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Anthropometrical Study of the Pinna Among Southeast Nigerians

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Abstract

The knowledge of the dimensions of the external ear is important in the understanding of the physiognomy and aesthetics of the human body. Recent indications have also demonstrated experimentally that the pinnae perform an acoustical transformation essential to localization in human hearing. Standardized measurements of the longitudinal and transverse diameters of the normal pinna were measured in 148 male and female Nigerian Igbos of the Southeast zone, between the ages of 6 and 70 years. The subjects studied were selected to meet the inclusion criteria and were grouped according to age and sex. The data were analysed using the SPSS version 10.0. The mean length of the pinna for males (n = 101) for right and left side were 5.98 ± 0.3929 and 6.02 ± 0.2892 respectively .. The mean width for right and left were 3.182 ± 2.761 and 3.220 ± 0.1580 respectively. There were no statistical difference ($p < 0.05$) in the lengths and widths between the right and left sides of the males in the population under study. The means for lengths of right and left female pinna were 5.94 ± 0.2466 and 5.96 ± 0.2671 respectively. The means for the width of right and left female pinna gave 3.02 ± 0.1984 and 2.98 ± 0.1357 respectively. In all cases there were no statistical differences between the left and right sides as well as in the age categories. Overall data showed slight sex differences which was not statistically significant.

KEYWORDS: Anthropometer, Nigerian Igbos. Pinna Dimensions

INTRODUCTION

Earlier views portrayed that in humans the sizes of the pinna or external ear appear not to be related to the ability or precision of hearing. In fact, the ear was rather recognised as a cosmetic organ and its importance is more related to the aesthetics and physiognomy of the face. People having abnormal set of ears through congenital malformation or loss of the auricle through trauma usually feel depressed and uncomfortable (Saddler 2000). However, recent indications have demonstrated experimentally that the pinnae perform an acoustical transformation essential to localization in human hearing (Rayker et al 2005). The mathematical form of this acoustical transformation is given, the inverse to the transformation is shown to exist, and a theory of localization constructed from the evidence. Tollin and Koka (2009) demonstrated that during development, the increasing inter aural distance and pinnae size associated with growing head and pinnae result in localization cues that change continuously until maturation is complete.

Extrinsic muscles move the auricle to the direction of sound in the lower animals, in man such muscles have no functions (Last 1981) hence the pinna is long in lower animals so that it can rotate towards sound. It is therefore worthy to note that apart from the cosmetic aspects of the pinna in improving the facial physiognomy in man, sound localization is also of importance. Biometrical comparism has tended to show an average larger dimension for the Caucasian ear over the negroid ear (Saddler 2000). Not much has been documented with regards to the dimensions of the pinna in the Nigerian population. The external ear is elastic and cartilaginous in texture in the outer ring, the helix and in the inner ring, the ant-helix as well as the two processes guarding the external acoustic meatus known as the tragus and the ant-tragus. The ear lobe is the fatty tissue which is sometimes perforated for .ear rings usually in the

females (Last1981).

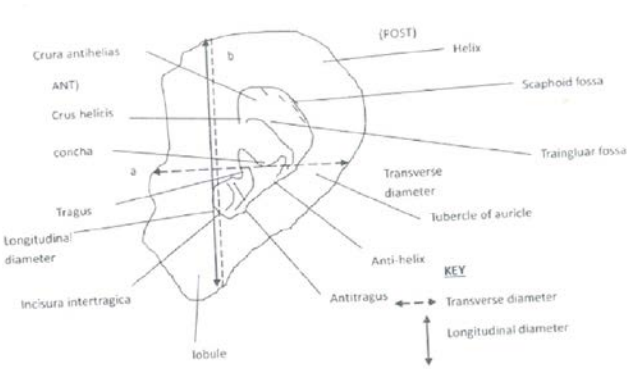
Development of the ear is associated with the development of the Central Nervous System (CNS) which starts in the period of organogenesis around the 4 - 8th week of intra- uterine life; with the lens (eye) and otic (ear) vesicles. Some of the congenital malformations involving the defects of the auricle include facial defects in foetal hydantin and alcoholic syndromes, rubella infection resulting to deafness. Sometimes the auricle may be absent congenitally or could be lost traumatically. The ugly sight with the absence of the ear is ameliorated by fashioning new set of ear from myocutanous flap raised from the upper limb or Temporalis Muscle (Akpuaka et a11992; Achebe et a11992; Thore k 1985).

Knowing the mean dimensions of the ear among the age groups is very important in view of total or partial loss of the ear especially in the younger age groups where traumatic loss by human bite is very common. The plastic surgeon therefore will have to reconstruct the size of the ear identical using an identical model from the racial group (Akpuaka et a11992). The work of the plastic surgeon in this regard cannot be easy if proper normograms of the pinna related to the race is unavailable. This study observes the dimensions of the ear in populations of Southeast Nigerians stratified under various categories of age groups. It seeks to provide pinna normograms for possible reconstructive surgery in the event of trauma or accident for the population understudy.

MATERIALS AND METHODS

A total of 148 subjects comprising of 101 males and 47 females were randomly recruited from Enugu and Abakaliki towns for the study. Part of the inclusion criteria for the study is that subjects would have no history of surgical reconstruction or any deformity of the ear. Anthropometrical measurements of tile left and right ears were taken using flexible measuring tapes and calipers.

Tile longitudinal diameter of the pinna was measured from the otic crest on tile helix to the interior margin of the lobule while tile transverse diameter was measured from tile end of the helix interiorly, near the tragus to the midpoint of the helix posteriorly on the upper margin of the anti-tragus (Fig. 1). Both the left and right ears were measured in both sexes since there ma y be differences in the dimensions of the ear relative to side.



RESULTS

The mean length of the pinna for males (n = 101) for right and left side were 5.98 ± 0.3929 and 6.02 ± 0.2892 respectively (Table 1). The mean width for right and left were 3.182 ± 2.761 and 3.220 ± 0.1580 respectively. There were no statistical difference ($p < 0.05$) in the lengths and widths between the right and left sides of the males in the population under study. Table 1 also presents the mean length and widths of the different age categories. Although slight differences exist but there were no significant difference ($p < 0.05$) in the values of the different age categories.

Table 2 showed the mean length and width of the female pinna of subjects from southeast Nigeria. The means for lengths of right and left female pinna were 5.94 ± 0.2466 and 5.96 ± 0.2671 respectively. The means for the width of right and left female pinna gave 3.02 ± 0.1984 and 2.98 ± 0.1357 respectively. In all cases there were no statistical differences between the left and right sides as well as in the age ca tegories.

Sexual dimorphism was observed not to be significant in the male: female external ear dimensions. The pinna of males showed slightly larger dimensions in length and width although the differences observed were not statistically significant ($p > 0.05$).

Table 1: Mean length and width of the male ear according to age groups.

Subjects(age groups)	length CM ± SD	width CM±SD
11- 25 Age Group n = 55	R5.98cm± 0.3804	R3.18±0.3403
	L6.08cm ± 0.2461	L3.19±0.1673
26-45 Age Group n =38	R5.98 ±0.3159	R3.16±0.1951
	L5.86 ± 1.4914	L3.19±0.1173
46 -and above n = 8	R 6.000 ± 0.9571	R3.29 ±0.2813
	L 5.8625 ± 0.8141	L3.54±0.2000
Males total n=101	R5.98±0.3m	R3.182±0.2761
	L 6.02 ± 0.2892	L3.220±0.1580

R= Right L= Left

Table 2: mean length and width of the female ear according to age groups

Subjects	Mean length	Mean width
1 11- 25 Age Group n = 38	R 5.92 ± 0.2634	R3.06±0.1803
	L 5.95 ± 0.2820	L 2.98 ± 0.1350
11 26 - 45 Age Group n = 9	R 6.16 ± 0.284	R 2.90 ± 0.212
	L 6.07± 0.2267	L 2.93 ± 0.1267
Total 47	R 5.94 ± 0.2466	R3.02 ± 0.1984
	L 5.96 ± 0.2671	L 2.98 ± 0.1357

DISCUSSION

The human ear-is divided into external middle and inner ear. The pinna and the external acoustic meatus form the external ear. The lateral surface of the pinna is irregularly concave, faces slightly forward and displays numerous eminences and depressions. These structures do not merely act as trumpet; they are the first in the series of stimulus modifiers in the auditory apparatus (Williams et al 1987).

The anatomy of the external ear is well known in many texts. Shame et al (2007) observed that Northwest Indians have similar ear lobule to the Caucasians and Japauese populations while Ejiwunmi et al (1984) earlier documented shorter ear for negro neonates when compared with the Caucasians, the average values of 5.55±0.30cm and 5.95±0.25 for males and females respectively obtained in this study is significantly lower than the 6.30cm obtained by Brucker et al (2003) for Caucasian population. The differences could be attributed to racial and ethnic differences. However the results of this study compares favourably with the dimensions obtained by Ekanem et al (2010) on adult Nigerians resident in Maiduguri.

The ear is one of the structures which highlight the beauty of the face or the human physiognomy. One can imagine how awkward the face will appear without one or both ears just like the loss of one eye or both eyes and also with the loss of the nose (Simpson 1979). This makes the study of the pinna dimensions important in establishing normative values which will be of assistance to the plastic surgeons in the event of reconstruction. Amongst warring nations loss of external ear partially or fully are rampant caused by traumatic agents including matchets and other forms of trauma including biting off the lobule or the whole external ear especially among ladies quarrelling. The lips are also sometimes chopped off in order to deface their opponents. Attack with acid solutions on the face and its parts including the external ear are also encountered. In such conditions the plastic surgeon tries to repair the damaged ear, reconstruct the bitten off parts and in severe injuries, involving loss of the parts, fashion out or raise flaps from any part of the body including the myocutaneous parts of the upper limbs and eventually reconstruct the external ear with the myocutaneous flap in other to avoid ugly physiognomy of the parts affected (Akpuaka and Odo 1992; Achebe et al 1992). Precise knowledge of ear anthropometry as reported in this study has been mentioned to aid this reconstruction.

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