 DOI: 10.18231/2455-846X.2017.0004

Anatomical and clinical considerations regarding the greater palatine foramen

Zuberi Hussain Riyaz[1,*], Ahar Ahmed Siddiqui[2]

[1]Associate Professor, [2]Professor & HOD, Dept. of Anatomy, JIUs Indian Institute of Medical Sciences & Research, Warudi, Maharashtra

***Corresponding Author:**
Email: zuberihussain@gmail.com

Abstract

Knowledge of the position of the greater palatine foramen (GPF) is very important for anaesthesia in posterior part of soft palate in various surgical procedures. Blocking of maxillary division of trigeminal nerve or its branches is common practice for maxillofacial surgeries for local anaesthesia.

Objective: The aim of this study is to determine the morphology of greater palatine foramen in relation to certain fixed points.

Methodology: The present study was conducted on 43 dry adult Maharashtrian skulls. The measurements were taken with compass asthesio meter. Using flexible stainless steel wire direction of opening of GPF into oral cavity was noted.

Results: In 69.76% cases, GPF is located opposite third maxillary molar tooth. Mean distance from GPF to the incisive fossa (IF) was found to be 37.8 mm. The mean distance between posterior margins of GPF to posterior border of hard palate was 3.6 mm. The distance between the GPF to the midline maxillary suture was 16.5 mm. In 74.42% cases, direction of opening of GPF was located antero laterally.

Conclusion: The location of greater palatine foramen is variable in most of the cases it is located opposite third molar tooth and is directed antero-lateral.

Keywords: Greater palatine foramen, Hard palate, Clinical anatomy.

Introduction

The larger greater palatine foramen is located in usually at the apex of the maxillary third molar tooth. The poster lateral region of each of the palatine bones. The greater palatine nerve and blood vessels passes through greater palatine foramen. The lesser palatine nerve and blood vessels passes through smaller opening nearby, the lesser palatine foramen. These two foramina are openings of the pterygopalatine canal that carries the descending palatine nerves and blood vessels from the pterygopalatine fossa to the palate[1]. For the dentist and the oral and maxillofacial surgeon the greater palatine foramen (GPF) is of paramount importance. The anatomical relation of this foramena have not been studied in detail.

This clinical anatomy must be born in mind during various procedures in this region like dental implant placements, local anesthetic administration, Greater palatine foramen (GPF) very importance Le Forte osteotomies, sinonasal surgeries etc.[(2)] For injection of local anaesthetic for optimal pain control in maxillofacial and dental surgeries.[(3)] Evaluation of the relative position of GPF is important in maxillary divisions of the trigeminal nerve or its branches are usually blocked by administering anaesthesia in the greater palatine canal. Many textbooks fail to give the exact location of the greater palatine foramen.

For studies on craniofacial growth, detailed information on the clinical anatomy of GPF can also be helpful in since the space for maxillary premolars and molars development is obtained through growth processes at the level of the transverse palatine suture.[(4,5)] This study presents greater palatine foramen as an anatomical landmark important for connective or epithelialized grafts harvesting.

The aim of this study was to locate GPF according to clinically identifiable anatomical landmarks.

Material and Methods

The study is carried out on 43 dry human adult skulls with erupted third molar tooth. The data was collected from skulls obtained from department of anatomy at IIMSR, Warudi Tq. Badnapur, Dist. Jalna. Skulls with bony abnormalities were excluded from the study. All measurements were taken with a compass asthesio meter. Using flexible stainless steel wire direction of opening of GPF into oral cavity was noted. All measurements were tabulated and analyzed using statistical software SPSS. The following observations were made.

1. Relationship of the greater palatine foramen (GPF) with maxillary molar teeth (MM)
2. Distance between the centre of GPF and the incisive fossa (IF)
3. Distance between posterior margins of GPF to posterior border of hard palate (PBHP)
4. Perpendicular distance measured between the medial margin of GPF to midline maxillary suture (MMS)
5. Direction of opening of the GPF into the oral cavity

Results

The relation between GPF to the maxillary molar teeth (MM) was studied and it was found that the GPF

is located opposite third maxillary molar tooth in 30 (69.76%) cases as shown Table 1.

Table 1: Showing relationship of GPF to maxillary molar teeth (MM)

Relation to maxillary molars	Right side(%)	Left side(%)	Both sides(%)
Opposite second molar	3 (6.98%)	3 (6.98%)	6 (6.98%)
Between second and third molar	9 (20.94%)	9 (20.94%)	18 (20.94%)
Opposite third molar	30 (69.76%)	30 (69.76%)	60 (69.76%)
Distal to third molar	1 (2.32%)	1 (2.32%)	2 (2.32%)
Total	43 (100%)	43 (100%)	86(100%)

Table 2: Showing various distances calculated from GPF (In mm)

Various distances in	Right side	Left side	Mean of both sides
GPF to incisive fossa (IF)	38.2	37.2	37.8
GPF to posterior border of hard palate (PBHP)	3.8	3.5	3.6
GPF to midline maxillary suture (MMS)	16.8	16.3	16.5

The mean distance from GPF to the incisive fossa (IF) as shown in Table 2 was found to be 38.2 mm on right side and 37.2 mm on left side. The mean distance between posterior margins of GPF to posterior border of hard palate was 3.8 mm on right side and 3.5 mm on left side. The distance between the GPF to the midline maxillary suture was 16.8mm(higher) on right side as compared to left side 16.3mmThe direction of opening of GPF into oral cavity was found to be anterolateral in 32 (74.42%) cases, anteriorly in 6 (9.97%) cases, anteromedially in 3 (6.97%) cases and vertically in 2 (4.65%) cases.

Discussion

For prompt anesthesia inserting a needle into the canal through the greater palatine foramen. This causes the anaesthetic solution to reach the pterygopalatine fossa, where the trunk of the maxillary nerve and the ramification of the trigeminal nerve lie down. This study help for obtaining trigeminal nerve second division block is needed, when posterior palatine anaesthesia is required, and as alternative to posterior nasal packing and in cases of epistaxis arterial ligation. It is very important for prosthetic dentistry and comparative racial studies.[6]

The position of maxillary molar, is one of the most commonly used criteria. For determining the location of GPF In the present study, 69.76% GPF are located opposite the third maxillary molar. Kumar A et al[7] noted that 85% GPF are located opposite third molar tooth. Study by Wang et al [8] in Chinese population found GPF between 2nd and 3rd molar in 48.5% and opposite third molar in 33.5% cases. Comparison between the findings of our study and other authors is shown in Table 3.

The mean distance measured between the centre of GPF and the incisive fossa (IF) in the present study was 37.8 mm. Kumar et al[7] noted the same distance as 36.6 mm and 35.7 mm respectively on right and left side in Indian population. Vinay KV et al[3] also observed this distance as 36.6 mm and 35.9 mm respectively in south Indian population. Our findings correlate well with other Indian authors. Study on Brazilian population by Chrcanovic and Custodilo[10] noted as 36.21 and 36.52 mm on right and left side respectively. Teixeira et al[12] studied same length in Brazilian population and noted the values as 3.93 and 3.91 cm on right and left side respectively. The findings of this study doesn't correlate with our study. In Indian population; Ajmani[13] found it as 3.7 mm, Kumar et al[7] found as 3.58 mm. Vinay et al[3] found as 3.56 mm on the right side and 3.58 mm on the left side. Our results match with other Indian authors. Saralaya and Nayak[9] found this slightly on higher side; 4.2 mm. Slavikin et al[14] had quoted that this variations in the location of foramen may be due to sutural growth occurring between the maxilla and palatine bones. Further they said that antero-posterior dimensions of the palate increases with the eruption of the posterior teeth. In our study we found that mean perpendicular distance measured between the medial margin of GPF to midline maxillary suture (MMS) is 16.3 mm (Table 2). Table 4 shows that our values are very similar to Jaffar & Hamadah.[6] And differ from other Indian authors Kumar A et al[7] and Vinay KV et al[3] found slightly less values.

The GPF, the direction of the greater palatine canal should be kept in mind to deliver injections.[12] In our study shows that maximum i.e. 74.42% foramina are directed anterolaterally. This value is near to that found by Kumar A et al[7] in Indian population. Brazilian population studied by Chrcanovic & Custodio[10] noted maximum i.e. 69.38% are directed anteriorly. Jaffar & Hamadah[6] in Iraqi population found 60% directed antero-medially. It indicates that direction of opening of GPF is different in different populations studied. These variations cause the occasional problems to insert a needle into GPF and pterygopalatine canal. The variations in the direction of the greater palatine foramen are critical, for the anesthetic approach to block the maxillary division of the trigeminal nerve or for the injecting with vasoconstrictor anesthetic solution

of the pterygo-palatine fossa for reducing bleeding in maxillary sinus surgeries Slavikin et al[14] further added that frequency of anatomical obstruction of needle further increases with the age.

Table 3: Showing percentage of opening of GPF in relation to the maxillary molars

Researchers	Population studied	Opposite 2nd molar	Between 2nd and 3rd molar	Opposite 3rd molar	Distal to Third molar
Jaffar & Hamadah[6] (2003)	Iraqi	12	19	55	14
Saralaya & Nayak[9] (2007)	Indian	0.4	24.2	74.6	0.8
Chrcanovic & Custodio (2010)[10]	Brazilian	00	6.19	54.87	38.94
Kumar A et al[7](2011)	Indian	5	9	85	1
Vinay KV et al[3] (2012)	South Indian	3.67	19	76	1.33
Anjankar et al[11](2014)	Central Indian	6.98	16.27	73.26	3.49
Present study	Maharashtra	6.98	20.94	69.26	2.32

Table 4: Comparison between various parameters in our & other studies

Researchers	Population studied	GPF to PBHP	GPF to MMS
Westmoreland and Blanton(1982)[15]	Indian	1.9	15
Wang et al (1988)[16]	Chinese	4.11	16
Jaffar & Hamadah[6] (2003)	Iraqi	4.86	15.7
Saralaya & Nayak[9] (2007)	Indian	4.2	14.7
Chrcanovic & Custodio10 (2010)[10]	Brazilian	3.39	14,5
Kumar A et al[7](2011)	Indian	5.58	14.3
Vinay KV et al[3] (2012)	South Indian		14.8
Anjankar et al[11](2014)	Central Indian	6.98	15
Present study	Maharashtra	3.6	16.5

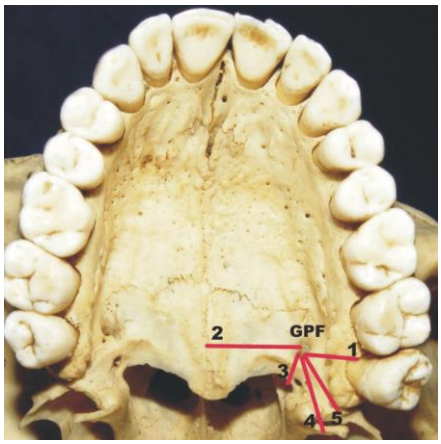

Fig. 1: Showing measurements .GPF: Greater palatine foramen, 1. PT distance, 2. PMP distance, 3. PPP distance, 4. PH distance, 5. PPtM distance (for explanation see text)

Conclusion

When maxillary division of never block is needed or when posterior palatal anaesthesia is desired the distance from the foramen to median palatine suture and posterior palatal margin, is important. For Oral and maxillofacial surgery procedures the GPF may be an anatomical landmark in the posterior area of the palate. The variations in its position are helpfull for clinicians in providing improved surgical procedures. Details study on clinical anatomy of GPF can also be helpful in evaluating and predicting craniofacial growth. Knowledge of variations of GPF will helpful for clinicians to improve the results of surgeries.

References

1. Illustrated Anatomy of the Head and Neck, Fehrenbach and Herring, Elsevier, 2012, page 55.
2. Swirzinski KH, Edwards PC, Saini TS and Norton NS. Length and Geometric Patterns of the Greater Palatine Canal Observed in Cone Beam Computed Tomography. International Journal of Dentistry. Volume 2010 (2010), Article ID 292753, 6 pages. http://dx.doi.org/10.1155/2010/292753.
3. Vinay KV, Beena DN and Vishal K. Morphometric analysis of the greater palatine foramen in south Indian adult skulls**.** International Journal of Basic and Applied Medical Sciences. 2012;2(3):5-8.
4. Sejrsen B, Kjaer I, Jakobsen J, Human palatal growth evaluated on medieval crania using nerve canal openings as references, Am J Phys Anthropol, 1996,99(4):603–611.
5. Westmoreland EE, Blanton PL, An analysis of the variations in position of the greater palatine foramen in the adult human skull, Anat Rec, 2005,204(4):383–388.
6. Jaffar AA and Hamadah HJ. An analysis of the position of the greater palatine foramen. J. Basic Med. Sc. 2003;3(1):24- 32.
7. Kumar A, Sharma A and Singh P. Assessment of the relative location of greater palatine foramen in adult Indian skulls: Consideration for maxillary nerve block. Eur J Anat. 2011;15(3):150-4.
8. Wang TM, Kuo KJ, Shih C, Ho LL and Liu JC. Assessment of the relative locations of the GPF in adult Chinese skulls. Acta Anat Basel. 1988;132:182-6.
9. Saralaya V and Nayak SR. The relative position of greater palatine foramen in dry Indian skulls Singapore Med J. 2007;48:1143-6.
10. Chrcanovic BR and Custodilo LN. Anatomical variation in position of greater palatine foramen. Journal of oral science. 2010;52(1);109-13.
11. Vaibhav P. Anjankar, et al Analysis of position of greater palatine foramen in central Indian adult skulls: a consideration for maxillary nerve block**.** Indian J. Pharm. Biol. Res.2014;2(1):51-54.
12. Teixeira CS, Souza VR, Marques CP, Silva Junior W and Pereira KF. Topography of the greater palatine foramen in macerated skulls. *J. Morphol. Sci.*, 2010;27(2):88-92.
13. Ajmani ML. Anatomical variation in position of the greater palatine foramen in the adult human skull. *Journal of Anatomy*. 1994;84:635-7.
14. Slavikin HC, Canter MR, Canter SR. An anatomic study of the pterygomaxillary region in the craniums of infants and children. *Oral Surg Oral Med Oral Pathol*.1966;21:225-35.
15. Westmoreland EE and Blanton PL. An analysis of the variations in position of the greater palatine foramen in the adult human skull. *Anatomical Record*, 1982;204(4):383-8.
16. Wang TM, Kuo KJ, Shih C, Ho LL and Liu JC. Assessment of the relative locations of the GPF in adult Chinese skulls. *Acta Anat Basel*. 1988;132:182-6.