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Orbit Dimensions and Bony Interorbital Distance in Southeast Nigerians: A radiologic study

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ABSTRACT

The objective of this study was to obtain the orbit dimensions and bony interorbital distance in Southeast Nigerians. 350 pairs (217 males 133 females) of plain films of the skull were used. Measurements were taken on films of healthy subjects using a pair of dividers and a meter rule calibrated in millimeters. The parameters include orbital height, width, depth and interobital distance. Data analysis was done using Microsoft excel version 2000. This work shows orbital height to the 26.62 + 0.27mm; orbital width to be 39.39±0.17mm, orbital depth to be 54.95±0.35mm and bony interorbital distance to be 36.84±0.26mm. There was a steady increase in orbit height and width up to 30-39 years age group and 40-49 years age group in males and females respectively. The depth increased up to 40-49 years age group and 20-29 years age group and in males and females respectively. The bony interorbital distance increased up to 20-29 years age group and 40-49 years age group in males and females respectively. Thereafter, declines were observed. We found no statistically significant difference in all the parameters studied between males and females. Symmetry was also observed between left and right orbits. These agree so much with the findings of other workers. The interorbital distance for this work (36.84±0.26mm) is significantly higher than that of the American (2.67cm). More so the orbital depth from this work (54.95±0.35mm) in greater than that of the Greece population (4.96 2cm. The difference may be attributed to generic, racial and environmental factors and this explains the variation in the faces of these different populations.

Keywords: Orbit Dimensions, Bony Interorbital distance.

Delicate tissues and organs in the body are housed in bony cavities to protect them from harmful environments and injuries. The bony orbits are the cavities in the skull, which contain and protect the eyeballs, their muscles, nerves and vessels together with most of the lacrimal system. The orbit roughly pyramidal in shape with the apex located posteriorly forming the optic canal and the base located anteriorly forming the orbital rim (Sinnatamby, 2000).

Orbit dimension and volumes have been given values by many researchers (Forbes 1985, Karampatakis, 1998 Mercandetti and Cohen, 2004). Orbit dimensions have been found to depend on race and age (Dilmen et al 2002, Merz 1995, Haas 1993, Dennis 1998). Orbit dimensions has been co-related with sex (Dennis 1998, Karampatakis 1998) Symmetry of the orbits of both sides has been studied by Haas (1993). Since most of these literatures are foreign, it becomes imperative to investigate and document the dimensions in our own environment. This study will serve as a guide to ophthlmologists, anatomists and surgeons in the diagnoses and treatment of orbit related pathologies.

MATERIALS AND METHODS

A total number of 350 pairs of radiographs of human skulls, made up of both the frontal and lateral views of the skulls, were collected, comprising 133 females and 217males from the National orthopaedic hospital, Enugu. Measurement were only taken on skulls that are evidently healthy or, if pathology was present, from those that did not affect the dimensions of the orbit. All cases of raised intracranial or intraorbital pressures as reported by the radiologists were discarded. The skulls that were selected for the research were strictly those of South-Eastern Nigerians as indicated by their names and states of origin.

Measurement Techniques

Measurements were taken on films of healthy subjects using a pair of dividers and a meter rule calibrated in millimeters. The interorbital distance was measured from the anteroposterior film of the skull in a horizontal plane, a distance between the medial margins of the left and the right orbital rims. The height of the orbital rim was measured from the film of the skull as a vertical distance between the superior and inferior orbital rims approximately midway between the medial and lateral walls. The width of the orbital rim was measured from the frontal film of the skull as a horizontal distance between the medial and lateral orbital rims approximately midway between the superior and inferior orbital walls. The depth of the

orbit was measured from the lateral film of the skull a distance between the orbital rim and apex a distance just anterior to the anterior clinoid process.

Statistical analysis:

The analysis was done using Microsoft excel version 2000. Results are reported as mean±standard error (SD). The orbital heights and widths of both sides were compared using the students t-test (2 samples and paired). The results were also compared in both sexes using the students t-test (2 samples, unpaired, assuming, equal variance) . The differences were considered statistically significant when $P<0.05$. The parameters measured were also correlated with age using correlation coefficient.

TABLE1: mean values of the orbit dimensions and bony interorbital distance

	Height(mm)	Width(mm)	Depth(mm)	BIOD(mm)
Mean±SE	26.62±0.27	39.39±0.17	54.95±0.35	36.84±0.20
Count	700	700	350	350

TABLE 2: Gender distribution of the orbit dimensions and bony interorbital distance (in millimeters).

Sex	Right Height	Left height	Right width	Left width	Depth	BIOD
Male (n=217)	29.72±0.49	29.75±0.50	40.18±0.31	40.10±031	55.79±0.43	37.70±0.30
Females (n=133)	26.82±0.60	26.77±0.59	38.06±0.38	38.06±0.38	53.59±0.57	35.43±044

$P>0.05$ according to paired t-test for the right and left orbital height and width in both sexes.
$P>0.05$ according to unpaired t-test for the males and females orbit dimensions and bony interorbital distance on both sides.

TABLE 3: Relationship between the orbital dissension and interorbital distance in millimeters with age in males.

Age (years)	MRH	MLH	MRW	MLW	MD	MBIOD
0-9(13)	23.42	23.46	33.96	33.89	47.65	29.19
10-19(29)	25.83	25.74	38.86	38.19	52.78	36.24
20-29(66)	30.86	30.91	41.62	41.55	57.14	38.43
30-39(47)	32.47	32.52	41.7	41.61	58.5	38.39
40-49(24)	29.81	29.92	39.81	39.88	58.5	38.33
50-59(16)	29.75	29.72	39.63	39.41	55.25	38.03
60-69(12)	29.33	29.58	39.5	39.29	54.58	38
>70(10)	28.45	28.25	38.5	38.2	52.1	37.4
P1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
P2	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

P1 for increase with age
P2 for decrease with age

TABLE 4: Relationship between the orbital dimensions and bony interorbital distance (in millimeters) with age in females.

Age (years)	FRH	FLH	FRW	FLW	FW	FBIOD
0-9(26)	21.48	21.2	33.98	33.7	47.68	29.8
10-19(12)	25.71	25.63	35.96	36.17	53.79	31.92
20-29(35)	27.37	27.46	37.71	37.79	55.71	36.14
30-39(20)	29.18	29.2	40.98	41.1	55.03	37.28
40-49(13)	31.42	31.37	41.35	40.81	55.03	38.35
50-59(13)	30.42	30.42	40.92	40.15	54.19	37.54
60-69(13)	24.81	24.81	39.58	38.92	51.42	37.81
>70(7)	22.93	22.93	36.36	35.93	51.21	37.86
P1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
P2	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

P1 for increase with age
P2 for decrease with age

RESULTS

The mean values of the orbit dimensions and bony interorbital distance are shown in Table 1. The mean orbital height is 26±0.27mm (range 13.5mm to 52mm). The mean orbital width in 39.39±0.17mm (range 25mm to 54mm). The mean orbital depth is 54.95±0.35mm (range 31mm to 72mm). The mean bony interorbital distance is 36.84±0.26mm (range 19mm to 47mm). Table 2 shows gender distribution of orbit dimension and bony interorbital distance. There was no statistically significant difference between orbital height and width of the left and right sides in both sexes ($p>0.05$). There was also no statistically significant difference between the orbital dimensions and bony interorbital distance between males and females ($p>0.05$).

The relationship between the orbital dimensions and bony interorbital distance with age is shown in Tables 4 and 5. The orbital height and width increase with age reaching its peak at 30-39 years age group in males and 40-49 years age group in females ($p<0.05$) after which there are decreases with age The decrease is not statistically significant ($p>0.05$) in females. The bony interorbital distance increases with females ($p<0.05$) after which there is decrease with age. The decrease with age is not statistically significant in females ($p>0.05$).

DISCUSSION

The study established the mean orbital height to be 26.62±0.27mm, orbital width to be 39.39mm±0.17mm, orbital depth to be 54.95±0.35mm and the bony interorbital distance to be 36.84±0.26mm. Previous studies on Caucasians (Petruzzelli and Hampson, 2005) showed the orbital height to be 25mm. This could be attributed to environmental and racial variations.

The values of the orbital depth is greater than the value (4.962cm, SD 0.0246) given by Karampatakis (1998) on Greece population and could be attributed to genetic, racial and environmental factors. This study showed that there is no significant difference between males and females on both sides in all the parameters

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studied . This agrees so much with the findings of Ferrario et al (2001), Beentley et al (2002) and Dennis (1998). Hence, it could be said that gentlic factor(s) that control these parameters is not located on the sex chromosome.

The values of interorbital distance is greater than that given by Mafee et al (1986) on American population ranges from 2.29 to 3.21cm (average, 2.56cm) in women. This racial variation explains the wide flattered nose among blacks and narrow elongated nose among the whites.

The study should that there is no significant difference between the right and left orbits in both sexes in all parameters studied. Hence, the same gene might be controlling these parameters on both sides. Previous studies (Bentley et al 2001,Haas 1993) showed similar findings.

This study showed that there is a correlation between age and the parameters studied. There is an increase in all the parameters with age before attaining peak. Thereafter a decrease with increase in age was observed except the bony interorbital distance in both sexes, orbital depth in females and orbital height in males which do not show any statistically significant change ($p>0.05$) after attaining peak. A correlation exists between orbital width and height .

REFERENCES

Bentley RP, Sgnours S, Natarajan K, Dover MS, Hockley AD (2002). Normal changes in orbital Volume during children. Journal of Neurosurgery: 96(4): 742-746 (Apr).

Dennis D (1998). A biometric study of the eye, orbital and face in 205 normal human fetuses. Invest Opthalmol Vis Sci: 39(12): 2232-8(Nov).

Dilmen G, Koktener A, Turhan No, Tez S (2002). Growth of the fetal lens and orbit Int J Gynaecol Obstet: 76(3): 267-71 (Mar).

Ferrarior VF, Sforza C, Colombo A, Schinitz JH, Serrao G, Yaremchuk MJ (2001). Morphometry of the orbital region: A soft tissue study from adolescence to mid-adulthood. Plastic and reconstructive: 108(2): 285-293.

Forbes G (1985). Volume measurements of normal orbital structures by computed tomographic analysis. AJR Am J Roentgenol: 145(1): 149-54(Jul).

Haas A (1993). Fetal development of the human orbit. graefes Arch Exp Ophthalmol: 231(4): 217-20(Apr).

Karampatakis V (1998). Orbital depth measurements of human skull in relation to reterobulbar anesthesia. Eur J Ophthalmol: 8(2): 118-20(Apr-Jun).

Mafee Mf, Pruzansky S, Corrales MM, Phatak Mg, Valvasson Ge, Dobben GD, Capek V (1986). CT in the evaluation of the orbit and the bony inter orbital distance. American Journal of Neuroradiology: 7(2): 265-269.

Mercandetti M, Cohen AJ (2004). Tumors, orbit. www.emedicine.com/oph/topic758.htm(December 14).

Merz E (1995). Orbital diameter, inner and outer obital distance: a growth model of fetal orbital measurements Ultraschall med: 16(1): 12-7(Feb).

Petruzzelli GJ, Hampson CM(2005): Orbit anatomy (Dec. 15)

Sinnatamby Chummy S. (2002). Last's Anatomy Regional and Applied 10th edition. Churchill livingstone. Edinburgh. Pg 389-396.