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Correlation between ear length and width with height of individual – Research study

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ABSTRACT

Anthropometry refers to the study of measurement of human individual. It's an ancient tool which has been used for identification, for the purposes of understanding human physical variation. Human population shows variation in anthropometry depending on various factors like sex, race, region etc.

Identification of an individual includes age, sex, religion and other parameters where stature is an important parameter. Measurement of height of individual has been done by means of various body parts such as long bones, foot. Calculation of height is a difficult arena in case of dismembered body parts.

The doctor measures the height in all the medico legal cases e.g. Age-estimation, autopsies, general examination of road side person brought by police. Police officials have to go through the data of missing persons in order to cross reference the height provided, so as to establish identity.

In this study an attempt has been done to understand the relation of height with parameters of ear, so as to be helpful in ascertaining height in case of dismembered bodies by studying the usual natural pattern.

Keywords: Anthropometry, Height, Ear length, Ear width.

INTRODUCTION

Anthropometry refers to the study of measurement of human individual. An early tool of physical anthropology, it has been used for identification, for the purposes of understanding human physical variation.

Anthropometry involves the systematic measurement of the physical properties of the human body, primarily dimensional descriptors of body size and shape. Eating, living style and one's origin lead to changes in the distribution of body dimensions, and require regular updating of anthropometric data collections.

The fetal development of ear starts shortly after conception and by the 38th day, some of its features are recognizable. The ear moves to its definitive position on 56th day and the shape of ear can be recognized on the 70th day. The shape is

fixed from then on and never changes from birth until death. [2]

MATERIAL & METHODS

The present study was conducted at Department of Forensic Medicine & Toxicology at Government Medical College Mumbai. The study comprises of total 90 (Ninety) healthy individual in the age group of 18 to 25 years and residing in same region. Of which 59 were male and 31 were female subjects. The study was carried out from Jan.2016 to Feb.2016.

A specially designed Proforma & Consent form was devised to collect data of case. The measurement of ear dimensions was done using metal Vernier Calliper; height was measured using standard Stadiometer. Each and every case was attended personally and data was collected in the standardized Proforma after taking the informed consent of the subject.

Exclusion criteria: (1) Congenital anomaly or acquired defect to ear. OR (2) Congenital anomaly or acquired defect to lower limbs or vertebral column, were excluded.

Data analysis was performed on SPSS for Windows. Linear regression analysis was performed for estimation of stature using ear measurements as independent variables.

RESULTS AND OBSERVATIONS

As mentioned in Table 1, 2 & 3. Figure1&2.

Legends

Table 1.

EAR DIMENSION	SEX	N	MEAN
RIGHT EAR LENGTH	Male	59	6.24
	Female	31	5.56
LEFT EAR LENGTH	Male	59	6.23
	Female	31	5.53
RIGHT EAR WIDTH	Male	59	3.34
	Female	31	3.17
LEFT EAR WIDTH	Male	59	3.37
	Female	31	3.20

Table 2.

Correlation	Right Ear Length	Left Ear Length	Right Ear Width	Left Ear Width
Height	0.453	0.457	0.438	0.44

Table 3.

Regression Equations	Standard Error of Estimate
Height = 110.67 +8.835 (Right ear length)	5.6958
Height = 112.376 + 8.566 (Left ear length)	5.682
Height =48.502+35.121(Right ear width)	5.7436
Height =48.477+34.798(Left ear width)	5.7384

Figure 1. Maximum ear length

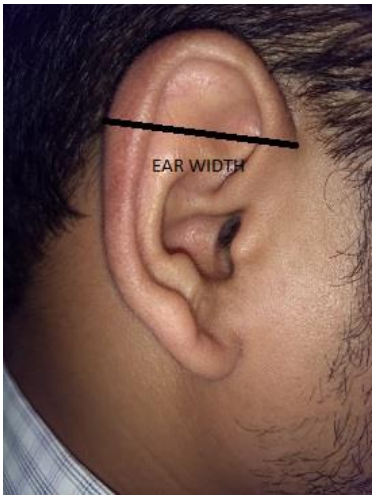

Figure 2. Maximum ear width

DISCUSSION

In late 19th century when Alphonse Bertillon utilized ear as one of the eleven anthropometric measurements for his manual system of identifying individuals, the beginning of ear as tool for human identification started. [1].

The use of ear dimensions had been significantly used by Plastic surgeons for the purpose of reconstructive surgeries and cosmetic reasons. Also the dimensions have been used to study racial variation.

The fetal development of ear starts shortly after conception and by the 38th day, some of its features are recognizable. The ear moves to its definitive position on 56th day and the shape of ear can be recognized on the 70th day. The shape is fixed from then on and never changes from birth until death. [2]

The ear consists of one single piece of fibro-cartilage with a complex structure on the anterior, concave side and a fairly smooth configuration on the posterior, convex side.

Figure 1 depicts the measurement of maximum ear length from inferior most projection of the lobule to the superior most projection of the helix.

Figure 2 depicts measurement of maximum ear width between the anterior most and posterior most point of the external ear.

Table 1 depicts the mean of ear dimensions in different sex.

Dimension of ear is larger in males as compared to that of female both in relation to length as well as breadth. The bilateral asymmetry observed as well as mean ear measurements of males and females disprove the common belief that right and left ear of an individual are perfectly identical.

In this study the correlation of height to the dimensions of ear of either side (Right and Left) was found to be significant (p- value < 0.5), as shown in Table 2.

Table3. Depicts the regression equation derived to calculate height from ear dimension. The standard error of estimate with use of REL (Right ear length) was 5.69, with use of LEL (Left ear length) was 5.68, with REW (Right ear width) was 5.74 and with LEW (Left ear width) was 5.73.

By this study it was found that the derived regression equation is significantly associated with height when it is calculated by using the Right ear length and also Left ear length (p- value < 0.5). Whereas the prediction of height by use of ear width either right or left is found to be not significant.

Ear biometrics can positively identify an individual using comparative analysis of the human ear and its morphology. It's usually seen that the lobules of some individual are very long and some are short, also in some it is not free enough. This dimensional variation of the pinna has been found among different ethnic groups [3]. The possibility of using ear characteristics for assessing familial

relationships, as the morphology of ears tends to be hereditary was proposed by Imhofer [4]. It was Johann Casper Lavater who first reported the study of human ear, while Haken Jorgensen established the system of recording the ear morphology using ear biometrics and ear moulds [7].

In a study done by Altmann the pattern of the free lobule was proposed to be a dominant trait [5]. In India one of the most wanted and cumbersome to catch criminal was encountered by the security forces in 2004. The body of the criminal was difficult to identify, due to distortion of his facial features. This challenge was solved by his ear morphology and biometrics measurements. This was the case of famous sandal wood smuggler Verrappan's body [6].

CONCLUSION

The uniqueness of any data from the human being adds an edge in identification. From this study it is found the dimension in same individual is not same for the ear, also it is different to different individual in aspect of height and sex. Thus ear dimension can be used as tool for identification. The data needed to cross match in case of identifying an unknown can be easily obtained by photographs or footages from his life.

Anthropometry can be applied to occupational injury prevention, for designing specific protective gears. Anthropometry along with ear dimension can also be used for reconstructive surgeries of ear, by plastic surgeons.

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