Original Research Article

Morphometry of The Orbital Region in Dry Skull and CT images

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Abstract

Introduction: The bony orbit is significant not only for anatomists, but also for ophthalmologists, oral and maxillofacial surgeons, and forensic experts who study the human face. The purpose of this study was to determine how the orbital index varies with race, regions, within the same race, and different times in evolution. The present study's objectives are to offer the normal reference orbital parameters for the NorthIndian population, as well as to determine the normal reference orbital parameters. **Materials and Method:** Materials and Method: The experiment was carried out on thirty-eight dried skulls of different ages, genders, and races. Manual vernier calipers were used to measure the length and breadth of the orbital plane. The orbital index was determined by using the formula Length /Breadth x 100 to the length/breadth ratio. To avoid interobserver and intraobserver error, the parameters were measured independently by two individuals using specified protocols. **Result:** To analyze all of the data collected, descriptive statistics such as mean, standard deviation, and range were computed and used to summarize the findings statistically. There were no significant differences in maximum orbital length and breadth between the right and left sides, however, there were differences in maximum orbital length on the right side (33.7 1.8 mm) and 33. 8 2.1 mm on the left side (37. 22 09 mm). On the right and left sides, the maximum orbital length and breadth were determined to be 33.7 1.8 mm and 33. 8 2.1 mm, respectively, while the maximum orbital breadth was found to be 37. 4 2. 1 mm and 37. 22. 09 mm, respectively. **Conclusions:** The orbital index was determined based on the length and breadth of the orbital plane. which will be useful in plastic surgery, Ophthalmology, maxillary surgery, and reconstructive cosmetic surgery of the face all benefit from the use of orbital morphometry as a baseline measurement. A thorough understanding of anatomy and its variations will aid surgeons in avoiding surgical complications throughout the procedure as well as forensic research.

Keywords: orbital morphometry, orbital index, Orbital dimensions, orbital index, dry skull.

Introduction

Anthropometry (from Greek, literally meaning "measuring of humans") refers to the measurement of the human person to determinea physical variance in the human population. Having access to a craniofacial database based on correct anthropological measurements is essential for surgeons who wish to properly treat congenital or post-traumatic facial disfigurements[1,2].The research shows statistically significant differences in ocular and orbital morphometry between persons of different ages, genders, and ethnic backgrounds. According to Patnaik et al. (2001),the width of each orbital cavity is usually greater than the height of the cavity; the relationship between the two is given by the orbital index, which changes in different races of the particle(Orbital Index = orbital height divided by orbital breadth multiplied by 100[3]. Using the orbital index as a benchmark, three types of orbits have been identified and discussed.In the case of a Megaseme (large), the Orbital index is 89 or higher.This kind is commonly found in yellow races. Mesoseme (Intermediate) - The orbital index spans from 89 to 83, indicating that the student is in the middle of the spectrum. This type can be found in the white races, as can be expected.Microseme (Small) is defined as having an orbital index of 83 or less. This kind is found in black races where the orbital opening is rectangular, as is the case with this type[4].

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There has been a description of the orbit[4,5,6].

1. **Large:** The orbital index is 89 for Megaseme, and it is the first element in the sequenceover. This kind is commonly found in yellow races (Cassidy, 1913)
2. **Second**, the orbital index range of the mesoseme (intermediate). between the ages of 89 and 83 This type can be observed in the white colour. a variety of races (McGraw Hill, 2003).
3. **Orbital** index of 83 or below is required for Microsemi (Small). This

There are some traits of the dark races in which they are found.
The orbital opening is rectangular (Cassidy, 1913).
The study was carried out to collect anthropometrical data from the Indian population and compare it with data from earlier studies carried out in the same and different races. The data was analysed by calculating the mean, standard deviation, and range of values[5].

Materials and method

During the period of August 2020 to July 2021, thirty-eight dry skulls, regardless of age, gender, or race, with non-pathological bones were collected from the Anatomy Department of the Institute of Medicine, Coimbatore Medical College, Coimbatore. respectively. Measurements of both the right and left orbits were taken with the use of a Vernier Caliper, which was calibrated in millimetres and operated manually.

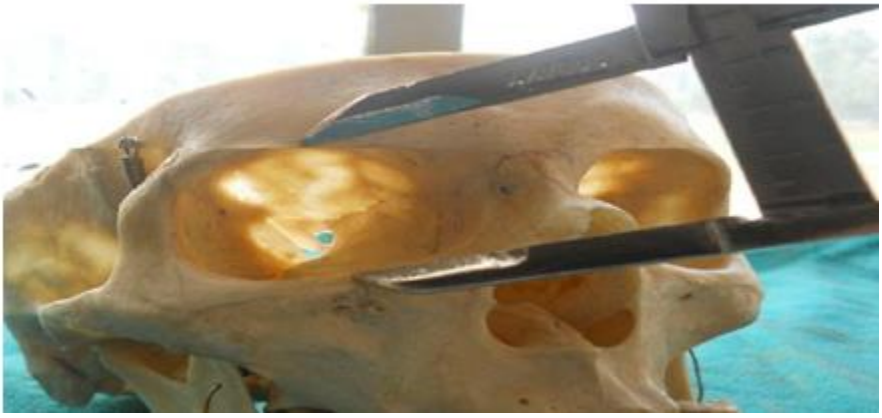

Fig. 1: A diagram of the human body The orbital length is: As defined by the maximum distance between the upper and lower borders of the orbital cavity, this was determined.

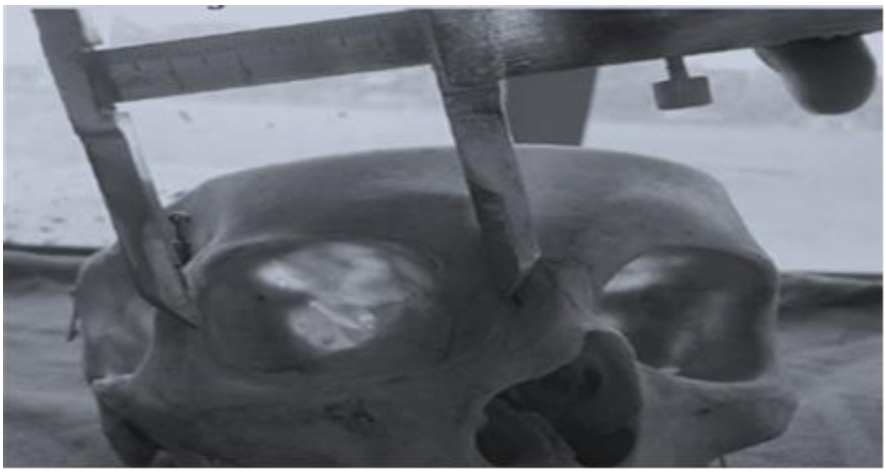

Fig. 2 Orbital width is the distance between the midpoints of the medial edge of the orbit and the midpoint on the lateral margin of the orbit (from the centre of the orbit to the centre of the orbit).

The orbital index is determined as the product of the orbital height divided by the orbital breadth multiplied by 100. Statistics were conducted using theGraphPad prism 9 of which was used. Calculations of the mean and standard deviations were made based on the measurements[3- 5].

Result

Themeanorbitallengthwasfoundtobe33.7±1.8 mmand 33. 8± 2.1 mm, maximum whereas the mean orbital breadthwas37.4 ±2.1 mm and37.2±2.09 mmontherightand left sides respectively (Table 1). By using orbitallength and breadth, the orbital index was calculated.

Table 1: Comparison of Orbital length, Orbital breadth, and Orbital Index between right and left side orbits

Orbital Dimension	Side	Mean	Standard Deviation	Maximum	Minimum
Orbital Length	**Right**	33.6	1.8	35.1	32.91
	Left	33.8	2.1	33.8	32.71
Orbital Breadth	**Right**	37.4	2.1	38.2	36.82
	Left	37.2	2.09	36.8	37.31
Orbital Index	**Right**	84.49	4.73	85.2	84.91
	Left	85.48	4.79	86.9	84.88

Discussion

The orbit's morphometric properties are significant in ophthalmology, oral maxillofacial surgery, and neurosurgery, among other specialities. It is necessary to compare the current study's findings to those of earlier investigations. The results of our investigation showed that there was no statistically significant difference between the right and left sides of the orbital cavity. Previous investigations have demonstrated that there is ethnic variance. When the widths of the orbits exceed the heights of the orbits, the orbits will have smaller orbital indices, but the orbits with greater orbital indices will have narrower faces. Its value changes according to race, the locality within the same race, and the period in evolution.

According to **Tandan *et al.*, (2020),** the right side orbit is 32.11mm tall with a 2.16mm standard deviation. The left orbit's mean height was 31.45mm, with a standard variation of 3.24mm. The right orbit's mean width was 38.65mm, with a standard variation of 3.64mm[7]. The left orbit's mean width was 37.34mm, with a standard variation of 3.34mm.present study result obtained mean orbital length was found to be33.7± 1.8 mmand 33. 8 ± 2.1 mm, maximum whereas the mean orbital breadthwas37. 4 ±2.1 mm and37.2±2.09 mmontherightand left sides The Orbital Index for the right side was 83.07 while the left was

84.22.**Kesavan*et al.*,(2020)**Mean cephalic index: 75.72 4.63 in the dry skull, 75.21 3.64 in CT scan images, 73.37 3.02 in MRI scan images Mean Orbital Index: 82.74 x 5.54 in the dry skull, 87.56 x 3.74 in CT scan images, 87.31 x 3.12 in MRI scan images Mean Auriculo Vertical Index: 76.19 3.81 in the dry skull, 72.77 4.81 in CT scan images[9]. Patraet In this study, the OI of guys aged 40-49 years was 83.39 2.30. However, in girls aged 10-19, the OI peaked at 81.67 0.40. Unlike our study, the OI peaked in the 40-49 age group in Nigerians[10]. The OI peaked at 81.91 x 5.61 for the 40-49 age group. The OI peaked among Malawians aged 48-57 years old, both sexes.The OI peaked sooner in the Nigerian (Igbo) population (30-39 years). This earlier peak among Igbos may indicate early metamorphic alterations in the orbital bones. But this hypothesis needs more research. ***Açıkgözet al.,(***2020) SOD, IOD, OH and OB mean values were 48.13 mm (right), 50.49 mm (left) and 34.67 2.24 mm (right), respectively. The mean ID and BB measures were 21.85 mm and 95.93 mm, respectively. Our investigation indicated that SOD and IOD readings were lower in Kenyans but greater in Koreans. When comparing OH measures, we discovered that Asians had higher mean levels than Africans (Nigerians) (Korean, Indian). **Pandey *et al.*, (2020)**found that the meanorbitallengthwasfoundtobe34.44±2.61mmand 33. 79 ±3. 11mm whereas the mean orbital breadthwas38.08±2.34mmand37.00±2.61mmontherightand left sides respectively similar result observed in the present study The maximum orbital length was found to be 33.7 ± 1.8 mm and 33. 8± 2.1 mm, respectively, while the maximum orbital breadth was 37. 4± 2. 1 mm and 37. 22±09 mm on the right and left sides, respectively. The maximum orbital length was found to be 33.7 1.8 mm and 33. 8 2.1 mm, respectively, while the maximum orbital breadth was 37. 4 2. 1 mm and 37. 22. 09 mm on the right and left sides.These measures are significant for both the evaluation and diagnosis of craniofacial syndromes and post-traumatic deformities. Knowing the typical values for a given location or population can be utilised to address abnormalities to achieve the optimum cosmetic and functional outcome. The use of the orbital index in the interpretation of fossil records, skull classification in forensic medicine, and the explanation of trends in evolutionary and ethnic distinctions all contribute to the significance of the orbital index[12].

Conclusion

This study analysed the length of the orbital roof and floor between genders and sides of the skulls. Midfacial trauma often causes orbital fractures. The orbital floor is typically involved, either as a 'pure' blow-out fracture or as an impure fracture associated with other zygomatic fractures. The infraorbital groove and canal degrade the already thin (0.5mm) floor [2]. Having an understanding of orbital characteristics can aid restore normal orbit anatomy during maxillofacial and reconstructive procedures. We intended to measure additional orbital characteristics as well. This study gives helpful baseline and anthropometric data for ophthalmology, oral and maxillofacial surgery, and even neurosurgery in this region of the world. Many essential anatomic landmarks that were not assessed and evaluated in our current study should be measured and evaluated in future research.

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