

Anatomical sizes of Orbital Index among Nigerians using Normal Plain Radiographs: A Five-year Retrospective Study in Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

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ABSRTACT

This study examines Anatomical sizes of orbital index among Nigerians using normal plain radiographs. It is a retrospective study of normal plain skull radiographs collected from Radiology Department, Usmanu Danfodiyo University, Sokoto, Nigeria over a 5-year period from September 2004 to September 2009 to determine the various anatomical sizes and shapes of the orbit. Radiographs were mounted on illuminators or viewing boxes and measurements made with a metric rule (best foot ruler, transparent plastic size 30cms/12") and a marker (HB Pencil) based on the method employed by Lloyd and Glynn (1975). Five hundred (500) radiographs of the skull were collected from the archives of the Radiology Department; Usmanu Danfodiyo University Teaching Hospital, Sokoto, for the study. The radiographs were for subjects seen from September, 2004 to September, 2009. Out of this number only 255 satisfied the inclusion criteria. The age range of the subjects for the study is between 1-70 years. The most prevalent type of orbit seen on the right side based on orbital index is the Megaseme Orbit which corresponds to the orbit type seen in Caucasians as reported by Lloyd and Glynn (1975) then followed by the Microsemetype. However, based on the orbital index measurement, Microseme is the most prevalent on the left which is in conformity with the predominant type of orbit seen in black race.

Keywords: *Anatomical sizes, orbital index, radiographs, plain skull*

INTRODUCTION

The morphometric assessment of the orbit by radiography and familiarity with its anatomy is significant clinically in knowing how to diagnose and tackle subtle orbital bony injuries, subtle lesions of retro-orbital space and the orbital muscles and also in reconstructive surgeries. It is also relevant in diagnosing disease-states of the orbit in case of space-occupying lesions especially those causing proptosis, oedema of the soft tissue and/or haemorrhage. This shows an important link between diagnostic radiology and ophthalmology (Isadore and Meschan, 1976; Kier, 1966; Lombardi, 1971; Newton and Potts, 1971). According to Lloyd and Glynn (1973), the orbital index is high in the child, the vertical diameter of the orbital opening being

practically the same as the horizontal but later the transverse increases more than the vertical. The interorbital distance is small (Umar, Singh and Shugaba, 2005). This is of some practical importance. Children are not infrequently brought to the ophthalmic surgeon because they are thought to squint when the strabismus is apparent only (Sadler, 2006). This appearance is due to the narrow interorbital distance which makes the eye look too close together (Last, 1951, 1968). With the growth of the frontal and ethmoidal air-cells the interorbital distance increases and so causes the squint to disappear (Umar, Singh and Shugaba, 2005). The orbital process of the zygomatic (malar) bone may almost reach the lacrimal fossa and this condition may persist to ten years (Williams J., Rowe and Williams M., 1994).

When orbital enlargement is gross it is obvious on inspection of the plain films, but minor enlargements may be difficult to detect; they are important in making the diagnosis of a probable space-occupying lesion, and in helping to distinguish between a space-occupying lesion and a dysthyroid exophthalmos (Lloyd and Glynn, 1973). To appreciate lesser degrees of orbital enlargement, measurement of the orbit is necessary. In the first instance, valid measurement can be obtained from plain x-ray studies, when the correct projection is used, but these need to be augmented by tomograms for full assessment of orbital size, particularly in the transverse plane. The aim of this is to examine the Anatomical sizes of Orbital Index among Nigerians using Normal Plain Radiographs. Hence, it is a Five-year Retrospective Study in Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.

MATERIALS AND METHOD

Five hundred (500) radiographs of the skull were collected from the archives of the Radiology Department; Usmanu Danfodiyo University Teaching Hospital, Sokoto, to determine the various anatomical sizes and shapes of the orbit. The radiographs were for subjects seen from September, 2004 to September, 2009. Out of this number only 255 satisfied the inclusion criteria. The age range of the subjects for the study is between 1-70 years. Of this number, two hundred and six (206) were radiographs from males, and forty nine (49) from females (m : f ratio = 4:1). Radiographs were mounted on illuminators or viewing boxes and measurements made with a metric rule (best foot ruler, transparent plastic size 30cms/12") and a marker (HB Pencil) based on the method employed by Lloyd and Glynn (1975).

The orbital height (h) was measured from the midpoint of a horizontal line drawn tangent to the superior orbital margin from point A to point B to a midpoint on a horizontal line drawn tangential to the inferior orbital margin from point C to point D on the right side. The same was done on the left orbit from midpoint of a horizontal line drawn tangent to the superior orbital margin from point E to F to a midpoint on a horizontal line drawn tangential to the inferior orbital margin from point G to H as annotated in figure 2 and 3 below. The orbital width (w) was

measured from the midpoint of a horizontal line drawn tangent to the lateral orbital margin from point A to point C to a midpoint on a horizontal line drawn tangential to the medial orbital margin from point E to point G on the right side. The same was done on the left orbit from midpoint of a horizontal line drawn tangent to the lateral orbital margin from point F to H to a midpoint on a horizontal line drawn tangential to the medial orbital margin from point E to G. The interorbital distance (IOD) was measured as a distance between the midpoint of a vertical line from point B to D on the right side to a midpoint of a vertical line from point E to G on the left side. The orbital index was calculated for each subject using the formula employed by Lloyd and Glynn (1973), as follows: The orbital index = Height of orbit \times 100/width of orbit.

RESULT AND DISCUSSION

The various anatomical sizes based on the orbital index are shown on table 4. In this study, out of the two hundred and fifty five (255) subjects, one hundred and twenty one (121) have Megaseme Orbit (whose orbital index is from 89 and above) on the right side which amounts to 47.45%, thirty nine (39) i.e. 15.29% have Mesoseme Orbit (orbital index from 83 to 89) and ninety five (95) i.e. 37.26% 255 have Microseme Orbit (orbital index of 83 or less).

The various anatomical sizes based on the left orbital index were also shown on table 2. In this study, out of the two hundred and fifty five (255) subjects based on the left orbital index alone, one hundred and twelve(112) have Megaseme Orbit (whose orbital index is from 89 and above) which amounts to 43.9%, twenty nine (29) out of the 255 have Mesoseme Orbit (orbital index from 83 to 89) about 11.4% and one hundred and fourteen (114) out of the 255 has Microseme Orbit (orbital index of 83 or less) which is about 44.7%. The mean value of orbital indexes of both the right and left orbits as found in the study showed the left orbital index to be slightly higher than the right. This falls within the category of Mesoseme orbit i.e. orbital index of 83 to 89. This is quite different from findings of Lloyd in 1973 which categorized blacks of African descent as having orbital index of less than 83 i.e. Microseme orbit as compared to Mesoseme (orbital index between 83 to 89) seen mostly in Asians, and Megaseme orbit (orbital index of 89 and above) seen predominantly in the Caucasians as shown by the study.

The orbital dimensions of the subjects used in this study in relation to their age groups revealed a steady rise in the dimensions with increase in age until the age range of 51-60 years when it reaches the peak value and then gradually declines. In the measurement of the interorbital distance in relation to age it was similarly found to increase with increasing age of the subjects however reaching its peak at age range of 31 - 40 years then gradually dropping. This study x-rayed the anatomical sizes of orbital index among Nigerians using normal plain radiographs.

CONCLUSION

The study is a five year retrospective study in Usman Danfodiyo University Teaching Hospital, Sokoto. Based on the study, the most prevalent type of orbit seen on the right side based on orbital index is the Megaseme Orbit which corresponds to the orbit type seen in Caucasians as reported by Lloyd and Glynn (1975) then followed by the Microseme type. However, based on the orbital index measurement, it is concluded that Microseme is the most prevalent on the left which is in conformity with the predominant type of orbit seen in black race in the study by Lloyd and Glynn (1975).

Table 1: The various Anatomical types of Orbit based on Orbital Index

| Parameter | Orbital Type | Right | | Left | |
|-------------------------|--------------|-----------|------------|-----------|------------|
| | | Frequency | Percentage | Frequency | Percentage |
| Orbital Index ≥ 89 | Megaseme | 121 | 47.5 | 112 | 43.9 |
| 83 - 89 | Mesoseme | 39 | 15.3 | 29 | 11.4 |
| ≤ 83 | Microseme | 95 | 37.2 | 114 | 44.7 |
| Total | | 255 | 100 | 255 | 100 |

Source: Retrospective study 2004 - 2009

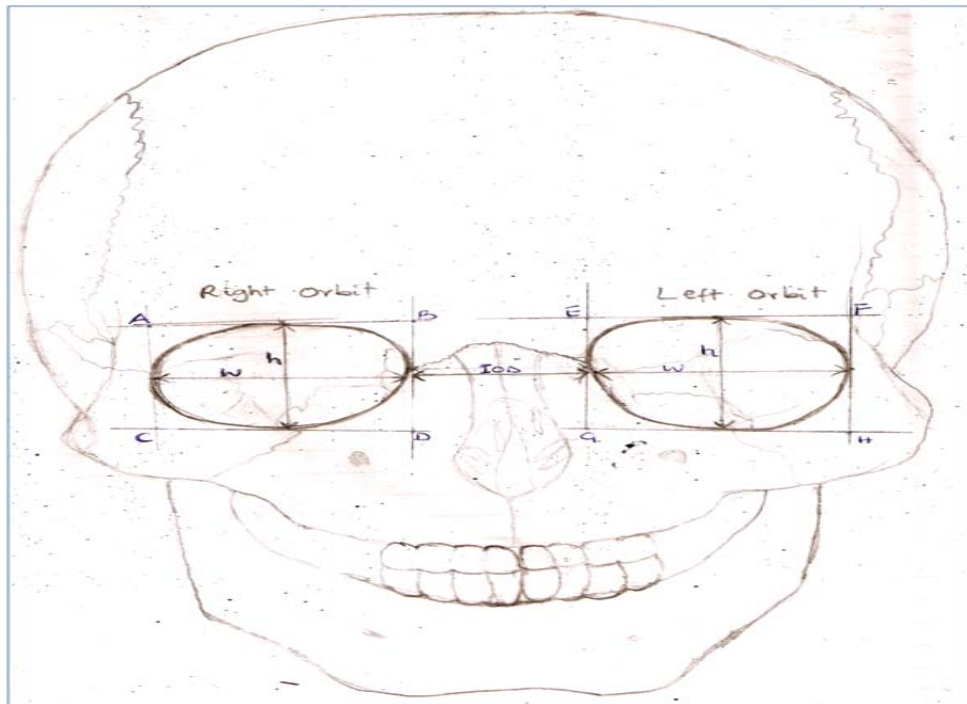


Figure 1: An annotated diagram of the anterior aspect of the skull showing the orbits and their dimensions

Table 2: The various anatomical sizes of orbit in relation to sex

| Orbit Type | Male | | Female | |
|------------|-----------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage |
| Megaseme | 104 | 50.5 | 20 | 40.8 |
| Mesoseme | 31 | 15.0 | 7 | 14.3 |
| Microseme | 71 | 35.0 | 22 | 44.9 |
| Total | 206 | 100 | 49 | 100 |

Source: Retrospective study 2004 - 2009 Mean = 2.49; df= 4; p< 0.05.

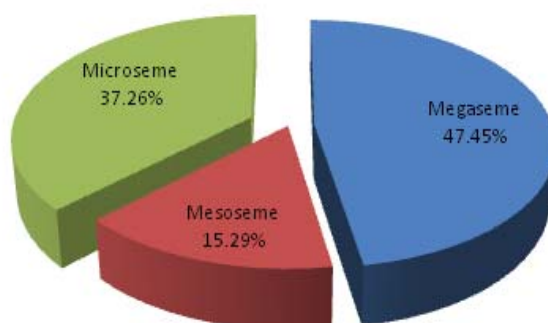


Figure 2: Graphical representation of the different anatomical sizes of the orbit.

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