

Anthropometric Assessment of Canthal Distances and Canthal Index of South Indian Region: A Cross-Sectional Study

Radha K.¹, Srinivasan K.R.²

¹Professor, Dept. of Anatomy, Vinayaka Missions Medical College, Karaikal, Puducherry, India-609 609,

²Professor Emeritus, Aarupadai Veedu Medical College, Pondicherry, India-607402

Abstract

Background: Orbitofacial anthropometric measurements can be used in identification of gender and ethnicity in forensic anthropology. It also plays a crucial role used in plastic surgery and for identifying genetic syndromes. Canthus is the term employed to explain the either corner of the eyes. Inner canthus is also called as medial or nasal canthus. Outer canthus, is otherwise called as lateral or temporal canthus. Normal canthal values can function as a guide for the diagnosis of pathology and interventions for craniofacial abnormalities. Thus, it is necessary to have a knowledge about the local data of those parameters since this standard reflects the doubtless different pattern of craniofacial growth resulting from racial, ethnic, sexual and dietary differences. Hence this study is undertaken to find out the normative inner canthal and outercanthal distance measurement in population of South Indian region.

Aims and Objectives: The present study was done to find out the normal inner and outercanthal distance and also canthal index of population of South Indian ethnic origin and also to analyse the sexual dimorphism in them.

Materials and Method: This descriptive cross-sectional study was conducted on 200 volunteers of age group 18-25 years of both sexes belonging to South Indian region. Innercanthal distance(ICD) and Outer canthal distance(OCD) were measured using digital vernier caliper.Canthal index was calculated. All the data were analysed using SPSS 16.0 version software and correlated with gender.

Results: Mean innercanthal distance was found to be 2.64 ± 0.51 cm in males and 2.51 ± 0.46 cm in females respectively in the present study. There is significant sexual dimorphism in ICD . The study also showed outercanthal distance to be 10.35 ± 0.81 cm in males and 10.19 ± 1.02 cm in females respectively. Canthal index was 25.71 ± 4.91 in males and 24.83 ± 7.83 in females. There is no significant sexual dimorphism in OCD and Canthal index.

Conclusion: It was observed that all the values were significantly higher in males than females of south Indian ethnic origin. And there is a significant sexual dimorphism in inner intercanthal distance.

Keywords: Innercanthal distance, outercanthal distance, orbitofacial anthropometry.

Introduction

The face is the most appealing and attractive structure in the human body. Orbit, the anatomical entity in the face plays a vital role in determining the facial attractiveness. It also influences the visual judgement of healthy person as well as those with facial deformities^[1]. Anthropometry which is the branch of anthropology measures human physical dimensions^[2]. Measurements of soft tissue using a anthropometric instrument is considered as a direct quantitative method to assess

physical dimension and the method are non-invasive and easy to perform^[3].

Orbitofacial anthropometry has a key role in assessing dysmorphic syndromes, hypertelorism, facial trauma especially naso-orbitoethmoid injury and alsoin diagnosing neural crest anomalies. It also aids in planning reconstructive surgical procedures of face and getting fruitful outcome.

Canthus is the term used to describe the either

corner of eyes. Inner canthus (medial or nasal canthus) is formed by the medial part of superior and inferior eyelids whereas outer canthus (lateral or temporal canthus) is formed by the lateral part of superior and inferior eyelids^[2]. Inner intercanthal distance (ICD) is the distance between medial canthi of eyes and Outer canthal distance (OCD) is the distance between lateral canthi of eyes^[4].

Canthal measurements become stable once it has reached the adult level most probably in the mid to late twenties^[5]. Canthal measurements are influenced by age,sex,race and ethnicity.

Normal values of canthal distance helps and serves as a guide to diagnose the pathologies and for early surgical intervention. Knowledge of subtle morphological changes in Dysmorphic syndromes which were diagnosed based on molecular and cytogenetic techniques will help in directing towards the useful diagnostic test^[6].

Knowledge of variation in the morphological and anatomical relationships of periorbital structures among different ethnic groups helps the surgeons to retain the ethnical features and to derive an ideal outcome in the reconstructive and cosmetic surgeries. Hence this study is under taken to find out the normative inner intercanthal and outer-intercanthal distance measurement of people of south Indian ethnic origin.

Materials and Method

Present study was done with 200 volunteers of south Indian ethnic origin (Males and Females) of age group 19-25 years. Prior to the initiation of study process, approval was obtained from Institutional Ethical Committee, Vinayaka Missions Medical College, Karaikal. Informed,written consent was got from each participant after explaining the study clearly. Those

having orbitofacial deformity, facial trauma,any congenital anomalies involving orbitofacial region were excluded from the study.

All the measurements were taken using digital vernier caliper with the subjects sitting straight with eyes closed and in a relaxed state. Intercanthal distance (ICD) was measured from medial canthus of one eye to medial canthus of the other eye. Outercanthal distance (OCD) was taken from lateral canthus of one eye to the lateral canthus of other eye. All measurements were taken in centimetre. Each measurement was taken twice to avoid error and all the measurements were tabulated in a log book.

Canthal index was calculated using the formula

$$\text{Intercanthal distance/Outercanthal distance} \times 100$$

All measurements were analysed using SPSS software 16.0 version. Descriptive variables were depicted as mean and standard deviation. The mean values of the measurements were compared between either sexes using the independent t test.

Results

The study was done on 90 males and 110 females of age group 18-25 years showed the mean value of innercanthal distance as 2.55±0.51cm, the mean value of outercanthal distance as 10.26±0.92 cm and mean canthal index was 25.23±6.71.(Table 1).

Table I: Descriptive statistics for ICD, OCD, CANTHAL Index

Variable	N	Range	Mean±SD
ICD	200	0.90-4.31	2.55±0.51
OCD	200	3.38-12.65	10.26±0.92
Canthal Index	200	8.31-81.07	25.23±6.71

Table II: Gender with variables Mean±sd comparison using independent sample t test

Variable	Male		Female		t	p value
	N(%)	Mean±SD	N(%)	Mean±SD		
ICD	90(45%)	2.64±0.51	110(55%)	2.51±0.46	2.689	0.008
OCD	90(45%)	10.35±0.81	110(55%)	10.19±1.02	1.195	0.234
CANTHAL Index	90(45%)	25.71±4.91	110(55%)	24.83±7.83	0.935	0.351

Table II shows the mean value of ICD, OCD and CANTHAL INDEX among males and females. All

values are higher in males than females. And there is a significant sexual dimorphism in ICD.

Table III: Mean values of ICD,OCD And Canthal index of various regions of South India

State	N	ICD	OCD	Canthal Index
Tamilnadu	132	2.46±0.48	10.21±1.02	24.7±7.65
Kerala	42	2.68±0.39	10.24±0.61	26.2± 3.84
Andhrapradesh	5	2.86±0.50	11.4±0.22	25.15±4.69
Karnataka	21	2.72±0.47	10.35±0.69	26.33±4.44

The ANOVA test had shown that the ICD and OCD significantly varied between regions with (p value -0.006 for ICD and 0.039 for OCD) (Table IV).

Table IV: Showing values for ICD,OCD AND Canthal index between states

Variable	F	P value
ICD	4.336	0.006
OCD	2.845	0.039
Canthal Index	0.760	0.518

Discussion

The dimensions of face and proportions of its components vary in different ethnic groups^[7]. Ethnicity of South Indian population belongs to Dravidian ethnic group. Dravidians are one of the non-Aryan races of Southeast Asia and are distributed mainly in South India and Ceylon^[8]. Inter-canthal distance is influenced by the shape of face, race and gender^[9]. Inner intercanthal distance serves as a guide to estimate width of maxillary central incisors, which is a determinant of facial aesthetics^[10].

LeTT et al reported that facial profile can vary in different ethnic groups and that the dominant characteristics of the Asian faces were a wider ICD in relation to shorter palpebral fissures compared to Caucasians^[11]. Normal values of inner and outer canthal distances, canthal index serves as useful parameters in the evaluation and treatment of congenital or post-traumatic deformities of the cephalic and facial regions such as telecanthus, ocular hypotelorism and craniosynostosis.

Laestadius reported that in 78% of adults, the ICD is attained by the age of 1 year, after which the growth in this area is slow in contrast to outer orbital dimension^[12]. According to Epker and Fish, these values are established by 6–8 years of age and do not change significantly after this time. This stable landmark can be identified, located and measured accurately^[13].

Vasanthakumar et al did their study in Malaysian South Indian ethnic adults and found that the outer canthal distance was 97.15 mm in males and 91.78 mm in females which was lower than present study. And they also noted intercanthal distance and canthal index to be 34.1 mm and 35.22 in males; and 32.77 mm and 35.86 in females respectively. These values are very high compared to the values of present study. They have observed sexual dimorphism in all parameters whereas in the present study there is significant sexual dimorphism in intercanthal distance only^[14].

The values of inner intercanthal distance found in present study was lower than the normative value found by Farkas et al for Indian population. At the same time, the outer canthal distance was higher than that given by Farkas et al^[15]. Our study showed the lower inner canthal distance and higher outer canthal distance than that found by Singh J.R. et al^[16], Agarwal J^[17] for Indian population but our study coincides with the findings of Gupta et al^[18]. The present study showed mean inner intercanthal distance as 2.55±0.51 cm which is low compared to that reported by Harinee^[19] in her study on Kanyakumari population (Part of Tamilnadu, South India) which is 3.275±0.254 cm whereas mean outer canthal distance coincides with her study value.

CONCLUSION

The present study which is done on 200 participants of age 18-25 years showed low value for inner intercanthal distance and high outer canthal distance for South Indian population than Indian population as such. This data values will serve as important aiding tool in reconstructive cosmetic surgeries, for diagnosing dysmorphic syndrome by genetic counsellors and for identifying dead or live person by forensic experts.

Conflict of Interest: Nil

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Ethical Clearance: Ethical clearance from the institutional ethical committee obtained for the study

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