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ANTHROPOMETRIC MEASUREMENTS OF AURICLE IN POPULATION OF UTTAR PRADESH

Anatomy

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ABSTRACT

External ear consists of auricle or pinna and external acoustic meatus. The auricle projects to a variable and individual degree from the side of the head. According to many studies conducted on morphometry of external ear; the size, shape and the orientation of each external ear is unique as fingerprint but it can be generalized. Males have larger ears as compared to females. The present study is attempted provide anthropometric data on normal adult male and female auricles from population of Uttar Pradesh. **AIM**: To study the anthropometric measurements of auricle in population of Uttar Pradesh**. MATERIALS AND METHODS**: This study was conducted on 420 adults (210 males and 210 females) who were randomly selected from the population of Uttar Pradesh. The parameters measured were, ear length, ear breadth lobule length and lobule width of both ears. **RESULTS**: In our study, we found that both the ears are equal dimension except for lobule breadth, irrespective of the sex**. CONCLUSION:** Knowledge of normal ear dimensions is important in the diagnosis of congenital malformations and acquired deformities, and in planning of treatment. The data presented in this study would help the clinician to produce an anatomically correct ear during its reconstruction.

KEYWORDS

Anthropometry, Ear length, Ear breadth, Lobule length, Lobule breadth, Vernier calipers.

INTRODUCTION

External ear consists of auricle or pinna and external acoustic meatus. The auricle projects to a variable and individual degree from the side of the head. It collects sound waves and conducts them on the external acoustic meatus inward to the tympanum. The auricle therefore acts because the first component of a series of stimulus modifiers within the auditory apparatus.

The lateral surface of the auricle is on an irregular basis concave and faces slightly forwards. Its prominent curved rim, or helix, usually bears postero-superiorly a small auricular tubercle, a structure that is pronounced round the sixth month of intrauterine life, when the auricle closely resembles that of some adult monkeys[1].

In human, external ear is a very important aesthetic defining attribute of the face[2]. The auricle (pinna) formed from swelling that is creates from around the cleft. Pinna is formed about six mesenchymal thickening those apperason 1st and 2nd arches.

These swellings (auricular hillocks), three on either side of the external meatus, later fuse, and form the definitive auricle[3]. Males have larger ears as compared to females. In females' ears increases with age from birth to 99 years of age but in case of male's development of ears stop around 50-70 years of age[4]. The present study is attempted provide anthropometric data on normal adult male and female auricles from population of Uttar Pradesh. This study is required for better designing of ear phone, hearing aids, and also for plastic surgeons to plan reconstructive surgeries.

MATERIAL AND METHODS

The study was conducted in department of Anatomy, IIMSR, Lucknow. This study was conducted on 420 adults (210 males and 210 females) who were randomly selected from the population of Uttar Pradesh. Approval of Institutional Research Committee and Institutional Ethical committee was obtained prior to commencement of the study. Informed consent was obtained from each volunteer before taking the measurements.

INCLUSION CRITERIA –

- Interested volunteers were included in the study.
- Healthy adult individuals
- Subjects belonging to Uttar Pradesh

EXCLUSION CRITERIA -

- Subjects with ear inflammation, injury, surgery, and others ear related diseases.
- Congenital ear malformation
- Subject under 18 years of age.

All the landmark defined by De Carlo et al (1998)[5] were taken – (fig.1.)

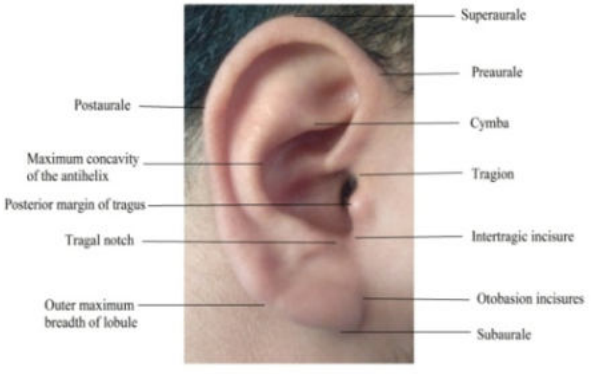

Fig.1: Photograph shows the ear anthropometric landmarks – (Preaurale, Postaurale, Superaurale, Subaurale, Otobasion inferius, Outer maximum breadth of lobule, Tragal notch).

MEASUREMENTS: -

- **The subject was made to sit in a chair or lab stool with head in Frankfurt`s plane.**
- After determining, the landmarks with skin marker measurement were taken with the help of digital caliper capable of measuring to the nearest 0.1 mm.

Following measurements were taken -

- **Ear length** – from Superaurale to Subaurale (fig.2).
- **Ear breadth** – from Preaurale to Postaurale.
- **Lobule length –**from Tragal notch to Subaurale.

Lobule breadth – from the Otobasion inferius to the Outermost maximum transverse width of the ear lobule.

Fig. 2 Measurement of Ear length

STATISTICALANALYSIS

- The data was stastistically analysed using student t-test with p-value <0.0001 taken as highly significant, p- value is 0.05 significant, and greater than p- value 0.05 is not significant.

RESULT

Table 1. Comparison of left and right auricular parameters -

s. no.	Parameters (mm)	sides	N=840	min-max (mm)	mean±SD (mm)	p-value
1.	Ear length	L	420	51.04-74.59	59.56±4.64	0.112
		R	420	50.11-74.71	58.75±4.59	
2.	Ear breadth	L	420	23.92-37.4	30.12±2.42	0.123
		R	420	23.05-37.25	29.86±2.48	
3.	Lobule length	L	420	11.21-22.74	17.25±2.32	0.354
		R	420	11.44-23.5	17.10±2.23	
4.	Lobule breadth	L	420	11.54-26.67	20.74±3.27	<0.0001
		R	420	11.25-26.65	20.08±3.19	

Table 2. Comparison of left and right auricle of female -

s. no.	Parameters (mm)	Sides	N-440	min max (mm)	mean±SD (mm)	p-value
1.	Ear length	L	210	51.04-65.26	56.35±2.93	0.006
		R	210	50.11-65.72	55.55±2.97	
2.	Ear breadth	L	210	25.16-35.17	29.13±2.07	0.443
		R	210	24.42-34.81	28.96±2.21	
3.	Lobule length	L	210	12.11-22.74	16.74±2.29	0.684
		R	210	12.12-23.5	16.65±2.17	
4.	Lobule breadth	L	210	11.54-26.13	19.76±3.71	0.053
		R	210	11.25-24.58	19.08±3.51	

Table 3. Comparison of left and right auricle of male-

s. no.	Parameters (mm)	Sides	N=420	min-max (mm)	mean±SD (mm)	p-value
1.	Ear length	L	210	52.04-74.59	62.77±3.69	0.006
		R	210	52.3-74.1	61.94±3.58	
2.	Ear breadth	L	210	23.92-37.4	31.01±2.35	0.413
		R	210	23.05-37.25	30.76±2.42	
3.	Lobule length	L	210	11.21-22.5	17.76±2.25	0.684
		R	210	11.44-23.00	17.56±2.20	
4.	Lobule breadth	L	210	12.67-26.67	21.71±2.39	0.053
		R	210	12.68-26.65	21.08±2.46	

According to Table 1, The mean ear length on the left side was 59.56±4.64 with maximum length of 74.59 mm and minimum length being 51.04 mm whereas the minimum length on the right side was 50.11 mm and maximum length was 74.71 mm with mean value of 58.75±4.59 mm. There was no significant difference between the left and right sides.

The mean ear breadth on the left side was 30.12±2.42 mm with maximum length of 23.92 mm and minimum length being 37.4 mm whereas the minimum length on the right side was 23.05 mm and maximum length was 37.25 mm with mean value of 29.86±2.48 mm. There was no significant difference between the two sides.

The mean lobule length on the left side was 17.25±2.32 with maximum length of 22.74 mm and minimum length being 11.21 mm whereas the minimum length on the right side was 11.44 mm and maximum length was 23.5 mm with mean value of 17.10±2.23 mm. There was no significant difference between the left and right sides.

The mean lobule breadth on the left side was 20.74±3.27 mm with maximum length of 26.67 mm and minimum length being 11.54 mm whereas the minimum length on the right side was 11.25 mm and maximum length was 26.65 mm with mean value of 20.08±3.19 mm. There was a significant difference between the left and right sides.

According to Table 2, The mean ear length on the left side was 56.35±2.93 with maximum length of 65.26 mm and minimum length being 51.04 mm whereas the minimum length on the right side was 50.11 mm and maximum length was 65.72 mm with mean value of 55.55±2.97 mm. There was no significant difference between the two sides.

The mean ear breadth on the left side was 29.13±2.07 mm with maximum length of 35.17 mm and minimum length being 25.16 mm whereas the minimum length on the right side was 24.42 mm and maximum length was 34.81 mm with mean value of 28.96±2.21 mm. There was no significant difference between the left and right sides.

The mean lobule length on the left side was 16.74±2.29 with maximum length of 22.74 mm and minimum length being 12.11 mm whereas the minimum length on the right side was 12.12 mm and maximum length was 23.5 mm with mean value of 16.65±2.17 mm. There was no significant difference between the left and right sides.

The mean lobule breadth on the left side was 19.76±3.71 mm with maximum length of 26.13 mm and minimum length being 11.54 mm whereas the minimum length on the right side was 11.25 mm and maximum length was 24.58 mm with mean value of 19.08±3.51 mm. There was no significant difference between the two sides.

According to Table 3, The mean ear length on the left side was 62.77±3.69 with maximum length of 74.59 mm and minimum length being 52.04 mm whereas the minimum length on the right side was 52.3 mm and maximum length was 74.1 mm with mean value of 61.94±3.58 mm. There was no significant difference between the left and right sides.

The mean ear breadth on the left side was 31.01±2.35 mm with maximum length of 37.4 mm and minimum length being 23.92 mm whereas the minimum length on the right side was 23.05 mm and maximum length was 37.25 mm with mean value of 30.76±2.42 mm. There was no significant difference between the left and right sides.

The mean lobule length on the left side was 17.76±2.25 with maximum length of 22.5 mm and minimum length being 11.21 mm whereas the minimum length on the right side was 11.44 mm and maximum length was 23.00 mm with mean value of 17.56±2.20 mm. There was no significant difference between the two sides.

The mean lobule breadth on the left side was 21.71±2.39 mm with maximum length of 26.67 mm and minimum length being 12.67 mm whereas the minimum length on the right side was 12.68 mm and maximum length was 26.65 mm with mean value of 21.08±2.46 mm. There was significant difference between the left and right sides.

DISCUSSION

L. Arora et. al. (2016) a study consisting of 50 male and female found the Ear length 61.61 mm for the left ear and 61.57 mm for the right ear in male, and to be 56.48 mm for the left ear and 56.74 mm for the right ear in female. Ear breadth was found 31.41 mm in left and 31.04 mm for the right ear in male, and to be 29.40 mm for the left ear and 29.40 mm in female for the right ear[6].

In the study of Vijay Laxmi et. al. (2017) The length of the left ear was found to be 6.18 cm in male and 5.73 cm in female, and right ear was found 6.2 cm in male and 5.73 cm in female. Ear breadth was found 3.40 cm in male and 3.2 cm for the left ear, and to be 3.42 cm in male and 3.2 cm in female for the right ear of 100 (male and female)[7].

Chakravarthy M.S. et. al. (2015) on their morphometric study of the external ear, Ear length of the left ear was found 60.29 mm in male and 54.54 mm in female. Ear length of the right ear was found 60.27 mm in male and 54.52 mm in female. Ear breadth was found 32.25 mm in male and 28.48 mm in female for left ear, and 32.04 mm in male and 28.33 mm in female for the right ear[8].

Ertugrul Talisumak et. al. (2015) Showed ear length 65.49 mm in male and 61.33 mm in female of left ear and 64.46 mm in male and 60.29 mm in female for the right ear. Ear breadth was found 33.96 mm in male and 32.28 mm in female for the left ear, and 35.32 mm in male and 32.96 mm in female for the right ear[9].

Ruku Pandit et. al. (2017) reported the Ear length was found 6.18 cm in male and 5.72 cm in female for left ear, and 6.20 cm in male and 5.74 cm in female for right ear. Ear breadth was found 3.25 cm in male and 2.97 cm in female, and 3.44 cm in male and 3.06 cm in female for right ear[10].

In the study of D. Deopa et. al. (2013) on their anthropometric measurements of external ear, obtained a mean Ear length of 6.03 cm in male and 5.77 cm in female for left ear, and 6.04 cm in male and 5.74 cm in female for right ear. Ear breadth was found 3.06 cm in male and 2.87 cm in female, and 3.02 cm in male and 2.88 cm in female for right ear[11].

In the present study, ear length is 62.77 mm in male and 56.35 mm in female for the left ear, and 61.94 mm in male and 55.55 mm in female for the right ear. Ear breadth is 31.01 mm in male and 29.13 mm in female and 30.76 mm in male and 28.96 mm in female for right ear.

L. Arora et. al. (2016) a study consisting of 50 males and female found the Lobule length to be 17.82 mm for the left ear and 17.03 mm for the right ear in male, and to be 18.3 mm for the left ear and 17.00 mm for the right ear in female. Lobule breadth was found 21.3 mm in left and 16.06 mm for the right ear in male, and to be 18.77 mm for the left ear and 16.03 mm for right ear in female[6].

In the study of Vijay Laxmi et. al. (2017) observed length of the left lobule 1.22 cm in male and 1.20 cm in female and right ear was observed 1.21 cm in male and 1.23 cm in female. Lobule breadth was observed 1.69 cm in male and 1.69 cm in female for the left ear, and to be 1.71 cm in male and 1.64 cm in female for the right ear[7].

A study done by Ertugrul Talisumak et. al. (2015) on Turkey population showed that the lobule length was 18.37 mm in male and 17.31 mm in female of left ear and 18.40 mm in male and 17.33 mm in female for the right ear. Lobule breadth was found 18.37 mm in male and 17.31 mm in female for the left ear, and 18.40 mm in male and 17.33 mm in female for the right ear[9].

Abdelaleen SA et. al. (2016) lobule length was found 19.68 mm in male and 19.58 mm in female for the left ear, and 19.09 mm in male and 19.09 mm in female for the right ear. Lobule breadth was found 20.77 mm in male and 20.45 mm in female for left ear, and 19.03 mm in male and 18.8 mm in female for the right ear[12].

D.E.O Eboh (2018) showed lobule length 14.97 mm in male and 15.77 mm in female for the left ear, while 15.00 mm in male and 15.77 mm in female for the right ear. Lobule breadth was found 15.97 mm in male and 16.17 mm in female for left ear, and 16.08 mm in male and 16.28 mm in female for the right ear[13].

Divya Kalra et. al. (2015) lobule length was found 1.69 cm in male and 1.68 cm in female for the left ear, and 1.67 cm in male and 1.66 cm in female for the right ear. Lobule breadth was found 1.96 cm in male and 1.95 cm in female for left ear, and 1.96 cm in male and 1.92 cm in female for the right ear[14].

In the study of D. Deopa et. al. (2013) studied on 177 young medical students of population of Uttarakhand of both sexes; lobule length was found 1.69 cm in male and 1.68 cm in female for left ear, and 1.67 cm in male and 1.66 cm in female for right ear. Lobule breadth was found 1.96 cm in male and 1.95 cm in female, and 1.96 cm in male and 1.92 cm in female for right ear[11].

In the present study, lobule length is found 17.76 mm in male and 16.74 mm in female for the left ear, and 17.56 mm in male and 16.65 mm in female for the right ear. Lobule breadth is found 21.71 mm in male and 19.76 mm in female for the left ear, 21.08 mm in male and 19.08 mm in female for the right ear.

CONCLUSION

The present study is attempted provide anthropometric data on normal adult male and female auricles from population of Uttar Pradesh. This study is required for better designing of hearing aids, mufflers, and for plastic surgeons to plan reconstructive surgeries. Both the ears are equal dimension except for lobule breadth, irrespective of the sex. Length of the ear is almost thrice the minimum breadth

REFERENCES

1. Standring Susan., et.al. External ear: Gray's Anatomy the Anatomical Basis of Clinical Practice. 41st ed., London: Churchchill Livingstone Elsevier 2016; 627-28.
2. Brucker M.J., Patel J. Sullivan PK. A morphometric study of the external ear: age- and sex-related differences. Plast.Reconstr. Surg. 2003; 112(2):647-52.
3. T.W. Sadler. External ear. Langman`s Medical Embryology. 12th ed., Lippincott Williams and Wilkins 2012; 326.
4. Shireen S., Karadkhelkar V.P. Anthropometric measurements of human external ear. Journal of Evolution of Medical and Dental Sci. 2015; 4(59):10333-38.
5. De Carlo D., Metaxas D., Stone M. An Anthropometric face model using variation techniques. Proceedings of the 25th Annual Conference on Computer Graphics and Interactive Techniques New York: ACM. 1998; 67-74.
6. Arora L., Singh V. Morphometric study of human auricle in the age group of 18-24 years in North West part of India. Global J. of Med. And Pub. Health.2016; 5(6):1-6.
7. Laxmi V., Palak.,Nidhi S., Kullar J.S., Sharma R.K. External ear: morphological and morphometric study in north indian males and females. Int. J. Anat. Res., 2017; 5(2.2): 3866- 69.
8. Chakravarthymarxsadacharan. Ear morphometry on indianamericans and its clinical importance. Int. J. of Applid Res., 2016; 2(1): 348-53.
9. Tatlisumak, E. Yavuz., M.S., kutlu N., Asirdizer M., Yoleri L.,&Aslan, A. Asymmetry, handedness and auricle morphometry. Int. J. Morphol., 2015; 33(4):1542-48.
10. Pandit R., Sharma N.,Shrestha R., Shestha S., Yadav P.K. Morphometric study of external ear of medical students in college of medical sciences and teaching hospital, bharatpur, chitwan, Nepal.Int. J. Anat. Res., 2017; 5(3.2):4269-74.
11. Deopa D., Thakkar H.K., Prakash C., Niranjan R., Barua M.P. Anthropometric measurements of external ear of medical students in uttarakhandregion. Journ. Of Anat. Society of India. 2013; 62:79-83
12. S.A.Abdelaleem.,F.A.FouadAbdelbaky. Estimation of stature in Upper Egypt population from external ear morphometry. Int. J. forensic sci.pathol., 2016; 4(10):276-284.
13. Eboh D. Morphological changes of the human pinna in relation to age and gender of Urhobo people in Southern Nigeria. Journal of Experimental and Clinical Anat., 2013; 12(2):68.
14. Kalra Divya., Kalra Anshu., Goel Shirish. Anthrometric measurements of external ear. International journal of enhanced research in medicines & dental care. 2015; 2 (3): 10-16.