NÁRODNÍ MUZEUM

Journal of the National Museum (Prague), Natural History Series
Vol. 193 (2024), ISSN 1802-6842 (print), 1802-6850 (electronic)

PŮVODNÍ PRÁCE / ORIGINAL PAPER

DOI: 10.37520/jnmpnhs.2024.005

Verification of biological relationships in the Dietrichstein princely family from Mikulov by cranial non-metric traits analysis (Moravia, 17th to 19th centuries)

Jan Cvrček[1, *], Petr Velemínský[1] & Eva Drozdová[2]

[1] Department of Anthropology, National Museum, Cirkusová 1740, Prague 20, 193 00 Horní Počernice, Czech Republic; jan.cvrcek@nm.cz, petr.veleminsky@nm.cz
[2] Laboratory of Biological and Molecular Anthropology, Department of Experimental Biology, Faculty of Science, Masaryk University, Kamenice 753/5, Brno, 62500, Czech Republic; drozdova@sci.muni.cz
** corresponding author*

Cvrček J., Velemínský P. & Drozdová E., 2024: Verification of biological relationships in the Dietrichstein princely family from Mikulov by cranial non-metric traits analysis (Moravia, 17th to 19th centuries). – Journal of the National Museum (Prague), Natural History Series 193: 53–62.

Abstract: This study details the verification of documented biological family relationships in the skeletal remains of 9 members of the Dietrichstein princely family from their tomb in Mikulov, Moravia, using skeletal morphology. Another goal was to determine the degree of morphological similarity to other examined family members of the unknown individual from the coffin of Walter Francis Xaver, 4th Prince of Dietrichstein. For these purposes, 93 cranial non-metric traits were evaluated, the degree of similarity of individuals was evaluated using the similarity coefficient. The results support the authenticity of the remains of individual family members and the documented biological family relationships. The variability of biologically related individuals is smaller than that of unrelated individuals. The unknown individual from the coffin of Prince Walter Francis Xaver is most similar to Rosa Barbara Ludovica, Countess of Dietrichstein, née Countess of Wallis, Baroness of Carrighmain (Oct. 8th, 1792 – Jun. 27th 1844). Given that her remains were also found unexpectedly in the tomb, in the coffin of Maximilian II, 1st Prince of Dietrichstein, the possibility that the two finds are related can be admitted.

Keywords: cranial morphology, similarity coefficient, biological distance, genealogically documented sample, family tomb

Received: 20 September 2024 | Accepted: 16 October 2024 | Published on-line: 30 October 2024

Introduction

The potential of osteological non-metric traits to detect or even verify possible biological family relationships has long been known in bioarchaeology (e.g. Matiegka 1934; Lane 1976, 1978; Alt et Vach 1995). This approach is applied either as a quick and economical step for selecting individuals suitable for DNA analysis if it is not possible to analyse an entire cemetery assemblage (mainly for financial reasons), or in situations where it is not possible to use DNA analysis for ethical reasons or due to poor preservation of the remains (e.g. Kaestle et Horsburgh 2002,

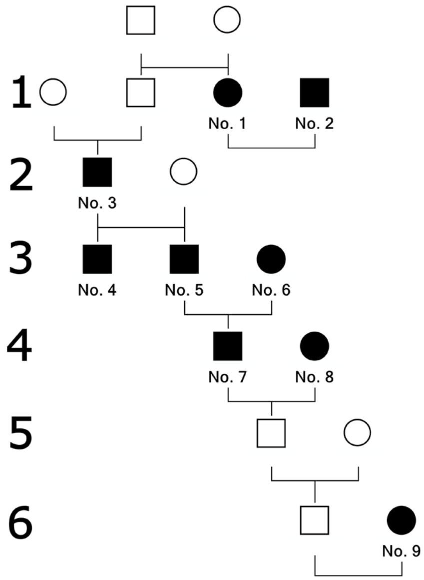

Fig 1. Simplified family tree of the Dietrichstein family (generations Nos. 1–6). All individuals included in this study (Nos. 1–9) are shown numbered in black. Individual No. 10, which is unknown, is not included.

Gamba et al. 2011). This is also the case for this study. Between 2000 and 2005, research was carried out on the skeletal remains of members of the Dietrichstein princely family from Mikulov in Moravia (Drozdová 2006, Pietsch 2008, Vitešníková et al. 2008), one of the most important noble families not only in Moravia, but within the entire Habsburg Monarchy. The research in their family tomb in Mikulov was triggered by the need to renovate the coffins of selected members of the family, which had been vandalized by thieves over the centuries. In many cases, the remains were found in a desolate state. The remains of another, unknown, adult individual were even found in the coffin of Walter Francis Xaver, 4th Prince of Dietrichstein, and the remains of Rosa Barbara Ludovica, Countess of Dietrichstein, née Countess of Wallis, Baroness of Carrighmain, were found in the coffin of Maximilian II, 1st Prince of Dietrichstein (Drozdová 2006). In view of this situation, the opportunity arose to verify the authenticity of the remains and the documented family relationships of the examined individuals. Although DNA analysis was unsuccessful, the authenticity of the remains and the documented family relationships were supported by blood group analysis (Drozdová, 2006). In addition, osteological non-metric traits were also recorded at that time, but their evaluation was not carried out due to an absence of a suitable methodology (e.g. Gemmerich-Pfister 1999, Velemínský et Dobisíková 2005). The aim of this study is to verify the kinship relationships of the examined individuals using the so-called "similarity coefficient" (Cvrček et al., 2018), to find out whether osteological non-metric traits reflect the assumed degree of biological relatedness of the individuals. Another goal was to find out to which family members the unknown individual found in the coffin of Walter Francis Xaver, 4th Prince of Dietrichstein, has the greatest affinity in terms of morphology.

Materials and methods

Materials

Data from 10 individuals (6 males and 4 females) from 6 generations were available for the study, all of them adults except for one individual (No. 4) aged three years. Family relationships are shown in Figure 1.

1. Margaret Francisca of Lobkowicz, née of Dietrichstein (1597 – Feb. 3rd or 4th, 1617)
2. Wenceslaus William Popel of Lobkowicz (March 20th, 1598 – Feb. 16th, 1626)
3. Ferdinand Joseph, 2nd Prince of Dietrichstein (Sep. 25th, 1636 – Nov. 28th, 1698, Fig. 2)
4. Reimund Joseph of Dietrichstein (Jun. 18th, 1679 – Aug. 18th, 1682)
5. Walter Francis Xaver Anthony, 4th Prince of Dietrichstein (Sep.18th, 1664 – Nov. 3rd, 1738)
6. Caroline Maximiliane, Princess of Dietrichstein, née Countess of Pruskov (Sep. 2nd, 1674 – Sep. 8th, 1734)
7. Charles Maximillian Philip Francis Xaver, 5th Prince of Dietrichstein, Count of Pruskov (Apr. 28th, 1702 – Oct. 24th, 1784, Fig. 3)

8. Maria Anne Josepha Princess of Dietrichstein, née Countess of Khevenhüller (March 15th, 1705 – Oct. 4th, 1764)
9. Rosa Barbara Ludovica Countess of Dietrichstein, née Countess of Wallis, Baroness (Freifrau) of Carrighmain (Oct. 8th, 1792 – Jun. 27th 1844).
10. Unknown adult individual from the coffin of Walter Francis Xaver, 4th Prince of Dietrichstein (probably male, an extremely gracile individual approx. 138 cm tall, age 40–50 years)

Fig. 2. Portrait of Ferdinand Joseph, 2nd Prince of Dietrichstein (Sep. 25th, 1636–Nov. 28th, 1698). Source: Wikipedia Commons.

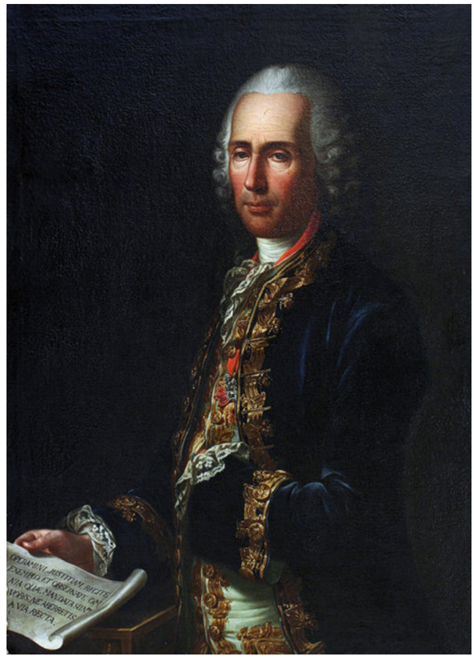

Fig. 3. Portrait of Charles Maximillian Philip Francis Xaver, 5th Prince of Dietrichstein, Count of Pruskov (Apr. 28th, 1702–Oct. 24th, 1784). Source: Wikipedia Commons.

Methods

Due to the very poor preservation of the postcranial skeletons (Drozdová 2006), only skulls were analysed. Determination of the similarity of individuals was based on the evaluation of 93 non-metric traits (Hauser et De Stefano 1989), of which 17 were unilateral and 76 bilateral (see Supplementary file, Tab. S1).

The calculation of the degree of similarity between individuals was performed applying the similarity coefficient (SC) (Cvrček et al. 2018). This coefficient ranges from 0 to 100; the larger the value, the greater the degree of morphological similarity between individuals. In the next step, the logarithm of the coefficient of relationship (r) between individuals, which was estimated using a tabular method (Falconer et Mackay 1996) based on the method of VanRaden (1992), was applied to graphically express the relationship between the resulting similarity coefficients of individuals and the degree of their relatedness. This adjustment of the degree of biological relatedness makes it possible to eliminate biologically unrelated individuals for the sake of clarity: their coefficients of relationship are zero and its logarithm is undefined. Based on these data, a linear regression model with a coefficient of determination (R2), which indicates how well genetic distance of individuals in a regression model explains the variability of morphological similarity of individuals. This coefficient ranges from 0 to 1; the larger the value, the greater the share of biological relatedness on the variability of the observed traits (i.e. represents 0 to 100 %).

In addition, the occurrence of characteristics with a population frequency of less than 10% (both incidence on individual and side), which could be considered familial, was monitored. For the comparison, we used the Pachner skeletal collection (Department of Anthropology and Human Genetics, Faculty of Science, Charles University, Prague) as a reference sample of randomly selected individuals from the second half of the 19th and the first third of the 20th centuries (Cvrček et al. 2018), which is the most suitable in terms of population and its temporal and geographical proximity (Königsberg 1990).

Statistical analyses were not performed in this study, however, due to the low number of individuals (Cvrček et Velemínský 2021).

Results

The resulting "similarity coefficient" (SC) values for all individuals are presented in Table 1. Figure 4 shows the relationship between the SC (degree of similarity) and the degree of biological distance of all the biologically related individuals in this study (blue line). There is only a very weak positive trend in this relationship (coefficient of determination R2 = 0.03): this is due to a single outlier representing the smallest degree of biological relatedness in the sample, the relationship between the most distant biologically related individuals Nos. 1 and 7. If we remove this value, a significant positive trend is shown among first three degrees of biological distance of other individuals (red line, coefficient of determination R2 = 0.39). This means that the greater the degree of biological relatedness between individuals, the greater the degree of their morphological similarity. In this sample, the greatest similarity was found between mother (No. 6) and son (No. 7) and fathers and sons (Nos. 3 and 4, 3 and 5, 5 and 7), i.e. first degree relatives.

	1	2	3	4	5	6	7	8	9	10
1	-	23	30	31	29	42	40	22	36	20
2		-	20	18	20	32	39	20	24	18
3			-	35	35	29	29	18	29	21
4				-	33	45	35	29	39	33
5					-	18	35	50	45	25
6						-	46	28	21	23
7							-	31	44	27
8								-	48	19
9									-	47
10										-

Table 1. Similarity coefficient (SC) values for individuals Nos. 1–10 by cranial non-metric traits. The darker the color, the greater the degree of morphological similarity between individuals.

The positive influence of biological relatedness on the variability of non-metric cranial traits in this sample is shown in Figure 5, where the variability of biologically related individuals is evidently smaller than the variability of biologically unrelated pairs in the sample. Individual No. 10. was excluded from this analysis due to its anonymity.

Despite the visible reduced morphological variability of biologically related individuals, no trait with a population frequency of less than 10% was found to occur at an increased rate among them (see Supplementary file, Tab. S1).

Regarding the question as to which of the investigated family members the unknown individual found in the coffin of Walter Francis Xaver, 4th Prince of Dietrichstein is the most similar in terms of morphology, based on Table 1, the answer turned out to be individual No. 9 – Rosa Barbara Ludovica, Countess of Dietrichstein, née Countess of Wallis, Baroness of Carrighmain (Oct. 8th, 1792 – Jun. 27th 1844). Their degree of similarity (SC = 47) significantly exceeds the similarity of this individual with other family members (SC = 18–33).

Discussion

The results of the morphological analyses support the authenticity of the remains of the individuals to which they were attributed: the greater the degree of biological relatedness of individuals, the greater their morphological similarity. These results are consistent with those of past studies dealing with genealogically documented material (e.g. Spence 1996, Velemínský et Dobisíkov 2005), thus confirming once again that non-metric traits are a suitable tool for detecting or verifying biological family relationships in the event that it is not possible to use DNA analysis (e.g. Irish et al. 2020). However, the low number of individuals and the preservation of the remains are major limitations to this study, mainly because of the unusability of statistical processing to detect possible familial traits the power of which would be low (Ellis 2010), although graphical and descriptive outputs represent an alternative to statistical tests. If there is an opportunity, for example during further renovations in the tomb, the presented set should therefore be expanded with additional individuals. Another limit may be in the material, the young age of individual No. 4 (three years), because the development of the skeleton is not yet complete at this age and it is not appropriate to evaluate cranial traits for comparison purposes in individuals under 10 years of age; further, there are statistically significant differences between non-adults and adults in the occurrence of some traits (Česnys 1985). Despite these facts, we left this individual in the evaluated sample because his family affiliation and relationships to

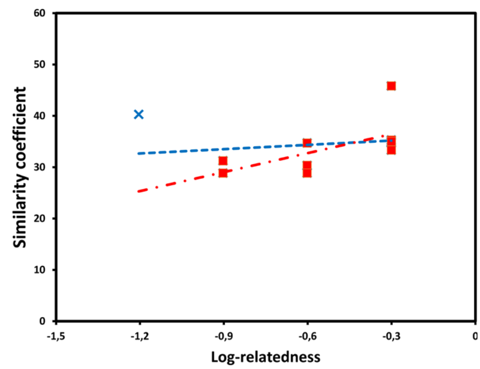

Fig. 4. **Relationship between the similarity coefficient (SC) of biologically related individuals Nos. 1–9 (y-axis) and the log-relatedness of individuals (x-axis). The red line represents the regression line. Note: log-relatedness disregards unrelated individuals.**

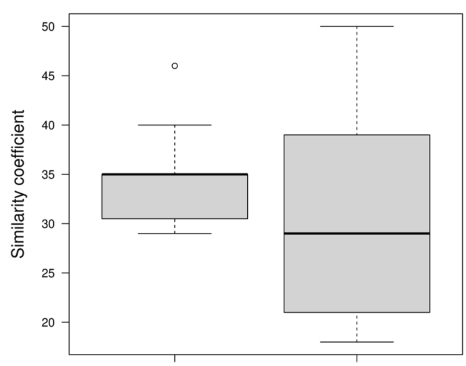

Fig. 5. **Variability in the degree of similarity between biologically related (N = 11 pairs) and unrelated (N = 25 pairs) individuals based on the similarity coefficient.**

the adults are unquestionable, and the occurrence of most of the evaluated traits is documented prenatally or in childhood (Hauser et De Stefano 1989, Mann et al. 2016).

Unknown individual No. 10 from the coffin of Walter Francis Xaver, 4th Prince of Dietrichstein, shows the greatest degree of similarity with individual No. 9, who is Rosa Barbara Ludovica, Countess of Dietrichstein, née Countess of Wallis, Baroness of Carrighmain (Oct. 8th, 1792 – Jun. 27th, 1844). Since her remains were also found in the coffin of another individual (Maximilian II, 1st Prince of Dietrichstein), the high degree of their morphological similarity, supported by their having the same blood type B (Drozdová 2006), may mean that the dislocation of both individuals is related and that they could be biologically closely related individuals. However, this does not necessarily have to be the case. The high degree of their morphological similarity could be caused by the poor preservation of the remains (in individual No. 9 the skull is broken and the base is missing, in individual No. 10 the facial part of the skull, base and mandible are missing). Thus, there are a small number of simultaneously evaluated traits and a high number of identical traits between the two individuals. However, their degree of similarity to individual No. 6, also with incomplete preservation, is halved, even though this individual lacks the top of the skull (cut off at autopsy), and the comparable parts of the skulls of these three individuals therefore overlap only a little. A previous study of genealogically documented material (Cvrček et al. 2018) has already pointed out that the degree of morphological similarity can correspond well with documented kinship relationships even among individuals whose remains are similarly very poorly preserved or have a different degree of preservation. However, if this unknown individual is biologically related to female No. 9, the basic question remains as to whether it is one of her descendants who was originally buried somewhere in the tomb and whose coffin was stolen, or whether it is a relative of the Counts of Wallis and his remains were moved here. This question is also valid for the remains of female No. 9: her remains were identified only on the basis of a wedding ring, although a case documented in the tomb of the Toman family from the second half of the 19th century shows that the wearer of such a ring is not necessarily its owner (Cvrček 2023). The possibilities of comparing the osteobiographical profile with known biographical data about this female were very limited (Drozdová 2006). According to Jenerál (1991) and the original record of her death in Vienna, which was located for the purposes of this publication (Matricula Online, death certificates from the Church of St. Charles Borromeo in Vienna for the years 1843–1851, folio 46, digital page 46, translation from German), her coffin should be located in the Wallis family tomb in the Church of St. Giles in Moravské Budějovice. There is no record of the transfer of her remains to the tomb of the Dietrichstein family, as was the case with some of the remains of the Swéerts-Sporcks in 1852 (Cvrček et al. 2022).

Acknowledgements

The authors thank genealogist F. Fortin for help with the translation of the original death record of Rosa Barbara Ludovica Countess of Dietrichstein, and Alastair Millar for a linguistic review.

Grant sponsorship

Ministry of Culture of the Czech Republic (DKRVO 2024-2028/7.I.a, 00023272).

References

Alt K.W., Vach W., 1995: Detection of kinship structures in skeletal remains. – In B. Jacob, W. Bonte (eds.): Advances in forensic sciences: Vol. 7. Forensic odontology and anthropology, pp 27–34. Berlin: Köster.

Cvrček J., Velemínský P., Dupej J., Vostrý L., Brůžek J., 2018: Kinship and morphological similarity in the skeletal remains of individuals with known genealogical data (Bohemia, 19th to 20th centuries): A new methodological approach. – American Journal of Physical Anthropology 167: 541–556.

Cvrček J., Velemínský P., 2021: Anthropological research into a family tomb from Vetlá cemetery (Bohemia, 19th–20th centuries), with a focus on the morphological similarity of biologically

related individuals. – Journal of the National Museum (Prague), Natural History Series 190: 45–60.
Cvrček J., Fortin F., Běličová M., Mašek P., Velemínský P., 2022. Revision and new discoveries in the genealogy of selected members of the Swéerts-Sporck family buried at Kuks (19th–20th century). In Czech. – Journal of the National Museum (Prague), Series Historia 191: 21–44.
Česnys G., 1985. Variability of discrete cranial traits in the skulls of Lithuanian children. – Anatomischer Anzeiger Jena 159: 43–54.
Drozdová E., 2006: Dietrichsteinové z Mikulova. Výsledky antropologického výzkumu vybraných příslušníků rodu (Dietrichsteins from Mikulov. The results of anthropological research of selected members of the family. In Czech). Brno: Masarykova univerzita.
Ellis P., 2010: The essential guide to effect sizes: Statistical power, meta-analysis, and the interpretation of research results. – Cambridge: Cambridge University Press.
Falconer DS., Mackay T.F.C., 1996. Introduction into Quantitative Genetics. – 4th Edition. Harlow: Longman House.
Gamba C., Fernandéz E., Tirado M., Pastor F., Arroyo-Pardo E., 2011: Brief communication: Ancient nuclear DNA and kinship analysis: The case of a Medieval burial in San Esteban church in Cuellar (Segovia, Central Spain). – American Journal of Physical Anthropology 144: 485–491.
Gemmerich-Pfister I.G.L., 1999: Création d´ une collection anthropologique de référence et application des caractères discrets dans le cas de généalogies connues. – Unpublished doctoral dissertation, Département d´ Anthropologie et d´ Ecologie de l´ Université de Genève.
Hauser G., De Stefano G.F., 1989: Epigenetic variants of the human skull. – Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung.
Irish J.D., Morez A., Flink L.G., Philips E.L.W., Scott G.R. 2020: Do dental nonmetric traits actually work as proxies for neutral genomic data? Some answers from continental– and global–level analyses. American Journal of Physical Anthropology 172: 347–375.
Jenerál, E., 1991: Epitafy a krypty v moravskobudějovickém kostele sv. Jiljí (Epitaphs and crypts in the Moravian Budějovice Church of St. Giles. In Czech). – Vlastivědný věstník Moravský, 159–171.
Kaestle, F.A, Horsburgh, K.A. 2002: Ancient DNA in anthropology: Methods, applications, and ethics. – Yearbook of Physical Anthropology 45: 92–130.
Königsberg L.W., 1990: Analysis of prehistoric biological variation under a model of isolation by geographics and temporal distance. – Human Biology 62: 49– 70.
Lane R.A., 1976: The genetic meaning of a distance measure based on non-metric skeletal variants. – American Journal of Physical Anthropology 44: 190–191.
Lane R.A., 1978: Non-metric osteological variation as a fiction of genetic kinship. – American Journal of Physical Anthropology 48: 413.
Mann R.W., Hunt D.R., Lozanoff S., 2016: Photographic regional atlas of non-metric traits and anatomical variants in the human skeleton. – Springfield: Charles C. Thomas Publisher LTD.
Matiegka J., 1934: Homo Předmostensis, fosilní člověk z Předmostí na Moravě. I, Lebky (Homo Předmostensis, fossil man from Předmostí in Moravia. I, skulls. In Czech) – Praha: Česká akademie věd a umění, Praha.
Pietsch J., 2008: The burial clothes of Margaretha Franziska de Lobkowitz, 1617. – Costume 42: 30–49.
Spence M.W., 1996: Nonmetric trait distribution and the expression of familial relationships in a nineteenth century cemetery. – Northeast Anthropology 52: 53–67.
VanRaden P.M., 1992: Accounting for inbreeding and crossbreeding in genetic evaluation of large populations. – Journal of Dairy Science 75: 3136–3144.
Velemínský P., Dobisíková M., 2005: Morphological likeness of the skeletal remains in a Central European family from 17th to 19th century. – Homo 56: 173–196.
Vitešníková A., Prokeš L., Nývltová Fišáková M., Drozdová E., Kouřil P., Stabrava P., Gryc J., 2008: Studium degradace kosterních pozůstatků pomocí infračervené spektrometrie (Study of skeletal residues degradation using infrared spectroscopy. In Czech.). – Museums, Monuments and Conservation: 24–30.

Supplementum

Table S1. Evaluated non-metric cranial traits (Nos. 1–93) and their frequencies in the Dietrichstein family sample in comparison with the reference frequencies from the Pachner collection (Cvrček et al. 2018).

Trait		Dietrichstein family						Reference sample					
		Incidence on individual			Incidence on side			Incidence on individual			Incidence on side		
		N	Inc.	%	N	Inc.	%	N	Inc.	%	N	Inc.	%
1	*Sutura metopica*	10	0	0	-	-	-	140	9	6.4	-	-	-
2	*Sutura supranasalis absens*	10	4	40	-	-	-	140	29	20.7	-	-	-
3	*Fissura metopica*	10	0	0	-	-	-	140	2	1.4	-	-	-
4	*Ossiculum metopicum*	10	0	0	-	-	-	140	0	0	-	-	-
5	*Sutura parametopica*	10	0	0	20	0	0	140	0	0	280	0	0
6	*Ossiculum suturae coronalis*	4	0	0	10	0	0	128	2	1.6	258	2	0.8
7	*Ossiculum internasale*	6	0	0	-	-	-	138	8	5.8	-	-	-
8	*Ossiculum praefrontale*	9	0	0	18	0	0	140	2	1.4	280	3	1.1
9	*Os lacrimale partitum*	7	0	0	14	0	0	52	0	0	134	0	0
10	*Lamina orbitalis partita*	8	0	0	17	0	0	107	3	2.8	221	3	1.4
11	*Os zygomaticum partitum*	9	0	0	18	0	0	140	0	0	280	0	0
12	*Fissura zygomatica transverza*	7	0	0	16	0	0	140	5	3.6	280	6	2.1
13	*Sutura infraorbitalis*	7	5	71.4	16	10	62.5	140	70	50	280	108	38.6
14	*Sutura incisiva*	7	1	14.3	14	2	14.3	139	1	0.7	278	2	0.7
15	*Ossiculum medianum palatinum anterior*	9	0	0	-	-	-	138	0	0	-	-	-
16	*Ossiculum medianum palatinum posterior*	9	0	0	-	-	-	138	0	0	-	-	-
17	*Ossiculum epiptericum*	8	2	25	18	3	16.7	126	23	18.3	260	33	12.7
18	*Stenokrotaphia*	9	0	0	19	0	0	131	1	0.8	267	2	0.7
19	*Sutura frontotemporalis*	9	0	0	19	0	0	128	1	0.8	265	1	0.4
20	*Processus frontalis squamae temporalis completus*	9	0	0	18	0	0	133	8	6.0	272	10	3.7
21	*Processus temporalis squamae frontalis completus*	8	2	25	17	3	17.6	119	0	0	248	0	0
22	*Processus parietalis ossis sphenoidalis*	7	1	14.3	16	1	6.25	131	19	12.8	269	32	11.9
23	*Ossiculum bregmaticum*	6	0	0	-	-	-	124	1	0.8	-	-	-
24	*Ossiculum suturae sagittalis*	6	0	0	-	-	-	112	4	3.6	-	-	-
25	*Ossiculum incisurae parietalis*	5	1	20	12	1	8.3	132	24	18.2	268	30	11.2
26	*Os parietale partitum*	6	0	0	13	0	0	140	0	0	280	0	0
27	*Ossiculum suturae squamosae*	4	0	0	12	0	0	128	3	2.3	266	4	1.5
28	*Squama temporalis partita*	7	0	0	17	0	0	138	0	0	278	0	0
29	*Sutura squamomastoidea*	9	4	44.4	18	5	27.8	139	56	40.3	279	89	31.9
30	*Processus mastoideus bipartitus*	8	0	0	17	0	0	137	4	2.9	277	4	1.4
31	*Ossiculum lambdae*	8	0	0	-	-	-	127	12	9.4	-	-	-
32	*Ossiculum suturae lamboidaea*	7	2	28.6	15	3	20	117	51	43.6	239	79	33.1
33	*Os Incae completum*	9	0	0	-	-	-	140	0	0	-	-	-
34	*Processus interparietalis*	8	1	12.5	-	-	-	139	6	4.3	-	-	-
35	*Sutura mendosa*	6	0	0	14	0	0	139	22	15.8	279	36	12.9
36	*Ossiculum asterii*	7	1	14.3	17	2	11.8	132	23	17.4	270	31	11.5
37	*Ossiculum suturae occipitomastoidae*	4	0	0	9	0	0	114	7	6.1	241	7	2.9
38	*Sulcus frontalis*	8	4	50	16	7	43.8	140	45	32.1	280	71	25.4
39	*Incisura trochlearis*	10	1	10	20	1	5	140	21	15.0	280	23	8.2
40	*Foramen trochleare*	10	0	0	20	0	0	140	3	2.1	280	3	1.1

	Trait	Dietrichstein family				Reference sample							
		Incidence on individual			Incidence on side	Incidence on individual					Incidence on side		
		N	Inc.	%	N	Inc.	%	N	Inc.	%	N	Inc.	%
41	*Incisura frontalis absens*	10	7	70	20	10	50	140	54	38.6	280	70	25.0
42	*Foramen frontale*	10	5	50	20	7	35	140	47	33.6	280	67	23.9
43	*Incisura supraorbitalis*	10	0	0	20	0	0	140	2	1.4	280	2	0.7
44	*Foramen supraorbitale*	10	1	10	20	1	5	140	22	15.7	280	26	9.3
45	*Foramen nasale absens*	5	2	40	11	2	18.2	137	25	18.2	274	30	10.9
46	*Foramen zygomaticofaciale absens*	8	1	12.5	15	1	6.7	140	35	25.0	280	52	18.6
47	*Foramen ethmoidale anterius absens*	9	0	0	18	0	0	133	0	0	269	0	0
	Foramen ethmoidale posterius absens							136	2	1.5	273	2	0.7
48	*Canalis opticus partitus*	9	0	0	18	0	0	115	10	8.7	248	15	6.0
49	*Foramen infraorbitale absens*	9	0	0	18	0	0	140	0	0	280	0	0
50	*Foramen palatinum minus absens*	6	1	16.7	13	2	15.4	139	1	0.7	278	1	0.4
51	*Foramen parietale absens*	6	2	33.3	13	7	53.8	140	85	60.7	280	127	45.4
52	*Foramen parietale inferior*	3	1	33.3	9	1	11.1	140	0	0	280	0	0
53	*Foramen squamosum superius*	5	0	0	15	0	0	133	1	0.8	271	1	0.4
54	*Processus parietalis squamae temporalis*	5	0	0	14	0	0	134	2	1.5	273	3	1.1
55	*Foramen mastoideum absens*	7	3	42.9	15	5	33.3	140	32	22.9	280	38	13.6
56	*Foramen tympanicum*	7	2	28.6	16	5	31.3	135	20	14.8	271	31	11.4
57	*Foramen marginale*	7	0	0	16	0	0	139	7	5.0	274	10	3.6
58	*Foramen postglenoidale*	5	0	0	13	0	0	-	-	-	-	-	-
59	*Foramen inferiosquamosus*	3	2	66.7	8	4	50	-	-	-	-	-	-
60	*Foramen occipitale*	8	2	25	-	-	-	140	19	13.6	-	-	-
61	*Foramen condylaris absens*	5	4	80	13	9	69.2	140	46	32.9	280	57	20.4
62	*Canalis condylaris absens*	6	5	83.3	14	10	71.4	139	55	39.6	279	74	26.5
63	*Canalis condylaris intermedius*	6	0	0	13	0	0	133	53	39.8	270	72	26.7
64	*Foramen hypoglossale partitum*	7	1	14.3	15	2	13.3	138	49	35.5	276	61	22.1
65	*Foramen spinosum incompletum*	8	6	75	18	9	50	136	14	10.3	275	20	7.3
66	*Foramen ovale partitum (cum spina)*	5	0	0	12	0	0	137	1	0.7	276	1	0.4
67	*Foramen ovale incompletum*	9	1	11.1	19	1	5.3	134	5	3.7	272	8	2.9
68	*Foramen ovale et spinosum confluens*	9	0	0	19	0	0	138	7	5.1	277	9	3.2
69	*Foramen Vesalii*	8	0	0	17	0	0	138	86	62.3	277	132	47.7
70	*Ponticulus jugularis (externus)*	3	0	0	6	0	0	138	18	13.0	277	18	6.5
71	*Ponticulus pterygospinosus*	7	1	14.3	15	1	6.7	140	4	2.9	274	4	1.5
72	*Ponticulus pterygoalaris*	4	0	0	9	0	0	140	4	2.9	280	5	1.8
73	*Foramen mentale absens*	7	0	0	14	0	0	52	0	0	104	0	0
74	*Ponticulus mylohyoideus*	8	1	12.5	16	1	6.3	54	3	5.6	108	5	4.6
75	*Foramen mandibulare accessorium*	6	0	0	14	0	0	-	-	-	-	-	-
76	*Foramen molare*	4	1	25	10	1	10	-	-	-	-	-	-
77	*Facies condylaris bipartita*	4	0	0	8	0	0	132	13	9.9	268	15	5.6
78	*Depressio biparietalis circumscripta*	8	1	12.5	16	2	12.5	140	3	2.1	280	6	2.1
79	*Spina trochlearis*	10	1	10	20	2	10	138	22	15.9	279	31	11.1
80	*Tuberculum marginale absens*	7	2	28.6	16	8	50	140	67	47.9	280	101	36.1
81	*Tuberculum zygomaxillare*	9	3	33.3	18	5	27.8	140	23	16.4	280	34	12.1

Trait		Dietrichstein family				Reference sample							
		Incidence on individual			Incidence on side	Incidence on individual					Incidence on side		
		N	Inc.	%	N	Inc.	%	N	Inc.	%	N	Inc.	%
82	*Torus palatinus*	9	6	66.7	-	-	-	138	66	47.8	-	-	-
83	*Torus maxillaris*	8	1	12.5	16	2	12.5	134	3	2.2	268	4	1.5
84	*Spina suprameatica*	7	2	28.6	15	4	26.7	138	60	43.5	278	102	36.7
85	*Depressio suprameatica*	7	2	28.6	15	3	20	135	34	25.2	278	64	23.0
86	*Torus acusticus*	7	0	0	17	0	0	139	1	0.7	275	2	0.7
87	*Tuberculum pharyngeum absens*	6	1	16.7	-	-	-	139	8	5.8	-	-	-
88	*Tuberculum praecondylare*	6	0	0	12	0	0	139	6	4.3	264	8	3.0
89	*Processus paracondylaris*	6	0	0	13	0	0	130	4	3.1	265	7	2.6
90	*Processus retromastoideus*	8	0	0	18	0	0	140	0	0	280	0	0
91	*Linea nuchae suprema*	6	0	0	13	0	0	140	81	57.9	280	159	56.8
92	*Torus occipitalis*	6	0	0	-	-	-	140	7	5.0	-	-	-
93	*Torus mandibularis*	8	0	0	16	0	0	52	0	0	104	0	0