

Location Of Greater Palatine Foramen In Dry Human Skulls

Research Article

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Abstract

The position of the greater palatine foramen varies between standard anatomy texts and various anthropometric studies. This study was done to locate the position of the foramen in relation to the maxillary molars in dry human skulls in Indian population. A total of 61 adult dry human skulls were selected. Measurements were made from the mid sagittal plane to the middle of the greater palatine foramen using a Digital vernier caliper. The overall position of the foramen was medial to the 3rd molar in 40 skulls, between 2nd and 3rd molar in 13 skulls and distal to the 3rd molar in 8 skulls. The overall position of the greater palatine foramen was medial to the 3rd molar in 40 skulls, between 2nd and 3rd molar in 13 skulls and distal to the 3rd molar in 8 skulls. The location of greater palatine foramen was about 1.36cm in third molar and mid palatine suture in both the genders.

Keywords: Greater Palatine Foramen; Maxillary Molar; Dry Human Skull.

Introduction

Blocking the greater palatine nerves and vessels is essential for various procedures in dentistry including molar and premolar extractions during upper molar and premolar tooth preparation, root canal treatments, sinus elevation in for dental implants in posterior maxilla [1]. Anesthetizing this nerve would provide anaesthesia of the posterior lingual soft tissue part of the maxilla [2]. The exact location of the foramen is unknown and various standard texts books provide only a general location and position of the foramen e.g lateral slope of the hard palate, between the 2nd and 3rd molar medial to the 3rd molar [3].

The position of the greater palatine foramen varies between standard anatomy texts and various anthropometric studies. Hence, this study was done to locate the position of the foramen in relation to the maxillary molars in dry human skulls in Indian population. This study also examined the greater palatine foramen and its distance from the mid palatine suture. This study will give the ability to predict the location of the greater palatine foramen without difficulty [4] to provide anaesthesia with a single injection. This provides better comfort for the patient than treat-

ment that requires repetitive injections.

Materials And Methods

This study was conducted on 61 adult Indian dry skulls available in the department of Anatomy in Saveetha Dental college, Chennai. Out of which 30 were male and 31 were female. A digital metal sliding caliper was used for measurements with a starting precision value of 0.0mm. All measurements were performed symmetrically, left-right. Skulls included for the study were normal with uniform arch form (U shaped) and had full complement of teeth with fully erupted 3rd molars.

Measurements were made with definite points on the right and left side of the hard palate.

The measurements were made from defined location in the foramen (centre of foramen).

- (1) Location of the foramen in relation to maxillary molar teeth
- (2) Distance from the middle of the greater palatine foramen to the mid sagittal suture.

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Result

Variation in location of greater palatine foramen in relation to third molars was recorded (Table 1). On the right side it was about 1.36cm and on the left it was about 1.367cm. There was no difference in the average mean value between male and female skulls. The distance of greater palatine foramen from the mid sagittal suture was about 1.36cm for both male and female skull. In majority of Indian skulls the greater palatine foramen was medial to the 3rd molar in 40 skulls, between 2nd and 3rd molar in 13 skulls and distal to the 3rd molar in 8 skulls. The Difference between the male and female skull and its distance from the mid sagittal suture was analysed using independent t test. There was no statistical significance ($P > 0.05$) (Table 2).

Discussion

The main aim of the study was to locate the position of the greater palatine foramen for greater palatine nerve block which varies in position from patient to patient. The locations described in the study can be easily detected clinically with reference to the molars. Even in the absence of any one molar the other molar can be used as a reference from the mid sagittal plane to locate its position.

According to Westmoreland et al [5] the greater palatine foramen was located 1.5cm from the palatal midline with the location of the foramen being opposite to the second molar in most of the cases. Wang et al stated that distance between the mid sagittal plane and the greater palatine foramen to be 16mm and in most cases the foramen was found to be located between the maxillary second and third molar [6]. Methatharithpet al in his study observed the distance between the mid sagittal plane to the greater palatine foramen to be around 16.2 ± 1.3 mm and the location of the foramen to be located palatal to the upper third molar in most of the cases [7]. Sujatha et al analysed that the location of the greater palatine foramen was medial to the third molar in 85.95% of skulls [8].

In the study by Chrcanoivcet al, the distance of the greater palatine foramen from the mid maxillary suture in brazilian skulls was about 14mm and the location of the greater palatine foramen

was found to be opposite or distal to the maxillary third molar (93.81%) [9]. A study done in dry human skulls by Surabaya and Nayak showed that the distance of the greater palatine foramen to the mid sagittal plane was about 15mm and its location to the maxillary molars was found to be opposite the maxillary third molars [10]. A study done in adult caucasoid skulls by Jaffar et al, showed the greater palatine foramen to be 1.57cm from the mid maxillary plane and the foramen to be related to the upper third molar in most of the skulls [11] (55%). Analysis of the location of the greater palatine foramen in relation to the third molars was found to be common in adult indian skulls, a study done by Kumar et al. [12].

According to a study done by Langenegger et al the greater palatine was located between 10mm and 16mm to the pterygoidhamulus and is distal to the upper third molar [13]. Klosek reported that the greater palatine foramen was located palatal to the third molar in most of the cases; interproximal to second and third molar in 35.7% in woman and palatal to second molar in 63% in men [14].

Ikuta et al., reported that the greater palatine foramen was located in the third molar region in 92 skulls in both male and female; its distance from the mid maxillary suture was found to be around 15.3mm [15]. In a study done by Sharma the distance of the greater palatine foramen to the mid maxillary suture was found to be 14.49mm and its relation to the third molar was opposite the maxillary molar in 73.38% of skulls [16]. Nimigeen et al reported that the distance between the greater palatine foramen and the mid maxillary suture to be around 14.3mm and the location of the foramen to be opposite the third molar in 73 skulls [17]. A cadaver study done by Jia-HuiFu et al observed the location of the greater palatine foramen to be located between the second and third molar in 66.6% of cases [18].

A study done by Lopes et al reported that the distance between the greater palatine foramen and the mid sagittal plane in male skulls were found to be around 15.6mm and 15.4mm (right and left side); in female it was found to be around 15.63mm in the right and 15.47mm in the left side [19]. Palatal analysis done by Hassanali and Mwaniki in 1984 reported that the greater palatine foramen was located at the level of the third molars in 76% of the cases, intermediate between second and third molar in 13.6% of cases and opposite the second molar in 10.4% of the cases [20].

Table 1. Variation in location of greater palatine foramen in relation to third molars.

LOCATION	MEDIAL TO 3RD MOLAR	BETWEEN 2ND AND 3RD MOLAR	DISTAL TO 3RD MOLAR
RIGHT	22	7	5
LEFT	18	6	4
TOTAL	40	13	8

Table 2. Position of Greater Palatine Foramen in Male and Female skulls.

LOCATION	RIGHT SIDE	LEFT SIDE	P VALUE
DISTANCE FROM THIRD MOLAR (CM)	1.36	1.367	$P > 0.05$
DISTANCE FROM MID SAGITTAL SUTURE (CM)	1.36	1.36	$P > 0.05$

Maria Piagkou et al reported that the greater palatine foramen was present proximo distal to the 3rd molar in 76.2% of cases: the distance between the foramen and the mid sagittal plane being 1.53cm [21]. Similarly a study done by D'Souza et al reported that the distance between the greater palatine foramen from the mid sagittal plane was about 14mm and the great palatine foramen was found at the level of the third molar in 75% : in between second and third molar in 22.5% and at the level of 2nd molar in 2.5% of cases [22].

The most common position of greater palatine foramen according to Osunwoke et al was opposite third molar in 75.30% [23]. A study done in indian skulls by Anjankar et al reported that the distance between the greater palatine foramen to the mid sagittal plane was about 15.3mm and the foramen was located opposite third molar in 73.26% of the skulls [24]. A study done in north indian skulls by Renu C showed that the position of the greater palatine foramen to be medial to the 3rd molar in most of the cases and the mean distance of the foramen from the mid sagittal plane to be 1.53 cm on the right side and 1.50cm on the left side. Thus in majority of the cases the greater palatine foramen was found to be medial to the third molar [25].

Conclusion

The overall position of the greater palatine foramen was medial to the 3rd molar in 40 skulls, between 2nd and 3rd molar in 13 skulls and distal to the 3rd molar in 8 skulls. The location of greater palatine foramen was about 1.36cm in third molar and midpalatine suture in both the genders.

References

- [1]. Wong JD, Sved AM. Maxillary nerve block anaesthesia via the greater palatine canal: a modified technique and case reports. *Aust Dent J.* 1991 Feb;36(1):15-21. Pubmed PMID: 2029227.
- [2]. Malamed SF, Trieger N. Intraoral maxillary nerve block: an anatomical and clinical study. *Anesth Prog.* 1983 Mar-Apr;30(2):44-8. Pubmed PMID: 6587797.
- [3]. Ajmani ML. Anatomical variation in position of the greater palatine foramen in the adult human skull. *J Anat.* 1994 Jun;184 (Pt 3):635-7. Pubmed PMID: 7928651.
- [4]. Tomaszewska IM, Tomaszewski KA, Kmietek EK, Pena IZ, Urbanik A, Nowakowski M, et al. Anatomical landmarks for the localization of the greater palatine foramen—a study of 1200 head CTs, 150 dry skulls, systematic review of literature and meta-analysis. *J Anat.* 2014 Oct;225(4):419-35. Pubmed PMID: 25131842.
- [5]. Westmoreland EE, Blanton PL. An analysis of the variations in position of the greater palatine foramen in the adult human skull. *Anat Rec.* 1982 Dec;204(4):383-8. Pubmed PMID: 7181144.
- [6]. Wang TM, Kuo KJ, Shih C, Ho LL, Liu JC. Assessment of the relative locations of the greater palatine foramen in adult Chinese skulls. *Acta Anat (Basel).* 1988;132(3):182-6. Pubmed PMID: 3414365.
- [7]. Methathrathip D, Apinhasmit W, Chompoopong S, Lertsirithong A, Ariyawatkul T, Sangvichien S. Anatomy of greater palatine foramen and canal and pterygopalatine fossa in Thais: considerations for maxillary nerve block. *Surg Radiol Anat.* 2005 Dec;27(6):511-6. Pubmed PMID: 16228112.
- [8]. Sujatha N, Manjunath KY, Balasubramanyam V. Variations of the location of the greater palatine foramina in dry human skulls. *Indian J Dent Res.* 2005 Jul-Sep;16(3):99-102. Pubmed PMID: 16454323.
- [9]. Chrcanovic BR, Custódio AL. Anatomical variation in the position of the greater palatine foramen. *J. Oral Sci.* 2010;52(1):109-13.
- [10]. Saralaya V, Nayak SR. The relative position of the greater palatine foramen in dry Indian skulls. *Singapore Med J.* 2007 Dec;48(12):1143-6. Pubmed PMID: 18043845.
- [11]. Jaffar AA, Hamadah HJ. An analysis of the position of the greater palatine foramen. *J Basic Med Sci.* 2003;3(1):24-32.
- [12]. Kumar A, Sharma A, Singh P. Assessment of the relative location of greater palatine foramen in adult Indian skulls: Consideration for maxillary nerve block. *Eur J Anat.* 2011 Sep 1;15(3):150-4.
- [13]. Langenegger JJ, Lownie JF, Cleaton-Jones PE. The relationship of the greater palatine foramen to the molar teeth and pterygoid hamulus in human skulls. *J Dent.* 1983 Sep;11(3):249-56. Pubmed PMID: 6580311.
- [14]. Klosek SK, Rungruang T. Anatomical study of the greater palatine artery and related structures of the palatal vault: considerations for palate as the subepithelial connective tissue graft donor site. *Surg Radiol Anat.* 2009 Apr;31(4):245-50. Pubmed PMID: 19015806.
- [15]. Ikuta CR, Cardoso CL, Ferreira-Júnior O, Lauris JR, Souza PH, Rubira-Bullen IR. Position of the greater palatine foramen: an anatomical study through cone beam computed tomography images. *Surg Radiol Anat.* 2013 Nov;35(9):837-42. Pubmed PMID: 23811933.
- [16]. Sharma NA, Garud RS. Greater palatine foramen—key to successful hemimaxillary anaesthesia: a morphometric study and report of a rare aberration. *Singapore Med J.* 2013 Mar;54(3):152-9. Pubmed PMID: 23546029.
- [17]. Nimigean V, Nimigean VR, Buşinciu LA, Sălăvăstru DI, Podoleanu L. Anatomical and clinical considerations regarding the greater palatine foramen. *Rom J Morphol Embryol.* 2013 Jan 1;54(3 Suppl):779-83.
- [18]. Fu JH, Hasso DG, Yeh CY, Leong DJ, Chan HL, Wang HL. The accuracy of identifying the greater palatine neurovascular bundle: a cadaver study. *J Periodontol.* 2011 Jul;82(7):1000-6. Pubmed PMID: 21284546.
- [19]. Mayor AM. Morphometric analysis of the greater palatine foramen in dry Southern Brazilian adult skulls. *Int. J. Morphol.* 2011;29(2):420-3.
- [20]. Hassanali J, Mwaniki D. Palatal analysis and osteology of the hard palate of the Kenyan African skulls. *Anat Rec.* 1984 Jun;209(2):273-80. Pubmed PMID: 6465536.
- [21]. Piagkou M, Xanthos T, Anagnostopoulou S, Demesticha T, Kotsiomitris E, Piagkos G, et al. Anatomical variation and morphology in the position of the palatine foramina in adult human skulls from Greece. *J Craniomaxillofac Surg.* 2012 Oct;40(7):e206-10. Pubmed PMID: 22055651.
- [22]. D'Souza AS, Mamatha H, Jyothi N. Morphometric analysis of hard palate in south Indian skulls. *Biomed. Res.* 2012 Apr 1;23(2):173-5.
- [23]. Osunwoke EA, Amah-Tariah FS, Bob-Manuel IF, Nwankoala QK. A study of the palatine foramen in dry human skulls in South-South Nigeria. *Scientia Africana.* 2011;10(1).
- [24]. Anjankar VP, Gupta SD, Nair S, Thaduri N, Trivedi GN, Budhiraja V. Analysis of position of greater palatine foramen in central Indian adult skulls: a consideration for maxillary nerve block. *Indian j. pharm. Boil. res.* 2014 Mar 31;2(01):51-4.
- [25]. Renu C. The position of greater palatine foramen in the adult human skulls of North Indian origin. *J Surg Acad.* 2013;3:54-7.