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Research Article

Shape of external auditory meatus in north-west Indian crania

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ABSTRACT

Background: Skeletal non-metric variables are widely used for population studies. Genetic factors and the usefulness of non-metric traits in population studies were studied by many workers. One of the non-metric traits (shape of external auditory meatus) was studied in present study.
Methods: For the study 148 skulls (113 males, 35 females) were used. The crania were retrieved in the Department of Anatomy, Pt. B.D. Sharma PGIMS Rohtak, India. The current investigation will focus on the shape of external auditory meatus.
Results: Shape of external auditory meatus was oval /ellipse in most of the cases in North West Indian crania. Oval/ellipse shape of external auditory meatus (EAM) was almost equally distributed (48.13% and 47.80% respectively) followed by round shape (4.07%). No statistically significant bilateral asymmetry was found in present series.
Conclusions: Present study has reflected that in addition to caucasoid and negroid features, crania of present series have some resemblance with mongoloid too because of oval/ellipse shape of EAM. Study of shape of meatus will help in racial identification in medico legal cases.

Keywords: Non-metric traits, External auditory meatus, North West Indians

INTRODUCTION

Much attention has been paid to the variations of the shape and size of the human skull and efforts have been made to associate these variations to characterize different races. It is a matter of common experience that in dealing with crania of different racial types, an impression of racial affinity and differences may often be introduced. Skeletal non-metric variables are widely used for such studies.[1] Among the earlier workers some have worked on non-metric traits to study human cranial morphology.[2] Later the genetic factors and the usefulness of non-metric traits in population studies were conducted by other workers.[1,3] Manzi et al suggested that these non-metric traits play a significant role in origins and diversification of the anatomically modern human populations (Homo sapiens sapiens).[4]

In spite of the similarities exhibited on superficial morphological or physical characteristics of various ethnic groups in India, there is considerable number of variations observed among the Indians. The current investigations on the human crania recovered from North West India will focus on the shape of external auditory meatus.

METHODS

For the study of shape of external auditory meatus 148 skulls (113 males, 35 females) were used. These bones were retrieved and available in the department of Anatomy, Pt. B.D. Sharma PGIMS Rohtak, India. Skulls showing obvious pathological deformities were excluded from the study. The age was noted from records and all

the skulls were around 40-50 years of age at the time of death.

RESULTS

Shape of EAM (oval/ellipse/round) was seen on both sides of all the crania in both sexes. Shape of external auditory meatus was oval /ellipse in most of the cases in North West Indian crania. Oval/ellipse shape of external auditory meatus (EAM) was almost equally distributed (48.13% and 47.80% respectively) followed by round shape (4.07%). No statistically significant bilateral asymmetry was found in present series. Percentage frequency of different shapes was calculated and is shown in the Table 1 and Table 2.

In the total series oval /ellipse shape (Figure 1) of external auditory meatus was seen in most of the crania (95.93%) and round shape of EAM was seen only in 4.07% of crania (Table 1). When data was pooled together oval and ellipse shape was found to be equally distributed. However in females oval shape of EAM was more often seen as compared to males and this difference was found to be statistically significant ($p<0.05$) while in males ellipse shape was more frequently seen and this difference was also found to be statistically significant ($p<0.05$).

Table 1: Shape of external auditory meatus.

	Percentage		
	Total series n=295 (Rt. and Lt.)	Females n=69 (Rt. and Lt.)	Males n=226 (Rt. and Lt.)
Oval	48.13	63.76	43.76
Ellipse	47.80	33.33	52.21
Round	4.07	2.89	4.42

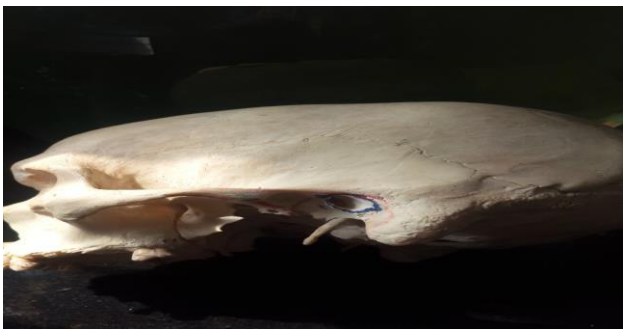

Figure 1: Oval type of external auditory meatus (white arrow at meatus).

Oval or round shape of external auditory meatus was more frequently seen on right side in total series while ellipse (Figure 1) shape of EAM was more frequently seen on left side but these differences were not found to be statistically significant ($p>0.05$).

In females, ellipse shape of EAM was more frequently on left side while round shape of EAM was more frequently seen on right side but these differences were not found to be statistically significant ($p>0.05$).

In males, oval and round shape of EAM was more frequently seen on right side while ellipse shape while ellipse shape was more frequently seen on left side. These differences were not found to be statistically significant ($p>0.05$).

Table 2: Shape of external auditory meatus in two sexes on two sides

	Percentage					
	Total series		Females N=35		Males N=113	
	Right	Left	Right	Left	Right	Left
Oval	49.64	42.68	64.70	64.70	44.85	36.69
Ellipse	43.97	56.00	32.35	35.29	47.66	61.46
Round	6.38	1.40	2.94	00	7.47	1.89

DISCUSSION

Shape of external auditory meatus is one of the criteria to find out race in medico legal cases. Larnach & Macintosh reported oval type of EAM in 71% of crania, ellipse in 13.4% of crania and round shape of EAM in 15.14% of crania in Australian aborigines. Round shape of EAM was also reported in 15.4% of crania in Queensland series and 4.1% of crania in New South Wales coastal series. Oval shape of EAM was reported in all the crania of Cairns Rain Forest area and 74.8% of New South Wale Coastal series.[1]

Talus reported round EAM in American white, American Black & elliptical EAM in Hispanics (South Western Mongoloids) crania.[5] Wood in his thesis on 'Influence of Growth & development in expression of Human morphological Variation' reported round EAM in 91.7% African, 69% Europeans and 37.3% Asians.[6] Forensic table summarizing typical non metric traits for three human races described round EAM for both Caucasoid & Negroids while elliptical EAM for Mongolian.[7] Reddy in his book has described that Indians are Caucasoid with few Negroid characters.[8]Thus above data published in different studies reported conflicting results.

Literature to find out ancestry from non-metric traits is different for same population as far as shape of EAM is concerned. Description of particular traits depends on the data available in the literature. Shape of EAM was never studied from this part of world to the best of our knowledge so present data will help to enrich the literature which is different from what has been already reported. In the present study, shape of external auditory meatus was observed as oval or ellipse in most of the crania and this feature is Mongoloid in present study.

Present study has reflected that in addition to Caucasoid and Negroid features, crania of present series have some resemblance with Mongoloid too. Study of shape of meatus will help in racial identification in medico legal cases.

It has been reported that non metric traits are genetic in nature i.e. they are not influenced by environment.[9] However, the authors feel that the shape of EAM may be affected by environment. Audition is related to basic aspect of an organism's survival particularly localization of sound sources including potential dangers in the environment and acoustic communication.[10]. The external auditory meatus with pinna funnel sound waves to the external auditory canal. From external auditory canal sound waves pass inward to the tympanic membrane.[11]

Population requiring more use of ear for hearing should have round EAM because surface area of this type of meatus is likely to be more hence more sound waves will be able to enter EAM resulting better hearing. If a given population is subjected to this type of requirement over a longer period, the said population may develop circular type of EAM. Further study may be required to authenticate this hypothesis. Another important aspect of the present study can be in use of hearing aids for a particular ethnic group. Hearing aids for a particular population can be manufactured according to the shape of EAM for better functioning.

CONCLUSION

In this study, significant rotational malalignment was found in 33.33% following closed intramedullary nailing of femoral shaft fractures. The clinical method of assessing rotational malalignment of femur is inaccurate as compared to CT evaluation. Patients with rotational malalignment >150 are symptomatic with knee and lower limb function. Every effort must be made to prevent rotational malalignment intraoperatively. Although various techniques are available for assessing rotational alignment between fracture fragments intraoperatively, Computer assisted navigation has the least margin of error and proves to be a promising tool on the road to eradication of this problem.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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