltoidea on right the humerus (12b) – man, grave 136

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Table 1. Inventory and basic characteristics of skeletal remains recovered. Grave goods.

nbr.	sex	age	age	preservation	stature	skeleton	pathology	H	S	goods
1	?	infans I		C+ P+				2	2	vessel
2	?	infans I (2–4 years)		C+ P+				2	2	vessel
3	?	infans I (1 year)		C++ P++				2	2	vessel 2x
4	?	infans I (4–5 years)		C++ P+				2	2	knife
5	?	infans I (1 year)		C+ P(+)				2	2	without finds
5	?	pre-natal (9–10 months)		C+ P++				2	2	without finds
6	?	juvenis (16 years)		C++ P++(+)				2	1	earrings 2x (bronze),1 gilded
8	female	adultus (25–40 years)	20–35	C+++ P+++	157,7(Fe), 154,6(Hu, Ti)	gracile	*1	2	2	without finds
9	?	infans I (do 6 months)		C+ P++				2	2	bracelet (Fe)
10	?	infans I (2–3 years)		C++(+) P++(+)				2	2	without finds
11	male	maturus (40–50 years)	35–50	C+ P+		medium robust to robust		1	1	pail, knife, axe, 2x spurs, dagger
12	male ?	adultus – maturus (30-50 years)	35–50	C++(+) P+++	168(Fe), 166,4(Hu, Ti)	medium robust		2	2	vessel
13	?	maturus – senilis (over 50 years)	over 50	C+ P?				2	2	beads, spindle whorl, bone pin, knife
14	male	adltus (30–40 years)	35–50	C++(+) P++				1	1	knife, axe
15	?	infans II (9 years)		C+++ P+++				2	1	earrings 2x (bronze), knife, spindle whorl
16	?	infans I (1–1,5 year)		C+ P+				2	2	vessel
17	female ?	maturus – senilis (over 50 years)	over 50	C+(+) P+(+)		medium robust		2	1	earrings (bronze, gilded), beads, vessel, knife
18	?	infans I (2–3 years)		C+(+)P++				2	1	Celtic iris (Au), knife
19	?	infans I (6 years)		C++ P+(+)				2	2	vessel
20	?	newborns		C+ P+(+)				2	2	without finds
21a	?(male?)	adultus (over 30 years)	35–50	C+ P+(+)		medium robust		1	1	pail, spurs 2x, buckles, axe 2x
21b	?(female?)	adultus (over 30 years)	35–50	C0 P+	160(Fe), 153,6(Hu, Ti)			2	1	earrings 2x (bronze), spindle whorl, knife
22	?	adult		C+ P0				2	2	without finds
23	male	maturus (50–60 years)	over 50	C+++ P++	174,5 (Fe)	robust	*2	2	2	knife, vessel
24	male ?	maturus (50–60 years)	over 50	C++(+) P0				1	1	earrings 7x (4 bronze gilded, 3 bronze), beads, knife, ring (bronze), pail
25	female ?	maturus (40–50 years)	35–50	C+(+) P+		medium robust		2	1	earrings (bronze), knife
26a	?	newborns (2 months)		C+ P++				2	2	without finds
26b	?	juvenis (18–20 years)		C+ P+				1	1	earrings 18x [6 Ag, 12 bronze (2 gilded)], ring 3x (bronze), beads, spindle whorl, sickle, knife
27	?	infans I (2–3 years)		C++(+) P+(+)				2	2	vessel
29	?	infans I (2 years)		C++ P++				2	2	without finds
30	?	infans II (9 years)		C++ P++				2	1	earrings 2x (bronze)
31	?	infans I (3 years)		C+++ P++				2	2	beads
32	?	infans I (3-4 years)		C+++ P+++				2	2	without finds

*1 healed fracture scaphoid bones
*2 healed fracture right clavicle, pronounced spondylosis of the lumbar spine

nbr.	sex	age	age	preservation	stature	skeleton	pathology	H	S	goods
33	?	adultus - maturus (over 30 years)	35-50	C+ P0				2	2	without finds
34	male ?	maturus (50–60 years)	over 50	C+ P+		robust	*3	1	1	knife, small axe, spurs 2x, buckles
35	?	infans II (8–9 years)		C+ P+				2	1	earrings 4x (bronze), bead, lunette (bronze), knife
36	?	infans I (3 years)		C+ P0				2	1	earrings (bronze), knife, vessel
38	male	adultus (20–30 years)	20-35	C+++ P+++	176,5(Fe), 176,6(Hu,Ti)	robust		2	2	without finds
39	?	juvenis – adultus (over 15 years)		C+ P+				2	1	earrings 3x (bronze), knife
40	?	newborns		C+ P++				2	2	without finds
41	?	infans I (4–5 years)		C+ P+				2	2	without finds
42	?	infans I		C0 P+				1	1	earrings 2x (Ag), vessel
43	female	maturus (40–50 years)	35-50	C++ P+++	156,5(Fe), 152,8(Hu,Ti)	gracile		2	1	earrings 2x (bronze)
44	female	maturus - senilis (over 50 years)	over 50	C+++ P++(+)	160,4 (Fe), 158,5(Hu,Ti)	medium robust		2	1	earrings (bronze)
45	male	maturus - senilis	over 50	C+++ P+++	170,4(Fe), 171,8(Hu,Ti)	robust	*4	2	2	vessel 2x
46	?	infans I (1 year)		C++ P++(+)				2	2	without finds
47	?	juvenis (14–16 years)		C+++ P+++				2	2	knife
48	?	newborns		C+ P++				2	2	without finds
49	?	pre-natal (9–10 months)		C0 P+				2	2	without finds
50	female	adultus (30–40 years)	35-50	C0 P++		medium robust		2	1	earrings (bronze, gilded)
51	?	infans I (1 year)		C+(+) P++				2	2	without finds
52	?	infans I (2 years)		C+(+) P++				2	2	without finds
53	?	infans I (3 years)		C+ P0				2	2	vessel
53	?	infans I (1 year)		C0 P+				2	2	without finds
54	?	infans I (3–4 years)		C+(+) P+				2	2	without finds
55a	female ?	adultus - maturus (30-50 years)	35-50	C+ P+				2	1	earrings 2x (bronze, gilded), knife
55b	?(female ?)	adultus (30–40 years)	35-50	C++ P+				2	1	earrings 2x (bronze, gilded)
57	?	adult		C0 P+				2	1	earrings 2x (bronze)
58	?	infans I (1–1,5 year)		C+ P+				2	2	vessel 2x
59	?	maturus (40–50 years)	35-50	C+(+) P+		medium robust		2	1	earrings 2x (bronze), knife
60	female	maturus - senilis	over 50	C+++ P+++	164,1(Fe), 161,3(Hu,Ti)	medium robust	*5	2	2	beads, pin, knife
61	?	juvenis (over 15-16 years)		C+++ P+++				2	2	without finds
62	?	infans I (1,5 year)		C+ P+				2	2	without finds
65	female ?	maturus (40–60 years)	over 50	C+ P+		gracile		2	2	knife
66	?	infans I (6-12 months)		C+ P+				2	2	vessel
67	male ?	adultus (25-30 years)	20-35	C+++ P++				1	1	axe, knife
69	?	infans I (1,5 year)		C+ P+				2	2	vessel
70	female	maturus (40–50 years)	35-50	C+++ P++(+)	167,6(Fe), 160(Hu,Ti)	medium robust	*6	2	2	without finds
71	?	infans II (7 years)		C0 P+				1	1	earrings 4x (2x bronze, gilded, 2x bronze),

*3 healed cutting injuries on the left of the od frontale
*4 conspicuously arthritic changes to the distal epiphysis of the left radius and both patellae, advanced deformational spondylarthrosis of all sections of the spine
*5 deformational spondylarthrosis of all sections of the spine, state after ulnar epicondylitis on the right
*6 deformational spondylarthrosis of the neck spine, irregular deformation of the alveolar notch of the maxilla, hypercementation of the dental roots

nbr.	sex	age	age	preservation	stature	skeleton	pathology	H	S	goods
										ring (bronze), beads
72	?	infans II (7 years)		C++ P++				2	2	without finds
73	female	adultus (30–40 years)	35–50	C+++P+++	158,5(Fe), 155,6(Hu,Ti)	gracile to medium robust		2	1	lunette (bronze), beads, brooch, pin, pail, knife
75	?	infans I		C+ P+				2	2	without finds
76	female	maturus – senilis (over 55 years)	over 50	C0 P+++	159,9 (Hu,Ti)	medium robust	*7	2	2	without finds
77	?	adult		C0 P+				2	2	without finds
78	male	maturus (40-50 years)	35–50	C++(+)P++	176(Fe), 177,5(Hu,Ti)	medium robust to robust	*8	2	2	without finds
79a	female	adultus – maturus (30–50 years)	35–50	C+++ P+++	158,4(Fe), 155,2(Hu,Ti)	gracile to medium robust	*9	2	1	earrings (bronze)
79b	?	newborns		C+ P+				2	2	without finds
80	female	maturus – senilis	over 50	C+++ P+++	156,7(Fe), 154,9(Hu,Ti)	medium robust	*10	2	2	without finds
81	?	infans I (1,5 year)		C+ P+				2	2	without finds
82	?	infans III (12–13 years)		C++ P++				2	1	earrings 3x (bronze), vessel
83	female ?	adultus (20–30 years)	20–35	C+ P+		gracile	*11	1	1	earrings 2x (Ag), beads, pendant (bronze a wood)
84	?	maturus (40–50 years)	35–50	C+ P+				2	1	earrings 2x (bronze, gilded), knife
85	male	maturus – senilis	over 50	C+++ P++(+)	166 (Hu,Ti)	medium robust to robust		2	2	without finds
86	?	newborns		C+ P+(+)				2	2	without finds
87	?	infans I (4 years)		C+ P++				2	2	without finds
90	female ?	maturus – senilis (over 50 years)	over 50	C++ P++	156,7(Hu,Ti)	medium robust	*12	2	1	earrings (bronze), knife, vessel
91	?(female ?)	maturus (50–60 years)	over 50	C+++ P++		medium robust		2	2	pin
92	?	newborns		C+ P++				2	2	without finds
93	?	juvenis		C0 P+				2	1	tube (bronze), bead
94a	?	infans III (13–14 years)		C++(+) P++(+)				2	2	without finds
94b	?	newborns		C+ P+				2	2	without finds
95	?	newborns		C+ P+				2	2	without finds
96	male	adultus (20–40 years)	20–35	C0 P++(+)	167,8(Fe), 165,2(Hu,Ti)	robust		2	2	knife
97	?	maturus – senilis (over 55 years)	over 50	C+ P+				2	2	knife, vessel
102	?	juvenis		C0 P+				2	2	without finds
103	?	infans I (6 years)		C+++ P++				2	1	earrings 2x (bronze), vessel,
104	?	adultus (30–40 years)	35–50	C+(+) P+				2	2	knife 2x
105	male ?	maturs (40–50 years)	35–50	C0 P+(+)	165,7(Fe), 167,9(Hu,Ti)	robust	*13	2	2	knife, vessel 2x
107	?	infans II (10 years)		C+ P+				2	2	knife
108	?	infans II (8–9 years)		C++(+)P+				2	2	knife
109	male	maturus (50–60 years)	over 50	C+(+)P++(+)	162,3(Fe), 160(Hu,Ti)	medium robust		2	2	knife

*7 deformational spondylarthrosis of all sections of the spine, arthritic changes of the head of the radius on both sides
*8 Pacchioni granulation, teeth caries, arthritic changes to the mandibular capitulum on both sides
*9 healed fracture right radius in its lower third
*10 advanced parodontitis, deformational spondylosis of the neck and lumbar spine, productive deformational changes to the sternum
*11 periostitis on the inner surface of the brain case
*12 the arthrosis of both elbows
*13 healed fracture rib

nbr.	sex	age	age	preservation	stature	skeleton	pathology	H	S	goods
110	?	infans II (8–9 years)		C+ P+				2	2	without finds
111	female ?	maturus (40–50 years)	35–50	C+(+) P++	158,5 (Hu,Ti)	medium robust		2	2	spindle whorl, vessel 2x
112	male	maturus (40–50 years)	35–50	C0 P++(+)	163,3(Fe), 165,7(Hu,Ti)	robust	*14	2	2	without finds
113	female	maturus (40–60 years)	over 50	C++ P+++	160,8(Fe) 160,2(Hu,Ti),	medium robust		2	1	earrings 3x (bronze), knife, vessel
115	?	infans I (4–5 years)		C+ P+				2	2	vessel 2x
116	female	maturus (50–60 years)	over 50	C++ P+++	162,4(Fe), 160,4(Hu,Ti)	gracile	*15	2	2	vessel
117	female ?	juvenis (18–20 years)		C+(+) P+(+)				2	2	without finds
118	?	newborns		C0 P+				2	2	vessel
119	?	newborns		C+ P++				2	2	vessel 2x
120	female	adultus (20–30 years)	20–35	C+(+) P+		gracile		2	2	knife
121	?	infans II (7–8 years)		C+(+) P+				2	2	vessel
122	?	infans I (3-4 years)		C+ P0				2	2	beads, vessel 2x
123	female ?	adultus – maturus (30-50 years)	35–50	C+ P+		gracile		2	1	
124	?	infans I (1,5 year)		C+ P++			*16	2	2	vessel
126	?	infans II (10 years)		C+ P+				2	1	earrings (bronze)
127	?	infans I		C+ P0				2	2	knife
128	female ?	adultus (30–40 years)	35–50	C+ P+				2	2	spindle whorl, knife
129	?(female ?)	maturus		C+ P+				2	2	knife
130	?	infans I		C+ P0				2	2	vessel
132	?	newborns (2–4 months)		C+ P+(+)				2	2	bead, nail
133	male	adultus (30–40 years)	35–50	C+ P++(+)	165,6 (Fe)	medium robust to robust	*17	1	1	dagger, spurs, vessel
134	female	maturus - senilis (over 55 years)	over 50	C+ P+(+)	159,8 (Fe)	gracile to medium robust	*18	2	2	sharpening steel, small stone, vessel
135	female	maturus (40–50 years)	35–50	C++ P++	160,8(Fe) 160,2(Hu,Ti)	medium robust		2	2	without finds
136	male	adultus (30–40 years)	35–50	C+++ P+++	166,8(Fe), 163,2(Hu,Ti)	robust	*19	2	2	sharpening steel, small stones
137	male	maturus (50–60 years)	over 50	C+++ P+++	175,1(Fe), 174,4(Hu,Ti)	robust	*20	2	2	sharpening steel, small stones, knife, nail, vessel
138	?	maturus		C+ P0				1	1	earrings (Ag), spindle whorl, pail, pin
139	female	maturus (50–60 years)	over 50	C++ P+		gracile	*21	2	2	without finds
140	?	infans I (5–6 years)		C+++ P+++				2	2	without finds
141	female ?	maturus (50–60 years)	over 50	C+(+) P+(+)		gracile		2	2	without finds
142	?	adult		C+ P+				1	1	earrings 3x (Ag)

*14 sub-periostal form of tuberculous process in the lumbar spine with massive ossification of the ligamentum longitudinale anterius
*15 fractured fifth right metacarpal
*16 hyperostosis porotica on both parietal bones, inflammatory changes on the left orbita, perhaps due to infection after loss of the eye
*17 flat osteom in the parietal region, healed spiral fracture of the right crural bone
*18 porotic compression of the lower vertebrae
*19 hypoplasia of the upper right limb
*20 healed fracture two ribs, isolated apophysis of the ulnar epicondylus of the humerus, compressiv fracture of the L4 with subsequent adaptive deformation in the L5 vertebra. Synostosis of the os metatarus I with the os cuneiforme mediale, arthritic changes to both temporo-mandibular joint
*21 lesion on the lamina externa of the skull

nbr.	sex	age	age	preservation	stature	skeleton	pathology	H	S	goods
144	female	senilis (over 60 years)	over 50	C++ P+++	162,8(Fe), 160,6(Hu,Ti)	gracile to medium robust	*22	2	2	without finds
146	male ?	adultus – maturus (30-50 years)	35–50	C+ P+			*23	1	1	whetstone, razor, knife, buckle, axe, spurs 2x
147	?	infans II (10 years)		C++ P+				2	1	earrings (bronze), beads
149	?	infans I (3–4 years)		C+ P+				2	2	without finds
150	?	infans I (5 years)		C+ P+				2	2	without finds
152	? (male ?)	adultus – maturus (30-50 years)	35–50	C+(+) P+(+)		gracile to medium robust		2	2	razor, knife, sharpening steel, buckle
153	female	adultus (30–40 years)	35–50	C++ P++	165,8(Fe), 161,1(Hu,Ti)	medium robust		2	1	earrings (bronze)
154	?	infans I (3–4 years)		C+ P+				2	2	without finds
156a	?	adult		C0 P+				2	2	without finds
156b	?	pre-natal (9–10 months)		C+ P+				2	2	without finds
157	?	infans II (13 years)		C+ P+				2	2	sharpening steel, flint and steel
158	?	maturus (40–60 years)	over 50	C+ P+				2	2	knife
159	?	adult		C+ P+(+)		medium robust		2	2	knife, sharpening steel,small stones
160	female ?	adultus (25–40 years)	20–35	C+ P++	161,6(Fe), 156,5(Hu,Ti)	gracile		2	1	earrings (bronze), spindle whorl
161	?	newborns		C+ P0				2	2	without finds
162	?	adult		C0 P+				2	2	without finds
163	female	maturus (50–60 years)	over 50	C+++ P++	160(Fe), 154,4(Hu,Ti)	gracile to medium robust	*24	2	2	without finds
164	?	infans II (8 years)		C+++ P+				2	2	vessel
165	?	newborns		C+ P+				2	2	vessel
166	?	infans I (do 6 months)		C+ P+				2	1	earrings 3x (bronze), vessel 2x
167	?	infans I (4 years)		C+ P+				2	2	without finds
168	male ?	adult (over 35 years)		C+ P+		medium robust		2	2	sharpening steel, knife
169	female	adultus (30–40 years)	35–50	C++ P+++	158(Fe),153,2(Hu,Ti)	gracile		2	1	earrings (bronze), knife, vessel
170	male	maturus-senilis (50+ years)	over 50	C++(+) P+(+)		robust	*25	2	2	knife
171	?	infans I (1year)		C++ P+				2	2	vessel
172	?	infans II (9 years)		C+++ P++				1	1	earrings (Ag), knife, vessel
173		infans I (1–2 years)		C+ P+				2	1	earrings (bronze), vessel
174	?	infans I (6 years)		C+ P+				2	2	without finds
176a	?	adult		C0 P+				2	2	knife, spurs 2x, whetstone
176b	?	adultus (over 30 years)		C0 P+				1	1	earrings (Ag), knife, pin
3Z	female	maturus (40–60 years)	over 50	C++ P++(+)	159,8(Fe), 159,6(Hu,Ti)	medium robust		2	2	spindle whorl, knife
5Z	female ?	adultus (30–40 years)	35–50	C+ (+) P0				2	2	without finds
6Z	female ?	maturus (40–60 years)	over 50	C++ P+(+)		medium robust		2	2	without finds
7Z	female ?	adultus (20–30 years)	20–35	C+(+) P+		gracile		2	2	pail
11Z	?	juvenis (18–20 years)		C+ P+				2	2	without finds
13Z	?	maturus (50–60 years)	over 50	C+(+) P++(+)		medium robust	*26	2	2	without finds

*22 arthritic changes to the left temporo-mandibular joint
*23 cutting injuries on the right arcus superciliares
*24 arthritic changes to the right temporo-mandibular joint
*25 deformational spondylosis of the lumbar spine
*26 deformational spondylosis of the lumbar spine, spondylolysis of the L4

Table 12. Basic statistical indicators for the post-cranial skeleton - men

Variable	SIN					DX				
	N	Mean	Min.	Max.	Std. Dev.	N	Mean	Min.	Max.	Std. Dev.
CLMAX1	5	146.4	135	164	14.4	4	151.5	136	163	11.3
CLSAGS5	9	12.8	12	13	0.4	9	13.1	11	15	1.1
CLVERTS4	9	11.0	9	13	1.4	9	11.4	9	13	1.2
STDELM2	5	60.6	52	69	6.8	1	93.0	93	93	--
HUMAX_1	7	326.6	289	355	25.5	7	320.1	284	353	26.4
HUTUBD7*	8	72.5	69	76	2.7	7	75.0	71	76	1.8
HUMIN7	8	66.4	64	69	1.6	6	66.2	61	69	2.9
HUDIMAX5	8	23.1	20	26	2.3	6	23.5	21	25	1.5
HUDIMIN6	8	18.9	18	20	0.8	6	19.3	18	20	0.8
HUSIR3	9	56.0	47	53	16.7	4	50.5	44	54	4.5
HUML_9	3	44.3	41	48	3.5	4	46.0	43	49	2.6
HUAP_10	7	47.1	42	52	3.8	4	46.0	36	52	7.0
HUSIR4A	8	65.6	59	68	2.9	5	61.6	57	67	4.6
RAMAX_1	9	246.7	220	274	15.7	9	249.2	223	275	17.0
RASTR5_5	9	44.8	42	49	2.5	8	45.6	38	54	5.1
RAMIN_3	9	42.2	39	46	2.6	9	43.7	36	50	4.2
RADIMAX4	10	17.1	15	19	1.3	9	17.7	13	21	2.3
RADIMIN5	10	12.2	10	14	1.1	9	12.6	11	14	1.1
RAMLK4 2	9	23.4	13	16	28.7	9	14.2	11	16	1.6
RAAPK5 2	8	14.8	12	17	1.5	9	14.9	12	17	1.6
RAMLH4 1	4	22.5	20	25	2.1	2	25.0	25	25	0.0
RAAPH5 1	4	23.3	21	25	1.7	3	24.3	22	26	2.1
RASIR5_6	9	34.1	30	40	2.9	8	33.4	28	38	3.2
ULMAX_1	7	271.7	258	295	12.5	5	277.2	255	295	15.7
ULSTR3A	8	48.3	45	53	3.0	6	47.5	43	52	3.7
ULMIN_3	7	37.7	34	41	2.3	6	37.0	35	39	1.7
ULDIMAX12	9	17.6	15	19	1.2	7	17.0	15	19	1.4
ULDIMIN11	9	12.8	12	14	0.7	7	12.3	11	13	1.0
ULAPS11A	7	20.7	20	22	0.8	6	20.7	19	23	1.5
ULML_12A	7	18.3	17	20	1.0	4	17.8	14	21	3.0
FEMAX_1	12	457.1	415	500	30.7	11	452.3	412	500	30.9
FEFYZ_2	11	456.4	412	497	31.4	11	449.0	407	497	30.8
FESTR_8	9	94.0	82	100	5.6	6	92.2	85	99	5.4
FELASP8a	9	92.3	86	99	4.4	6	90.0	86	95	3.8
FEDIMAX7a	8	30.1	26	35	2.7	7	30.0	27	35	2.5
FEDIMIN6a	8	30.3	24	34	3.1	7	29.7	24	34	3.1
FEMLS 9	8	33.9	32	36	1.5	7	33.6	29	36	2.7
FEAPS_10	8	28.3	26	31	2.1	7	27.7	25	29	1.3
FETRHORTŘET7b	8	32.1	29	35	2.0	7	31.6	22	35	4.5
FEAPHORTŘE7c	8	28.4	27	31	1.5	7	28.4	27	30	1.1
FETRDOLTŘ7d	9	36.9	30	44	4.5	8	36.3	29	44	5.1
FEAPDOLTŘ7e	9	31.0	26	35	3.0	8	31.0	28	34	2.1
FESIR 13a	9	93.7	83	105	6.4	9	92.9	81	106	7.5
FEMLH_18	9	48.3	43	52	2.5	7	47.7	44	52	2.7
FEAPH_19	6	48.2	44	53	3.1	7	48.0	44	54	3.7
FESIR_21	3	83.0	80	85	2.6	7	83.0	76	87	3.8
TIMAX_1	10	369.1	332	405	24.4	7	374.7	332	405	25.8
TIMED1b	10	363.4	328	404	24.9	7	368.4	328	404	26.8
TIFN_10A	9	94.3	82	104	6.4	8	93.6	81	104	7.3
TISTR_10	7	83.0	78	93	4.9	6	83.7	74	94	7.1
TIMIN10B	9	75.6	66	85	5.1	6	76.5	73	87	5.4
TIDIMAX8	7	31.4	29	36	2.6	7	30.9	27	35	2.9
TIDIMIN9	7	22.4	20	25	1.9	7	23.1	21	25	1.6
TIAPF8A	9	35.8	32	40	2.8	8	35.1	32	40	3.0

Variable	SIN					DX				
	N	Mean	Min.	Max.	Std. Dev.	N	Mean	Min.	Max.	Std. Dev.
TIMLF9A	9	24.3	22	27	1.7	8	24.8	22	27	1.7
TILMSSAG8b	7	40.1	37	46	3.2	8	38.3	35	43	2.7
TILMSTR9b	7	26.7	24	30	2.0	8	26.8	23	30	2.2
TISIR_3	3	75.0	73	76	1.7	2	73.0	70	76	4.2
TISIR_6	8	50.9	46	55	2.6	5	50.6	47	54	2.6
FIMAX1	2	373.5	351	396	31.8	3	365.7	341	378	21.4
TAMAX1A	6	60.5	55	64	3.5	9	59.7	55	65	3.1
TAFYZ_1	8	55.1	51	59	2.5	9	55.3	52	60	2.9
TASIR_2	5	45.6	44	49	2.1	7	43.9	39	49	3.6
TAVYS 3a	7	34.1	31	37	2.0	8	32.6	28	35	2.3
CADEL_1A	7	73.1	66	78	4.4	6	73.5	66	78	4.2
i. platymericus	8	83.5	74.3	90.9	6.8	7	82.8	77.8	90.3	4.7
i. knemicus	9	68.1	60.5	75.8	3.9	8	70.8	60.5	75.8	5.7

Table 13. Basic statistical indicators for the post-cranial skeleton - female

Variable	SIN					DX				
	N	Mean	Min.	Max.	Std. Dev.	N	Mean	Min.	Max.	Std. Dev.
CLMAX1	13	135.8	121	145	8.8	13	132.9	118	150	8.7
CLSAGS5	20	10.8	9	13	1.1	19	10.6	9	12	1.2
CLVERTS4	20	9.1	7	12	1.3	19	9.7	8	13	1.3
STDELM2	10	50.5	43	61	6.3	3	89.3	83	94	5.7
HUMAX_1	16	289.5	266	315	13.9	18	293.5	269	314	11.9
HUTUBD7*	17	57.8	52	63	2.7	17	59.3	54	66	3.3
HUMIN7	17	52.3	45	58	3.6	17	53.8	47	60	3.7
HUDIMAX5	17	19.4	17	22	1.4	17	19.9	18	23	1.4
HUDIMIN6	17	15.0	14	16	0.9	17	15.5	14	17	1.0
HUSIR3	15	43.6	41	48	2.0	14	44.7	42	47	1.4
HUML_9	6	40.0	37	46	3.2	8	39.1	38	41	1.1
HUAP_10	12	40.3	37	44	2.3	12	40.8	37	44	2.4
HUSIR4A	11	54.8	50	59	2.8	10	55.8	50	60	3.3
RAMAX_1	12	217.3	195	235	12.8	12	221.5	199	235	11.5
RASTR5_5	16	36.4	34	40	1.7	13	37.8	34	41	2.0
RAMIN_3	15	34.1	30	39	2.5	14	35.4	32	40	2.4
RADIMAX4	17	13.4	12	15	0.9	14	14.1	12	16	1.2
RADIMIN5	16	9.8	9	11	0.7	13	10.0	9	11	0.7
RAMLK4 2	16	11.6	10	13	1.0	13	11.8	10	13	1.0
RAAPK5 2	15	12.5	10	15	1.3	13	12.0	11	15	1.2
RAMLH4 1	8	19.5	18	21	0.9	5	21.0	20	24	1.7
RAAPH5 1	10	20.2	19	23	1.2	4	21.0	19	24	2.2
RASIR5_6	12	29.0	26	32	1.7	11	29.5	27	31	1.2
ULMAX_1	12	237.0	212	260	13.9	6	242.2	217	259	15.3
ULSTR3A	14	37.7	35	42	2.3	11	39.6	33	44	3.3
ULMIN_3	15	30.3	25	35	2.5	14	30.9	26	35	2.7
ULDIMAX12	16	13.9	12	16	1.1	12	14.0	12	16	1.3
ULDIMIN11	15	10.3	9	12	0.8	12	10.8	10	12	0.6
ULAPS11A	13	18.0	16	20	1.1	8	18.8	17	21	1.3
ULML_12A	10	15.1	13	17	1.1	10	15.7	14	17	1.3
FEMAX_1	18	411.6	380	464	23.2	19	407.4	380	449	18.3
FEFYZ_2	18	407.9	378	458	22.1	18	404.1	379	443	17.4
FESTR_8	18	76.9	62	87	5.8	20	77.4	64	87	5.6
FELASP8a	16	77.8	64	87	5.8	19	79.3	67	88	5.5
FEDIMAX7a	18	25.5	23	29	1.7	19	25.9	22	29	1.7
FEDIMIN6a	18	24.8	22	29	1.9	19	25.1	22	29	1.9

Variable	SIN					DX				
	N	Mean	Min.	Max.	Std. Dev.	N	Mean	Min.	Max.	Std. Dev.
FEMLS 9	15	30.2	26	33	1.8	17	30.0	26	32	1.6
FEAPS_10	15	22.7	20	27	2.2	17	22.7	19	26	2.1
FETRHORTŘET7b	15	29.3	26	31	1.4	17	29.4	27	31	1.4
FEAPHORTŘE7c	15	22.5	20	25	1.7	17	22.5	19	25	1.7
FETRDOLTŘ7d	20	32.0	24	38	4.6	19	32.2	25	39	4.8
FEAPDOLTŘ7e	20	25.6	22	29	1.7	19	26.2	23	30	2.1
FESIR 13a	13	84.8	76	94	4.2	12	83.0	77	87	2.7
FEMLH_18	11	41.9	38	44	1.6	13	41.8	39	43	1.2
FEAPH_19	11	42.2	39	45	1.7	12	42.2	40	43	1.2
FESIR_21	10	72.2	69	75	1.9	9	72.3	70	77	2.0
TIMAX_1	18	338.9	308	380	21.0	16	338.7	309	380	21.8
TIMED1b	18	333.2	305	377	20.9	18	332.8	305	371	19.8
TIFN_10A	17	79.6	62	90	6.5	17	78.9	62	85	6.1
TISTR_10	18	70.6	56	80	5.2	17	70.8	59	82	5.0
TIMIN10B	14	63.9	50	70	5.3	17	64.6	53	70	4.4
TIDIMAX8	18	26.8	25	31	1.6	18	26.9	25	31	1.5
TIDIMIN9	18	19.3	17	23	1.5	17	19.5	15	24	2.1
TIAPF8A	17	30.5	27	34	2.1	17	30.1	26	33	1.8
TIMLF9A	17	20.8	18	24	1.8	17	20.7	17	24	2.0
TILMSSAG8b	17	33.9	30	38	2.1	18	33.2	30	37	2.1
TILMSTR9b	17	23.4	19	30	2.4	17	23.0	19	27	2.3
TISIR_3	1	71.0	71	71	--	2	68.5	66	71	3.5
TISIR_6	8	44.9	42	49	2.0	11	48.0	44	56	3.4
FIMAX1	3	322.0	303	350	24.8	5	319.2	301	343	17.7
TAMAX1A	15	53.3	50	56	2.2	14	53.6	50	58	2.1
TAFYZ_1	20	48.9	44	54	2.3	18	49.7	45	54	2.1
TASIR_2	15	39.1	36	43	2.1	13	38.0	33	42	2.4
TAVYS 3a	19	30.4	26	34	2.1	18	30.6	27	34	1.8
CADEL_1A	11	66.5	64	72	2.8	12	67.3	64	76	3.4
i. platymericus	15	75.1	62.5	87.1	6.3	17	75.7	65.6	83.9	5.3
i. knemicus	17	68.3	55.9	79.3	5.7	17	68.8	58.6	79.3	6.0

Table 14. Verification of aspect asymmetry - men

Variable	N dx	Mean dx	Std. Dv. sin	Mean sin	Std. Dv. sin	t	df	p
CLMAX1	2	145.0	12.7	147.5	17.7	0.7	1	0.605
CLSAGS5	6	12.8	1.0	12.8	0.4	0.0	5	1.000
CLVERTS4	6	11.5	1.5	11.2	1.5	-1.6	5	0.175
STDELM2	1	93.0	0.0	69.0	0.0	--	0	--
HUMAX_1	6	320.5	28.9	321.8	24.4	0.2	5	0.822
HUTUBD7*	6	74.8	1.9	72.5	2.3	-3.3	5	0.022*
HUMIN7	6	66.2	2.9	66.0	1.4	-0.1	5	0.889
HUDIMAX5	6	23.5	1.5	23.3	2.5	-0.2	5	0.833
HUDIMIN6	6	19.3	0.8	18.8	0.8	-1.5	5	0.203
HUSIR3	3	50.3	5.5	50.7	3.1	0.2	2	0.885
HUML_9	2	48.0	1.4	46.0	2.8	-2.0	1	0.295

Variable	N dx	Mean dx	Std. Dv. sin	Mean sin	Std. Dv. sin	t	df	p
HUAP_10	3	45.7	8.5	47.0	4.4	0.4	2	0.742
HUSIR4A	5	61.6	4.6	64.8	3.5	1.6	4	0.191
RAMAX_1	8	247.9	17.7	247.8	16.5	0.0	7	0.963
RASTR5_5	7	46.3	5.1	45.0	2.6	-0.9	6	0.417
RAMIN_3	6	42.3	3.6	41.8	2.3	-0.3	5	0.786
RADIMAX4	8	17.6	2.5	17.3	1.4	-0.6	7	0.598
RADIMIN5	8	12.5	1.2	12.4	0.9	-0.4	7	0.732
RAMLK4 2	8	14.3	1.7	13.9	1.0	-0.9	7	0.402
RAAPK5 2	8	14.8	1.7	14.8	1.5	0.0	7	1.000
RAMLH4 1	1	25.0	0.0	25.0	0.0	--	0	--
RAAPH5 1	3	24.3	2.1	23.3	2.1	-1.7	2	0.225
RASIR5_6	7	32.7	2.9	33.9	3.3	1.4	6	0.203
ULMAX_1	5	277.2	15.7	276.8	11.0	-0.1	4	0.932
ULSTR3A	6	47.5	3.7	48.0	2.4	0.4	5	0.673
ULMIN_3	6	37.0	1.7	37.5	2.4	0.4	5	0.681
ULDIMAX12	7	17.0	1.4	17.3	1.3	0.7	6	0.522
ULDIMIN11	7	12.3	1.0	12.7	0.8	1.0	6	0.356
ULAPS11A	6	20.7	1.5	20.8	0.8	0.3	5	0.741
ULML_12A	4	17.8	3.0	18.3	1.3	0.5	3	0.638
FEMAX_1	11	452.3	30.9	454.3	30.6	2.1	10	0.058
FEFYZ_2	10	450.7	31.9	453.2	31.2	3.6	9	0.005**
FESTR_8	6	92.2	5.4	93.7	6.5	1.3	5	0.248
FELASP8a	6	90.0	3.8	90.3	3.8	0.7	5	0.530
FEDIMAX7a	6	30.0	2.8	30.3	3.0	0.8	5	0.465
FEDIMIN6a	6	29.7	3.4	30.2	3.7	1.5	5	0.203
FEMLS 9	6	33.2	2.7	34.0	1.7	1.4	5	0.224
FEAPS_10	6	27.7	1.4	28.3	2.1	1.1	5	0.328
FETRHORTŘET7b	6	31.0	4.7	32.0	2.4	0.8	5	0.456
FEAPHORTŘE7c	6	28.7	1.0	28.7	1.6	0.0	5	1.000
FETRDOLTŘ7d	7	37.0	5.0	37.4	4.7	2.1	6	0.078
FEAPDOLTŘ7e	7	31.3	2.1	31.6	2.6	0.7	6	0.522
FESIR 13a	8	92.0	7.5	93.1	6.7	1.4	7	0.197
FEMLH_18	7	47.7	2.7	47.7	2.4	0.0	6	1.000
FEAPH_19	6	48.3	3.9	48.2	3.1	-0.2	5	0.856
FESIR_21	3	82.0	5.6	83.0	2.6	0.6	2	0.622
KOLÚH 29	0	0.0	0.0	0.0	0.0	--	-1	--
TIMAX_1	7	374.7	25.8	375.6	26.7	0.5	6	0.642
TIMED1b	7	368.4	26.8	369.6	27.8	0.7	6	0.519
TIFN_10A	7	92.7	7.4	94.0	7.4	1.6	6	0.163
TISTR_10	5	82.6	7.4	82.8	6.0	0.2	4	0.854
TIMIN10B	6	76.5	5.4	76.3	4.5	-0.2	5	0.822
TIDIMAX8	5	30.6	3.3	31.6	3.2	3.2	4	0.034*
TIDIMIN9	5	22.6	1.5	22.2	1.8	-1.6	4	0.178
TIAPF8A	7	34.9	3.2	35.7	3.3	1.9	6	0.111
TIMLF9A	7	24.6	1.7	24.1	2.0	-1.2	6	0.289
TILMSSAG8b	6	38.2	2.8	40.0	3.5	2.1	5	0.090
TILMSTR9b	6	26.5	2.0	26.7	2.2	0.2	5	0.862
TISIR_3	2	73.0	4.2	76.0	0.0	1.0	1	0.500
TISIR_6	5	50.6	2.6	51.0	3.4	0.5	4	0.621
FIMAX1	0	0.0	0.0	0.0	0.0	--	-1	--
TAMAX1A	6	59.7	3.4	60.5	3.5	0.8	5	0.462
TAFYZ_1	8	55.8	2.8	55.1	2.5	-2.4	7	0.049*
TASIR_2	5	45.4	2.9	45.6	2.1	0.2	4	0.828
TAVYS 3a	6	33.3	1.6	33.7	1.6	1.6	5	0.175
CADEL_1A	6	73.5	4.2	73.5	4.7	0.0	5	1.000
i. platymericus	6	83.7	4.5	83.5	6.7	-0.1	5	0.943
i. knemicus	7	70.8	6.2	67.8	4.5	-1.7	6	0.136

Table 15. Verification of aspect asymmetry - female

Variable	N dx	Mean dx	Std. Dv. sin	Mean sin	Std. Dv. sin	t	df	p
CLMAX1	8	136.0	8.8	134.9	8.8	-0.8	7	0.450262819
CLSAGS5	17	10.8	1.1	10.8	0.9	-0.3	16	0.749805842
CLVERTS4	17	9.5	1.1	9.3	1.2	-1.7	16	0.103727362
STDELM2	1	91.0	0.0	61.0	0.0	--	0	--
HUMAX_1	16	293.6	12.6	289.5	13.9	-4.5	15	0.000397983***
HUTUBD7*	15	58.8	3.2	57.3	2.5	-3.8	14	0.002057804**
HUMIN7	15	53.3	3.5	51.9	3.5	-4.0	14	0.001291121***
HUDIMAX5	15	19.7	1.2	19.1	1.2	-3.7	14	0.00250178**
HUDIMIN6	15	15.3	1.0	15.0	0.8	-2.6	14	0.019187621*
HUSIR3	12	44.6	1.5	43.5	1.6	-3.8	11	0.003116173**
HUML_9	3	39.3	0.6	38.7	1.5	-1.0	2	0.422649731
HUAP_10	9	40.8	2.6	40.6	2.5	-1.5	8	0.169020163
HUSIR4A	8	55.4	3.3	55.0	2.8	-1.0	7	0.350616638
RAMAX_1	9	221.3	13.0	220.0	13.4	-1.5	8	0.17569872
RASTR5_5	12	37.5	1.9	36.8	1.6	-1.6	11	0.135959908
RAMIN_3	13	35.1	2.3	34.4	2.4	-2.6	12	0.021776609*
RADIMAX4	13	14.0	1.1	13.6	0.9	-1.2	12	0.239684251
RADIMIN5	12	9.9	0.7	9.8	0.6	-1.5	11	0.16608678
RAMLK4 2	12	11.8	1.0	11.5	0.9	-1.3	11	0.219887865
RAAPK5 2	12	12.1	1.2	12.3	1.2	0.7	11	0.503545887
RAMLH4 1	3	21.3	2.3	20.0	1.0	-1.5	2	0.269703265
RAAPH5 1	3	21.7	2.1	21.3	1.5	-1.0	2	0.422649731
RASIR5_6	8	29.5	1.2	29.4	1.5	-0.2	7	0.826379828
ULMAX_1	4	235.8	14.7	231.8	15.7	-4.4	3	0.022006046*
ULSTR3A	11	39.6	3.3	37.8	2.6	-3.5	10	0.005699332**
ULMIN_3	12	30.8	2.9	30.3	2.8	-1.6	11	0.137204754
ULDIMAX12	12	14.0	1.3	13.8	1.0	-1.4	11	0.191054279
ULDIMIN11	12	10.8	0.6	10.4	0.8	-2.8	11	0.017180488*
ULAPS11A	6	18.2	0.8	17.7	0.8	-2.2	5	0.07558682
ULML_12A	7	15.3	1.3	15.1	1.3	-0.2	6	0.829079518
FEMAX_1	17	407.6	19.4	408.5	19.7	1.0	16	0.319122917
FEFYZ_2	16	403.9	18.5	404.9	19.3	1.1	15	0.281396167
FESTR_8	18	77.3	5.8	76.9	5.8	-1.4	17	0.18717601
FELASP8a	16	78.7	5.5	77.8	5.8	-1.7	15	0.11019833
FEDIMAX7a	18	25.8	1.7	25.5	1.7	-1.3	17	0.20966815
FEDIMIN6a	18	25.0	1.9	24.8	1.9	-0.9	17	0.386299377
FEMLS 9	14	29.8	1.6	30.1	1.9	1.3	13	0.207851773
FEAPS_10	14	22.4	1.9	22.4	1.9	0.0	13	1
FETRHORTŘET7b	14	29.3	1.4	29.1	1.4	-0.6	13	0.547028238
FEAPHORTŘE7c	14	22.2	1.5	22.3	1.6	0.3	13	0.792905737
FETRDOLTŘ7d	18	32.2	5.0	31.7	4.7	-1.3	17	0.197360457
FEAPDOLTŘ7e	18	26.0	2.0	25.5	1.8	-2.2	17	0.045950356*
FESIR 13a	10	83.2	2.9	83.6	3.5	1.1	9	0.30923321
FEMLH_18	9	41.7	1.3	41.6	1.5	-0.6	8	0.594263998
FEAPH_19	7	42.1	1.5	41.9	1.7	-1.5	6	0.172308298
FESIR_21	8	72.5	2.1	71.9	1.9	-1.7	7	0.139519575
KOLÚH 29	0	0.0	0.0	0.0	0.0	--	-1	--
TIMAX_1	16	338.7	21.8	338.8	22.3	0.1	15	0.908711442
TIMED1b	17	332.0	20.1	333.1	21.5	1.6	16	0.125894484
TIFN_10A	15	79.0	6.3	79.0	6.3	0.0	14	1
TISTR_10	15	71.2	5.3	70.4	5.7	-1.5	14	0.157965168
TIMIN10B	14	64.7	4.6	63.9	5.3	-1.6	13	0.143512289
TIDIMAX8	15	26.9	1.6	26.7	1.6	-0.9	14	0.384000222
TIDIMIN9	15	19.9	1.8	19.3	1.6	-3.7	14	0.00250178**
TIAPF8A	15	30.2	1.9	30.3	2.0	0.2	14	0.827499398
TIMLF9A	15	20.9	1.8	20.7	1.6	-1.0	14	0.33428192

Variable	N dx	Mean dx	Std. Dv. sin	Mean sin	Std. Dv. sin	t	df	p
TILMSSAG8b	16	33.3	2.2	34.0	2.2	3.1	15	0.006615948**
TILMSTR9b	15	23.1	2.1	23.4	2.5	0.6	14	0.545650541
TISIR_3	0	0.0	0.0	0.0	0.0	--	-1	--
TISIR_6	7	47.9	4.2	44.9	2.1	-3.3	6	0.015722266**
FIMAX1	1	313.0	0.0	313.0	0.0	--	0	--
TAMAX1A	11	53.4	1.9	53.6	2.2	0.8	10	0.431578736
TAFYZ_1	17	49.5	1.9	48.8	2.4	-3.0	16	0.009328704
TASIR_2	12	37.8	2.5	38.7	1.7	2.4	11	0.034073373
TAVYS 3a	17	30.5	1.8	30.4	2.1	-0.3	16	0.798310327
CADEL_1A	10	66.2	2.0	65.9	2.2	-1.0	9	0.343436379
i. platymericus	14	75.1	4.8	74.3	5.5	-0.8	13	0.466388016
i. knemicus	15	69.4	5.7	68.5	5.9	-0.9	14	0.36898442

Explanations of the individual measurements in the postcranial skeleton:
CLMAX1 – maximum clavicle length. CLSAGS5 – sagittal diameter. CLVERTS4 – vertical diameter. STDELM2 – length of the manubrium sterni. HUMAX_1 – maximum length of the humerus. HUTUBD7* - maximum circumference of the tuberositas deltoidea. HUMIN7 – minimum circumference of the diaphysis. HUDIMAX5 – maximum diameter of the middle of the diaphysis. HUDIMIN6 – minimum diameter of the middle of the diaphysis. HUSIR3 – width of the upper epiphysis. HUML_9 – maximum transverse diameter of the head. HUAP_10 – maximum vertical diameter of the head. HUSIR4A – width of the lower epiphysis. RAMAX_1 – maximum length of the radius. RASTR5_5 – circumference of the middle of the diaphysis. RAMIN_3 – minimum circumference. RADIMAX4 – maximum width of the diaphysis. RADIMIN5 – sagittal diameter of the diaphysis. AMLK4 2 – cervical width. RAAPK5 2 – sagittal diameter of the cervix. RAMLH4 1 – head width. RAAPH5 1 – sagittal diameter of the head. RASIR5_6 – width of the lower epiphysis. ULMAX_1 – maximum length of the ulna. ULSTR3A – circumference of the middle of the diaphysis. ULMIN_3 – minimum circumference. ULDIMAX12 – width of the diaphysis. ULDIMIN11 – sagittal diameter of the diaphysis. ULAPS11A – sagittal diameter of the head. ULML_12A – width of the head. FEMAX_1 – maximum length of the femur. FEFYZ_2 – physiological length. FESTR_8 – circumference of the middle of the diaphysis. FELASP8a – circumference of the diaphysis at the asperal bifurcation line. FEDIMAX7a – transverse diameter of the middle of the diaphysis. FEDIMIN6a – sagittal diameter of the middle of the diaphysis. FEMLS 9 – subtrochanteric transverse diameter of the diaphysis. FEAPS_10 – subtrochanteric sagittal diameter of the diaphysis. FETRHORTŘET7b – upper transverse diameter of the diaphysis. FEAPHORTŘE7c – upper sagittal diameter of the diaphysis. FETRDOLTŘ7d – lower transverse diameter of the diaphysis. FEAPDOLTŘ7e – lower sagittal diameter of the diaphysis. FESIR 13a – upper width of the epiphysis. FEMLH_18 – vertical diameter of the head. FEAPH_19 – transverse diameter of the head. FESIR_21 – epicondylar width. TIMAX_1 – overall length tibie. TIMED1b - medial length. TIFN_10A – circumference of the diaphysis on the foramen nutricium. TISTR_10 – circumference of the middle of the diaphysis. TIMIN10B – minimum circumference of the diaphysis. TIDIMAX8 – maximum diameter of the middle of the diaphysis. TIDIMIN9 – width of the middle of the diaphysis. TIAPF8A – sagittal diameter in the upper foramen nutricium. TIMLF9A – width of the diaphysis in the upper foramen nutricium. TILMSSAG8b – sagittal diameter in the upper linea musculi solei. TILMSTR9b – width of the diaphysis on linea musculi solei. TISIR_6 – width of the lower epiphysis. TAMAX1A – maximum length of the ankle bone. TAFYZ_1 – physiological length. TASIR_2 – width. TAVYS 3a – height. CADEL_1A – length of the calcaneum.

Table 16. The expression of sexual dimorphism in measurements and indices of the skull.

Variable	MALE		FEMALE		variance			
	N	Mean	N	Mean	t-value	degree of free	p	l.s.
M1	13	188.4	17	177.4	4.9	28	0.000038	***
M5	10	105.6	10	96.5	5.5	18	0.000031	***
M8	13	137.1	17	133.8	2.1	28	0.048552	*
M9	13	99.2	22	94.3	3.1	33	0.003606	**
M17	10	138.0	12	129.2	4.1	20	0.000532	***
M23	13	527.5	14	504.4	4.5	25	0.000125	***
M38	10	1481.8	10	1283.4	4.6	18	0.000245	***
M40	10	99.9	10	89.2	6.6	18	0.000003	***
M45	11	133.5	16	123.8	6.6	25	0.000001	***
M47	10	121.2	17	105.8	6.5	25	0.000001	***
M48	11	71.9	18	63.2	5.9	27	0.000003	***
M51	11	42.9	18	40.7	2.7	27	0.010597	*
M52	11	33.1	18	32.2	1.4	27	0.175944	
M54	11	25.9	18	24.1	2.8	27	0.010454	*
M55	11	51.5	18	46.7	3.9	27	0.000579	***
M66	10	104.9	14	91.6	5.9	22	0.000006	***
M69	11	35.9	15	29.1	6.1	24	0.000003	***
I1	13	72.8	17	75.4	-2.4	28	0.022934	*
I2	10	73.5	11	72.9	0.4	19	0.664778	
I3	10	99.9	11	96.2	2.3	19	0.033388	*
I13	13	72.4	17	69.8	2.2	28	0.034497	*
I38	10	90.6	16	85.9	2.7	24	0.011768	*
I39	11	53.9	16	51.4	1.9	25	0.062933	
I42	11	77.1	18	117.0	-0.8	27	0.414707	
I48	11	50.4	18	51.8	-0.9	27	0.379922	
I60	10	94.6	10	92.4	1.7	18	0.105515	

Explanations: level of significancy (ls) - *=5%, **=1% and ***=0.1% (bold values)

Table 17. The expression of sexual dimorphism in the measurements of the post-cranial skeleton – left side (sin).

Variable	MALE		FEMALE		variance			
	N	Mean	N	Mean	t-value	degree of free	p	l.s.
CLMAX 1	5	146.4	13	135.8	1.9	16	0.073	
CLSAGS 5	9	12.8	20	10.8	5.4	27	0.000	***
CLVERTS 4	9	11.0	20	9.1	3.7	27	0.001	***
STDELM 2	5	60.6	10	50.5	2.9	13	0.013	*
HUMAX 1	7	326.6	16	289.5	4.5	21	0.000	***
HUTUBD 7*	8	72.5	17	57.8	12.6	23	0.000	***
HUMIN 7	8	66.4	17	52.3	10.4	23	0.000	***
HUDIMAX 5	8	23.1	17	19.4	5.1	23	0.000	***
HUDIMIN 6	8	18.9	17	15.0	10.6	23	0.000	***
HUSIR 3	9	56.0	15	43.6	2.9	22	0.009	**
HUML 9	3	44.3	6	40.0	1.9	7	0.103	

Variable	MALE		FEMALE		variance			
	N	Mean	N	Mean	t-value	degree of free	p	l.s.
HUAP 10	7	47.1	12	40.3	4.9	17	0.000	***
HUSIR4A	8	65.6	11	54.8	8.1	17	0.000	***
RAMAX 1	9	246.7	12	217.3	4.7	19	0.000	***
RASTR 5.5	9	44.8	16	36.4	10.1	23	0.000	***
RAMIN 3	9	42.2	15	34.1	7.7	22	0.000	***
RADIMAX 4	10	17.1	17	13.4	8.8	25	0.000	***
RADIMIN 5	10	12.2	16	9.8	6.8	24	0.000	***
RAMLK4 2	9	23.4	16	11.6	1.7	23	0.106	
RAAPK5 2	8	14.8	15	12.5	3.8	21	0.001	***
RAMLH4 1	4	22.5	8	19.5	3.6	10	0.005	**
RAAPH5 1	4	23.3	10	20.2	3.8	12	0.003	**
RASIR5 6	9	34.1	12	29.0	5.0	19	0.000	***
ULMAX 1	7	271.7	12	237.0	5.4	17	0.000	***
ULSTR 3A	8	48.3	14	37.7	9.2	20	0.000	***
ULMIN 3	7	37.7	15	30.3	6.7	20	0.000	***
ULDIMAX 12	9	17.6	16	13.9	7.7	23	0.000	***
ULDIMIN 11	9	12.8	15	10.3	7.9	22	0.000	***
ULAPS 11A	7	20.7	13	18.0	5.9	18	0.000	***
ULML 2A	7	18.3	10	15.1	6.2	15	0.000	***
FEMAX 1	12	457.1	18	411.6	4.6	28	0.000	***
FEFYZ 2	11	456.4	18	407.9	4.9	27	0.000	***
FESTR 8	9	94.0	18	76.9	7.3	25	0.000	***
FELASP 8a	9	92.3	16	77.8	6.5	23	0.000	***
FEDIMAX7a	8	30.1	18	25.5	5.3	24	0.000	***
FEDIMIN6a	8	30.3	18	24.8	5.5	24	0.000	***
FEMLS 9	8	33.9	15	30.2	4.9	21	0.000	***
FEAPS 10	8	28.3	15	22.7	5.9	21	0.000	***
FETRHORTŘT 7b	8	32.1	15	29.3	3.9	21	0.001	***
FEAPHORTŘE 7c	8	28.4	15	22.5	8.1	21	0.000	***
FETRDOLTŘ 7d	9	36.9	20	32.0	2.7	27	0.013	*
FEAPDOLTŘ 7e	9	31.0	20	25.6	6.3	27	0.000	***
FESIR 13a	9	93.7	13	84.8	3.9	20	0.001	***
FEMLH_18	9	48.3	11	41.9	7.0	18	0.000	***
FEAPH_19	6	48.2	11	42.2	5.2	15	0.000	***
FESIR_21	3	83.0	10	72.2	7.9	11	0.000	***
TIMAX_1	10	369.1	18	338.9	3.4	26	0.002	**
TIMED1b	10	363.4	18	333.2	3.4	26	0.002	**
TIFN_10A	9	94.3	17	79.6	5.5	24	0.000	***
TISTR_10	7	83.0	18	70.6	5.4	23	0.000	***
TIMIN10B	9	75.6	14	63.9	5.2	21	0.000	***
TIDIMAX8	7	31.4	18	26.8	5.4	23	0.000	***
TIDIMIN9	7	22.4	18	19.3	4.4	23	0.000	***
TIAPF8A	9	35.8	17	30.5	5.5	24	0.000	***
TIMLF9A	9	24.3	17	20.8	4.9	24	0.000	***
TILMSSAG 8b	8	38.3	18	33.2	5.1	24	0.000	***
TILMSTR 9b	8	26.8	17	23.0	3.9	23	0.001	***
TISIR 3	2	73.0	2	68.5	1.2	2	0.368	
TISIR 6	5	50.6	11	48.0	1.5	14	0.154	
FIMAX1	3	365.7	5	319.2	3.4	6	0.015	**
TAMAX1A	9	59.667	14	53.6	5.6	21	0.000	***
TAFYZ_1	9	55.333	18	49.7	5.9	25	0.000	***
TASIR_2	7	43.857	13	38.0	4.3	18	0.000	***
TAVYS 3a	8	32.625	18	30.6	2.5	24	0.020	*
CADEL 1A	6	73.500	12	67.3	3.4	16	0.004	**
i. platymericus	7	82.827	17	75.7	3.1	22	0.005	**
i. knemicus	8	70.758	17	68.8	0.8	23	0.450	

Table 18. The expression of sexual dimorphism in the measurements of the post-cranial skeleton – right side (dx).

Variable	MALE		FEMALE		variance			
	N	Mean	N	Mean	t-value	degree of free	p	l.s.
CLMAX 1	4	151.5	13	132.9	3.5	15	0.003	**
CLSAGS 5	9	13.1	19	10.6	5.3	26	0.000	***
CLVERTS 4	9	11.4	19	9.7	3.4	26	0.002	**
HUMAX 1	7	320.1	18	293.5	3.5	23	0.002	**
HUTUBD 7*	7	75.0	17	59.3	11.8	22	0.000	***
HUMIN 7	6	66.2	17	53.8	7.4	21	0.000	***
HUDIMAX 5	6	23.5	17	19.9	5.2	21	0.000	***
HUDIMIN 6	6	19.3	17	15.5	8.4	21	0.000	***
HUSIR 3	4	50.5	14	44.7	4.4	16	0.000	***
HUML 9	4	46.0	8	39.1	6.6	10	0.000	***
HUAP 10	4	46.0	12	40.8	2.4	14	0.033	**
HUSIR4A	5	61.6	10	55.8	2.9	13	0.014	**
RAMAX 1	9	249.2	12	221.5	4.5	19	0.000	***
RASTR5 5	8	45.6	13	37.8	5.0	19	0.000	***
RAMIN 3	9	43.7	14	35.4	6.0	21	0.000	***
RADIMAX 4	9	17.7	14	14.1	4.8	21	0.000	***
RADIMIN 5	9	12.6	13	10.0	6.5	20	0.000	***
RAMLK4 2	9	14.2	13	11.8	4.5	20	0.000	***
RAAPK5 2	9	14.9	13	12.0	4.9	20	0.000	***
RAMLH4 1	2	25.0	5	21.0	3.1	5	0.027	*
RAAPH5 1	3	24.3	4	21.0	2.0	5	0.096	*
RASIR5 6	8	33.4	11	29.5	3.6	17	0.002	**
ULMAX 1	5	277.2	6	242.2	3.7	9	0.005	**
ULSTR3A	6	47.5	11	39.6	4.5	15	0.000	***
ULMIN 3	6	37.0	14	30.9	5.1	18	0.000	***
ULDIMAX 12	7	17.0	12	14.0	4.6	17	0.000	***
ULDIMIN 11	7	12.3	12	10.8	4.2	17	0.001	***
ULAPS11A	6	20.7	8	18.8	2.6	12	0.024	*
ULML 12A	4	17.8	10	15.7	1.9	12	0.085	
FEMAX 1	11	452.3	19	407.4	5.0	28	0.000	***
FEFYZ 2	11	449.0	18	404.1	5.0	27	0.000	***
FESTR 8	6	92.2	20	77.4	5.7	24	0.000	***
FELASP 8a	6	90.0	19	79.3	4.4	23	0.000	***
FEDIMAX 7a	7	30.0	19	25.9	4.7	24	0.000	***
FEDIMIN 6a	7	29.7	19	25.1	4.6	24	0.000	***
FEMLS 9	7	33.6	17	30.0	4.1	22	0.001	***
FEAPS 10	7	27.7	17	22.7	5.8	22	0.000	***
FETRHORTŘET7b	7	31.6	17	29.4	1.9	22	0.077	
FEAPHORTŘE7c	7	28.4	17	22.5	8.5	22	0.000	***
FETRDOLTŘ 7d	8	36.3	19	32.2	2.0	25	0.059	
FEAPDOLTŘ 7e	8	31.0	19	26.2	5.6	25	0.000	***
FESIR 13a	9	92.9	12	83.0	4.3	19	0.000	***
FEMLH 18	7	47.7	13	41.8	6.8	18	0.000	***
FEAPH 19	7	48.0	12	42.2	5.1	17	0.000	***
FESIR 21	7	83.0	9	72.3	7.3	14	0.000	***
TIMAX 1	7	374.7	16	338.7	3.5	21	0.002	**
TIMED 1b	7	368.4	18	332.8	3.7	23	0.001	***
TIFN 10A	8	93.6	17	78.9	5.3	23	0.000	***
TISTR 10	6	83.7	17	70.8	4.8	21	0.000	***
TIMIN 10B	6	76.5	17	64.6	5.4	21	0.000	***
TIDIMAX 8	7	30.9	18	26.9	4.5	23	0.000	***
TIDIMIN 9	7	23.1	17	19.5	4.1	22	0.000	***
TIAPF 8A	8	35.1	17	30.1	5.2	23	0.000	***
TIMLF 9A	8	24.8	17	20.7	5.0	23	0.000	***

Variable	MALE		FEMALE		variance			
	N	Mean	N	Mean	t-value	degree of free	p	l.s.
TILMSSAG 8b	8	38.3	18	33.2	5.1	24	0.000	***
TILMSTR 9b	8	26.8	17	23.0	3.9	23	0.001	***
TISIR 3	2	73.0	2	68.5	1.2	2	0.368	
TISIR 6	5	50.6	11	48.0	1.5	14	0.154	
FIMAX1	3	365.7	5	319.2	3.4	6	0.015	**
TAMAX1A	9	59.667	14	53.6	5.6	21	0.000	***
TAFYZ_1	9	55.333	18	49.7	5.9	25	0.000	***
TASIR_2	7	43.857	13	38.0	4.3	18	0.000	***
TAVYS 3a	8	32.625	18	30.6	2.5	24	0.020	*
CADEL 1A	6	73.500	12	67.3	3.4	16	0.004	**
i. platymericus	7	82.827	17	75.7	3.1	22	0.005	**
i. knemicus	8	70.758	17	68.8	0.8	23	0.450	