

Anatomical Variations of Supraorbital, Infraorbital and Mental Foramen based on Gender and Side- A Review

Akshay Satwik, Saravana Kumar

Abstract:

The aim of the study is to review the anatomical variations of supraorbital, infraorbital and mental foramen related to gender and side in the dry skull. From our review, we found that supraorbital foramen lies 23.9mm right and 25.6mm left from the nasion approximately. Similarly we found that infraorbital foramen lies in the maxillary bone lower to the edge of the orbital canal and it is bilateral, which contains infraorbital nerve and vessels. The mean distance from the lower edge of the orbital cavity to the center of infraorbital foramen do not show any significant differences regarding laterality in male and female individuals, both between genders, regardless of the side and regardless of genus. Likewise, mental foramen is found in the mandible which is oval or round in shape located at the interval between the mandibular premolar, through which mental nerves and vessels pass. A review of the literature revealed that the incidence of 1.2% of the triple foramina after investigating dry skulls. From the comparisons of results from previous studies, the large variation of the anatomical characteristics of all the foramina is evident, not only due to the diversity of the used parameters, but also due to the distinct investigated populations.

Keywords: Anatomy, review, skull, variation and foramen.

INTRODUCTION:

The supraorbital, infraorbital and mental foramen lie in the skull, they are bilateral. The supraorbital margins are formed by the frontal bone. At the junction of its lateral two-thirds and medial one-third, it presents the supraorbital foramen. Knowledge of variations of supraorbital foramen in maxillofacial surgery provides an accurate approach and helps to facilitate the surgeon's innervations. Even the anatomical variation of these regions has special considerations for oculoplastic surgery. The infraorbital margin is formed by the zygomatic bone laterally and the maxilla medially. The infraorbital foramen lies 1cm below the infraorbital margin, lower to the edge of the orbital cavity and it is bilateral. The infraorbital nerve and vessels run through this foramen. The study and acknowledgement of the anatomical variations of the infraorbital foramen are significant in local anesthesia procedures, in the effective blockage of the infraorbital nerves. Mental foramen lies in the mandible, below the interval between the premolar teeth. It is round or oval in shape, through which mental nerves and vessels pass. The following nerves and vessels are localized to give anesthesia during surgeries. In dentistry, anesthesia is given during extraction.

METHODS:

Articles that address the position, number and size of the supraorbital, infraorbital and mental foramen were evaluated for information in clinical performing maxillofacial surgery, blockage of infraorbital nerves, even help during osteotomy procedure and before implant surgery.

DISCUSSION:

The review on this topic with reference to certain articles (Table 1), it has been found that supraorbital foramen is found in relation to midline nasion. However, published reports on the anatomy of supraorbital foramina had different methodological approaches. In 1998 Beer et al focused on symmetry reported a novel classification on 507 European skulls. His result was that the supraorbital foramen are not at constant level. In 1993 Saylam et al made a comprehensive description based on supraorbital foramen and notch. In his report he did not find any non-existent foramina with 50 cadavers and 200 crania. These two didn't find any evaluation according to gender and age. In 1986 Webster et al studied 111 skulls and reported bilateral foramina in 26% and unilateral foramen 25%. In 2003 Cutright et al enrolled 80 skulls of known race and sex reported that 92.5% which was supraorbital notch. In 2005, Angthong et al reported significant size and sex differences in 110 Asian adult skulls reported as average distance of supraorbital foramina from midline was 23.9mm and 24.6mm in right and 24.2mm and 25.6mm in left side in men and women respectively.

Infraorbital foramen lies in maxillary bone lower to the edge of the orbital cavity. In 1975 Berry reported that there are variations regarding gender and different population. In 1996 by Molliex, Navez and Baylot their study also applies to sectional blockage of infraorbital nerve. Thus, allowing for good intra-surgical conditions. In 2001 Aziz, Marchena and Puran from their study reported that the infraorbital foramen varies according to

location, size, shape, laterality and incidence of accessory foramen. In 2005, Agthong, Huanmanop and Chentonez, In their study revealed that infraorbital foramen was absent in 73.7% of investigated skulls, With their analysis found that 3.6% on the right side and 4.5% on the left side, but with the significant difference thus suggesting that laterality and not genus has to be accounted for the location and the approach of infraorbital foramen. In 2006 a study by Apinihasmit, Chompoopong, Methathathip et al them on Thai skulls reported that the infraorbital foramen are 3.3%double.

Mental foramen is found in mandible. In 1976 Fishel et al reported that mental foramen location in the vertical plane for the first and second pre-molars. Thus, after extraction of the teeth and resorbition of alveolar bone

the mental foramen is closer to the alveolar crest. However, the other researchers noted that a high rate of sensory dysfunction post operatively. In 1986 Gerhenson A, studied 525 mandibles and reported that mental foramen are found double in 4.3% of population and triple in 0.7% and quadruple in 0.1%. In 1998 M bajiorgu et al found that there are different shape of mental foramen in mandible. Reported that 34.5% of foramina are round 65.5% are oval. Agthong et al indicated that foramen was 28mm from away from the midline of the mandible. Similarly. In 2004 Neiva et al reported that foramen was 27.6mm from the midline and 12mm from the apical portion. In 2009 Naitoh studied 157 mandibles and reported that mental foramen are 7% double and 1.2% triple.

TABLE: 1: Reports of Position of Supraorbital, Infraorbital and Mental Foramen.

Author's Name and Year	Related Foramen	Population	Results
1. BERRY (1975)	Infraorbital foramen	A study done in 99 skulls to find variations in Infraorbital foramen	Infraorbital foramen variations are found regarding genus and different population.
2. FISHEL et al (1976)	Mental foramen	A study was done in 1000 number of dry skulls to find the position of foramen.	Found that 18.9% of foramen are at apical to the second premolar and 70.4% between the apices of premolars.
3. WEBSTER et al (1986)	Supraorbital foramen	He studied 111 skulls, To find percentage of bilateral foramens.	He reported that in 26% of population the foramens are bilateral and 25% located on either of the side.
4. GERSHENSON A (1986)	Mental foramen	He studied 525 number of mandibles by viewing preoperative computed tomography.	He found that 4.3% of population has double foramen, 0.7% triple foramen and 0.1% quadruple.
5. SULIVA, JULIANO AND YAMAMURA (1998)	Infraorbital foramen	A study on Brazilian individuals using Mitutoyo caliper measured the distance from anterior nasal spine.	He found foramen is very much closer to anterior nasal spine distance even less than 34.18+ or - 3.50.
6. Angthong (2005)	Supraorbital foramen	He studied 110 asian skulls to find the distance of foramen from midline using parameter.	He reported that distance of supraorbital foramina from midline was 23.9mm and 24.6mm in right and 24.2mm and 25.6mm in left side in men and women respectively.

REFERENCES:

- [1] Abrahams P., Marks S., Hutching R., Hardwick L. and Spratt M.A. (2003): McMinn's, A colour Atlas of human anatomy, 5th ed. Wolfe Medical Publications, London, P. 31- 36.
- [2] Agthong S., Hummanop Th. and Chentanez V. (2005): Anatomical variations of the supraorbital, infraorbital and mental Foramina Related to Gender and Side J. Oral Maxillofacial Surg. 63 : 800 –804.
- [3] Apinhasmit W., Chempoogonez S., Methathrathip D., Sa UK R., and Phetphunphiphat W. (2006): Supraorbital notch / foramen, infraorbital foramen and mental foramen in this : Anthropometric measurements and Surgical relevance J. Med. Assoc. This 89 (5) :675 – 682.
- [4] Aziz S.R., Marcena J.M. and Puran A. (2000): Anatomic Characteristics of infra orbital foramen : Acaelover study. J. Oral Maxillofacial Surgery, 58 (9) : 992 – 996.
- [5] Bademci, G.; Kindi, T. and Agalar F. (2007): Persistent metopic suture can mimic the skull fractures in the emergency setting? Neuralgia (Astur) 18 (3) : 238 – 240.
- [6] Bayadas B., Youuzi I., Uslu H., Dagsuyu I.M. and Ceyland I. (2006): Nonsurgical rapid maxillary expansion effects on craniofacial structures in young adult females. Abone Scintigraphy study. Angle Ortho 76 (5): 759 – 767
- [7] Beer G.M., Putz R., Mager K., Schumacher M. and Keil W. (1998): Variations of frontal exit of the supraorbital nerve : an anatomic study. Plastic Reconstr. Surg. 102 : 334 – 341.
- [8] Benden U., Edizer M., Emali M., Lcten N., Gungor I., Sulu Y. and Erkan D. (2007): Surgical anatomy of the deep lateral orbital wall. Eur. J. Ophthalmol. 17 (3) : 281 – 286.
- [9] Berge J.K. and Bergman R.A. (2001): Variations in size and in symmetry of foramina of the human skull. Clin. Anat., 14(6): 406.
- [10] Bressan C., Geuna S., Malerba G., Giacobini G., Griordano M., Robicchi M.G. and Vercillino V. (2004): Descriptive and topographic anatomy of accessory infraorbital foramen, clinical implication in maxillary surgery. InervaStomatol. 53 (9): 495 – 505.
- [11] Buretic – Tomljanovic A., Giacometti J., Ostojic S. and Kapovic M. (2007): Sex specific differences of craniofacial traits in Croatia : the impact of environment in small geographic area. Annu. Hum. Biol. 34 (3) : 296 – 314.
- [12] Campbell M.J. and Machin, D. (1993): Medical statistics. A commonsense approach 2nd ed., John Wiley & sons New York; Chichester; Brisbane. Toronto & Singapore, 4 : 18 – 25.
- [13] Cheng A.C., Yuen H.K., Lucas P.W., Lam D.S. and So K.F. (2006): Characterization and localization of the supra orbital and frontal exits of the supraorbital nerve in Chinese Anatomic study. Ophthalm. Surg. 22 (3) : 209 – 213.
- [14] Chung M.S., Skim H.L., Kang H.S. and Chung I.H. (1995): Locational relationship of the supraorbital notch or foramen and infraorbital and mental foramina in Koreans. Act anat. 154 : 162 – 166.
- [15] Cutright B., Quillopa N. and Schubert W. (2003): An anthropometric analysis of the key foramina for maxillofacial surgery. J. Oral Maxillofac. Surg. 61 (3) : 354 – 357
- [16] Darke R.L., Vogl W., Michell A., Tibbitts R. and Richardson P. (2008): Gray's atlas of anatomy international ed. Churchill Livingstone. Philadelphia P 10 – 30.
- [17] De Stefano G.F. and Hawser G. (1983): Structures : some reflections on topographic anatomy and methodology. Act. Com. III. Congr. Antrop. Biol. Esp., Santiago de Compostela, PP. 550 – 565
- [18] Forment A. (1992): Morphologic differentiation of modern humans: correspondence between skull form and geographic distribution of population CR Acad. Sci. III : 315 (8) : 3423 – 3429.
- [19] Francesquini Junior L., Francesquini M.A., De La Cruz B.M., et al., (2007): Identification of sex using cranial base measurements. J. Forensic Odontostomatol. 25 (1) : 7-11.
- [20] Gönül E., Erdogan E., Duz B. and Timurkayank E. (2003): Transmaxillary approach to the orbit an anatomic study Neurosurgery. 53 (4) : 935 -41; discussion 941 – 2.
- [21] Hanihara T. and Ishida H. (2001): Frequency variations of discrete cranial traits in major human population vessels and nerves related variations. J. Anat. 199 (Pl. 3) : 273 – 287.
- [22] Hildebolt C.F., Vannier M.W. and Knapp R.H. (1990): Validation study of skull three dimensional computerized tomography measurements. Am. J. Phys. Anthropol. 82 (3) : 283 – 294.
- [23] Hu K.S., Kwak, H.H., Song W.C., Kong H.J., Kim H.C., Fontanic and Kim H.J. (2006): Branching patterns of the infra orbital nerve and topography within the infraorbital space. J. exaninofor Surg. 17 (6): 121 -125.
- [24] Kazkayasi M., Ergin A. and Ersoy M. (2001): Certain anatomical relations and morphoment of infraorbital foramen – canal and groove and anatomical and cephalometric study. Laryngoscope 111 : 609 –614.
- [25] Kim M.K. (1993): A clinical and anatomical study on the infra orbital foramen and infra orbital canal in Korean. J. Phys. Anthropol. 6: 101 – 110.