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Frequency arrangement of cranioscopic features of the Eskimo and American Indian skulls

Alina Wiercińska

Laboratory of Anthropology, State Archaeological Museum, Warsaw

Keywords: Eskimo, American Indian, cranioscopic features

Material and method

The application of anthropological research, with the purpose of solving several aspects of ethnogenesis, depends on the diagnostic value of particular features, which reveal the extent of relationship between human populations.

Regarding the craniological series, apart from standard metric and epigenetic features, cranioscopic traits can be applied. However, they should be designated in a very inter-subjective way. In order to cover that need, proper cranioscopic scales in the shape of a photographic form had been created by I. Michalski; subsequently these scales were transformed by A. Wierciński and K. Piasecki into graphic scales, known as M – W – P scales. Results of the research carried out by A. Wierciński (1968, 1973) and K. Piasecki (1986) proved the fact that many cranioscopic features, which were assigned in accordance with both scales, are of a significant diagnostic value in distinguishing main human races.

The purpose of the present study is to show the results of applying the M – W – P scales to the comparative description of two Amerindian skulls series: the Mobridge series from South Dakota (n = 50), American Indians from California (n = 67), and the Eskimo series from St. Laurence, Alaska (n = 51).

Apart from the set of 11 standard craniometrical features (*g – op*, *eu – eu*, *zy – zy*, *zm – zm*, *n – gn*, *n – pr*, *n – ns*, nasal breadth, *mf – ek*, orbital height), the skulls having been re-measured, using the R. Martin method, in order to render homogeneous, we also included designation of belonging under the category of 28 cranioscopic features, according to the M – W – P scales (1. *Neurocranium – norma verticalis*, 2. *Neurocranium – n. occipitalis*, 3. *Frons – forma lateralis*, 4. *Frons – inclinatio*, 5. *Paries – forma*, 6. *Paries – situatio*, 7. *Occiput – forma lateralis*, 8. *Occiput – bathrocephalia*, 9. *Processus mastoideus – magnitudo*, 10. *Glabella – forma lateralis*, 11. *Arcus supraorbitalis – forma lateralis*, 12. *Orbita – magnitudo*, 13. *Orbita – forma*

lateralis, 14. *Ossa nasalia – forma frontalis*, 16. *Apertura piriformis – margo inferior*, 17. *Fossa canina – profunditas*, 18. *Incissura maxillaris – profunditas*, 19. *Maxilla – prominentia*, 20. *Radix nasi – altitudo*, 21. *Radix nasi – profunditas*, 22. *Nasus osseus – prominentia*, 23. *Nasus osseus – forma lateralis*, 24. *Spina nasalis – situatio*, 25. *Spina nasalis – prominentia*, 26. *Mentum – prominentia*, 27. *Arcus mandibulae – forma basiliaris*, 28. *Radix nasi – latitudo*.

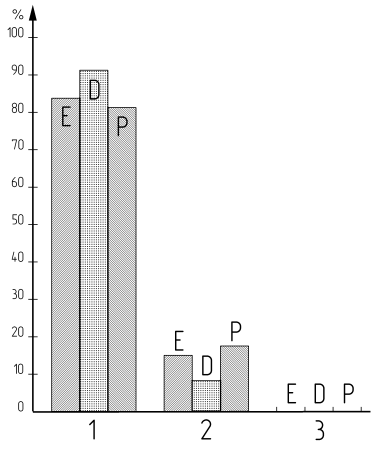

Figure 1: Glabella – forma lateralis

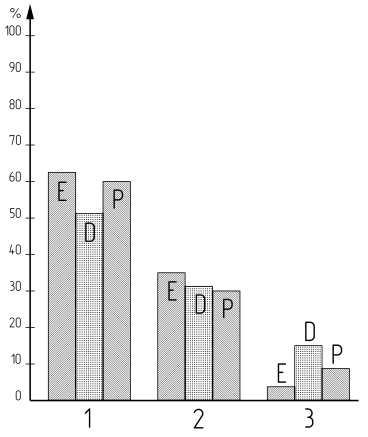

Figure 2: Arcus supraorbitalis – forma frontalis

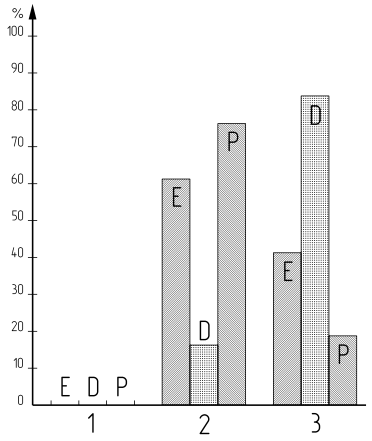

Figure 3: Orbita – magnitudo

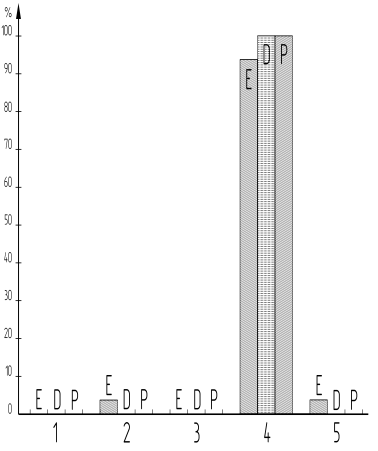

Figure 4: Orbita – forma frontalis

After we had completed the description of the above cranioscopic series, the frequency arrangements of categories of 16 features, which are being recognized to be diagnostic in denoting human races, were finally compared. Only male

skulls were taken into account, because their particular features are much better displayed than in the case of female skulls, and also because of the fact, that a number of these features shows quite well-marked dimorphism.

Subsequently, the estimation of differences between frequency arrangements had been performed, using the Chi–square test, at the same time, in consideration of a little amount of the material, the categories of scales were set up into some relatively universal divisions.

Eventually, we reckoned up the probability values of affiliation to 3 human races at a time, according to Piasecki's tables. The results were presented graphically as the arrangements of particular skulls in the triangular system.

Results of the analysis

Results of the analysis of frequency arrangements are presented in Figures 1–16. In the range of glabella extension both Amerindian series show no differences, displaying the highest pitch of frequency in the range of archimorphical forms; flattened forms were not recorded.

The arrangement of Eskimo series is analogical. Certainly, the extension of supercilliary arches is similar, notably correlated with the preceding feature; however, a higher frequent occurrence of intermediate forms (D. 32%, P. 31%) and smoother forms (D. 16%, P. 16%) has appeared. The Eskimo skulls are a little more archimorphical, but in general, they are not far from the American Indian skulls. There had been significant differences in the orbital height of those two series. Large orbits are most frequent in Mobridge series (84%), middle and small orbits are most frequent in Californian series.

While small orbits were not recorded, middle (59%) and large (41%) orbits prevail in Eskimo skulls, what makes them slightly different from Californian skulls.

There are not any differences between these series in the range of orbital shape and the absolute maximum of frequency is found in the category of rhomboidal forms.

The shape of nasal bones revealed distinct differences; heavily upper concave forms were present in Mobridge (88%), however they are in the biggest number in both Amerindian series. There were also more wide rhomboid forms in Californian series (23%).

The Eskimo series arrangement shows analogical maximum of frequency (56%), but it is distinctly different in the proportion of typically Mongoloid triangular forms (31%).

The arrangement in Mobridge series is more regular, displaying the maximum of prognathism (46%), but the presence of mesognathic (42%) and even orthognathic forms (13%) had also been recorded. The Eskimo skulls are not very different from the Mobridge skulls; however they were not any orthognathic forms in Eskimo series.

Both Amerindian series are slightly different in the aspect of the nose base, showing significant maximum of frequency in the range of high forms (D. 88%, P. 74%); there had been lack of very low forms.

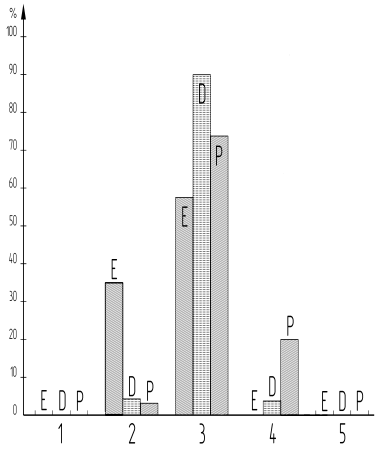

Figure 5: Ossa nasalia – forma frontalis

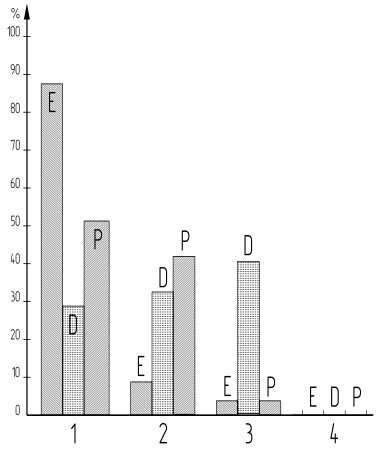

Figure 6: Apertura pyriformis – forma frontalis

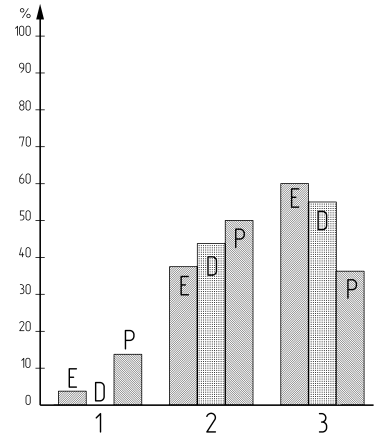

Figure 7: Fossa canina – profunditas

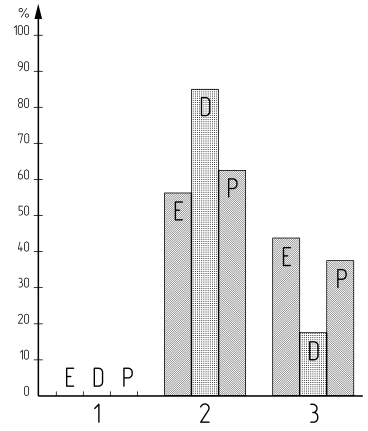

Figure 8: Incisura maxillaris

Low forms were present in Eskimo skulls, which were also different from Amerindian skulls in the sphere of slightly high forms.

The matter of the nose protrusion is similar, what means, that differences among the American Indians are not crucial; the maximum of frequency is observed in the sphere of strongly protruding forms (D. 78%, P. 65%).

The arrangement of Eskimo skulls is more regular; maximum of frequency is present in the category of non protruding forms (44%).

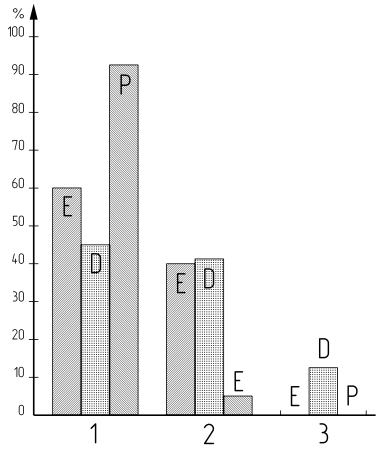

Figure 9: Maxilla – prominentia

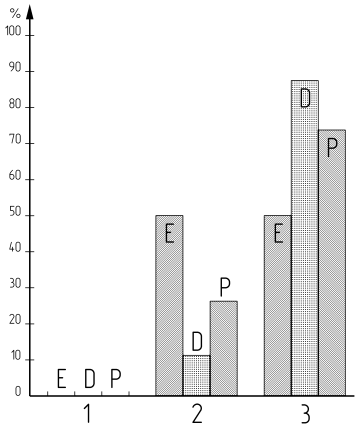

Figure 10: Radix nasi – altitudo

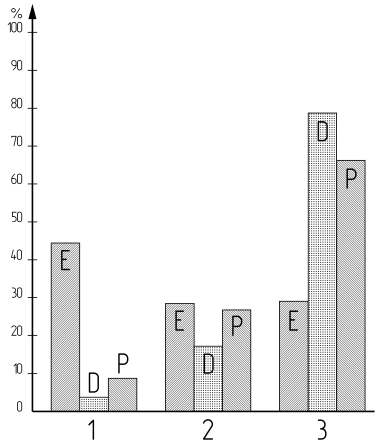

Figure 11: Nasus osseus – prominentia

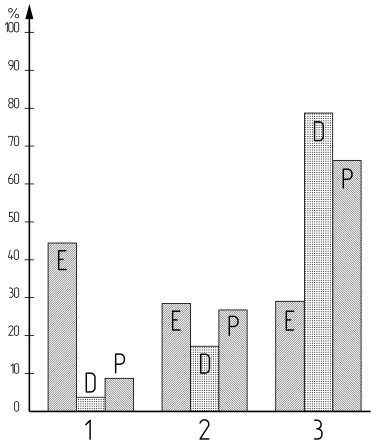

Figure 12: Nasus osseus – forma lateralis

It is interesting, that the shape of nose profile had already displayed some distinct differences in both Amerindian series. The Californian series is more differentiated and includes concave, straight and convex forms, with the moderate maximum of frequency present in the category of very convex forms (96%). The Eskimo skulls, with the arrangement similar to the Californian series, are different in the range of concave and straight forms (34%) and also in the aspect of the maximum of convex – mixed forms (44%).

The position of spina nasalis shows no differences in both Amerindian series. There are not any raised forms, and the maximum of frequency is observed in the category of lowered forms (D. 79%, P. 73%).

The Eskimo skulls are not different from the American Indian skulls in the aspect of that feature. In the range of spina nasalis protrusion, only unessential differences exist. Strongly protruding forms are most frequent in both series (D. 75%, P. 78%); non–protruding and slightly protruding forms were also recorded in Californian series (9%).

The arrangement of Eskimo skulls shows unsubstantial differences, and is similar to Californian series. The protrusion of mentum does not indicate any differences; middle protruding forms are most frequent (D. 68%, P. 77%) in Amerindian series, while very slightly protruding forms are missing. The absolute greater part of middle protruding forms makes the Eskimo skulls different.

There are not any important differences in the width of nose base, which gives straight arrangements for both Amerindian series, with little number of narrow forms (D. 16%, P. 9%) and the maximum in the category of middle wide forms (D. 60%, P. 47%). The Eskimo skulls are closer to Mobridge, but they are significantly different from Californian series in which wide forms occur two times more often.

Generally, we can state, that, according to most diagnostic features in distinguishing 3 human races, both Amerindian series are distinctly different from the Negroid type, with considerable signs of archimorphism in the forehead area. Only Californian series in one feature, which is the prominent prognathism, is closer to the range of Negroid skulls; rest of its features is definitely different, and furthermore, prognathism can be characteristic for some various Mongoloid groups.

One much differentiated feature – the frontal form of nose foramen – did not indicate any dissimilarities, because of the fact, that all high maximum of frequency was found in the category of rounded forms (D. 88%, P. 90%). In the case of Eskimo skulls it had been 75%, however, bigger number of narrowed forms was observed.

Lower edge of nose foramen showed different aspects, revealing important dissimilarities and giving moderate maximum of frequency in Dakota (40%) within the category of antropina type, while in the case of Californian series the maximum is present in the range of sulcus or fossa praenasalis (52%). In both series there are no sharp and wriggled forms. Concentration of frequencies assigns Eskimo skulls in the first category (88%).

Depth of fossa canina is not different in both Amerindian series, however it would be important to notice, that not large maximum of frequency (56%) in Mobridge occurs in the category of shallow fossa, and in Californian series – middle deep fossa (50%).

In this aspect the Eskimo skulls are not different from Mobridge series. Depth of incissura maxillaris, moderately correlated with the above feature, had shown particular differences. In Mobridge series, middle deep forms are most often present (80%), less number of these forms occurs in Californian series (57%), which is also different in the range of shallow forms (37%).

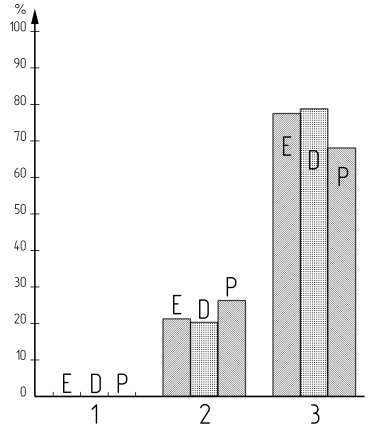

Figure 13: Spina nasalis – situatio

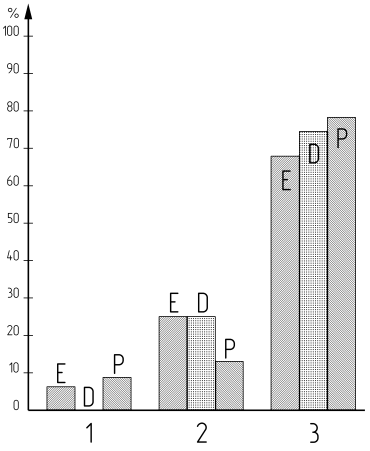

Figure 14: Spina nasalis – prominentia

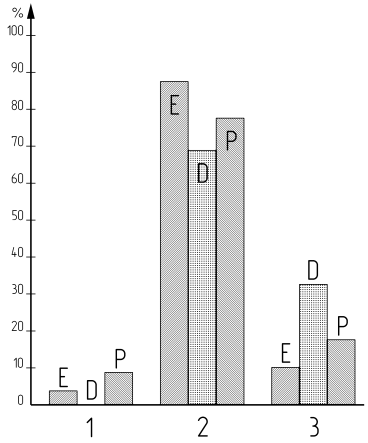

Figure 15: Mentum – prominentia

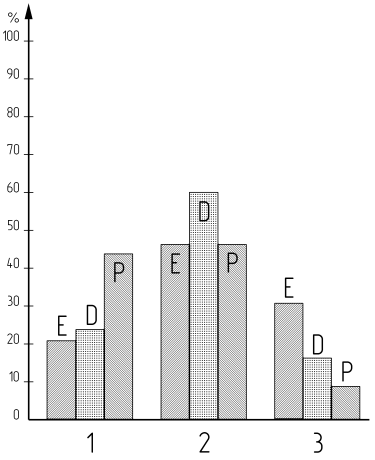

Figure 16: Radix nasi – latitudo

The arrangement of Eskimo skulls is not different from Californian series. In the case of maxilla protrusion both series are significantly different, because of very high maximum of frequency of prognathic forms, recorded in Californian series (94%); orthognathic forms were missing.

Relation of both Amerindian series to the Mongoloid types and European types is not clear. Judging only on the basis of the above examples of frequencies in single features, we can see a specific variegation; morphology of nose area is closer to European type, what is best seen in Mobridge. Moreover, the depths of fossa canina and incissura maxillaris also evince transitional appearance.

Considering the fact, that both series are (D = 77.6%, P = 78.3%), we can assume the influence of mostly Ainuid element (Amurian Race according to J. Birdsell), which would probably be responsible for the tendency to European types. However, in Mobridge series we might be dealing with Pacific element, as the nose protuberance is really significant (D 77.6%, P. 78.3%).

Eskimo skulls show Mongoloid traces in all features. The rise of nose base height and more protruding lowered spina nasalis probably constitute their specificity, however some traits of their mixture with Amerindian neighbors can be seen, since mesocephaly is present in Eskimo skulls (77.1%), while arctic element shows distinct dolichocephalism.

Example of the pair of features

It would be worth to consider the issue of deformation, which is inevitably brought by the comparative analysis, based on single, individually treated features. The above issue of deformation results from an assumption of their inter-independence. Biological subjects are taken as accidental combinations of particular values used in their taxonomic features description. In fact, we deal with standardized systems and the skull, being one of the sub-systems, does not belong to any incoherent scheme.

We shall now consider the results of comparison of three craniological series in a range of single features, which had not shown any distinct differences. These are: 11. Arcus supraorbitalis – forma frontalis and 25. Spina nasalis – prominentia, which were observed in different parts of skull. We will now treat them jointly as a pair of features. In consideration of little amount of material, female skulls were included into the same proportion, which is 36–38% of total amount. Only dichotomic partition for both features had been assumed. Category 1 means strongly developed arcus supraorbitalis or slightly and protruding spina nasalis; respectively, category 2 means middle and slight arcus or strong protruding spina.

Table 1: Comparison of frequency arrangement: 11. Arcus supraorbitalis – forma frontalis and 25. Spina nasalis – prominentia

11	25	E	D	P	
1	1	10.0 (5)	10.2 (4)	10.8 (4)	$X^2_{ED} = 5.719^*$
1	2	32.0 (16)	23.1 (9)	29.7 (11)	$X^2_{EP} = 0.096^*$
2	1	30.0 (15)	15.4 (6)	32.4 (12)	
2	2	28.0 (14)	51.3 (20)	27.0 (10)	$X^2_{DP} = 8.315^*$
		100.0 (50)	100.0 (39)	99.9 (37)	

Comparison of frequency arrangement in the pair of those features is shown in Table 1. It became evident that there are very distinct differences between Mobridge series and Californian series. If the Eskimo series is also compared, it appears that a serious difference exists in the relation of Eskimo series to Mobridge series; unsubstantial difference is observed in its relation to Californian series.

Joint examination of only 2 features resulted in radically different outcome in relation to the results acquired separately for those features.

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