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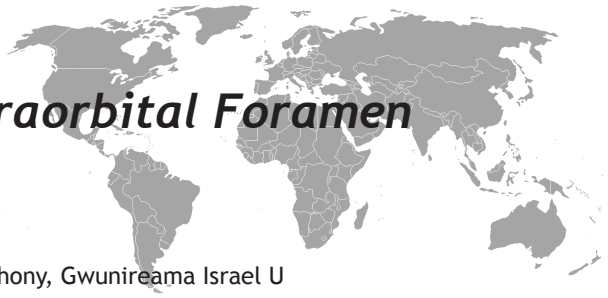
Original Article



Anthropometric Study of Infraorbital Foramen in a Nigerian Population

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ABSTRACT

This study aims to establish the size, shape, orientation and location of the IOF in a Nigerian population. It also seeks to compare the bilateral differences and variations in gender of dry skulls in Nigeria. One hundred skulls (78 males and 22 females) were used in this study. The longitudinal and transverse diameters of the IOF were measured as well as the distance from the infraorbital foramen to the infraorbital margin and lateral nasal border respectively using electronic digital Vernier Caliper. The result show significant sexual dimorphism in the following parameters. The difference between left transverse diameter in males and females was statistically significant. The distance between IOF-IOM in male was found to be 7.46±0.18 mm while female was 5.72±0.84 mm. The difference was significant. Distance between left IOF-LNB was found to be statistically significant. The shape of the infraorbital foramen was found to be oval in 71%, round in 21% and semilunar in 3% of cases on the right side of the skull, while the left side showed 77% for oval, 20% for round and 0.3% for semilunar shapes of the infraorbital foramen. This study provides useful information in predicting the locations and morphology of the infraorbital foramen, especially in the Nigerian population.

Key words: *infraorbital foramen, infraorbital margin, anthropometry*

Nijerya'da Infraorbital Foramenin Antropometrik Çalışması

ÖZET

Bu çalışmada Nijerya'da IOF'un büyüklüğü, şekli, yönü ve konumunu saptamak amaçlanmıştır. Aynı zamanda Nijerya' da kuru kafatasının cinsiyet ile ikili farklılıkl ve değişimleride karşılaştırdık. Yüz kafatası (78 erkek ve 22 kadın) bu çalışmada kullanılmıştır. IOF'un uzunlamasına ve enine çapları ile birlikte elektronik dijital Vernier çap ölçücü kullanarak infraorbital ve burun sınırına infraorbital foramenin mesafesi ölçüldü. Sonuç aşağıdaki parametrelerde anlamlı cinsel dimorfizm gösterdi. Kadın ve erkeklerde sol enine çap arasındaki fark istatistiksel olarak anlamlı olduğu saptandı. Kadınlarda IOF-IOM arasındaki mesafe 5.72±0.84 mm iken erkeklerde 7.46±0.18 mm olarak anlamlı bulunmuştur. Sol IOF-LNB arasındaki mesafe istatistiksel olarak anlamlı olduğu saptandı. Infraorbital foramenin sol kenarı % 77'inde oval, %21'inde yuvarlak ve kafatasının sağ kenarında % 3 semilunar, oysa sol kenar %77 oval, yuvarlak %20 ve % 0.3 semilunar idi. Bu çalışma, özellikle Nijeryalı nüfusta infraorbital foramenin morfolojisisi ve lokasyonunu saptamada önemli bilgiler sağlamaktadır.

Anahtar Kelimeler: *İnfraorbital foramen, infraorbital sınır, antrpometri*

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INTRODUCTION

The infraorbital foramen IOF is an anatomical structure with an important location through which the infraorbital vessel and nerve fibers of infraorbital nerve pass. These vessels and nerve fibres are responsible for the sensitive innervations of the inferior eyelid, nasal wing, superior lip vestibular gum of the anterior and premolar teeth (1)-). Infraorbital nerve blocking through the infraorbital canal is used to anaesthetize the lower eye lid, upper lip, lateral nose, upper teeth and related gingivae. A detailed knowledge of anatomical morphometry of this area is necessary for surgeons while performing maxillofacial surgery.

The IOF has been analyzed in several studies in order to determine its location in dry skulls by direct or indirect means. One of these studies (2), attempted to determine and standardize the correct IOF anatomical relationship, course and location in 35 dry adult skulls. Other authors referred to the location of the IOF according to sex and obtained different mean distances between men and women (3, 4). Some authors have shown the IOF relationship with other anatomical structures in studies with different purposes, which shows the importance of the IOF as a point reference for anatomical and surgical repair (5-6).

Whereas there is anthropometric information on the sexual variations of IOF amongst the Mongoloid and Caucasians, there is a dearth of such data amongst the Negroid populations and Africans. The present study is an attempt to fill such information gap as we report the IOF diameter, shape and orientation in a Nigerian population.

MATERIALS AND METHODS

A total of 100 dry adult human skulls, free from damage and deformity fully ossified (78 males, 22 females) from Departments of Anatomy in some Nigerian Universities constituted the materials for this study. The transverse and vertical (longitudinal) diameters of the infraorbital foramen and its distance to the nearest point of the infraorbital margin and lateral nasal border were measured with the help of a digital Vernier caliper on both sides of the skull. Measurements were made to the center of the foramen by using Vernier calipers capable of measuring to the nearest 0.01 mm. Its orientation in relation to teeth and other close structures were ascertained.

The shapes of both sides of the foramina were assessed by using direct inspection, Data was analysed with Graph Pad Prism 3.0 and result expressed as Mean±SEM. Student‘s t-test and analysis of variance were used to compare male-female and right-left measurements.

RESULTS

Table 1 shows the effect of side on the diameters of IOF in male and female Nigerians. The difference between left transverse diameter in males and females was found to be statistically significant at p.< 0.05. The effect of side on the distance between IOF-IOM in male and female Nigerians is shown in Table 2. The distance between IOF-IOM in male was found to be 7.46 ± 0.18 while female was 5.72 ± 0.84. The difference was significant.

Table 3 shows the effect of side on the distance between IOF –LNB in male and female Nigerians. Distance between left IOF-LNB was found to be statistically significant at p< 0.05. The shape of the infraorbital foramen was found to be oval in 71%, round in 21% and semilunar in 3% of cases on the right side of the skull, while the left side showed 77% for oval, 20% for round and 0.3% for semilunar shapes of the infraorbital foramen (Table not shown).

DISCUSSION

The infraorbital foramen is the way to the infraorbital

***Table 1**. Effect of side on the diameters (mm) of IOF in male and female Nigerians*

IOF	*Male*	*Female*
Left transverse diameter	*2.46±0.08 (0.03-4.81)*	*3.05±0.47 (1.76-4.50)**
Right transverse diameter	*2.55±0.07 (0.02-4.22)*	*2.97±0.26 (2.10-3.58)*
Left longitudinal diameter	*3.09±0.10 (0.04 - 5.68)*	*3.58±0.26 (3.09 - 4.47)*
Right longitudinal diameter	*3.52±0.23 (0.05-4.60)*	*3.80±0.31 (3.14 -4.80)*

IOF=infra-orbital-foramem.
Number in parentheses is range.
** Significant difference*

***Table 2**. Effect of side on the distance (mm) between IOF-IOM in male and female Nigerians*

IOF-IOM	Male	Female
Right IOF-IOM	6.82±0.02 (3.25 ± 10.98)	5.72±0.84 (3.86- 8.10)
Left 1OF-IOM	7.46±0.18 (2.60 -12.18)	5.72±0.84(6.20-9.16)*

IOF=infra-orbital-foramem, IOM= infra-orbital-margin
Number in parentheses is range.
** Significant difference*

nerve and vessels; knowledge of its position is very useful to the professionals who manipulate the maxilla region, for instance, in acupuncture, or maxillofacial surgery. The accurate identification of the infraorbital foramen is important for both diagnostic and clinical procedures.

In this study the right longitudinal and transverse diameters were 3.52 ± 0.23 and 2.55± 0.07 mm for males respectively while the female parameters were 3.80± 0.31, 2.97± 0.26 mm. The left longitudinal and transverse diameters were 3.09 ± 0.10 and 2.46± 0.08 for males respectively while the female parameters were 3.58± 0.26, and 3.05± 0.40 mm. This is different from the previous study of Brazilian skulls by Elias et al (2004) (7), where they reported right longitudinal and transverse diameter to be 6.71 ± 1.70 and 13.28 ± 2.17mm while the left long and transverse were found to be 6.83 ± 1.83 and13.31 ± 2.19. Hence the dimensions of the left side of the skull were greater than the right side.

Report of Lopes et al (2009)(8) on the morphometric measurements of the distance from the infraorbital foramen to the infraorbital margin showed that the distance in male and female subjects on the right side of the skull was 6.64±1.75mm and 6.36±1.55mm respectively and the distance in male and female subjects on the left side of the skull was 6.87±1.64mm and 6.46±1.61mm respectively. They also found the distance in the right and left sides of the female skulls to be 6.41±1.57mm and that of the male skulls was found to be 6.76±1.69mm. Also Macedo et al 2009 (9) found the general mean to be 6.37± 1.69 with a mean of 6.28 ±1.79 on the right side and 6.45± 1.76 on the left side. The differences are insignificant when compared to the recent study which showed male parameters on the left and right to be 7.46 ± 0.18 (2.60-10.79) and 6.82± 0.20 (3.25-10.98) mm while the female parameters on were 5.72± 0.18 (6.20-9.16) and 5.72 ±0.84 (3.86-8.10) mm respectively. This agrees with work done by Hollinshead 1982, Hindy and Abdel-Raouf 1993, Chung et al 1995, Karakas et al 2002 (10-13) which ranged from 4mm to over 10mm.

The distance between infraorbital foramen to the lateral nasal border found in this study was 16.15± 0.31 and 15.17± 0.99 mm for male and female on the right side while the left side was 17.72 ± 0.25 and 15.41± 1.18 for male and female respectively. These values were higher than the result obtained in Egyptian population which recorded 14.7± 2.7 mm (11). The distance between infraorbital foramen to the lateral nasal border also is in agreement with that reported by Kazkayazi et al 2001(2) whose average was found to be 17.23± 2.64

In the study carried out on Thai skulls by Wandee et al (2006) (14), the shape of the infraorbital foramen was oval in 50% cases, semilunar in 29.2% cases and round in 20.8% cases, hence the oval-shaped infraobital foramen are more than that of the round and semilunar. This result is consistent with the present study of the shape of infraorbital foramen where the oval- shaped infraorbital foramen (71% and 77% on both the right and left sides of the skull) is more prominent than others (round in 21% and semilunar in 3% on the right side; and on the left side, round in 20% and semilunar in 0.3% of cases).

In conclusion, this study provides data that will be useful in predicting the locations concerning the morphology of the infraorbital foramen, especially in the Nigerian population. The knowledge of the distances from surgically encountered anatomical landmarks in the present study

***Table 3**. Effect of side on the distance (mm) between IOF -LNB in male and female Nigerians*

IOF-LNB	Male	Female
Right IOF-LNB	16.15±0.30(10.21-20.99)	15.17±0.99(12.60-17.49)
Left IOF-LNB	17.72±0.25(11.2-21.2)	15.41±1.18(11.2-18.35)*

*IOF=infra-orbital-foramem, LNB = lateral nasal border. Number in parentheses is range. * Significant difference*

may assist surgeons to localize these important maxillofacial openings; avoid injury to the neurovascular bundles and facilitate surgical, local anesthetic and other invasive procedures.

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