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OBSAH – INHALT

BODY REMAINS OF ARCHBISHOP GEORGIUS (JURAJ) LIPPAY, EXHUMED FROM THE CRYPT UNDER ST. MARTIN'S CATHEDRAL IN BRATISLAVA

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Keywords: *skeletal remains, anthropological and palaeopathological analysis, ecclesiastical dignitary, 17th century, historical investigation, Central Europe*

Abstract: ***Body remains of Archbishop Georgius (Juraj) Lippay, exhumed from the crypt under the St. Martin's Cathedral in Bratislava.*** As it was already mentioned in a previous publication, during underground research of the St. Martin's Cathedral in Bratislava realized (with pauses) in 2009 – 2011, besides the remains of Cardinal Peter Pázmány (PP), also the remains of Archbishop Georgius Lippay (GL; 9. 10. 1600 – 3. 1. 1666) were found. His body was deposited on his back in a half-crumbled coffin placed along the south wall of the crypt in such manner that he rested in a stretched position with a slightly twisted head which was directed to the west, so his look could lead to the east. The deceased archbishop was dressed in mass closing with two cassocks and a reverend, his feet were covered with silk brogues and stockings bound around the knees. Just behind his skull, as a confirmation of his position in the Roman Catholic Church, there was a flattened mitre, while beside the right side of the body, there were placed bishop's crutch, a gilded wooden chalice with the paten, rosary, and gilded silver cross.

From the whole body, only its partially decomposed skeleton covered with aggregates of light yellow brushit minerals scattered on bones has been preserved. However, some parts of the head retained not only the mummified skin but also the dark brown hairs. The lower parts of the face, including the mandible, were thickly infested by insect pupas building almost monolithic layer. As to the decomposition, mostly the right part of the body inclined to the right, where the products of decomposition including fluidized components were concentrated, was affected. His physique is characterized by the moderate robust skeleton and medium relief of muscle insertions, the skull is brachycranic (relatively short). The body height calculated from limb bone length reached 167.7 cm, so it may be placed into the widely used categories of tall-medium stature. According to the osteological age, mostly estimated by the exocranial suture closure and the tooth-wear pattern, his age-at-death could be placed in a theoretical age range of 53 – 66 years. With its upper limit, this estimation reaches his calendar age at death (66 years).

The preserved parts of the skeleton show that in the head, as well as in the upper part of the skeleton, no pathological changes have been observed. Besides this, the health condition of his teeth was very good, too. There was no one carious tooth in his dentition. The only visually observable pathological changes, present in the form of arthritis, could be found in two joints of his lower extremities – in the knee and ankle ones. This find is in agreement with the problems related to lower limbs mentioned in his testament from December 31, 1665, which had been written only a couple days before his death.

Discovery context

As it was already mentioned in a previous publication (*Thurzo et al. 2017*), during the underground research of the presbytery in St. Martin's Cathedral in Bratislava, realized (with some interruptions) in 2009 – 2011, besides the remains of Cardinal Petrus Pazmanus (Peter Pázmány) also the remains of Archbishop Georgius (Juraj) Lippay (GL) – his enthusiastic admirer, Archbishop of Veszprém and Hungarian chancellor – were found. According to his wishes stated in the will from December 31, 1665, he was inhumated alongside the remains of Petrus Pazmanus. The topography of the crypt, its investigation, and the findings acquired during it were mentioned in several publications (*Farkaš et al. 2015*; *Haľko/Komorný 2010, 2011; Thurzo et al. 2017*), so in this contribution, we will speak only on the circumstances immediately relevant to the remains of GL.

His remains had been deposited in a disintegrated coffin placed along the south wall of the crypt. GL rested on the back in a stretched position with slightly twisted head, which was directed to the west, so his look could lead to the east (Fig. 1). Remains of the left (northern) sidewall of his coffin were found on the ground next to the coffin, while the right (southern) sidewall was leaning against the plastered wall of the crypt. Both coffin foreheads were leaning against the eastern wall of the crypt. As it reports N. Knauz (*Knauz 1859*), some parts of "the boards of both dented coffins" were brought

Fig. 1. Lippay's body remains deposited in a disintegrated coffin touching the south wall of the crypt. Photo by M. Poljak

Obr. 1. Telesné pozostatky J. Lippaya uložené v rozpadnutej rakve pri južnej stene hrobky. Foto M. Poljak

Fig. 2. Lippay's head *in situ*, with a flattened bishop's mitre just behind it. Photo by M. Poljak

Obr. 2. Hlava J. Lippaya in situ s deformovanou biskupskou mitrou ležiacou tesne za lebkou. Foto M. Poljak

Fig. 3. A piece of greenish, finely woven fabric in the form of an irregular rectangle measuring 16 x 7 cm imprinted to the Lippay's occiput. Photo by M. Thurzo

Obr. 3. Kus zelenkavej, jemne pletenej látky v podobe nepravidelného obdĺžnika s rozmermi 16 x 7 cm, ktorá bola vtlačená do záhlavia J. Lippaya.

to light during the discovery of the crypt on September 12, 1859. Moreover, their parts have also been found during our informative sightseeing on December 21, 2009. They lay on the ground not only between the coffin and the western wall of the crypt, where is the recent inlet opening but also under the coffin foreheads leaning against the eastern wall of the crypt. In addition, in several places of the tiled crypt floor and on the GL's left coffin sidewall there are remains of fallen brickwork and mortar. Obviously, as J. Haľko and T. Krampl (*Haľko/Krampl 2011*) presume these artefacts got there during the re-walling the crypt, which was realized after the deprecated exhumation of the crypt still in 1859.

Because the edges of the prisms near the southern wall of the crypt, on which the coffin stood, have partially gone out, the coffin was tilted to this side. This has caused worse conservation of parts from the right side of the body, as mentioned below.

Unlike PP, who was buried without rank insignia and other artefacts only in damask reverend and shoes on legs, GL has been buried more generously. His head slightly tilted to the right i.e. to the southern crypt´s wall lay on a pillow of originally magenta colour; the head was partially covered with a flattened and faded episcopal mitre (Fig. 2). On the occiput of the skull, there was an imprinted piece of greenish, finely woven fabric in the form of an irregular rectangle measuring 16 x 7 cm (Fig. 3). Either it was part of a mitre, or it's lining.

The deceased archbishop was dressed in mass closing with two cassocks and a reverend and was buried with silk brogues and stockings bound around the knees. The burial equipment placed on the right side of the body consisted of bishop's crutch, a gilded wooden chalice with the paten, rosary, and gilded silver cross (*Haľko/Krampl 2011, Farkaš et al. 2015*).

GL's remains exhumation

GL's exhumation took place on July 2, 2010; it was realized by anthropologist Radoslav Beňuš and art-historical restorer Sylvia Birkušová (Fig. 4). The photographic documentation was performed by Michal Poljak (Fig. 5), Roman Bajzík, and Michal Staudt, the artefacts found in the GL's coffin were documented by Tomáš Krampl (Fig. 6), who also compiled the memorandum about the whole undertaking. Other members of the research team were Jozef Haľko, Milan Thurzo, and Zdeněk Farkaš. In the process of exhumation, S. Birkušová uncovered parts of the garments, while R. Beňuš removed the skeletal remains rested beneath them. Finally, the skeletal remains were transported to the Department of Anthropology of Faculty of Natural Sciences of Comenius University in Bratislava for anthropological and palaeopathological investigation (Fig. 7); its main part was realized by M. Thurzo.

Fig. 4. R. Beňuš and S. Birkušová during the exhumation of Lippay's remains. Photo by M. Poljak
Obr. 4. R. Beňuš a S. Birkušová pri exhumácii pozostatkov Juraja Lippaya. Foto M. Poljak

Fig. 5. M. Poljak takes the pictures during the Lippay's exhumation. Photo by M. Thurzo
Obr. 5. M. Poljak pri fotodokumentácii exhumácie Juraja Lippaya. Foto M. Thurzo.

Fig. 6. T. Krampl in making records of the going research and the artifacts found during it. Photo by M. Thurzo
Obr. 6. T. Krampl pri písomnom dokumentovaní výskumu a nájdených artefaktov. Foto M. Thurzo

Fig. 7. Lippay's skeletal remains prepared for anthropological investigation at the Anthropological department of the Faculty of Natural Sciences (Comenius University in Bratislava). Photo by M. Thurzo.
Obr. 7. Kostrové pozostatky J. Lippaya počas antropologickej analýzy na Katedre antropológie Prírodovedeckej fakulty UK v Bratislave. Foto M. Thurzo.

After removing the skeletal remains, the bottom of the coffin retaining garments was covered with wrapping paper and transferred through the crypt inlet to other areas of the Cathedral´s underground. Later, after the anthropological analysis of GL, the remains of both personalities, inhumated originally in the same crypt, were removed into ready-made wooden coffins, which have been on March 18, 2013, during a festive funeral ceremony held in St. Martin's Cathedral, stored in the original tomb.

Taphonomic conditions and preservation state of skeletal remains

During the exhumation it turned out that the bones least well preserved included the ones from the right side of the body, lying in coffin deeper than the left ones. In that place, where decomposition products, including putrefaction fluids, have been collected, the decomposition was most intense. From all the skeletal remains, the skull resting on an only weakly damaged pad was best preserved.

A common symptom of decomposition were also aggregates of colourless to pale yellow minerals found between the disintegrating bone tissues. They not only covered the surface of disintegrated bones and preserved garments but they filled also some part of the space between them. According to the analysis of Mgr. Miloš Gregor, at that time a custodian of the geological collections at the Slovak National Museum-Museum of Natural History in Bratislava, it seems to be the brushit mineral ($CaHPO_4.2H_2O$). Its formation from hydroxylapatite binds to collagen breakdown in the bones due to bacterial activity (*Mays 1998*). The newly formed brushit minerals not only cover the bones but also replace hydroxylapatite inside them. Obviously, they crystallized directly from the solutions produced by putrefaction processes. Since brushit has a larger volume than the original hydroxylapatite, the tissue of many bones has been torn apart. Despite this, their original shape (contour) could be sometimes preserved. As a result of decomposition, the right-hand ribs, the right humerus, the sacrum, the right half of the pelvis, the right tibia and the lower spine almost completely disintegrated. Isles of brushit also occurred on the skull, its denser deposition was in the basal part of the skull, especially around the foramen magnum.

Besides decomposition due to brushit, the destructive effects of biogenic origin (by bacteria, fungi and moulds) can also be observed not only on bones but also on the wood mass of the coffin. They have a form of light (especially on wood) and dark spots, as well as irregular pits on the bone surface. Such effects usually occur at the end of the putrefaction stage in the cold and dry crypt environment (*Winkler et al. 1988*).

Some parts of the face, especially orbits, nasal cavity, the chin overgrow on the mandible (the later being loosened and separated from the upper jaw), as well as the entire body of hyoid, were covered by a dense layer of insect pupae (discussion concerning it could be found in the study published by *Thurzo et al. 2017*). The remnants of the mummified skin have been retained on the following parts of the skull: mandible (Fig. 8), supraorbital margins with

Fig. 8. Lippay's mandible with remains of the mummified skin localized above the chin. Photo by M. Thurzo
Obr. 8. Sánka J. Lippaya so zvyškami mumifikovanej kože nad bradou. Foto M. Thurzo.

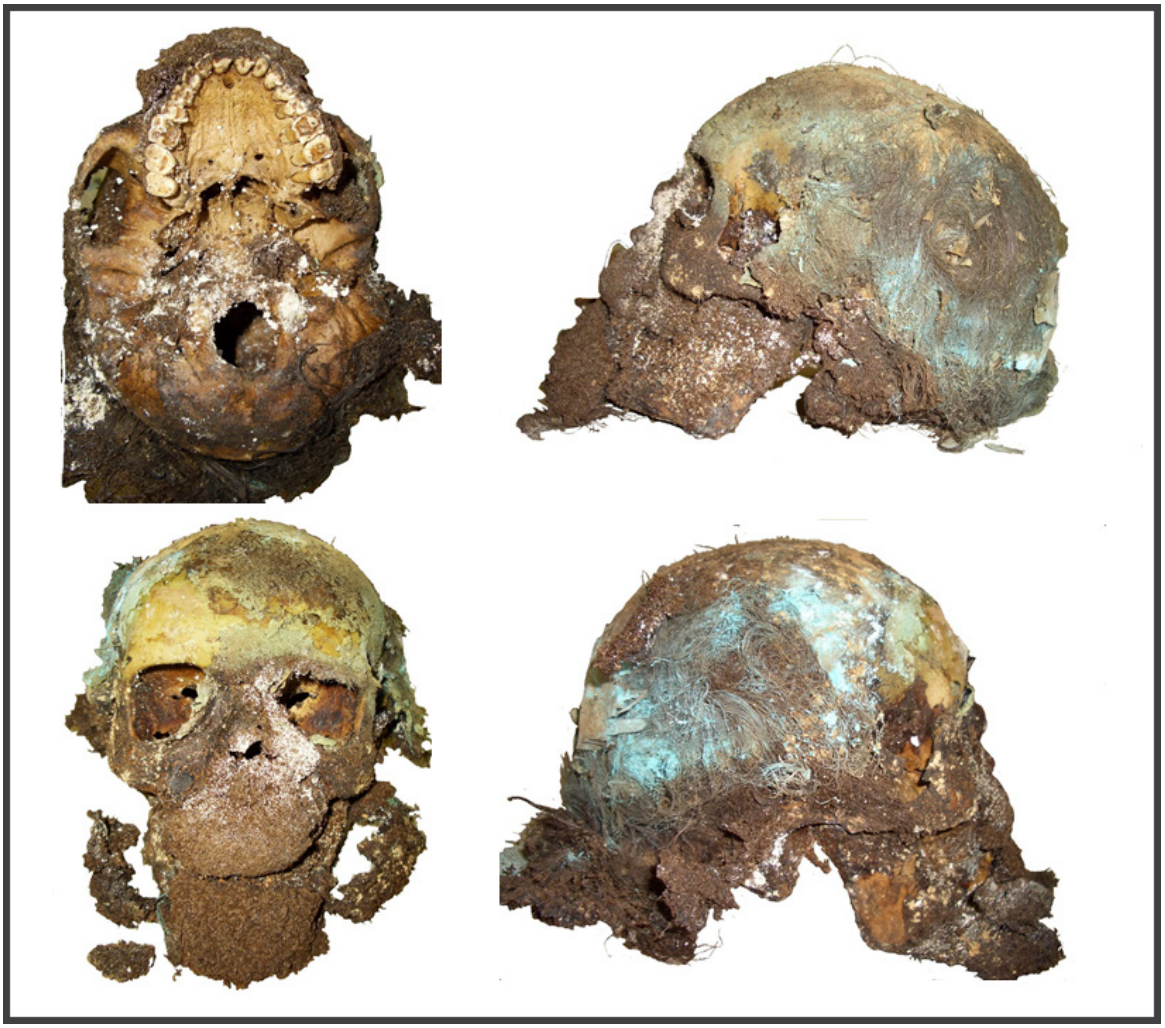

Fig. 9. Lippay's skull shortly after the exhumation shown in basal, left lateral, facial and right lateral views. Photo by M. Thurzo
Obr. 9. Lebka J. Lippaya krátko po exhumácii pri pohľade zdola, zľava, spredu a sprava. Foto M. Thurzo

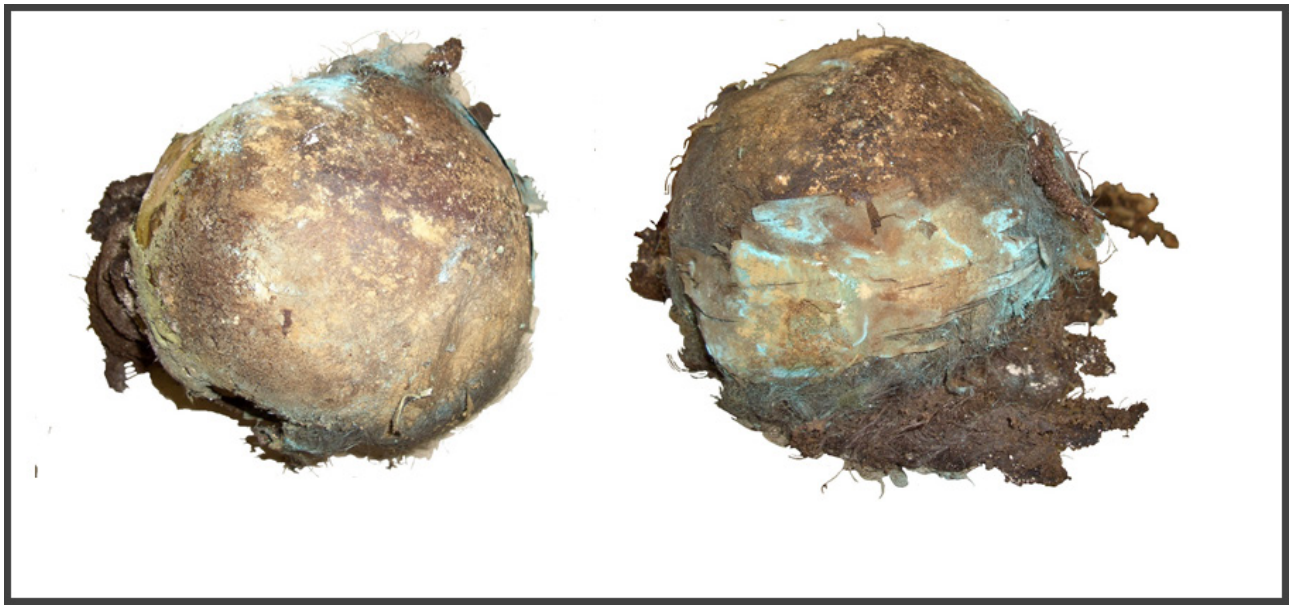

Fig. 10. Lippay's skull shortly after exhumation in the vertical and posterior views. Photo by M. Thurzo
Obr. 10. Lebka J. Lippaya krátko po exhumácii pri pohľade zhora a zozadu. Foto M. Thurzo

eyebrows, forehead, temporals, and occiput (Fig. 9, 10). Hair has been preserved on the skull, too, it was up to five centimetres long in the temporals, and 7.5 centimetres in the occiput (Figs. 3, 9, 10). The colour of the preserved hair can be visually assessed as dark brown. According to the sample book made by Laboratoire d'Anthropologie at Sorbonne, its shade could be evaluated as "N", while using a sample book stored at the Department of Anthropology of the Faculty of Science, Comenius University in Bratislava, the hairs have a shade labelled as „Y". However, N. Knauz (*Knauz 1859*) in his description surprisingly mentions "bright curly hair and blond moustache and beard" of GL. It is possible that in 1859, in the light of candles, the hair and chin looked lighter or they were only dusty, what might have happened during brickwork interventions in the tomb. Because of the uniform colour of the hair, it is unlikely that the hair may become darker due to the wood of the coffin, which was uncoloured.

The skull as a whole has a greenish circle around its perimeter (Figs. 2, 9), such marking has a part of the hair and a large part of the underlying cushion, too. It seems to be a trace of a copper that might have left a metallic (copper?) reinforcement of the mitre.

Anthropological characteristic of Georgius Lippay

Methods

Morphoscopic and morphometric evaluation is based on the method of R. Knussmann (*Knussmann 1988*), the estimation of the braincase capacity is complemented by the method of G. Olivier et al. (*Olivier et al. 1978*). Individual dimension categories are determined either by R. Knussmann (*Knussmann 1988*) or by V. P. Alexejev and G. F. Debec (*Alexejev/Debec 1964*). The manifested degree of sexual-diagnostic features was assessed according to Gy. Acsádi and J. Nemeskéri´s (*Acsádi/Nemeskéri 1970*) Degrees of Sexualisation (DS), ranging from –2 (typically feminine value) to +2 (typically masculine), from which the total degree of skeletal sexualisation was calculated. Besides the tooth wear and alveolar resorption, only the degree of obliteration of some exocranial sutures was used to estimate the age-at-death. The extent of the marrow cavities in the long bones was not evaluated for ethical and technical reasons. Body height estimation was performed according to methods of R. Pearson, A. Telkkä, E. Breitinger, M. Trotter and G. C. Gleser (cf. *Knussmann 1988*), P. Rother (cf. *Hunger/Leopold 1978*), and T. Sjøvold (*Sjøvold 1975*).

Preservation

From the body remains greatly decomposed by recrystallization of bone tissue´s hydroxylapatite to brushit, only the following parts of the skeleton were preserved (Fig. 11):

1. Complete undamaged skull with mandible and teeth in both jaws. All teeth are retained in the alveoli; the teeth are cracked, with partially peeled enamel, their alveoli damaged by brushite. Besides dark brown moustache and beard, also hairs of the same dark brown colour are preserved in the occiput and the temples of the head.

2. Seven undamaged cervical vertebrae, nine defective thoracic vertebrae, fragments of two lumbar vertebrae, fragments of the sacrum.

3. Fragments of moderately robust ribs and a medium-sized and broad manubrium that has not been fused with corpus sterni.

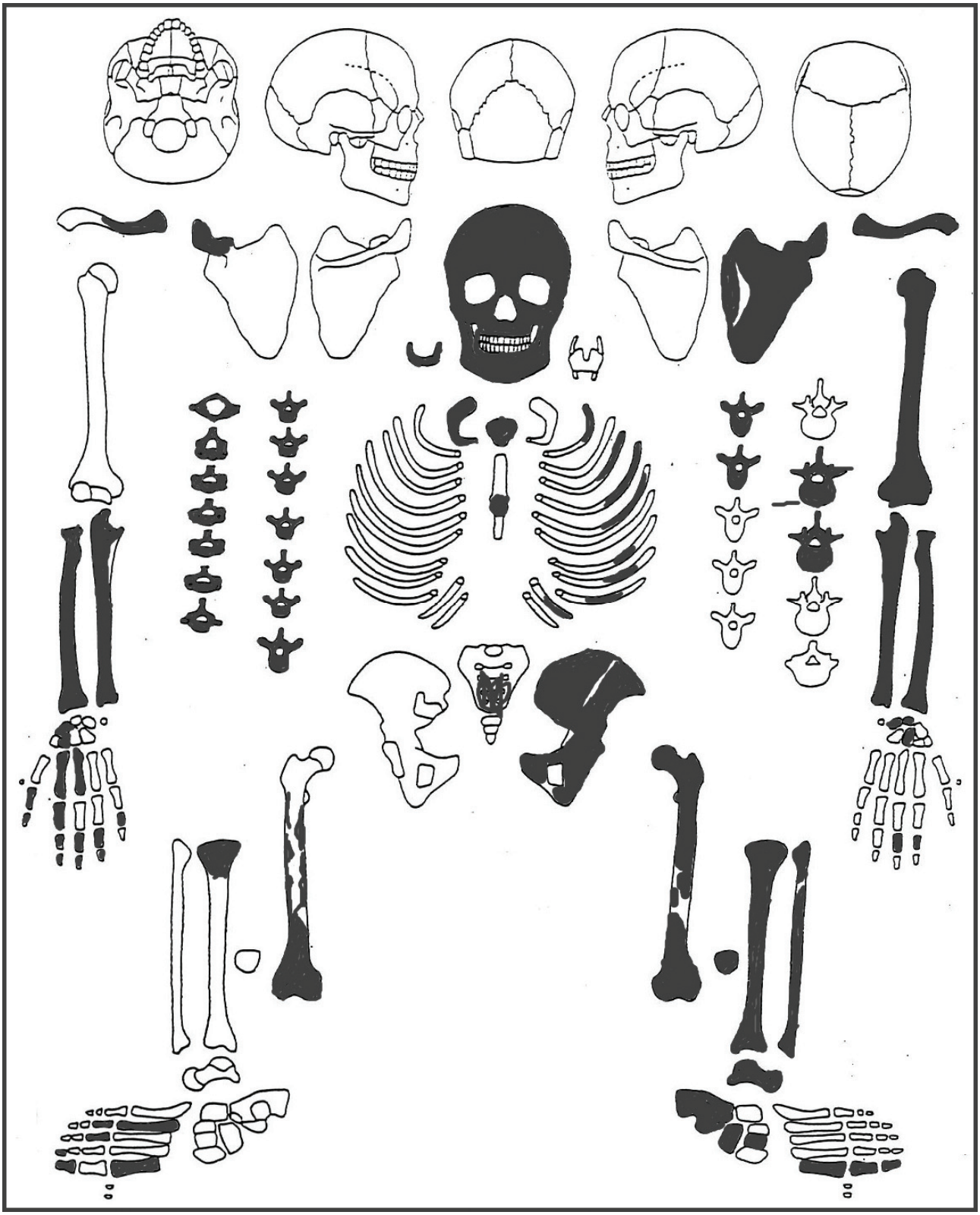

Fig. 11. The schematic drawing showing the preserved parts of Lippay's skeleton (black colour). Adapted by M. Thurzo
Obr. 11. Schematické zobrazenie zachovaných častí kostry J. Lippaya (vyfarbené načierno). Upravil M. Thurzo

4. Incomplete left scapula.
5. Both clavicles.
6. Fragment of the thyroid cartilage.
7. The greater part of the hyoid body.
8. Fragment of right humerus and middle robust left humerus.
9. Damaged and moderate robust forearms (radii and ulnae).
10. Medium-sized wrist and metacarpal bones with some phalanges, especially on the right hand.

Fig. 12. Lippay's prepared skull shown in basal, left lateral, facial, and right lateral views. Photo by M. Thurzo
Obr. 12. Upravená lebka J. Lippaya pri pohľade zdola, zľava, spredu a sprava. Foto M. Thurzo

11. Fragment of the right os coxae and defective left os coxae.
12. Highly damaged parts of the lower right leg and almost complete bones of the left one.

Body structure and skeletal muscle relief

All skeleton components are characterized by moderate to robust structure and medium muscle relief, indicating some kind of mild physical activity.

Morphological and metric characters of the skeleton

Due to the significant damage and disintegration of most right-sided bones, only some of the common morphological and metric features have been evaluated.

Morphological traits of the skull (Figs. 12, 13)

State of preservation: Undamaged skull without deformation. *Norma frontalis:* elliptical face, moderate superciliary arches (0), slightly rounded supraorbital margin (+1), absent frontal eminences (+2), weakly angular orbits (+1), fused metopic suture, concave nasals, inferior margin of nasal aperture in anthropic form. *Norma verticalis:* ovoid outline, absent parietal tubers (+2), absent parietal foramina, moderate zygomatic arches (0), cryptozygia. *Norma occipitalis:* medium-high arch with converging walls and straight base, large mastoid processes (+1), right asterionic bone, absent Inca bone, evident nuchal lines and external occipital crest (0). *Norma lateralis:* glabella (Broca) 4 (+1), oblique forehead, straight nasal profile, moderate prominent nose, 4th grade of nasal spine, shallow canine fossae, obliterated pterion, nine sections of exocranial sutures obliterated with average value of 3.0 (indicating 53 – 66 years), vaulted occiput, small ret-

Fig. 13. Lippay's prepared skull in the vertical and posterior views. Photo by M. Thurzo
Obr. 13. Upravená lebka J. Lippaya pri pohľade zhora a zozadu. Foto M. Thurzo

romarginal processes (-1), distinctive facial relief. *Norma basalis:* indicated palatine torus, obliterated transverse palatine suture, the ovoid foramen magnum. *Mandible* (Fig. 7) undamaged, with moderate to strong robust structure and moderate muscle relief, smoothly arched when viewed from below, visible alveolar plane and mental protuberance when viewed from above; flat mental spines, strongly marked and everted mandibular angles with a lateral elevation, bilaterally simple mental foramina. Parabolic dental arches, psalidont occlusion, partially to fully worn enamel, slightly formed mental trigon (-1), medium-thick mandibular body (0), large mandibular condyle (+1).

Morphological traits of the postcranial skeleton

Undamaged cervical vertebrae, damaged thoracic vertebrae, fragmental lumbar vertebrae, all of medium size – without Schmorl's nodes or spondylitic changes; medium-sized, unfused manubrium; fragments of corpus sterni, fragments of moderate robust costae; damaged, moderate robust and slightly curved clavicles; damaged and moderate robust left scapula, moderate robust left humerus with a moderate muscle relief, moderate robust forearms, medium-sized carpals and metacarpals, medium-long phalanges, "arc composé" of pelvis in form of a continuing arch; moderate robust to robust femora, medium-sized and equally large patellae, moderate robust left tibia without the distal fazette and with 2nd type of diaphyseal cross section (according to classical scheme of Hrdlička), medium-sized tarsals and metatarsals.

Metric characters of skull and postcranial skeleton

An overview of measurable cranial and postcranial dimensions and indices, as well as calculated body height according to different methods, are listed in Tables 1 – 3. The rating of the individual size categories showed that very high values refer in particular to the width dimensions of the face (the minimum and the maximum width of the frontal bone, the width of the orbits, and the biorbital width), while the small values are typical for some height dimensions (nasal height, mandibular symphysis height, total face height). Surprisingly, the medium-sized main dimensions of the skull partly contradict the very low cranial module. On the other hand, the cranial capacity is marked as aristenkephal – large. This opposition could indicate that the categories used for rating the size dimensions of the skull are quite inconsistent.

Age, sex and stature estimation

Based on the obliteration of the exocranial sutures, the age of GL can be estimated as 53 – 66 years, the resorption of the dental alveoli is equal to the age of 55 years, and the degree of tooth attrition indicates an older adult individual. This data suggest that from the biological point of view GL was slightly "younger" than his real calendar age at death – i.e. 66 years.

The degree of sexualisation (DS), i.e. the ratio of masculine and feminine characters manifesting on the skeleton, is + 0.53, which lies in the category of gender classification suggesting a male individual.

According to his body height, with an average value (167.7 cm) calculated from multiple methods, GL is categorized as a tall-medium stature.

Cranial measurements		Value	Category	
1 - maximum cranial length g-op		182	Scheidt (1930)	medium
1c - metopion-occipital length m-op	(Welcker)	180		NA
1d - nasio-occipital length n-op		176		NA
3 - glabella-lambda length g-l		178		NA
5 - cranial base length n-ba	(Howells 1973)	97	Alexejev, Debec (1964)	small
7 - foramen magnum length ba-o		33	Alexejev, Debec (1964)	small
8 - maximum cranial breadth eu-eu	(Howells 1973)	154	Scheidt (1930)	broad
9 - minimum frontal breadth ft-ft		107		very big
10 - maximum frontal breadth co-co		134		very big
11 - biauricular breadth au-au		134		very big
12 - biasterionic breadth ast-ast		110		medium
13 - bimastoidal breadth ms-ms	Toldt (1920)	109		NA
16 - foramen magnum breadth fol-fol		29		medium
17 - basion-bregma heigth ba-b	Howells (1973)	132		medium
23 - horizontal skull circumference g ^ op ^ g		537		big
24 - transversal arch po ^ b ^ po		331		very big
25 - mediosagittal arch n ^ o		381		big
26 - frontal arch n ^ b		126		medium
27 - parietal arch b ^ l		135		big
28 - occipital arch l ^ o		120		big
29 - frontal chord n-b	Howells (1973)	110		medium
30 - parietal chord b-l	Howells (1973)	121		big
31 - occipital chord l-o	Howells (1973)	94		medium
38a - cranial capacity Welcker I.		1581	Sarasin (1916/22)	aristenkephal
38c - cranial capacity Manouvrier		1622,67	Sarasin (1916/22)	aristenkephal
cranial capacity Olivier		1563,38		aristenkephal
40 - basion-prostion length ba-pr	Howells (1973)	96	Alexejev, Debec (1964)	small
43 - upper facial breadth fmt-fmt		113		NA
43(1) - inner upper facial breadth fmo-fmo		104		NA
44 - biorbital breadth ek-ek		104		NA
45 - bizygomatic breadth zy-zy	Howells (1973)	134	Alexejev, Debec (1964)	medium
46 - bimaxillary breadth zm-zm	Virchow (1889)	98	Alexejev, Debec (1964)	medium
46a – zygomaxillar breadth zm' - zm'	Abinder	98?		NA
47 - facial height n-gn		112	Scheidt (1930)	small
48 - nasion-prostion height n-pr		66	Scheidt (1930)	very big
49a - dacryal chord DC	Howells (1973)	26?	Alexejev, Debec (1964)	very big
49b - dacryal subtense DS	Howells (1973)	23?		very big
50 - anterior interorbital breadth mf-mf		25		NA
51 - orbital breadth mf-ek, sin		46	Alexejev, Debec (1964)	very big
52 - orbital height, sin	Howells (1973	34	Alexejev, Debec (1964)	medum
54 - nasal breadth apt-apt	Howells (1973)	27	Alexejev, Debec (1964)	big
55 - nasal heigth n-ns		47	Alexejev, Debec (1964)	very small
57 - simotic chord SC		9		medium
57a - simotic subtense SS		5	Howells (1973)	very big
60 - maxillo-alveolar length pr-alv		52		small
61 - maxillo-alveolar breadth ekm-ekm		65	Alexejev, Debec (1964)	big
63 - palatal breadth breadth enm-enm		42		NA
65 - bicondylar breadth kdl-kdl		121	Alexejev, Debec (1964)	medium
66 - bigonial breadth go-go		109	Alexejev, Debec (1964)	big
67 - bimental breadth ml-ml		49		NA
69 - chin height id-gn		27	Alexejev, Debec (1964)	very small
70 - maximum ramus mandibulae height go-kdl, sin		66	Alexejev, Debec (1964)	big
71 - minimum ramus mandibulae breadth, sin		31		NA
80 - palatal length		53		NA
80a - mandibular dental arch length		51		NA
80(1) - maxillar dental arch breadth		70		NA
80(1) - mandibular dental arch breadth		69		NA
80(2) - maxillar dental lenght P1 - M3 sin		39		NA
80(3) - maxillar molar length M1 - M3 sin		26		NA

Table 1. Cranial dimensions of G. Lippay (in mm, NA – not available)
Tab. 1. Kraniometrické charakteristiky J. Lippaya (v mm, NA – nezaraďované)

Cranial indices		Category	
I 1- cranial index M8/M1	84.1	Garson (1886)	brachycran
I 2 - cranial length-height index M17/M1	72.5	Martin (1929)	orthocran
I 3 - cranial breadth-heigh index M17/M8	85.7	Broca (1875)	tapeinocran
I 9 - cranial circumference-height index M17/M23	24.6		NA
I 11 - cranial circumference-breadth index M11/M24	40.5		NA
I 12 - transversal frontal ndex M9/M10	79.8	Alexejev, Debec (1964)	medium
I 13 - fronto-parietal index M9/M8	69.5	Schwalbe (1923)	mesosemn
I 14 - transversal parieto-occipital index M12/M8	71.4	Alexejev, Debec (1964)	very small
I 16 - sagittal fronto-parietal index M27/M26	107.1	Alexejev, Debec (1964)	very big
I 17 - sagittal fronto-occipital index M28/M26	95.2	Alexejev, Debec (1964)	big
I 18 - sagital parieto-occipital index M28/M27	88.9	Alexejev, Debec (1964)	medium
I 19 - frontal arch index M26/M25	33.1		NA
I 20 - parietal arch index M27/M25	33.1		NA
I 21 - occipital arch index M28/M25	31.5		NA
I 22 - frontal arc/chord index M29/M26	87.3	Alexejev, Debec (1964)	medum
I 24 - parietal arc/chord index M30/M27	89.6	Alexejev, Debec (1964)	medium
I 25 - occipital arc/chord index M31/M28	78.3	Alexejev, Debec (1964)	very small
I 29 - occipital squama index M31/M12	85.4		NA
I 33 - foramen magnum index M16/M7	87.9	Alexejev, Debec (1964)	NA
I 37 - cranial module (M1+M8+M17)/3	156.0	Alexejev, Debec (1964)	very small
I 38 - total facial index M47/M45	83.6	Martin, Saller (1957)	euryprosop - medium
I 39 - upper facial index M48/M45	49.3	Martin (1928)	euryen - low
I 40 - jugo-mandibular index M66/M45	81.3	Alexejev, Debec (1964)	very big
I 41 - jugo-malar index M46/M45	73.1		NA
I 41(5) - dacryal index M49b/M49a	88.5?		very big
I 42 - orbital index sin. M52/M51	88.5?	Martin, Saller (1957)	chamaekonch
I 42(1) - jugo-orbital index M51/M45	34.3		NA
I 42(2) - orbital-facial height index M52/M48	51.5		NA
I 46a - interorbital index M50/M44	24.0		NA
I 48 - nasal index M54/M55	56.2	Martin, Saller (1957)	chamaerrhin
I 51(1) - jugo-nasal index M54/M45	20.1		NA
I 52(1a) - simotic index M57a/M57	55.6		big
I 54 - maxillo-alveolar index M61/M60	125.0	Turner	brachyuran
I 55 - jugo-maxillar index M61/M45	48.5		NA
I 56 - palato-basal index M60/M40	54.2		NA
I 60 - gnathic index M40/M5	99.0		maesognath
I 61 - facial module (M40+M45+M47)/3	114.0		NA
I 63 - index ramus mandibulae M71/M70	47.0		NA
I 64 - mandibular breadth index M66/M65	90.1	Alexejev, Debec (1964)	big
I 67 - maxillar arc index M80(1)/M80	132.1		NA
I 67a - mandibular arc index M80(1)/M80a	137.2		NA
I 68 - dental length index M80(2)/M5	40.2		NA
I 69 - longitudinal cranio-facial index M40/M1	52.7		medium
I 71 - transversal cranio-facial index M45/M8	87.0	Alexejev, Debec (1964)	very small
I 72 - index of fronto-facial breadth M9/M43	94.7		NA
I 73a - jugo-frontal index M9/M45	79.8		very big

Table 2. Cranial indices of G. Lippay (NA – not available)
Tab. 2. Lebečné indexy J. Lippaya (NA – nezaraďované)

Pathological changes

In the head, as well as in the upper part of the skeleton, no pathological changes have been observed. In addition, the health condition of his dentition was very good, too: there was no one carious tooth in his dentition. The only visually observable pathological changes, present in the form of arthritis, could be found in two joints of the lower extremities – in the knee and ankle ones.

Most notably, there are signs of gonarthrosis (Fig. 14-1) in the left knee joint (the right one cannot be assessed), manifested by arthritic osteophytes at the edges of the distal femoral and proximal tibial articulation surfaces, including the medial edge of the patella (Fig. 14-2). Osteoarthritis also affected the left ankle joint, manifested by the arthritic rim – osteophytes at the edge of the articular surfaces of the left calcaneus (Figure 14-3) and talus (Figure 14-4).

This find confirms the problems related to lower limbs mentioned in his testament, which had been written shortly before his death – on December 31, 1665. Between the lines, GL complains about it with these words: "My legs are weak for years." (9. Závet ostrihomského arcibiskupa Juraja Lippayho – Prešporok 31. decembra 1665, úryvok [ex *Hargittay et al. 2007*, p. 26 – published in Slovak]).

Long bones' metrical traits			
Humerus	dx	sin	**Method / Category**
H1 - maximum length	NA	313	
H2 - overall length	NA	308	
H 5 - maximum midshaft diameter	NA	23	
H6 - minimum midshaft diameter	NA	18	
H7 - minimum diaphyseal circumference	NA	64?	
H8 - circumference of the head	NA	136	
Robusticity index H7/H1	NA	20.4	Vallois (1957) medium
Diapyseal cross section index H6/H5	NA	78.3	Olivier (1960) eurybrachic
Radius	dx	sin	
R1 - maximum length	231	230	
R1b - parallel length	230	229	
R2 - physiological length	219	217	
R3 - minimum diaphyseal circumference	45	44	
R4 - transversal diaphyseal diameter	17	17	
R5 - sagittal diaphyseal diameter	11	12	
Robusticity index R3/R2	20.5	20.3	Stloukal et al. (1999) robust
Diaphyseal cross section index R5/R4	64.7	70.6	
Ulna	dx	sin	
U1 - maximum length	256	248	
U2 - physiological lenght	223?	214	
U3 - diaphyseal circumference	40	36	
U11 - antero-posterior diameter	NA	12	
U12 - transverzal diameter	NA	16	
Robusticity index U3/U2	NA	16.8	
Length index	NA	115.9	
Diaphyseal cross section index U11/U12	NA	75.0	
Femur	dx	sin	
F1 - maximum length	NA	457?	
F2 - bicondylar length	NA	454?	
F18 - vertical diameter of the head	NA	46?	
F19 - transveral diameter of the head	NA	46	
F20 - circumference of the head	NA	150	
Head cross section index F19/F18	NA	100.0	
Head robusticity index F19+F18/F2	NA	46.0	
Tibia	dx	sin	
T1 - lateral length	NA	365	
T1a - maximum length	NA	374	
T1b - medial length	NA	367	
T3 - maximum proximal epiphyseal breadth	NA	74	
Fibula	dx	sin	
Fi2 - maximum midshaft diameter	NA	16	
Fi3 - minimum midshaft diameter	NA	14	
Diapyseal cross section index Fi3/Fi2	NA	87.5	
Proportional indices	dx	sin	
Intermembral index (H1+R1)/(F1+T1)	NA	65.5	
Tibio-radial index R1/T1	NA	63.5	
Index brachialis R1/H1	NA	73.5	
Index femoro-tibialis T1b/F2	NA	80.8	
Index cruralis T1/F1	NA	79.9	
Stature			**Knussmann**
Manouvrier (1894)	167.7		tall-medium
Pearson (1899)	164.1		medium
Telkkä (1950)	168.5		tall-medium
Breitinger (1937)	168.0		tall-medium
Rother (1978)	163.3		small-medium
Trotter, Gleser (1952)	172.5		tall
Sjovold (1990)	169.7		tall-medium
Mean value	167.7		tall-medium
Overall estimate			tall-medium

Table 3: Long bone dimensions and the estimated stature of G. Lippay
Tab. 3. Metrické znaky dlhých kostí a výška postavy J. Lippaya

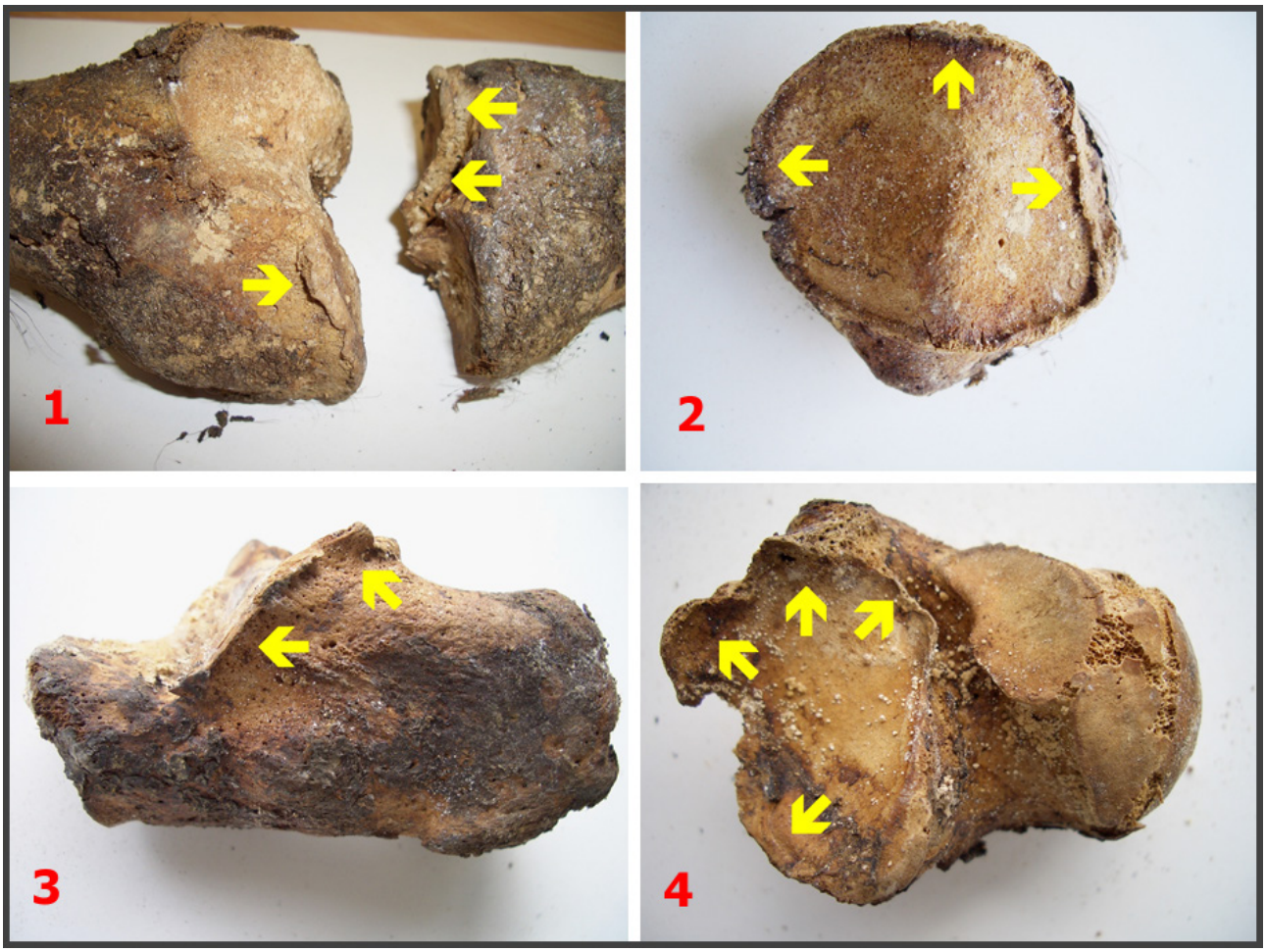

Fig. 14. Arthritic changes in some Lippay's joints: 1 – knee joint, 2 – patella, 3 – calcaneus, 4 – talus. Photo by M. Thurzo
Obr. 14. Artrotické zmeny na kĺboch J. Lippaya: 1 – kolenný kĺb, 2 – patella, 3 – pätová kosť, 4 – členková kosť. Foto M. Thurzo

Conclusion

The skeletal remains of GL were found deposited in a disintegrated coffin placed along the south wall of the crypt. He rested on the back in a stretched position with slightly twisted head, which was directed to the west. As to the closing, he was dressed in mass closing with two cassocks and a reverend, he had silk brogues and stockings bound around the knees. Partly covering the back of his skull, as a confirmation of his position in the Roman Catholic Church, there was a greenish, stained, and flattened mitre. Besides the right side of the body, the following grave goods were placed: bishop's crutch, a gilded wooden chalice with the paten, rosary, and gilded silver cross.

From the whole body, only its partially decomposed skeleton covered with aggregates of light yellow brushit minerals, scattered on bones and in their surroundings, has been preserved. However, some parts of the head retained not only the mummified skin but also the dark brown hairs, which were mostly preserved in temples and occiput. The lower parts of the face, including the mandible and the whole hyoid, were thickly infested by insect pupas building almost monolithic layers. As to the decomposition, the right part of the body inclined to the right was mostly affected. Namely, at this lowest point of the coffin inclined to the right side, the products of decomposition, including its fluidized components, were concentrated, so the decomposition was most intense right there. From all the skeletal remains, the skull, with a pad under it, was best preserved. Apparently, this was caused by its advantageous, elevated position. On the occiput of the skull, there was an imprinted piece of greenish, finely woven fabric. Either it was some part of a mitre, or it's lining.

The physique is characterized by a middle robust skeleton with medium relief of muscle insertions. The skull of GL has brachycranic (relatively short) shape, a form typical for modern Europeans living before the 20th century (*Thurzo 1987*). The body height calculated from limb bone length reached 167.7 cm, so it may be placed into the widely used categories of tall-medium stature (Table 3). According to the osteological age, mostly estimated by the exocranial suture closure, the tooth-wear pattern, and alveolar resorption, representing the biological point of view, his age-at-death could be placed in a theoretical age range of 53 – 66 years. This range only by its upper limit reaches his chronological age-at-death (66 years).

Overviews of measurable cranial and postcranial dimensions and indices are listed in Tables 1 – 3. The rating of the individual size categories showed that very high values refer in particular to the width dimensions of the face, while the small values are typical for some height dimensions. Surprisingly, the medium-sized main dimensions of the skull partly contradict the very low cranial module.

According to developed sexual-diagnostic features, evaluated by the so-called degree of sexualisation (DS), the value of this degree (0.53) falls into the category of individuals with the probably male sex.

In the head, as well as in the upper part of the skeleton, no pathological changes have been observed. Besides this, the health condition of the teeth was very good, too. Despite the GL's older age, there was no one carious tooth in his dentition. The only pathological changes observable visually are the ones present in the form of arthritis, they occur in two joints of the lower extremities – in knee and ankle. This find is in agreement with the problems related to lower limbs mentioned in his testament, which had been written shortly before his death – on December 31, 1665.

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TELESNÉ POZOSTATKY ARCIBISKUPA JURAJA LIPPAYA, EXHUMOVANÉ Z KRYPTY POD DÓMOM SV. MARTINA V BRATISLAVE

MILAN THURZO – RADOSLAV BEŇUŠ

Ako sa už uvádzalo v predchádzajúcej publikácii (*Thurzo et al. 2017*), počas výskumu podzemia Dómu sv. Martina v Bratislave, realizovaného (s prestávkami) v rokoch 2009 – 2011, sa okrem pozostatkov kardinála Petra Pázmánya našli aj telesné pozostatky arcibiskupa Juraja Lippaya (JL; 9. 10. 1600 − 3. 1. 1666). Jeho telo bolo uložené na chrbte v napoly rozpadnutej rakve pri južnej stene krypty, s hlavou orientovanou na západ a s „pohľadom" smerujúcim na východ.

Zvyšky ľavej (severnej) bočnice rakvy JL ležali na zemi vedľa jej dna, pravá (južná) bočnica bola za rakvou opretá o omietnutú stenu hrobky, obidve čelá rakvy boli opreté o východnú stenu krypty. Časti „dosák obidvoch preliačených truhiel" sa vyniesli na svetlo pri objavení hrobky 12. septembra 1859, ako to uvádza vo svojej správe N. Knauz (*Knauz 1859*). Ich súčasti sa však našli aj pri predbežnom prieskume hrobky v decembri 2009 – ležali na zemi tak medzi rakvou a západnou stenou hrobky, kde je aj súčasný vstupný otvor, ako aj pod čelami rakiev opretými o východnú stenu rakvy.

Zosnulý arcibiskup mal oblečené omšové rúcho, sutanu, reverendu, pančuchy zviazané v oblasti kolien a na nohách mal hodvábne črievice. Na hlave ležiacej na vankúši mal čiastočne nasadenú vyblednutú a sploštenú mitru. Do výbavy pochovaného patrili aj biskupská berla, ruženec, kalich s paténou a strieborný pozlátený krížik, ktoré boli uložené pri jeho pravom boku.

Z tela JL sa zachovala iba čiastočne rozpadnutá kostra a agregátmi svetložltého minerálu brushitu nielen na kostiach, ale aj v priestoroch medzi nimi, ten značnou mierou prispel k dekompozícii kostrových pozostatkov. Okrem dekompozície kostí vplyvom brushitu možno na kostiach (ale aj na drevnej hmote rakvy) pozorovať aj deštrukčný vplyv biogénneho pôvodu (pôsobením baktérií, plesní a húb), ide o svetlé (najmä na dreve) a tmavé škvrny na povrchu kostí a nepravidelné jamkovité priehlbiny.

Časti tváre, najmä dutiny očníc a nosa, bradový zárast na sánke uvoľnenej a oddelenej od hornej čeľuste, ako aj celú jazylku, pokrývala hustá vrstva hmyzích kukiel. Diskusia o výskyte kukiel je uvedená v štúdii M. Thurzu (*Thurzo et al. 2017*). Na niektorých úsekoch vyššie uloženej hlavy sa však zachovali nielen zvyšky mumifikovanej kože, ale aj vlasy – v oblasti spánkov dosahovali dĺžku do päť centimetrov, na záhlaví až 7,5 centimetra. Farbu zachovaných vlasov možno vizuálne hodnotiť ako tmavohnedú. N. Knauz (*Knauz 1859*) však vo svojom opise nesprávne uvádza "svetlé kučeravé vlasy" aj „plavé fúzy a bradu" arcibiskupa Lippaya. Je možné, že pri svetle sviečok v roku 1859 vyzerali vlasy aj brada svetlejšie, alebo boli iba „zaprášené", k čomu mohlo dôjsť pri murárskych zásahoch v hrobke. Vzhľadom na rovnomerné sfarbenie vlasov nie je totiž pravdepodobné, že by vlasy mohli stmavnúť vplyvom nenafarbeného dreva rakvy.

Keďže južné konce hranolov, na ktorých rakva JL ležala, čiastočne odhnili, rakva sa skláňala k stene na južnej strane hrobky, čo sa prejavilo aj na horšom zachovaní pozostatkov z pravej strany tela. V najnižšom mieste rakvy sa hromadili produkty dekompozície vrátane jej tekutých zložiek, takže tam dochádzalo k najintenzívnejšej dekompozícii.

JL sa vyznačoval stredne robustnou kostrou s prevažne stredným reliéfom svalových úponov a mal brachykrannú (relatívne krátku) lebku, s pomerne širokou a nízkou tvárou. Telesná výška, vypočítaná podľa dĺžky kostí končatín, dosahovala 167,7 cm, čo spadá do kategórie nadprostredne vysokej postavy. Podľa kostného veku, odhadnutého prevažne na základe obliterácie švov exokránia a stupňa resorpcie alveol, sa JL dožil biologického veku s teoretickým rozpätím 53 – 66 rokov. Toto rozpätie iba svojou hornou hranicou dosahuje jeho chronologický vek v čase úmrtia (66 rokov).

Zachované časti kostry svedčia o tom, že na jeho lebke a hornej časti kostry nie sú žiadne stopy po patologických procesoch a v jeho chrupe sa nevyskytuje ani jeden kariézny zub. Jedinými vizuálne postihnuteľnými patologickými znakmi sú artrotické zmeny na dolných končatinách v podobe gonartrózy – artrotických zmien ľavého kolena (pravé sa nedalo hodnotiť) a analogických zmien na ľavom členku. Toto zistenie je v súlade s problémami týkajúcimi sa dolných končatín, ktoré JL uvádza vo svojom testamente z 31. decembra 1665, napísanom iba niekoľko dní pred jeho skonom.

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