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Morphometric Analysis of Infraorbital Foramen in South Indian Skulls

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ABSTRACT

The maxillae are paired bones in the face which forms the roof of the oral cavity, forms the upper jaw ,and houses the teeth.The infraorbital foramen is an anatomical structure present bilaterally on the maxillary bone below the infraorbital margin which transmits infraorbital vessels and nerves.The infraorbital foramen is an opening by which the infra orbital canal giving passage to the infra orbital artery,vein and nerve and communicates with the face.The infraorbital foramen is a very important landmark for oral and maxillofacial surgery and local anaesthesia.The study of infra orbital foramen is significant in local anaesthesia procedures in maxillofacial surgeries and consequently in protection against procedural neurovascular injuries.The presence of accessory infra orbital foramen may be difficult during anesthetization of the region inter aged by infra orbital nerve.The aim is to study the morphometry of the infraorbital foramen with respect to nearby anatomical landmarks in different skulls of south indian population. Presence of accessory infraorbital foramen was very rare. Only 3 skulls had accessory infraorbital foramen. The parameters which were measured should be known to help in giving anaesthesia in a correct and proper position of a person.

KEY WORDS: : INFRAORBITAL FORAMEN; ANTERIOR NASAL SPINE; LOCAL ANAESTHESIA; ACCESSORY INFRAORBITAL FORAMEN.

INTRODUCTION

The infraorbital foramen (IOF) is situated bilaterally on the maxillary bone, down to the infraorbital border, close 1cm, but there are variations in size from 4 to 12 mm. This foramen is directed inferior medial and in it passes the nerve and vessels which have its same name (Elias et al., 2004). It is relatively larger than the supraorbital foramen and varies in form and position.. The infraorbital nerve is a totally sensory nerve that innervates the skin of the upper cheek, mucosa of the maxillary sinus, maxillary incisor, canine and premolar teeth and adjacent gingivae, the skin and the conjunctiva of the inferior eyelid, part of the nose and the skin and the mucosa of the upper lip(Ilayperuma, Nanayakkara and Palahepitiya, 2010).

A nerve block is essential during surgical procedures around the infraorbital foramen. Therefore the location of the infraorbital foramen assumes great importance (Singh, 2011). The study of the infraorbital foramen is significant in local anesthesia procedures in maxillofacial surgeries and consequently in protection against procedural neurovascular injuries(Veeramuthu et al.,

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2016). The infraorbital foramen at infancy lies very close to the infraorbital margin. Due to the lateral growth of the face as a whole, the maxilla also grows longitudinally. Hence, the distance increases with age gradually(Begum et al., 2019).

In previous studies most commonly measurements on the height and width of the IOFs and the distances from the foramen to the anterior nasal spine (ANS) (Fig. 1) and distance between IOF and Infraorbital margin (IOM) (Fig 2) were made with the aid of digital calipers with precision to 0.01 mm (de Oliveira et al., 2016). The anaesthetic complications can be avoided if the position, shape and direction of IOF is known. Mostly presence of accessory infraorbital foramina is troublesome for anaestization(Veeramuthu et al., 2016). Multiple studies have demonstrated that the dimensions and relative position of the IOF vary between the genders and among different population groups. To know the exact location of IOF various soft tissue and bony anatomical landmarks have been used. Significant variations have been reported in the literature with regard to the position of IOF in relation to the infraorbital margin (Nanayakkara et al., 2016).

Despite its clinical relevance, information available on the dimensions and relative position of the IOF in this study is limited as only a limited number of south indian skulls were used. Hence, the present study was done to analyse the presence of accessory foramina, the shape, dimensions and position of the IOF in relation to important anatomical landmarks. Previously our department has published with a rich case bank established over 3 decades we have been able to publish extensively in our domain (Abdul Wahab et al., 2017; Eapen, Baig and Avinash, 2017; Patil et al., 2017; Jain and Nazar, 2018; J et al., 2018; Marimuthu et al., 2018; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019; Senthil Kumar et al., 2019; Sweta, Abhinav and Ramesh, 2019). Based on this inspiration we aim to study the morphometry of the infraorbital foramen with respect to nearby anatomical landmarks in different skulls of south indian population.

MATERIAL AND METHODS

30 adult dry human skulls of unknown sex of south indian origin were investigated. The skulls which are damaged were excluded. The skulls were obtained from the Department of Anatomy, Saveetha Dental College, Chennai, Tamilnadu, India. All the parameters were measured in the following planes:
The maximum vertical diameter of the IOF.
The maximum horizontal diameter of the IOF.
The distance between the inferior orbital margin (IOM) and the infraorbital foramen (IOF) (Fig. 2)
The distance between the anterior nasal spine (ANS) and the infraorbital foramen (IOF) (Fig.1)
Presence of accessory foramina.

Location: The measurements related to IOF were taken with vernier calipers to measure the distance. From the

Figure 1: Distance between IOF and Anterior nasal spine

Figure 2: Distance between IOF and IOM

above measurements mean value was calculated.

The infraorbital foramen was studied in 30 adult dry human skulls and it was present in all the skulls. The location of infra orbital foramen has become mandatory for different procedures to reduce the risk in orbital surgeries. Knowledge of the position of the IOF is very useful to dentists as well as to head and neck surgeons for both diagnostic and clinical procedures. The measurements was taken using various parameters are shown in Table1.The mean distance from centre of left IOF and IOM was found to be 5.32mm, and the mean distance from the nasal spine was found to be 31.56mm, and the mean of horizontal and vertical diameter of left IOF was found to be 2.6mm and 3.11mm.The mean distance from centre right IOF and IOM was found to be 4.96mm, the mean distance from the nasal spine was found to be 31.56mm and the mean vertical and horizontal diameter of right infraorbital foramen was found to be 3.11mm and 2.6mm respectively. Most of the left and right infraorbital foramen were round in shape. Presence of accessory infraorbital foramen was very rare. Only 3 skulls had accessory infraorbital foramen.

In previous studies,it was found that the infraorbital foramina were located at an average distance of 6.33 ± 1.39 mm below the infraorbital margin(Aggarwal et

al., 2015),which varies from the present study. This can be due to the fact that the skulls taken were not south indian.In another study the mean horizontal distance was 4.9 mm(right, 4.9 mm; left, 4.9 mm). The mean vertical diameter was 5.5 mm (right, 5.3 mm; left, 5.6 mm)(Takahashi, Kakizaki and Nakano, 2011).The results vary from the present study as the skulls taken by the previous study were japanese skulls.The shape of IOF was vertically oval, horizontally oval(Varshney and Sharma, 2013),whereas mostly round in the present study.This study did not include all the soft tissue present around the infraorbital foramen when compared to previous studies(Ercikti, Apaydin and Kirici, 2017)(Hwang et al., 2013)(Chrcanovic, Abreu and Custódio, 2011)(Kazkayasi et al., 2001)

Table 1. Shows the mean vertical and horizontal diameters, of left & Right Infraorbital foramen, Mean distance between IOF and IOM and the mean distance between IOF and nasal spine.

	AVERAGE DISTANCE BETWEEN IOF & IOM inmm	AVERAGE DISTANCE BETWEEN IOF & ANTERIOR NASAL SPINE in mm	AVERAGE VERTICAL DIAMETER OF IOF in mm	AVERAGE HORIZONTAL DIAMETER OF IOF in mm	SHAPE
Left infraorbital foramen	5.32	31.8	2.88	2.59	Round
Right infraorbital foramen	4.96	31.56	3.11	2.6	Round

CONCLUSION

The parameters which were measured should be known to help in giving anaesthesia in a correct and proper position of a person.The landmarks described could be identified and effectively applied with success in various clinical scenarios, thereby decreasing the risk of failures and complications during local anaesthesia.

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Conflict of Interest: The author declares that there is no conflict of interest in the present study.

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