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SKULL ASYMMETRY IN PREHISTORIC HUMAN SKELETAL REMAINS

A Comparative Study Documented with Clinical Cases

ABSTRACT. — *This palaeopathological study compares two cases of skull asymmetry with three clinical cases. After describing the skeleton and its pathological changes follows a morphological comparison with the use of cephalograms (tele-X-ray pictures) according to Jarabak. The authors deal with the pathogenesis of defects, with their presence in other prehistoric finds and they discuss also differential diagnosis. As a result of our study condylar hyperplasia was recognized in one case, and anomalous muscle traction with certain features of the torticollis in the other.*

KEY WORDS: *Skull Asymmetry — Palaeopathology.*

One of the most conspicuous findings in prehistoric osteological materials is cranial asymmetry. Changes in the shape exceeding normal variability of the studied population can have various causes ranging from artificial deformation in vivo and changes caused by specific pathological processes to post-mortal deformations due to the pressure of the overlying earth.

In the rich osteological materials collected from Old Slavonic burial sites we found three cases of asymmetry of the central axis of the skull, cases that had not been caused artificially, nor by the pressure of the earth, but probably by pathological processes. The studied skulls are: Mikulčice (grave No. 659), Komárno (grave No. 76) and Holiare (grave No. 468). (Deposition of the skulls: Mikulčice (grave No. 659) — Anthropological Department of the National Museum in Prague; Komárno (grave No. 76) — Slovak National Museum in Bratislava; Holiare (grave No. 468) — Anthropos Institute — Moravian Museum Brno, the skull is missing).

Following the principal cranial measurements, either realized by us or taken from the literature (Holiare), we examined the pathological changes of

the postcranial skeletons and compared the three skulls with the population variability in the individual cemeteries. In order to make asymmetry metrically more emphasized we used some new measurements (i.e. we measured the distance between the lower orbital border and the external edge of the M1 socket).

After analysing the possible causes of deformation the find was compared with three patients suffering from a disease seemingly most similar to the described deformation.

SKELETAL CHARACTERISTICS

Komárno — Shipyard (grave No. 76)

The skull belongs to a male of medium-to-robust stature and of the maturus age-group (50–60). Brachycranial, chamaecranial, tapeinocranial, metriorhine, mesoprosopic, leptene, mesoconch, leptorhine. It is asymmetric, medium long, medium wide, low.



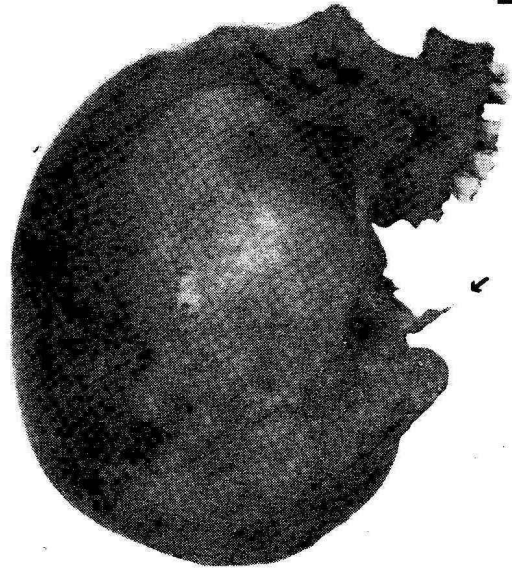
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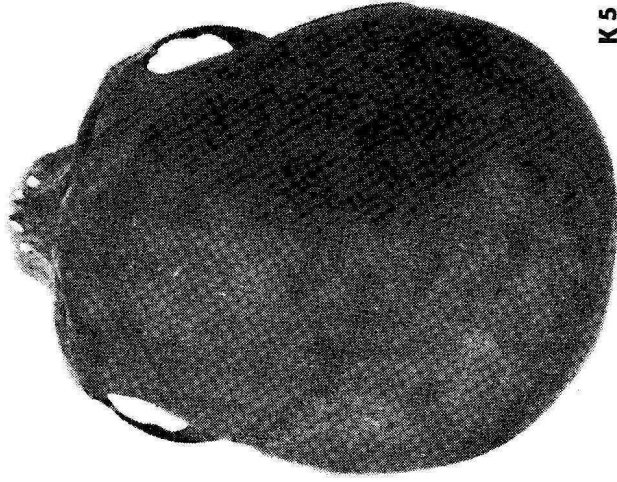
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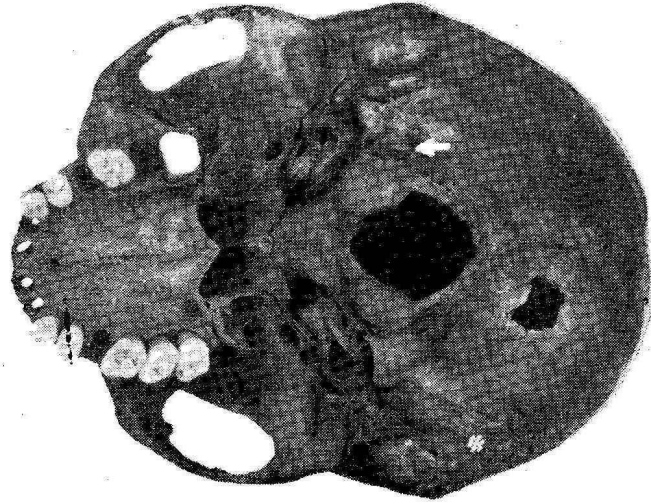
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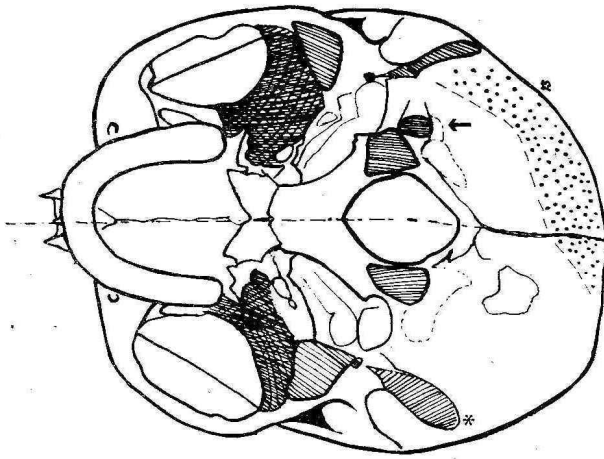
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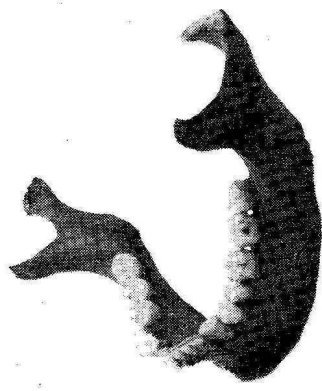


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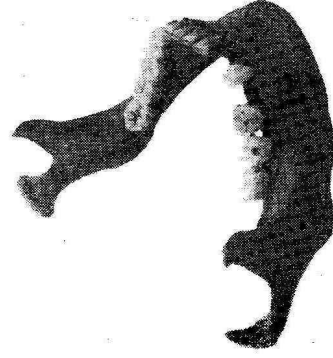


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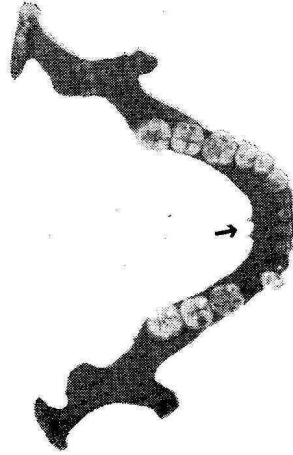
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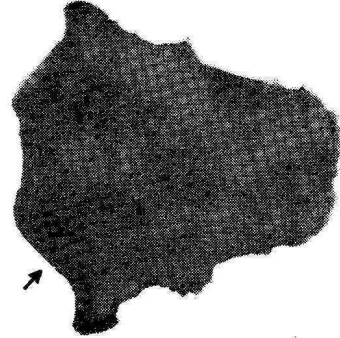
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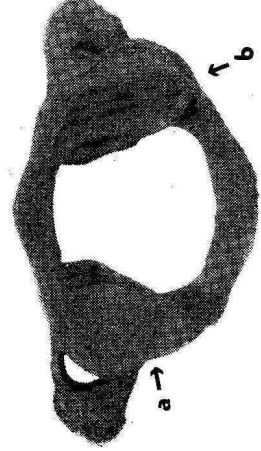
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K11



K12



K13

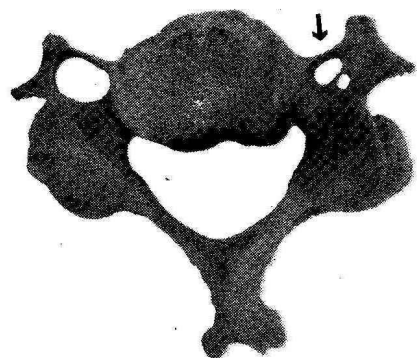
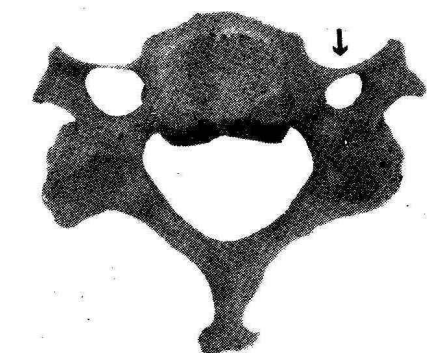
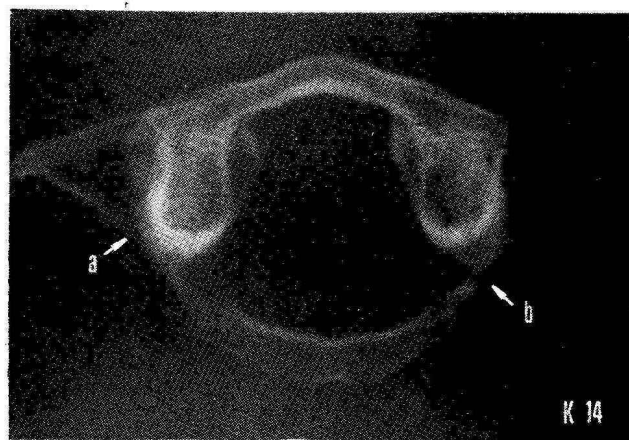


FIGURE 1. Grave No 78 Komárno K1-K16
K1-K3 General view and detailed views of the asymmetry in the maxillary region
K4-K6 Asymmetry of styloid and of the sutures
K7 Norma basialis with an anomalous process on the left condyle and with extended mastoid incisure on the right side
K8 Asymmetric surfaces on the cranial base expressed by the diagram
K9-K11 The lower jaw with an asymmetry of the mental spine
K12 Sternal asymmetry with a larger right-hand side clavicular incisure
K13-K14 Atlas a) anomalous articular surface of supernumerary process, b) overbridged sulcus of the vertebral artery
K15-C3 Diminished foramen costotransversarium on the right side
K16-C4 Double foramen costotransversarium on the right side

The face is broad, medium high, the upper face is high. The asymmetry is well visible in the following views:

Norma frontalis — the maxillary height measured from the lower orbital border to the external edge of the M1 socket is 4.8 mm larger on the left side (R 41 mm, L 45.8 mm), the orbital floor is flat.

In the *norma basalis* the axis of the skull is concavely deflected to the right. The asymmetries are well perceptible in the following regions (see diagram K 8): 1. fossa pterygoidea with the adjoining part of proc. zygomaticus ossis temporalis, 2. the region of fossa mandibularis, 3. on the left condyle there is an extra process — processus epitransversarius (Köhler, Zimmer, 1982) with articulation surface. 4. the mastoid incisure for the posterior part of the digastric muscle on the right side is somewhat broader, 5. the occipital region on the left is somewhat flatter than on the right (dotted).

In the *norma verticalis* there is a well represented concave deflection to the right.

TABLE 1. Absolute dimensions and indices of the skulls from Mikulčice, Komárno-Lodenica and Holiare (Malá 1965)

Dimension	Komárno	Mikulčice	Holiare
Maximum length of the skull (1)	181	—	169
Length of skull base (5)	97	98	—
Maximum skull breadth (8)	150	—	138
Minimum frontal breadth (9)	99	97	92
Maximum frontal breadth (10)	120	120	—
Biauricular breadth (11)	134	132	—
Occipital breadth (12)	128	—	—
Skull height (17)	123	129	128
Auricular-bregma height (20)	116	112	—
Cranial circumference (23)	525	—	—
Transversal arc (24)	315	310	—
Longitudinal arc (25)	355	—	—
Frontal arc (26)	134	120	—
Parietal arc (27)	110	—	—
Occipital arc (28)	111	—	—
Frontal chord (29)	119	106	—
Parietal chord (30)	100	—	—
Occipital chord (31)	91	—	—
Facial length (40)	94	95	—
Upper facial breadth (43)	107	101	—
Biorbital breadth (43-1)	97	93	—
Bizygomatic breadth (45)	140	130	117
Middle facial breadth (46)	92	90	84
Facial height (47)	120	119	102
Upper facial breadth (48)	77	68	60
Interorbital breadth (50)	20	20?	—
Orbital breadth (51)	L 40 R 40	L 37 R 37	37
Orbital height (52)	L 37 R 36	L 36 R 37	31
Nasal breadth (54)	22	24	23
Nasal height (55)	54	51	47
Minimum nasal breadth (57)	10	9	—
Bicondylar breadth (65)	136	122	—
Bigonial breadth (66)	93	88	92
Symphysal height (69)	30	34	—
Height of the ascending branch (70)	L 53 R 49	L 78 R 52	L 48 R 62

In the *norma lateralis dextra* the right styloid process (22 mm) is wider at its base than on the left side and in the parieto-mastoideal suture there are ossa suturaria.

Norma lateralis sinistra — the styloid process has been damaged (6 mm). At the mandible the mental spine has been deflected to the right, the right condyle is smaller than the left one and there are arthritic changes on both the condyles. The length of the left mandibular ramus is 53 mm and the right ramus is 49 mm long. The absolute dimensions and indices are presented in Table 1.

Most dimensions fall within the normal variation limits. The dimensions of the skull base and of the cranial height are near the lower limit of the variation of the population while the dimensions of the max. breadth of the frontal bone, occiput, bizygomatic, orbital height and of the bigonial breadth form the upper limit.

The traces of asymmetry can be followed on the postcranial skeleton.

In the cervical spine there are irregularities of the corresponding articular surfaces and orifices through which the vertebral artery and the committing veins are passing. At the atlas on the right side there are smaller articular surfaces. Cranially on the right side, the sulcus of the vertebral artery is overbridged, on the left there is an atypical articular surface for the condyle. The foramina costotransversaria of axis, C3, C4 and C5 are of various dimensions. The maximum diameters of the right side are smaller. C3 — (L 9 mm, R 6 mm); C4 — (L 8 mm, R 5 mm doubled); C5 — (L 9 mm, R 6 mm).

On further vertebrae we found spondylosis. The sternum is slightly inclined to the right, the right clavicular incisure is deeper than the left one (L 23×15 mm, R 27×15 mm).

TABLE 2.

Indices	Komárno	Mikulčice	Holiare
Length-breadth index (I 1)	82.84	—	81.7
Length-height index (I 2)	67.96	—	75.7
Breadth-height index (I 3)	82.00	—	92.8
Transversal fronto-parietal index (I 13)	66.00	—	66.7
Facial index (I 38)	85.71	92.3	87.2
Upper facial index (I 39)	55.00	53.2	51.3
Orbital index (I 42)	81.39	87.8	83.8
Nasal index (I 48)	40.74	48.2	48.9

Mikulčice (grave No. 659)

A female skull belonging to the adultus age-group (30-40 years), leptoprosopic, mesene, hypsi-conch, mesorrhine. The right half of the skull is evidently smaller than the left one, the facial skeleton has been preserved, the occipital part has been heavily damaged. The skull is medium high, with broad and high face. The upper face is of mean size.

In the *norma facialis* the height of the right maxilla is 8.7 mm smaller (L 43.6 mm, R 34.9 mm). The left orbit is 1 mm lower.

On lifting the skull we can see the symmetric mastoideal regions.

In the *norma lateralis* part of the temporal regions, and on the left also part of the occipital region are missing. The mandibular branches with condyles are asymmetrical:

— length of the left mandibular ramus — 78 mm
— length of the right mandibular ramus — 52 mm.

The base of the mandible is shorter on the right side, causing considerable teeth crowding and abnormal position of I₂ and C (Stloukal, Vyhnanek, 1976).

The postcranial skeleton has not been preserved.

Holiare (grave No. 486)

The skull is missing and thus we were unable to examine it. The absolute dimensions and indices have been taken from an earlier publication (Malá, 1965).

Brachycranic, hypsicranic, metriocranic, metriometopic, euryprosopic, mesene, mesoconch, mesorrhine.

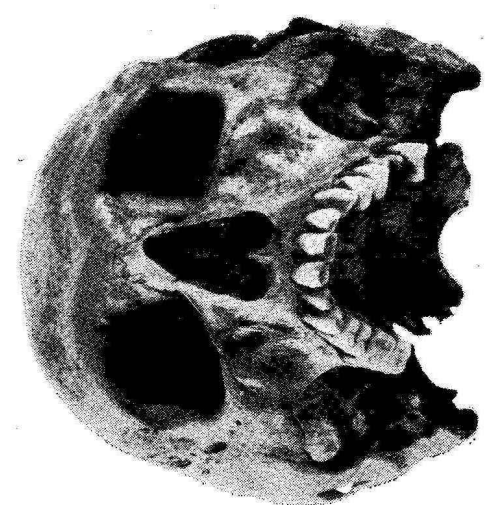
According to the absolute dimensions and photodocumentation the skull appears to be medium-long, medium-broad, with narrow and short face. The skull without the mandible seems to be symmetrical, the head of the mandible on the left side is evidently smaller.

The left ramus of the mandible is 48 mm long, the right ramus measures 62 mm.

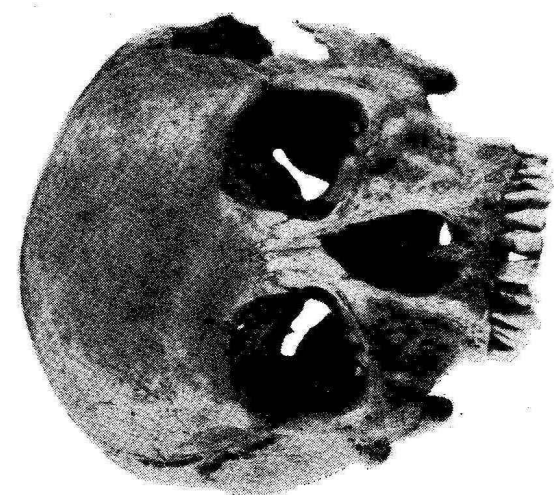
All dimensions of the skull fall within the variation of the Holiare population. The orbital breadth forms its lower limit of the variation of this measurement. The postcranial skeleton is incomplete, the upper limbs are missing, from the lower limbs only the two ankle bones have been preserved. The clavicles, parts of the sternum with parts of the shoulder-blades, ribs, pelvic bone and the sacrum do not show any asymmetry or pathological process. On the atlas there are irregular articular surfaces, larger on the left than on the right side, the sulcus of the vertebral artery is overbridged on the right side. In the vertebral column the right foramina transversaria are smaller. C6 has a double foramen transversarium on the right side.

CRANIOMETRIC RESULTS AND THE DESCRIPTION OF PATHOLOGICAL CHANGES

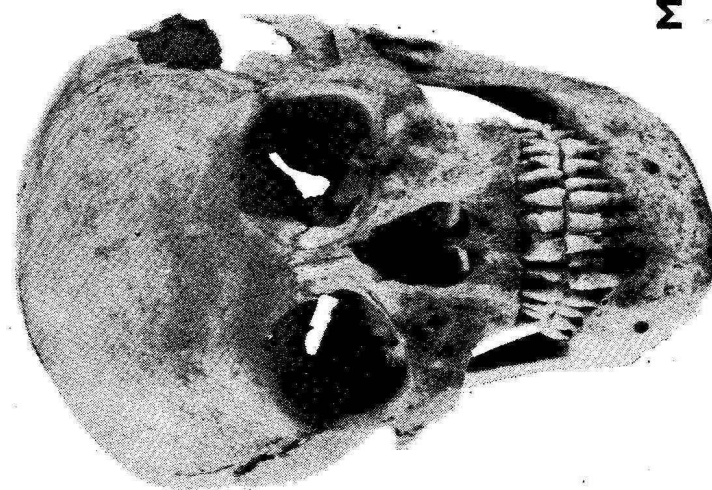
From the above description follows that there is an asymmetry reaching its maximal extent in the maxillary and mandibular regions. The orbit above the longer ramus of the mandible is only slightly smaller (with a difference of only 1 mm in the orbital height of the Mikulčice and Komárno skulls). The changes increase in the maxillary region. On the side of the longer mandibular ramus the maxilla is



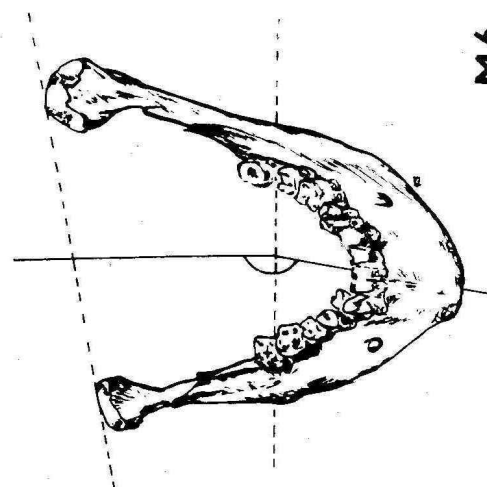
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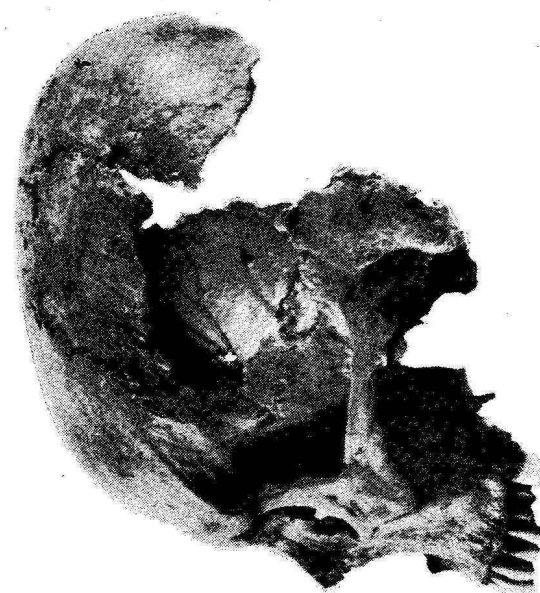
M2



M1



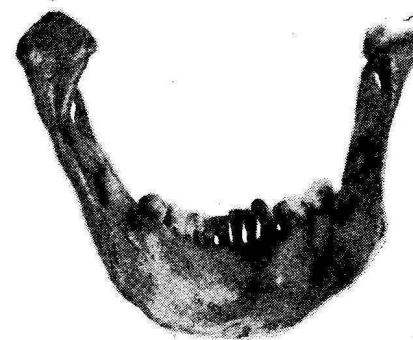
M6



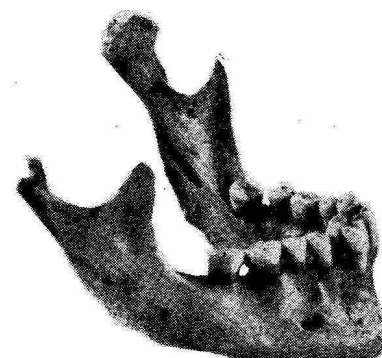
M5



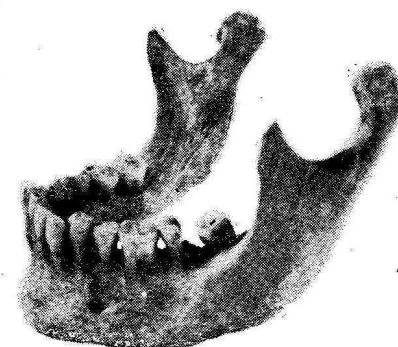
M4



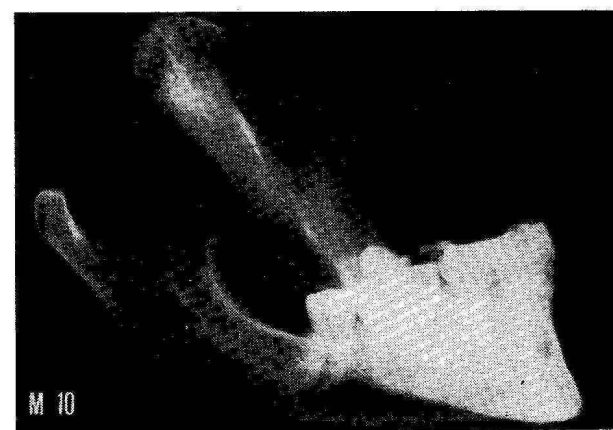
M7



M8



M9



M 10

FIGURE 2. Grave No. 659 Mikulčice M1—M10
M1—M3 General view and detailed views of the asymmetry in the maxillary region
M4—M5 Part of the temporal region important for differential diagnosis is missing on the left side
M6 Diagram of the condylar asymmetry
M7 A view of the condyles from the dorsal side and the lateral side M8—M9
M10 Patchy thinning of the left condyle which can be the manifestation of the degeneration of primary hyperplasy. It might have been caused also by an injury in the childhood.

8.7 mm higher in the Mikulčice skull and 4.8 mm higher in the Komárno skull than is the case on the opposite cranial side. It is difficult to say how it was with the Holiare skull. The most remarkable asymmetry is caused by the length of the mandibular ramus, where the difference between the longer and shorter branch reaches 26 mm in the Mikulčice skull and 14 mm in the Holiare skull. The difference between the two branches of the Komárno skull is only 4 mm — in this skull, however, the asymmetry of the skull base is very conspicuous (and it cannot be fully compared with the Mikulčice skull where part of its base is missing and with the Holiare find, as the skull was missing). On studying the remains of the two postcranial skeletons (Holiare, Komárno) we found that the changes were proceeding in the caudal direction, with asymmetries in the articular surfaces and in the orifices through which the vertebral artery is passing in the cervical vertebrae. The articular surfaces were smaller on the right side, so were also the foramina costotransversaria. The sulcus of the vertebral artery was overbridged also on the right side. These right-hand side changes correspond to the shorter mandibular ramus in the Komárno skull. In the Holiare skull the shorter ramus is on the left side.

The concentration of asymmetries on shorter mandibular ramus and on the acoustic meatus suggests that it might have been the result of a variant of an otomandibular dysostosis with manifestation on the backbone, i.e. of Goldenhamer's syndrom. We decided to test this hypothesis by making comparisons with patients suffering from otomandibular dysostosis, namely with the help of the cephalometric analysis according to Jarabak and Fizzel (1972).

CEPHALOMETRIC ANALYSIS

The skull from Mikulčice (grave No. 659) and that from Komárno (grave No. 76) have been treated by craniomeric analysis usually used with patients of the Clinic of Plastic Surgery. The cephalograms obtained through tele-X-ray pictures of the head from a distance of 300 cm, both in lateral and frontal projections were processed, by the Jarabak skeletodental cephalometric analysis, which is used at the clinic since the year 1969 (Jarabak, Fizzel, 1972). The cephalograms were compared with the cephalograms of a male and of a female patients treated at our clinic.

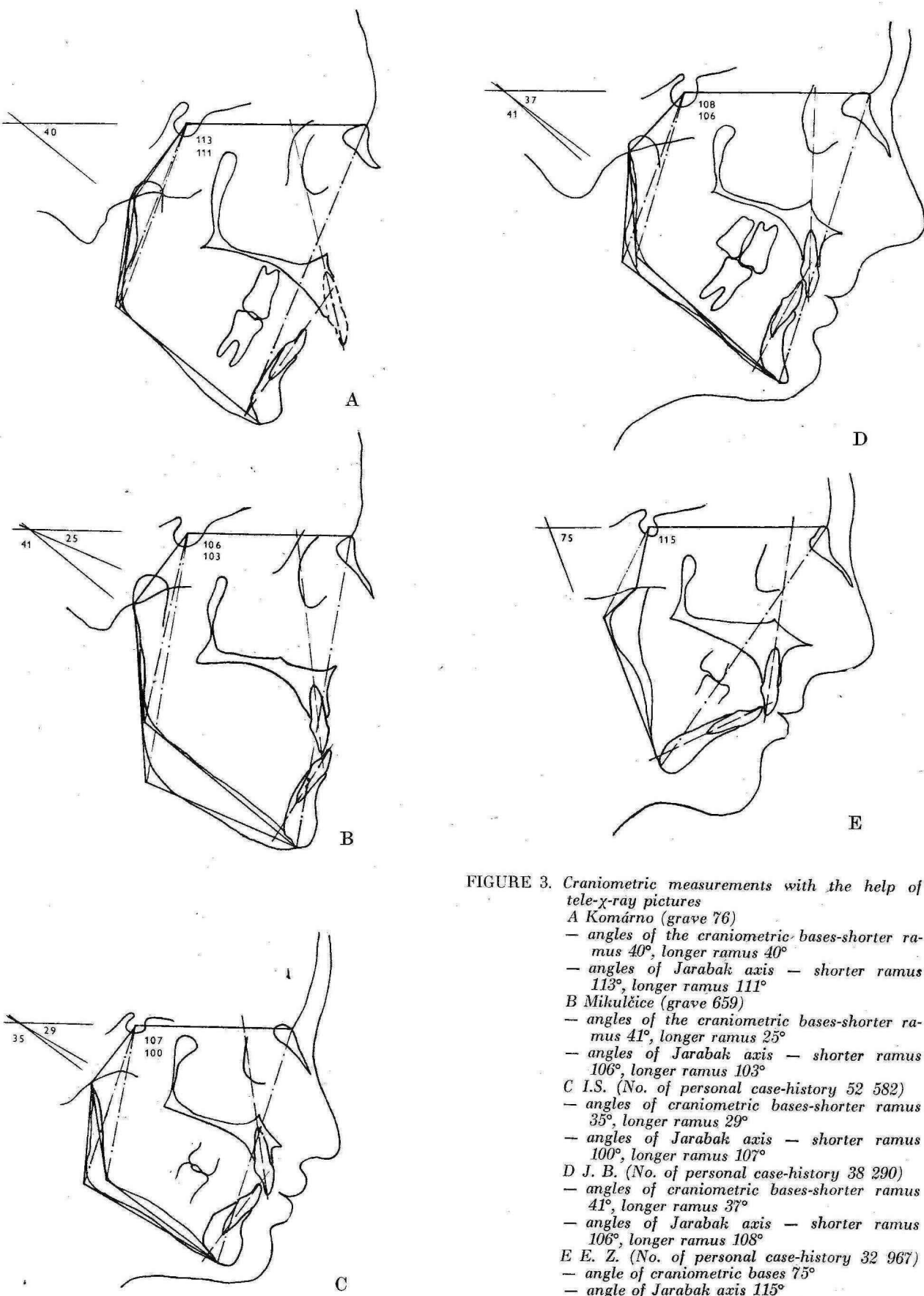


FIGURE 3. Craniometric measurements with the help of tele-x-ray pictures

- A Komárno (grave No. 76)
 — angles of the craniometric bases-shorter ramus 40°, longer ramus 40°
 — angles of Jarabak axis — shorter ramus 113°, longer ramus 111°
- B Mikulčice (grave No. 659)
 — angles of the craniometric bases-shorter ramus 41°, longer ramus 25°
 — angles of Jarabak axis — shorter ramus 106°, longer ramus 103°
- C I.S. (No. of personal case-history 52 582)
 — angles of craniometric bases-shorter ramus 35°, longer ramus 29°
 — angles of Jarabak axis — shorter ramus 100°, longer ramus 107°
- D J. B. (No. of personal case-history 38 290)
 — angles of craniometric bases-shorter ramus 41°, longer ramus 37°
 — angles of Jarabak axis — shorter ramus 106°, longer ramus 108°
- E E. Z. (No. of personal case-history 32 967)
 — angle of craniometric bases 75°
 — angle of Jarabak axis 115°

a) Komárno (grave No. 76)

The skeleton of the anterior cranial base is normal, the mandibular condyle is situated dorsally, the sella angle (N-S-Ar) is 128° at the upper limit of the standard. The angle of Jarabak axis (N-S-Go) is greatly increased, to 113°. The large articular angle (S-Ar-Go = 152°) corresponds to the steep mandibular branch, increasing the dorsal position of the Gonion. The angle of craniometric bases (anterior cranial base N-S to mandibular body Me-Go) is 40°, the length of the posterior cranial base is normal (35 mm). The height of the mandibular ramus corresponds with the posterior cranial base. The steep position of the ascending branch is matched by the small gonion angle (119°) and the dorsal position corresponds with the large angle of the Jarabak axis (113°). The upper segment of the gonion angle (Ar-Go-N) is smaller, the lower one is normal.

The relationship of the anterior and posterior facial heights (S-Go to N-Me) corresponds to the angle of the craniometric bases and also shows the neutral pattern of the growth of the lower jaw. The small S-N-B (B-point = supramentale) angle caused by the dorsal position of the lower jaw is one of the causes of the large A-N-B (A-point = subspinale) angle of the big overjet (14 mm). The upper incisors are missing, their position has been reconstructed according to the alveolar process. The angular relations of the incisors to the referential planes are normal (1+1 to S-N, 1-1 to Go-N).

Conclusion: There is a cephalometrically normal cranial and facial skeleton, with a conspicuously dorsal position of the lower jaw.

b) Mikulčice (grave No. 659)

The anterior cranial base is small (S-N 64 mm), fossa temporo-mandibularis is situated dorsally. The sella angle is large (N-S-Ar 131°). The angle of Jarabak axis is slightly increased (N-S-Go 106°). The angle of craniometric bases (N-S ÷ Me-Go) is 41° in the shorter ramus and 25° in the longer one. The posterior cranial base is of normal length. The shorter mandibular ramus is proportionally (44 mm). The longer ramus exceeds the standard considerably (68 mm, i.e. + 55%). The mandibular body on the side of the shorter ramus is slightly longer, but has a normal shape.

On the side with longer ramus the body has an atypical shape. The gonion angle is decreased, the decrease is caused by the upper part (Ar-Go-N). The lower part (N-Go-Me) is normal.

Relation between the posterior and anterior facial heights, 77.6% in the longer and 58.4% in the shorter ramus corresponds to the size of the angles of the craniometric bases. The relations of the anterior edges of the apical bases (point A, point B) to the cranium and to each other are almost normal. The cross bite of the incisors has been caused by the retrusion (98° to S-N) of the upper central incisors.

Conclusion: The left ramus of the lower jaw is longer, the right one is shorter, the body of the lower jaw has an atypical shape. The anterior facial configuration is almost normal and corresponds with the angular relations of the shorter (right) mandibular ramus.

c) Female patient I.S. (No. of case-history 52 582), born on June 10, 1976, still being treated orthodontically, not yet operated.

Personal history: her 6 years older brother has hypospadias the cousin of the mother has cleft palate. The mother of the patient did not use any medicines during her pregnancy and she had no infectious disease.

Description of the defect: the left flap is 1 cm smaller than the right one, its configuration is slightly abnormal, the meatus is lowered, the hearing is deteriorated, the left cheek and the left wing of the nose are hypoplastic, the mouth runs from the left side downwards to the right. When smiling the corner of the mouth is contracted to the wing of the nose. The left eyelid is abundant and overhanging, the left lateral corner of the eye is set lower as compared with the right one. The left eye is amblyopic. The uvula is bifid.

Cephalometric examination: the anterior cranial base of the skull is shorter also with regards to the age of the patient, the angle of the sella turcica is 128°, the angle of Jarabak axis is 107°, just at the upper limit of the standard. The articular angle and the posterior cranial base are normal. The right branch of the lower jaw is normal, the left one is shorter (-5 mm, 86%). The body of the lower jaw on the right side is normal shape and size, on the left one is shorter (-8 mm, 87%) and thinner. The gonion angle is small with the lower part clearly decreased — it means small vertical growth. The percentual ratio of the anterior and posterior heights of the face (78%) corresponds with the angle of the craniometric bases (29°) and with the structure of the segments of the gonial angle. These all indicate small vertical facial growth. The relation of the incisors to the facial plane is normal as a result of the current orthodontic treatment.

Conclusion: the facial skeleton shows little growth intensity, namely in vertical direction, considerable hypoplasia of the upper jaw, of the mandibular body and ramus on the left side. The small angle of the craniometric bases is the result of small gonion angle, namely of its lower segment.

d) Male patient J.B. (No. of case-history 38 290), born on March 1, 1950 — there is decoricated flap implanted into his left cheek, changing the configuration of the face.

Personal history: there are no inborn defects in the family, his twin-sister is healthy. He states that in 6 years of age, following scarlet fever, he contracted atrophy of the left cheek. In a photo when he was 4 years old he covers his left cheek with his hand, so that we cannot see the degree of





affection. In other photo, taken at the age of 14 years, we can see him already with the defect. He can hear perfectly with both ears.

An electromyograph taken in the year 1969 showed that the potentials of the muscles of the left cheek had not suffered any pathological changes. The neurologists concluded from the EMG finding that it was a congenital defect.

Cephalometric examination: the anterior and posterior cranial bases are normal, the angle of the sella turcica is large (132°), the angle of Jarabak axis is increased (108°), the angle of the cranio-metric bases is normal. The right ramus and body of the lower jaw are of normal size and shape, their left counterparts are 10 % shorter.

The gonial angle and its segments are normal. The mandibular symphysis is thin, with the chin well marked. The ratio of the anterior and posterior facial heights is 60 %, corresponding to a neutral

FIGURE 4. Patients with various forms of otomandibular dysostosis

I. S. (Female patient, No. of personal case-history 52 582) — 1-2 in two years of age, 3-4 in 9 years (not operated)

J. B. (Male patient, No. of personal case-history 38 290) — 1-2 in 35 years of age, his face on the left filled with decorticated flap

E. Z. (Female patient, No. of personal case-history 32 967) — 1-2 twelve years of age 3-5 in 26 years of age — the face on the left after the implantation of corium fat



type of growth, completely in line with the angles of the craniometric bases and segments of the gonion angle. The anterior edge of the maxillary dental base is placed dorsally (S-N-A 69°) the mandibular dental base too. That is why the relation of the incisors of the upper and lower jaws to the dental bases and to the cranium is good. The atypical shape of the mandibular symphysis increases the angle of the facial plane, strongly protruding before the incisors.

Conclusion: the facial skeleton is well developed. On the left side of the lower jaw, the body and the ramus are shorter. The short maxillary dental base mutually compensate each other, so that the incisors are in a favourable mutual position.

e) Female patient E.Z. (No. of case-history 32 967), born on September 6, 1959, unmarried, factory worker, she was an average student. She had a hearing defect and her right ear was operated. Corium fat has been implanted into her left cheek.

Personal history: there are no innate defects in her family, the three younger sisters and brother are healthy, her mother had German measles in pregnancy.

Description of the defect: the right flap is slightly deformed, the nasal septum is deviated to the left, the left cheek is asymmetrical, in the orotragal line there is a preauricularly situated blind skin pocket. When smiling the left corner of the mouth shifts upwards. On the left side there is a submandibular scar caused by the implantation of the corium fat.

Cephalometric examination: the anterior cranial base of the skull is normal. The angle of the sella turcica is small (115°). The posterior cranial base is also small (25 mm). The angle of the cranio-metric bases (S-N:Go-Me) is extremely high (72°). There is considerable hypoplasia in both mandibular branches. On the left side it nearly reaches aplasia and the gonion angle is disappearing. The mandibular body is slightly shorter as compared with the anterior cranial base of the skull.

The symphysis mandibulae is high and thin. The ratio between the anterior and posterior facial heights is 33.3 per cent. The maxilla and mandibula dental bases are dorsal, to the cranium. The upper (81° to S-N) and lower incisors (84° to Go-Me) are retruded.

Conclusion: heavy skeletal defect affecting both mandibular branches with an atypical position of the condyles in the fossa temporomandibularis.

THE RESULTS OF THE CEPHALOMETRIC ANALYSIS

The cephalometric examination showed the strong dorsal position of the lower jaw of the Komárno skull. As regards the Mikulčice skull, the configuration of the anterior cranial part corresponds to the angular relations of the shorter mandibular branch.

On comparing the tele-X-ray pictures of the above-mentioned skulls with a number of patients suffering from otomandibular dysostosis there were concurrences only in two of the 24 parameters being compared: 1. increased angle of the sella turcica above the normal. 2. decrease of the gonion angle.

DISCUSSION

Komárno (grave 76): The cephalometrically proved dorsal shift of the mandible would support the assumption that the muscular tension in this skull was directed to the right and downwards probably with maximum strength in the area of the infrahyoid muscles. Os hyoideum was strongly pulled downwards so the mental spine was pushed to the right and downwards by m. geniohyoideus. The posterior part of the digastric pressed the wider mastoid incisure to the right and the styloid process was wider and longer than in the left. Participating in this asymmetry was also the sternomastoid incisure to the right and the styloid articular surfaces and of the sternal body). The arching of the parieto-occipital region to the right would suggest also the participation of the trapezius. A hypoplasia of at least of 4 mm of the right mandibular condyle thus arose due to a coincidence of tensions exerted on the skull by the sternomastoid muscle and the trapezius and tensions on mandible by infrahyoid muscles. The occipital region of the skull is relatively flat, while the frontal region is vaulted on the side with no muscular tension. These characters speak for torticollis (Stloukal and Stloukalová, 1963). The movement of the head was probably hindered by the atypical process on the left occipital condyle that had formed an anomalous articular surface on the atlas.

In view of these findings on the cranial base, and of the irregularities in the size of the articular surfaces on the cervical spine, together with the irregularities in the orifices for the vertebral artery, we assume that the individual had an innate disposition to develop this defect. One could object that in large assemblages coming from prehistoric cemeteries spine asymmetries appear relatively frequently. In the above cases, both in Komárno and in the Holiaře skulls the irregularities consist in a decrease of the articular surfaces and in narrowing the orifices for the vertebral artery situated more on the right side. We do not know whether it is so by accident or there are further asymmetries of this type might throw some light on this problem.

Mikulčice (grave 659): In this case the results of the cephalometric analysis suggest that it might have been a case of hyperplasia of the left condyle since the angular relations of the face would rather correspond to the shorter mandibular branch. Condylar hyperplasia may result from uncontrolled growth of the ossification centres of the condyle or from an injury during childhood (Converse 1964). According to the above author hyperplasia results "in shifting the central point of the mandible to the opposite side and is accompanied by buccal malocclu-

sion of the teeth on this side. No limitations of the movement of the temporomandibular joint are expected. The defect often results in malocclusion of the upper front teeth and in a lingual inclination of the mandibular teeth and of alveolar process on the non-affected side. An increase in size of the condyle leads to the extension of the shape together with the extension of the ramus and to hyperplasy of the mandibular body. The hypertrophy is externally visible, the patient has a marked hypertrophy of the lower face. The chin is deviated to the non-affected side and looks as if elevated." To this description corresponds also the crowding of the teeth on the right side of the mandible (Stloukal, Vyhnanek, 1976).

Other possible diagnosis would be a wry neck (torticollis) see the original publication on the skull No. 659 (Stloukal, 1961). Unfortunately the post-cranial skeleton has not been preserved and we cannot examine the possible changes on the sternum and on the clavicles. The mastoideal regions seem to be symmetrical. The entire occipital region, however, seems to be damaged. Anyhow a secondary of the torticollis cannot be excluded. According to Pavlanský (1979) torticollis is a hereditarily conditioned genotypical recessive defect whose development can be furthered by various external factors. The third possible cause of the development of otomandibular dysostosis has probably been excluded by the craniometric examination. Otomandibular dysostosis has an incidence of 1 to 4000 births. No heredity has been proved. It arises through damaging the respective region during the early embryonal period with blood haematoma arising from anastomosis preceding the formation of arterial stapodial stem (Poswillo 1973).

Holiare (grave 468): The asymmetry of the skull was published as a hyperplasy of the condyle of the right mandibular branch (Malá, 1967). On the cervical spine similar changes have been found as in the Komárno skull. Unfortunately we were unable to examine the skull proper.

Other example of cranial asymmetry is a Palaeolithic female skull from Dolní Věstonice in the collections of the Anthropos Institute and the Director of the Institute Dr. Jelínek was kind enough to show it to us.

The most interesting view of the skull is in the norma basalis and frontalis. From the basal view we can see very well the various axial deviations under an obtuse angle enclosed by the plates of the upper palate and by the axis of the base. A further asymmetry can be seen in the region of the auditory ductus and in the area of the left temporomandibular joint, which is deformed. From frontal view we can see that the left side of the maxilla is smaller. The configuration of the zygomatic bone also differs on the left side. The head of the mandible left is hypoplastic with arthritic changes. With the mandible and the upper jaw in occlusal position the teeth do not close perfectly. The Palaeolithic female skull from Věstonice is suitable for detailed study, in Dr. Jelínek's view after its complete new reconstruction as some of the dimensions of the skull

have been changed due to incorrect reconstruction following the excavation.

Conclusion: The two asymmetric skulls found in the Slavonic burial sites in Komárno (grave 78) and from Mikulčice (grave 659) following the craniometric and cephalimetric description of the pathological changes in the skulls and in the remains of the post-cranial skeletons were compared with three patients suffering from otomandibular dysostosis. We considered also the skeleton from the Slavonic burial at Holiare (grave 468), but we were unable to compare the skull as it has been lost. The tele-X-ray pictures of the Slavonic skulls differed from the tele-X-ray pictures of the patients suffering from otomandibular dysostosis, but they differed also from each other.

In the skull from Mikulčice (grave 659) the asymmetry arose probably through condylar hyperplasia. In the skull from Komárno (grave 76) the asymmetry is probably due to abnormal tension exerted by the muscles on the right side of the neck, probably as a result of inborn disposition.

Our findings are in line with the conclusion by Weyers (in Gorlin 1964), stating that vertebral anomalies are more often connected with one-sided face hypoplasia than with two-sided affection.

After excluding the postmortal distortions caused by the overlying earth and also the artificial deformations in vivo we had a chance to study an interesting group of skull asymmetry, however, must be studied and assessed individually, including the examination of the preserved postcranial skeleton, with special regards to the population in which the individual lived, and also to the circumstances of their excavation.

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