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Morphometric and Volumetric Study of the Bony Orbit in Dry Adult Skull and its Utility in Medical Practice

Estudio Morfométrico y Volumétrico de la Órbita Ósea en Cráneos Adultos Secos y su Utilidad en la Práctica Médica

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SUMMARY: Morphometric and volumetric study of the bony orbit are critical for proper surgical interventions such as face reconstruction for proper restore of lost functional capacity or to improve cosmetic appearance. Therefore, accurate knowledge of orbital anatomy decrease incidence of surgical complications. The present study aimed to measure various parameters of the bony orbit in adult skulls and to assess side and sex differences. In the present study, 42 human adult dry skulls of unknown sex were examined; sex of dry intact skulls was determined using gross anatomical landmarks. Digital Vernier caliper was used to measure the following parameters: orbital height, orbital width, interorbital and biorbital distance. Derived values: orbital index and orbital opening area were calculated by specific equations. Three-dimensional models were used to determine bony orbital volume. Flexible wire and ruler were used to measure Orbital Rim Perimeter. Various parameters were analyzed to assess side and sex differences. In the present study, the total mean value of orbital height in male and female subjects was 35.59 mm and 34.83 mm respectively with non-significant difference. The total mean value of orbital breadth in male and female subjects was 42.16 mm and 41 mm respectively with significant difference. The total mean value of OI in female subjects was (84.99) greater than that of male subjects (84.5) with non-significant difference. The total mean values of the orbital rim perimeter for male and female subjects were 12.26 cm and 12.06 cm respectively with non-significant difference. The total mean values of the orbital opening area for male and female subjects were 11.79 cm^2 and 11.26 cm^2 respectively with non-significant difference. The total mean values of the bony orbital volume for male and female subjects were 28.2 ml and 25.5 ml respectively with significant difference. Current estimations of orbital morphometric parameters can be of value in maxillofacial procedures and in the designation of eye protective equipment. Moreover, there is a well-established difference in these parameters between males and females.

KEY WORDS: Morphometry; Orbital parameters; Orbit index; Orbital volume; Surgical anatomy.

INTRODUCTION

The orbits are paired pyramidal socket in the skull separated by the nasal cavity and paranasal sinuses. It has apex, base and four walls; roof, medial wall, floor, and lateral wall. Its apex is located posterior and the base located anterior andis called orbital opening (Gospe & Bhatti, 2018).

The boundaries of the orbit are formed by four facial bones and three cranial bones; frontal, lacrimal, maxillary, zygomatic, palatine, sphenoid and ethmoid. The bones of the orbit ossify by both endochondral and intramembranous process. It is perforated by different apertures and canal through which neurovascular bundle exits the skull from the brain to both eye and face and vice versa (Ansari & Nadeem, 2016).

The contents of orbit are eyeball and extraocular muscles, neurovascular bundle, lacrimal apparatus, and adipose tissue (Datta *et al*., 2009). The bones of the orbit protect the globe and surrounding structures, give attachment for the extraocular muscles and allow passage of neurovascular bundle through its apertures (Gospe & Bhatti, 2018).

Because of unique shape, structure and contents, any surgical intervention involving the orbital walls are to be performed with great caution to avoid any complications ranging from uncontrolled hemorrhage, oculocardiac reflex, orbital apex syndrome, and even blindness (Cotton *et al.* 2007).

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Blunt force trauma to the eye may result in partial herniation of the orbital contents through one of its walls. This usually occurs via the medial wall and floor as they are thin and weak. This fracture leads to herniation of orbital contents through the ethmoid and maxillary sinuses respectively (Runci *et al*., 2017).

Therefore proper understanding of the human orbital anatomical structures, anatomical relation with both intra- and extracranial structures is essential for proper dealing with several operations concerning orbit such as ophthalmological, maxillary surgeries and reconstructive cosmetic surgeries of face (Kumar & Gnanagurudasan, 2015).

Morphometric study of bony orbit will also provide craniofacial parameters for preoperative planning, prediction of postoperative outcome, and anthropological studies (Khan *et al*., 2021).

Patniak and his workers, 2001 documented that the width of orbital cavity is usually greater than the height at adult age. The proportion of the orbit height to its width multiplied by 100 % is called Orbital Index (OI). Its value varies according to genders and ethnic groups. Therefore, it is classified into three types; Megaseme (large) as the OI is greater than 89 that found in Yellow races, Mesoseme (medium) as the OI between the 83 89, which is found in the White races (Vulovic *et al*., 2022) and Microseme (small) as the OI less than 83 that is found in Black races (Nzei *et al*., 2022).

The present study aimed to measure various morphometric and volumetric parameters of the bony orbit in adult dry skulls and to assess side and sex differences.

This study proposes that orbital measures be given special consideration during orbital reconstruction.

MATERIAL AND METHOD

Forty-two adult intact human skulls free of major pathology were used in the present study. The human remains were obtained from the anatomy unit of the Basic Medical Sciences Department, Unaizah College of Medicine, Qassim University, Saudi Arabia. This study was approved by Committee of Research Ethics, Deanship of Scientific Research, Qassim University (Approval No. 24-01-02).

Adult skulls of unknown sex were used in the present study. Forty-two intact skulls (84 orbits) were selected 22 male and 20 females. Skulls with Deformity, fractures, major pathology, that of children and those with confusion of sex discrimination were excluded from the study. Determining of adult age was ensured by presence of erupted third molar teeth and suture fusion (Tuteja *et al*., 2012). Sex determinations were indicated by gross anatomical landmarks as males are characterized by prominent superciliary arch, glabella and mastoid process and more roughness at site of muscle attachments.

For proper determination of bony orbit dimensions, four fixed landmarks on the rim of base of orbit were determined as follows (Table I, Fig.1)

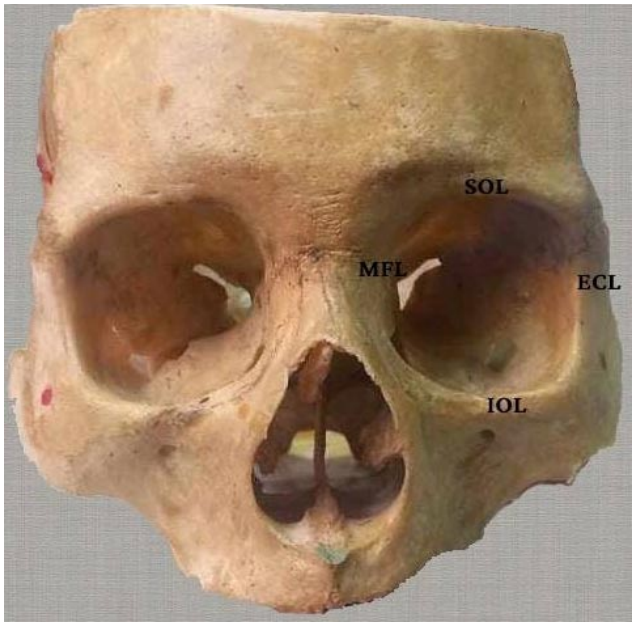

Fig 1. Showing four fixed landmarks on the rim of base of orbit used to determine bony orbit dimensions

Table I. Definition of fixed landmarks on the rim of base of orbit in the present study.

Landmark	Definition
Maxillofrontale landmark (MFL)	The junction between the frontomaxillary suture and the medial orbital edge
Ectoconchion landmark (ECL)	The junction between the lateral orbital edge and an imaginary horizontal line that divides the opening of orbit into two near equal upper and lower parts
Supraorbital landmark (SOL)	The superior junction between the superior orbital edge and the perpendicular bisector line of line MFL- ECL
Infraorbital landmark (IOL)	The inferior junction between the inferior orbital edge and the perpendicular bisector line of line MFL- ECL

Bony orbit dimensions localized and measured in the present work are:

1. Orbital height: between SOL-IOL (Fig. 2).
2. Orbital breadth: between MFL- ECL (Fig. 3).
3. Inter-orbital Breadth: It measures the straight distance between two MFL (Fig. 4).
4. Bi-orbital Breadth: It measures the straight distance between two ECL (Fig. 5).

Vernier Caliper was used to measure the above parameters to the nearest mm.

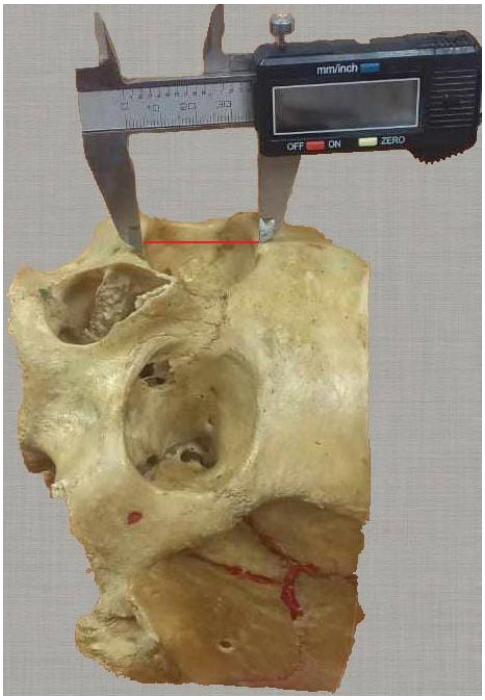

Fig. 2 showing orbital height: between SOL-IOL

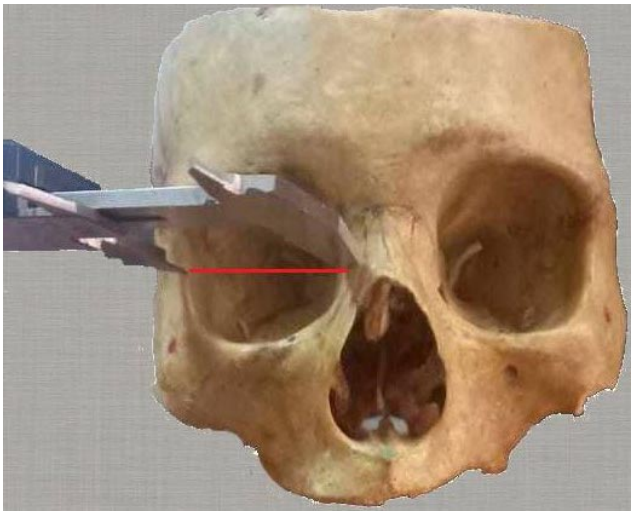

Fig 3. Showing orbital breadth: between MFL- ECL

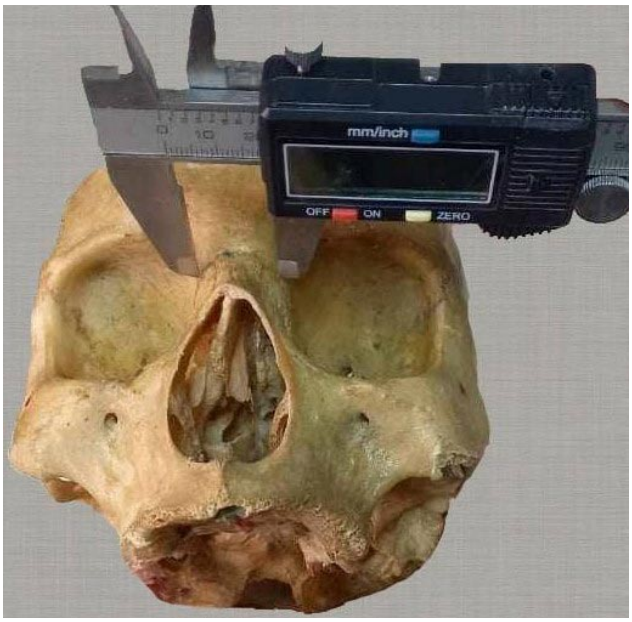

Fig 4. Showing inter-orbital Breadth which is the straight distance between two maxillofrontale landmarks (MFL)

Fig 5. Showing bi-orbital Breadth which is the straight distance between two ectoconchion landmarks (ECL).

After proper localization of four fixed landmarks on the rim of base of orbit, Vernier Caliper was applied to measure different orbital dimensions. Orbital height and orbital breadth were measured bilaterally. Each variable was taken twice by the same examiner and if non-similar values were obtained their average value was calculated and recorded.

5. Orbital Rim Perimeter (ORP) Flexible wire and ruler were used for this parameter (Fig. 6).

6. Bony Orbital Volume (BOV). Three-dimensional models were made to be fit to the bony orbits. This method was used to detect (BOV). Each model was immersed in graduated cylinder filled with distilled water. The displaced water volume was measured and represented in ml (Acer *et al*., 2009) (Figs. 7 and 8).

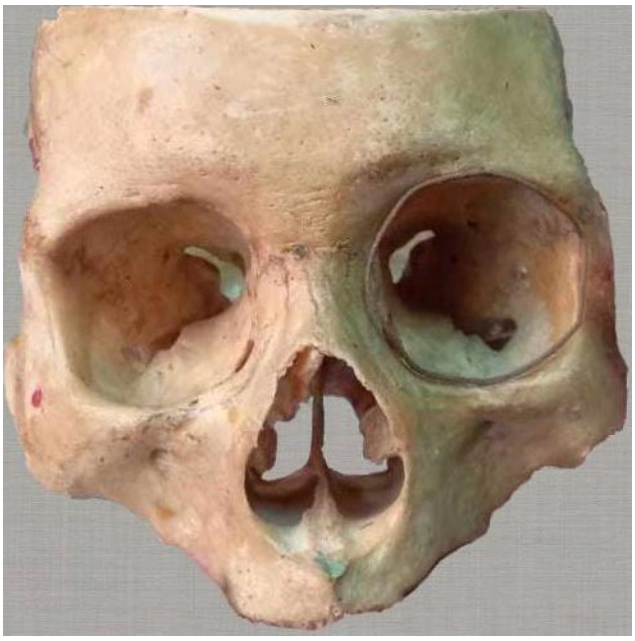

Fig 6. Showing methodology for measuring orbital rim perimeter (ORP) using flexible wire and ruler.

Fig 7. Showing methodology used to measure Bony Orbital Volume (BOV)

Fig 8. Showing The three-dimensional models that made to be fit to the bony orbits .

- Derived values

- Using the orbital opening dimensions height and breadth, Orbital Index and Orbital opening area were calculated according to specific equations.
- Orbital Index (OI)=height of orbit / breadth of orbital × 100
- Orbital opening area = 22/7 × A× B where A and B are the halves of orbital height and breadth respectively.

The data were analyzed using SPSS statistical package version 20. A level of significance ($p<0.05$) was adopted for all the performed tests. Mean, range and standard deviations were obtained for all parameters. Student-t test was done to establish the presence of significant side or sexual differences.

RESULTS

The values of measured parameters and derived values in the present study regarding general morphology for the right and left orbits in male skulls are shown in Table II.

Table II shows the mean value of orbital height was 36.00 mm in right and 35.18 mm in left. The mean value of orbital breadth was 42.59 mm in right and 41.72 mm in left. The mean value of orbital index was 84.59in right and 84.56 in left. The mean value of orbital rim perimeter was 12.3 cm in right and 12.22 cm in left. The mean value of orbital opening area was 12.05 cm^2 in right and 11.54 cm^2 in left. The mean value of bony orbital volume was 28.59 ml in right and 27.82 ml in left. All the parameters were greater in the right than in the left side with no statistically significant differences.

Table II. Descriptive statistics of the general morphology of bony orbit in right and left male orbits.

Variable (mm)	Male (right orbit) (n=22)		Male (left orbit) (n=22)		Mean difference
	Mean ±SD	Range	Mean ±SD	Range	
Orbital height (mm)	36.00±1.69	33-39	35.18±1.68	32-38	0.82
Orbital breadth (mm)	42.59±1.94	40-46	41.72±1.7	40-45	0.87
Orbital Index	84.59±3.9	75.5-92.5	84.56±4.2	73.3-90.2	0.03
Orbital rim perimeter (cm)	12.3±0.346	12-13	12.22±0.335	12-13	0.08
Orbital opening area (cm^2)	12.05±0.963	10.37-14.09	11.54±0.85	10.05-13.43	0.51
Bony orbital volume (ml)	28.59±2.54	25-33	27.82±2.02	25-31	0.77

*Significant at p-value<0.05. **Significant at p-value<0.01.

Table III. Descriptive statistics of the general morphology of bony orbit in right and left female orbits.

Variable (mm)	Female (right orbit) (n=20)		Female (left orbit) (n=20)		Mean difference
	Mean ±SD	Range	Mean ±SD	Range	
Orbital height (mm)	35.35±1.5	33-38	34.3±1.5	32-36	1.05*
Orbital breadth (mm)	41.35±1.84	39-44	40.65±1.42	39-43	0.7
Orbital Index	85.26±3.8	79.1-94.8	84.4±3.7	76.1-92.3	0.86
Orbital rim perimeter (cm)	12.15±0.41	11.6-13	11.98±0.35	11.5-12.7	0.17
Orbital opening area (cm^2)	11.56±1.025	10.11-13.13	10.98±0.77	9.8-12.16	0.58*
Bony orbital volume (ml)	26.1±1.59	24-28	25±1.49	22-27	1.1*

*Significant at p-value<0.05. **Significant at p-value<0.01.

The values of measured parameters and derived values in the present study regarding general morphology for the right and left orbits in Female skulls are shown in Table III.

Table III shows the mean value of orbital height was 35.35 mm in right side and 34.3 mm in left side. The mean value of orbital breadth was 41.35 mm in right side and 40.65 mm in left side. The mean value of orbital index was 85.26 in right side and 84.4 in left side. The mean value of orbital rim perimeter was 12.15 cm in right side and 11.98 cm in left side. The mean value of orbital opening area was 11.56 cm^2 in right side and 10.98 cm^2 in left side. The mean value of bony orbital volume was 26.1 ml in right side and 25 ml in left side. All the parameters were greater in the right than in the left with no statistically significant difference except for Orbital height, Orbital opening area and Bony orbital volume which were significantly greater in female right orbits ($p<0.05$).

The total means values of measured parameters and derived values in the present study regarding general morphology for Male and Female skulls are shown in Table IV.

Table IV shows comparison of the total means (right and left) of the dimensions of the general morphology of bony orbit and derived values. The mean value of orbital height was 35.59 mm in male subjects and 34.83 mm in female subjects. The mean value of orbital breadth was 42.16 mm in male subjects and 41mm in female subjects. The mean value of orbital index was 84.5in male subjects and 84.99 in female subjects. The mean value of orbital rim perimeter was 12.26 cm male subjects and 12.06 cm in female subjects. The mean value of orbital opening area was 11.79 cm^2 in male subjects and 11.26 cm^2 in female subjects. The mean value of bony orbital volume was 28.2 ml male subjects and 225.5 ml in female subjects. Orbital height, Orbital rim perimeter, Orbital opening area and

Table IV. Descriptive statistics of the sex differences between total means of male and female bony orbits general morphology.

Variable (mm)	Male orbit (n=22)		Female orbit (n=20)		Mean difference
	Mean ±SD	Range	Mean ±SD	Range	
Orbital height (mm)	35.59±1.72	32-39	34.83±1.57	32-38	0.76
Orbital breadth (mm)	42.16±1.85	40-46	41±1.66	39-44	1.16**
Orbital Index	84.5±4.02	73.3-92.5	84.99±3.8	76.1-94.8	-0.49
Orbital rim perimeter (cm)	12.26±0.34	12-13	12.06±0.4	11.5-13	0.2
Orbital opening area (cm^2)	11.79±0.94	10.05-14.09	11.26±0.93	9.8-13.13	0.53
Bony orbital volume (ml)	28.2±2.3	25-33	25.5±1.6	22-28	2.7**
Inter-orbital distance	2.018±0.29	1.5-2.6	1.89±0.34	1.3-2.5	0.128
Bi-orbital distance	11.44±0.7	10.2-12.4	10.34±0.7	9.2-11.4	1.1**

*Significant at p-value<0.05. **Significant at p-value<0.01.

Inter-orbital distance values were non significantly greater in the male subjects than in the female subjects however, orbital breadth, Bony orbital volume and Bi-orbital distance were significantly greater in the male subjects than in the female subjects ($p<0.01$). Orbital Index was not significantly greater in the female subjects than in the male subjects.

Table V shows the distribution of OI categories in male and female subjects by side. In male subjects the right orbit mainly belongs to Mesoseme category (40.9 %) while left one belongs to Microseme category (45.5 %). In female subjects both right (70 %) and left (60 %) orbits belong to Mesoseme category.

Table V. Shows OI categories and its distribution in the present study by side and sex (OI).

Obital Index (OI)	Male skull (22)		Female skull (20)	
	Right	Left	Right	Left
Microseme (<83)	8 (36.4 %)	10 (45.5 %)	4 (20 %)	6 (30 %)
Mesoseme (>83<89)	9 (40.9 %)	9 (40.9 %)	14 (70 %)	12 (60 %)
Megaseme (>89)	5 22.7 %)	3 (13.6 %)	2 (10 %)	2 (10 %)

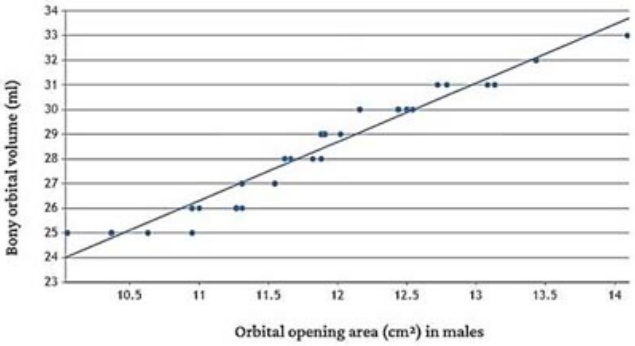

Fig.9. Positive Correlation graph (male subjects).

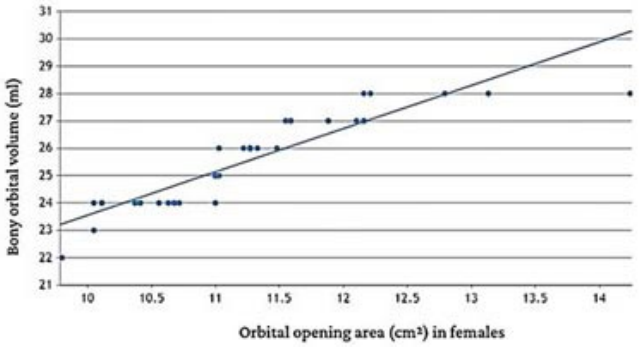

Fig.10. Positive Correlation graph (female subjects).

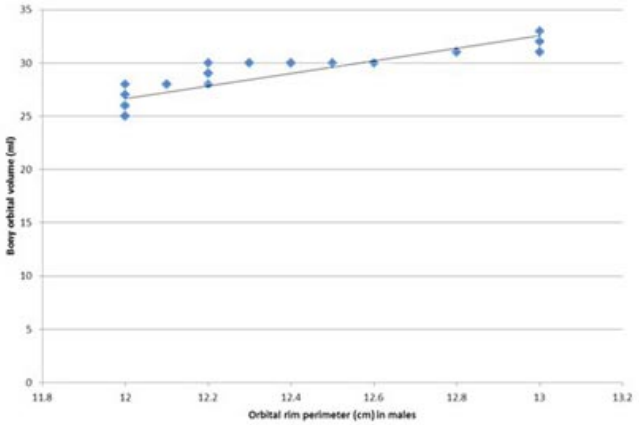

Fig.11. Positive Correlation graph (male subjects).

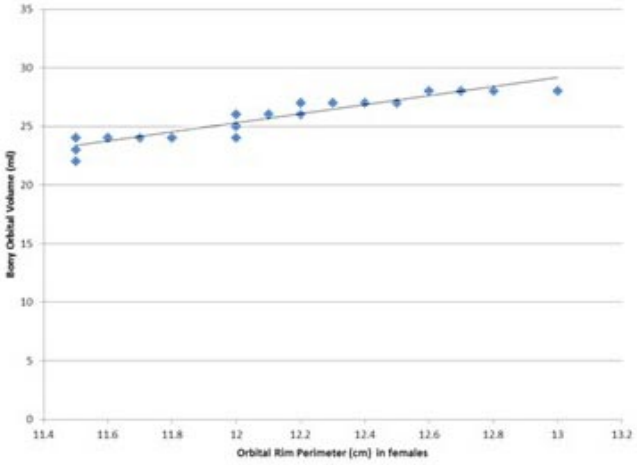

Fig.12. Positive Correlation graph (female subjects).

DISCUSSION

Precise knowledge of anatomical criteria of bony orbit are fundamental to avoid injuries to many important anatomical structures in the orbit as orbit may be exposed to many surgeries, such as orbital decompression, enucleation, exenteration. The normative measurements Orbital dimensions are significantly important in ophthalmology, oral maxillofacial surgery and neurosurgery (Khan *et al.*, 2021).

In general, the bone of orbit is thickest at the apex, it gets thinner as the walls of orbit diverge anteriorly, and then thickens again at the edges on the orbital opening. Although the bone of the medial orbital wall is thinnest, it is strengthened by the perpendicular septa of the ethmoidal air sinuses followed by the bone of the orbital floor. The floor of the orbit is most vulnerable to fracture as it is thin and unsupported (Turvey & Golden, 2012).

This study aimed at obtaining an accurate estimation of the values of different orbital dimensions and orbit volume by sex and side that could be of great concern in medical field.

In the present study four fixed landmarks on the rim of base of orbit were determined and used as reference points for measuring the two dimensions: height and breadth of orbital opening.

In the present study, the total mean value of orbital height in male and female subjects was 35.59mm and 34.83mm respectively with non-significant difference. These values are in close similarity with Fetouh & Mandour (2014) who reported height values of 35.57 mm in male subjects and 35.12 mm in female subjects. On other hand these values are greater when compared with Ji *et al*. (2010), on their study in Chinese populations who reported height values of 33.35 mm in male subjects and 33.22 mm in female subjects. In the present study, the total mean value of orbital breadth in male and female subjects was 42.16 mm and 41 mm respectively with significant difference. These values are less than that recorded by Fetouh & Mandour (2014) who reported breadth values of 43.25 mm in male subjects and 42.37 mm in female subjects. On the other hand, these values are greater than those recorded by Ukoha *et al*. (2011), in their study in Nigerian populations who reported breadth values of 36.03 mm in male subjects and 34.98 mm in female subjects.

Concerning growth of dimensions of orbital opening, in children, the breadth is usually the same as the height but the breadth increases more than the height as they grow. Accordingly, in adult age the breadth is usually greater than the height. The relation between height to breadth is called orbital index (Patnaik *et al*., 2001).

In the present study, the total mean value of OI in female subjects was (84.99) greater than that of male subjects (84.5) with non-significant difference. These values are in close similarity with Fetouh & Mandour (2014), and Munguti *et al*. (2013). On other hand these values were less than that recorded by by Igbigbi & Ebite (2010), in Malawian skulls and Ukoha *et al*. (2011), in Nigerian skulls

Evans & Webb (2007) classify bony orbit into three categories according to values of OI megaseme (OI more than 89), mesoseme (OI between 83 and 89) and microseme (OI less than 83).

In the present study, the total mean of OI was more than 83 in both male and female subjects this means that the orbits belong to the mesoseme category. Mesoseme orbits were reported for Caucasian population (Evans & Webb, 2007).

Normative value of OI is an important index in the diagnosis of craniofacial syndromes and post-traumatic deformities (Divya *et al*., 2018).

Estimation of the normal values of OI for a particular region is essential to deal with abnormalities. For the best aesthetic and functional outcome, standard values based on local data recording are required. T and to make the best aesthetic and functional outcome these standards reflect the various pattern of craniofacial growth resulting from racial, ethnic, social, behavioral, and dietary habits (Divya *et al*., 2018).

In forensic medicine, the OI has been used to determine the sex of an individual and is applied for skull classification. Various research on morphometric dimensions of orbit show variation in their values according to race, region and ethnicity (Kaur *et al*., 2012)

The orbital rim is the edges of orbital base, its shape and dimensions determine the orbitofacial appearance (Ji *et al*., 2010). In the present study, the total mean values of the orbital rim perimeter for male and female subjects were 12.26 cm and 12.06 cm respectively with non-significant difference.

The orbital opening area value is calculated using specific equation. In the present study, the total mean values of the orbital opening area for male and female subjects were 11.79 cm^2 and 11.26 cm^2 respectively with non-significant difference. These values are in close similarity to that recorded by Ji *et al*. (2010), in Chinese populations (11.8 cm^2 in males and 11.10 cm^2 in females).

The BOV total mean value is measured using three-dimensional models (Acer *et al*., 2009). In the present study, the total mean values of the BOV for male and female subjects were 28.2 ml and 25.5 ml respectively with significant difference. These values are in close similarity to those recorded by Fetouh & Mandour (2014) and Regensburg *et al*. (2008), but greater than that recorded by Chau *et al*. (2004) in Chinese and (Acer *et al*., 2009) in Turkish populations.

Orbital volume is critical for determination of the face appearance (Erkoç *et al*., 2015). Orbital volume measurement may help the ophthalmologist to diagnose unilateral ophthalmopathy and predict the size of orbital implants after enucleation (Galindo-Ferreiro *et al*., 2018).

The interorbital distance sets the right and left orbits apart from each other. Small interorbital distance may give an impression of squinting (Patnaik *et al*., 2001). The mean value of interorbital distance in male and female subjects was 2.018 cm and 1.89 cm respectively with non-significant difference. This longer interorbital distance of the male subjects although non-significant could be due to a wider nasal ridge compared to that of female.

The interorbital distance recorded in French population was 1.981 cm (Schmittbhul *et al*., 1998) while it was 2.571 cm among the Turks (Yasan *et al*., 2006). That means the interorbital breadth varies by populations. The interorbital breadth is therefore a significant parameter that should be considered in nasal bridge reconstruction and in the design of spectacle bridges.

The mean value of bi-orbital distance in male and female subjects was 11.44 cm and 10.34 cm respectively with significant difference. These values are greater than that recorded by Munguti *et al*. (2012), in their Kenyan study who reported 99.49 mm and 96.43 mm for male and female subjects respectively.

The biorbital breadth determines the width of the facial skeleton. This difference should be taken into account when designing nasal plates in the reconstruction of the nasal bridge and when designing frames for spectacles.

The difference between the interorbital distances of the two sexes is very small (0.128) compared to that of the biorbital breadth (1.1). This may be in part due to male subjects have significantly wider orbits.

Both interorbital and biorbital distances parameters are usually greater in male subjects than among female subjects (Igbigbi & Ebite, 2010) and should be considered for the proper restoration of aesthetic deficits.

All these variations between different values reported by various studies may be due to race difference, sample type; dry skulls, cadavers and radiographs and also it may be due to difference in anatomical reference landmarks.

The measured parameters of the present study were greater in the right side than in the left in male subjects but with no statistical difference. For female subjects the right side showed significant higher values in orbital height, orbital opening area and BOV.

The difference observed between the right and left orbits may be due to the differential growth of the two halves of brain as the right half shows dominance.

In addition, Seiji *et al*. (2009), reported asymmetrical dry skull in 4 measured parameters (height, breadth, perimeter and orbital opening area). On the other hand, Forbes *et al*. (1985), reported minimal mean difference in BOV between the right and left orbits.

In the present study sexual dimorphism of the bony orbit is well established concerning the orbit breadth, BOV and biorbital breadth values which were significantly greater in male subjects than in female. This is in accordance with Ji *et al*. (2010), who reported that the mean values in Chinese male subjects are greater than those of female subjects for all parameters, especially the volume, perimeter, breadth and there is no significant difference in height.

CONCLUSION

The present estimations of orbital morphometric parameters can be of value in maxillofacial procedures and in the designation of eye protective equipment. Sexual dimorphism of the bony orbit is well established concerning the orbit breadth, BOV and biorbital breadth values which were significantly greater in male subjects than in female.

Limitation of the study. This study had limitation of having small number of intact dry skulls, thus a larger number is required to yield more authoritative results. Moreover, demographic characteristics that affect growth were lacking

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ALSAYKHAN, H. & MAHMOUD ABOZAID, S. M. Estudio morfométrico y volumétrico de la órbita ósea en cráneos adultos secos y su utilidad en la práctica médica. *Int. J. Morphol., 43(3)*:843-851, 2025.

RESUMEN: El estudio morfométrico y volumétrico de la órbita ósea es fundamental para intervenciones quirúrgicas adecuadas, como la reconstrucción facial, para la recuperación de la capacidad funcional perdida, o para mejorar la apariencia estética. Por lo tanto, un conocimiento preciso de la anatomía orbitaria reduce la incidencia de complicaciones quirúrgicas. El presente estudio tuvo como objetivo medir diversos parámetros de la órbita ósea en cráneos adultos y evaluar las diferencias de lado y sexo. En el presente estudio, se examinaron 42 cráneos humanos adultos secos de sexo desconocido; el sexo de los cráneos secos intactos se determinó mediante puntos de referencia anatómicos macroscópicos. Se utilizó un calibrador Vernier digital para medir los siguientes parámetros: altura orbitaria, ancho orbital, distancia interorbitaria y biorbitaria. Los valores derivados: índice orbitario y área de apertura orbitaria se calcularon mediante ecuaciones específicas. Se utilizaron modelos tridimensionales para determinar el volumen orbitario óseo. Se utilizaron un alambre flexible y una regla para medir el perímetro del reborde orbitario. Se analizaron varios parámetros para evaluar las diferencias laterales y de sexo. En el presente estudio, el valor medio total de la altura orbitaria en sujetos masculinos y femeninos fue de 35,59 mm y 34,83 mm respectivamente con diferencia no significativa. El valor medio total del ancho orbital en sujetos hombtrd y mujeres fue de 42,16

mm y 41 mm respectivamente con diferencia significativa. El valor medio total del OI en sujetos de sexo femenino fue (84,99) mayor que el de los sujetos masculinos (84,5) con diferencia no significativa. Los valores medios totales del perímetro del reborde orbitario para sujetos masculinos y femeninos fueron de 12,26 cm y 12,06 cm respectivamente con diferencia no significativa. Los valores medios totales del área de apertura orbitaria para sujetos masculinos y femeninos fueron de 11,79 cm^2 y 11,26 cm^2 respectivamente con diferencia no significativa. Los valores medios totales del volumen orbitario óseo en hombres y mujeres fueron de 28,2 ml y 25,5 ml, respectivamente, con una diferencia significativa. Las estimaciones actuales de los parámetros morfométricos orbitarios pueden ser útiles en procedimientos maxilofaciales y en la designación de equipos de protección ocular. Además, existe una diferencia bien establecida en estos parámetros entre hombres y mujeres.

PALABRAS CLAVE: Morfometría; Parámetros orbitarios; Índice orbitario; Volumen orbitario; Anatomía quirúrgica.

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