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3D AVERAGE FACIAL RECONSTRUCTION OF ADULT FEMALE SKULLS FROM THE NECROPOLIS OF THE CASTLE OF PTUJ (SLOVENIA)

Abstract

The necropolis of the Castle of Ptuj (Slovenia) was discovered by the notary public V. Škrabar on 1909. The excavations of the necropolis took place in 1946 and 1947 and involved the examination of about 300 skeletons. The necropolis belonged to ancient Slavs who lived in the area during the 10th and 11th centuries. It was an ordinary cemetery used by the inhabitants of the left bank of the Drava river. It was in use for a tranquil period of about a century. The high death rate of 22 to 30 year olds is remarkable.

The specific conditions of the subjects buried in the necropolis ensure that according to their gender and age, they can be subdivided in groups (infant I, infant II, juvenile, mature, adult, senior) having homogeneous somatic and cranial parameters. Thus, each group can be characterised by the average values of the corresponding somatic and cranial parameters. Based on previous work we have done with a 10,500 years old Magdalenian female skull from Oberkassel bei Bonn (Germany), and based on a similar work we had done with a 6,000 year old Neolithic "square mouth pottery" Culture male skull, we applied the same 3D facial reconstruction methodology to the 3D average skull of the group of the adult females from Ptuj necropolis. Said 3D average skull was generated by calculating the average values of the cranial parameters of the members of the group. Said 3D average skull model was subsequently used for a 3D facial reconstruction.

Patently it is hard to have a clear idea of the actual original pigmentation of the eyes, hair and skin of ancient subjects. However, in the case of this ancient group, it is helpful to quote Procopius. According to him: "Slavs were tall, of fair and reddish complexion". Thus, combining the dimensions of the 3D average skull model, the flesh thicknesses used in the facial reconstruction of the skull from Oberkassel bei Bonn and the information from Procopius we obtained the 3D average facial reconstruction of the group. The 3D average facial reconstruction of a group of ancient subjects gives well the impression of the average facial appearance of the members, but in principle also opens the way for verifying the reliability of ancient chronicles, tales or legends dealing with the general appearance of the members of the group.

Introduction

In two previous papers [1,2], we made, respectively, a 3D facial reconstruction of a 6.000 years old Neolithic male skull of the "*square mouth pottery*" Culture [1] found at Quinzano (Verona – Italy) and of a 10.500 years old Magdalenian female skull found at Oberkassel bei

Bonn [2]. Applied to individual skulls, our facial reconstruction technique was successful in providing the facial appearance of the corresponding single ancient subjects.

However, the discovery and the study [3] of the necropolis of the Castle of Ptuj (Slovenia) has provided us with an unexpected possibility to extend our technique, for gaining information about the facial appearance also of ancient homogeneous groups of people.

The Necropolis of Ptuj

According to Ivaniček [3], the necropolis of the Castle of Ptuj (Slovenia) was discovered by the notary public V. Škrabar on 1909. The excavations of the necropolis took place on 1946 and 1947 and involved the examination of about 300 skeletons. From the point of view of the cultural anthropology, the main results can be summarised as follows:

a) The necropolis belonged to ancient Slav subjects who lived on location during the 10^{th} and 11^{th} centuries;
b) The necropolis was an ordinary cemetery, in which the dead from a neighbouring settlement or settlements were buried;
c) The necropolis was used by the inhabitants of the adjacent country on the left bank of the Drava river, the inhabitants on the right bank of the Drava had their own cemetery near the village of Spodnja Hajdina;
d) The necropolis was in use for about a century;
e) The skeletons show a high death rate in 22 to 30 years old adults;
f) The people lived in a relatively tranquil period, as indicated by the practically equal number of buried geriatric males and females and by the high percentage of buried males at the age of 30 to 40. In time of war the percentage of buried female ought to be higher as men would be buried in battlefields. This tranquil period is also testified by the fact that the dead were buried orderly in single graves and not so many would be richly furnished with presents;
g) The skulls of both males and females show a prevalence of Nordic, Nordic Cro-Magnon, Nordic-Baltic, Nord-Alpine phenotype characteristics.

In section A: Orthograms, Ivaniček [3] presents the layouts of 173 skulls of the necropolis, with the indications of the linear parameters 1- ab2, 40 - 71 and the goniometric parameters 32/1 - 79 according to the order established by Martin [4].

In section B: Numerical Tables, he [3] summarises the data as follows:

Table I: Overview: skull numbers, sex, age description (infant I, infant II, juvenile, mature, adult, senior, abbreviated as inf. I, inf. II, juv., mat., ad., sen.);

Table II: Skeletal dimensions;

Table III: Cranial Linear Data (*cranium cerebrale*): parameters 1 - ab2 for male and female type skulls, according to [4];

Table IV: Cranial Linear Data (*cranium viscerale*): parameters 40 -71 for male and female type skulls, according to [4];

Table V: Linear Osteometric Data: for male, female and unknown type skulls;

Table VI: Goniometric Data: parameters 32/1 - 79 [4] for male and female type skulls;

Table VII: Cranial Indices (*cranium cerebrale*) for male and female type skulls;

Table VIII: Cranial Indices (*cranium viscerale*) for male and female type skulls;

Table IX: Other Cranial Indices for male and female type skulls;

Table X: Osteometric Indices for male, female and unknown type skulls.

3D Average Facial Reconstruction – Theory

The above features a)-f), ensure that buried male and female according to their age (inf. I, inf. II, juv., mat., ad., sen.), formed groups having homogeneous somatic and cranial parameters. Thus, each male or female group can be characterised by the average values of the somatic and cranial parameters of the members listed in Tables I-X of ref. [3]. A 3D average skull model can then easily be constructed for a group by simply collecting the average values of the cranial parameters of the members. On such a 3D average skull model our 3D facial reconstruction technique can obviously be applied. The reconstructed 3D face of a group is the average facial appearance of the members of the group.

3D Average Facial Reconstruction – Implementation & Application

We proceed with the skulls of the group of the adult women buried in the necropolis. Of particular interest, for the construction of the 3D average skull model of this group, are the corresponding skull linear parameters of Tables III and IV of ref. [3]. For each skull linear parameter we calculated its average value. The average parameters actually retained in the 3D average skull model are listed in Table 1.

Because, in looking to the female adult skull layouts presented in Section A of ref. [3], it appears that they are not particularly different from the skulls of the present Central European women and not afflicted by particular deformities or distortions, it appeared reasonable to assume, also in the case of the average skull model, thicknesses of the soft tissues on the different portions of the skull not dissimilar from that of the today's Central European adult women and/or adult American women of Central European origins. Thus, once again, we applied also to the 3D average skull model the thickness values of the Look Up Table (LUT) containing the set of warping points 1-21 derived from [5] and already used in [2] (cf. Tab. 2).

As mentioned in the previous papers [1,2], it is hard to have a clear idea of the actual original pigmentation of the eyes, hair and skin of ancient subjects. However, in the case of this ancient group, it is helpful to quote Procopius in [3] – cf. page 96, according to his statement: "Slavs were tall, of fair and reddish complexion". Thus, combining the dimensions of the 3D average skull model of Table 1, the flesh thicknesses of Table 2 and the informa-

Table 1. 3D Average skull model – parameters

Parameter No. [4]	Parameter name [4]	Average size [3] (mm)
1	Cerebral-Cranial length	182
2	Glabello-Inion length	174
3	Glabello-Lambda length	174
8	Cerebral-Cra. larger width	142
13	Mastoid width	106
18	Cranial total height	130
40	Facial length	104
48	Facial upper height	91
50	Inter-orbital frontal width	20
51	Orbital width	40
52	Orbital height	38
54	Nose width	7
66	Jaw angular width	98

Table 2. Table of measurements for flesh thickness, after J.S.Rhine and C.E. Moore, *Forensic Anthropology*, Maxwell, Museum Technical Series,1984 (from Prag and Neave, [5]).

	Values for average adult female	Position	Size (mm)
1	Supraglabella	Frontal	3.50
2	Glabella	Frontal	4.75
3	Nasion	Frontal	5.50
4	End of Nasals	Frontal	2.75
5	Midphiltrum	Frontal	8.50
6	Upper Lip Margin	Frontal	9.00
7	Lower Lip Margin	Frontal	10.00
8	Chin-lip Fold	Frontal	9.50
9	Mental Eminence	Frontal	10.00
10	Beneath Chin	Frontal	5.75
11	Frontal Eminence	Bilateral	3.50
12	Supraorbital	Bilateral	7.00
13	Suborbital	Bilateral	6.00
14	Inferior Malar	Bilateral	12.75
15	Lateral Orbit	Bilateral	10.75
16	Zygomatic Arch, midway	Bilateral	7.50
17	Supraglenoid	Bilateral	8.00
18	Gonion	Bilateral	12.00
19	Supra M2	Bilateral	19.25
20	Occlusal Line	Bilateral	17.00
21	Sub M2	Bilateral	15.50

tion from Procopius we obtained the 3D average facial reconstruction of said group. Figure 1 shows the 3D average facial reconstruction in four different orientations.

An artistic 3D average facial appearance of the members of the group, in the possible ancient environment of city Ptuj is provided in Figure 2.

Conclusion

The 3D average facial reconstruction of a group of ancient subjects gives us well the impression of the average facial appearance of the group members, but in principle also

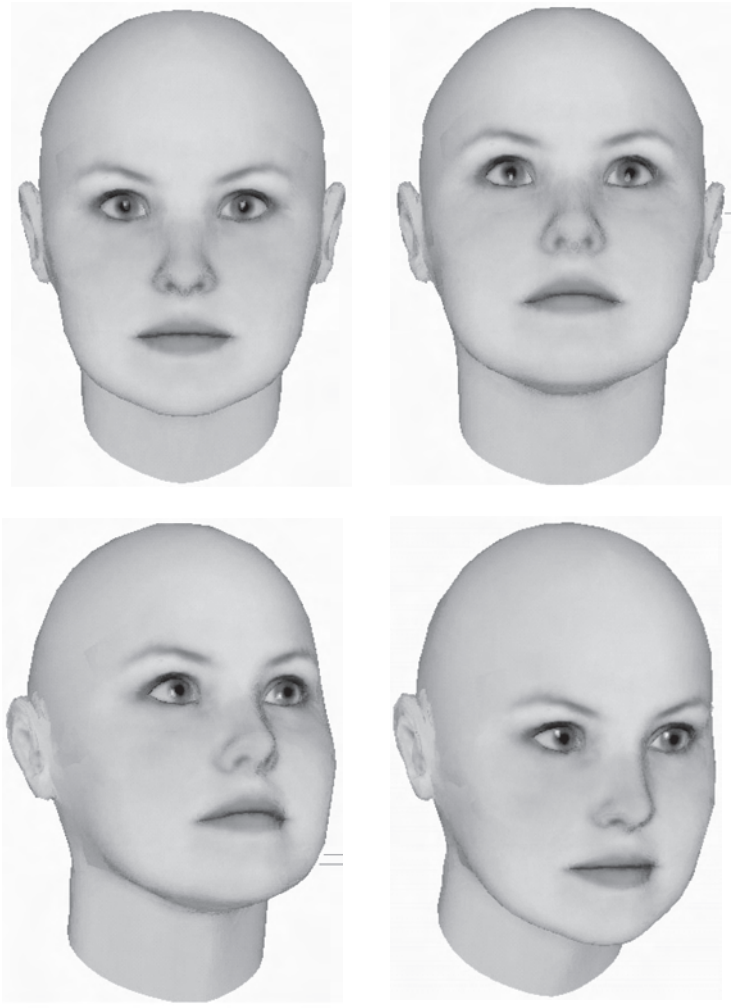

Figure 1. Final 3D facial reconstruction of the average adult female from the necropolis of the Castle of Ptuj (Slovenia)

Figure 2. Artistic 3D average facial reconstruction of the average adult female from the necropolis of the Castle of Ptuj (Slovenia)

open the way for verifying the reliability of ancient chronicles, tales or legends dealing with the general appearance of the members of the group.

Bibliography

1. Silvestri M, Tomezzoli G, 3D Facial Reconstruction from a Skull of a Male Subject of the Neolithic Square Mouth Pottery Culture of Quinzano, *Proceedings of the Third International Topical Conference "Ancient settlers of Europe"*, Jutro, Ljubljana 2005, 159-164
2. Silvestri M, Tomezzoli G, 3D Facial Reconstruction of an Ancient Female Skull from Oberkassel bei Bonn (Germany), *Proceedings of the Fourth International Topical Conference "Ancient inhabitants of Europe",* Jutro, Ljubljana 2006, 229-235.
3. Ivaniček F, *Staroslavenska nekropola u Ptuju*, Slovenska Akademija Znanosti in Umetnosti v Ljubljani, Classis I: Historia et Sociologia, Dela * Opera 5, Ljubljana 1951.
4. Martin R, *Lehrbuch der Anthropologie in systematischer Darstellung*, Verlag von Gustav Fischer, Jena 1928.
5. Prag, J, Neave R, *Making Faces Using Forensic and Archaeological Evidence*, British Museum Press, London 1997.

Additional Materials

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Povzetek

3D rekonstrukcija povprečnega obraza lobanj odraslih žensk z grobišča ptujskega gradu

Grobišče ptujskega gradu je odkril notar V. Škrabar leta 1909. Izkopavali so ga leta 1946 in 1947 ter preiskali 300 okostij. Pripadalo je Slovanom, ki so živeli tam v 10. in 11. stoletju. To je bilo pokopališče ljudi, ki so živeli na levem bregu Drave. Uporabljali so ga v mirnem obdobju, ki je trajalo približno eno stoletje. Opazna je velika umrljivost v starosti 22 do 30 let.

Posebnosti pokopov omogočajo razdelitev po spolu in starosti (otrok I, otrok II, mladostnik, dozorevajoč, odrasel, ostarel) v skupine, ki imajo podobne somatske in lobanjske parametre in ki jim je mogoče določiti povprečne vrednosti.

Isto 3D metodologijo kot pri rekonstrukciji obraza 10.500 let stare ženske lobanje iz Oberkassla pri Bonnu in 6000 let stare moške lobanje sva uporabila tudi pri povprečni lobanji odraslih žensk s ptujskega grobišča, ki sva jo izračunala iz povprečij lobanjskih mer. Obarvanost oči, las in kože je težko določiti. Pomagala sva si s Prokopijem, ki pravi: "Slovani so visoki, svetlega in rdečkastega videza". S temi podatki sva dosegla 3D rekonstrukcijo povprečnega obraza, ki daje dober prikaz povprečnega videza tedanjih žensk in načeloma odpira možnost preverjanja zanesljivosti starih kronik, zgodb in legend, ki opisujejo splošni videz članov tistih skupin.