Section: Anatomy

Original Research Article

A CADAVERIC STUDY ON GREATER PALATINE FORAMEN OF HUMAN SKULL IN SOUTH INDIAN POPULATION

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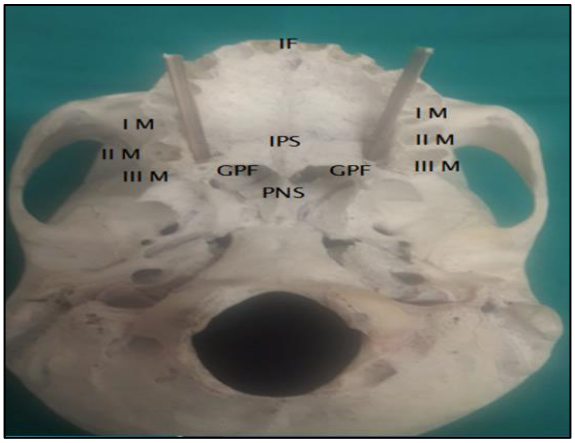
Abstract

The hard palate is an essential region of skull formed by the two palatine processes of maxilla and the two horizontal plates of palatine bones which are linked by a cruciform suture formed by the fusion of these bones. Greater palatine foramina, one on each side, is located in the posterolateral margin of the hard palate medial to maxillary molar tooth. The present study was undertaken to define the position of greater palatine foramina in relation to several anatomical landmarks in the maxilla. Out of 100 human skulls examined, the predominant shape of the foramen was found to be ovoid in 91%(R) and 88%(L) side, the most common location was medial to the third maxillary molar tooth in 92%(R) and 89%(L) cases, the mean distance from incisive fossa(IF) was 36.5mm(R) 36.8mm(L), from the midpalatal suture (MPS) was 14.5mm(R)14.8mm(L), from the posterior nasal spine(PNS) was 13.8mm(R) 13.1mm(L). Hence the morphometric study of the foramen will be useful for oral and maxillofacial surgeons in performing maxillary nerve blocks, for oral surgeons during harvesting of the gingival grafts, for dental surgeons while implanting dental implants and dental extractions, for otorhinolaryngologists during endoscopic sinus surgeries.

INTRODUCTION

The greater palatine foramina, is situated along the posterolateral margin of the hard palate in relation to the maxillary molars. The location of the foramina may vary due to difference in the growth rates of maxilla and palatine bones. The foramen represents the lower end of greater palatine canal which extends from the pterygopalatine fossa to the hard palate. It transmits the greater palatine nerve and descending palatine vessels responsible for the innervation of the hard palate.



MATERIALS AND METHODS

The present study was conducted in 100 human adult dry skulls at the Institute of Anatomy, Madras Medical College, Chennai in the year 2023. All the measurements were taken bilaterally using inch tape, metre scale and digital vernier calipers.

The parameters noted were:

I. The shape of the Greater Palatine Foramina (GPF).

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II. The relationship of the Greater Palatine Foramen (GPF) to the Maxillary Molar tooth on either side.
III. The mean distance from the centre of the Greater Palatine Foramen (GPF) to the centre of the Incisive Fossa (IF)
IV. The mean distance from the centre of the Greater Palatine Foramen (GPF) to the Mid Palatal Suture (MPS)
V. The mean distance from the centre of the Greater Palatine Foramen (GPF) to the base of the Posterior Nasal Spine (PNS).

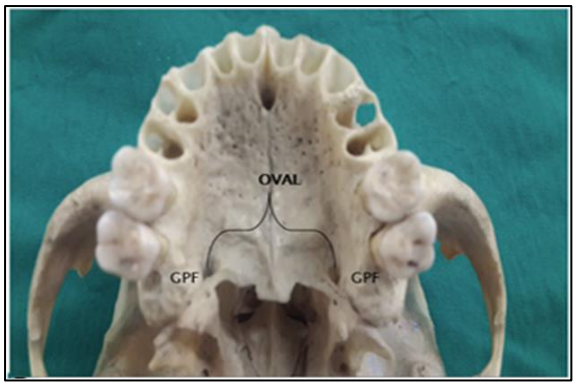


Figure 1: Shape of GPF

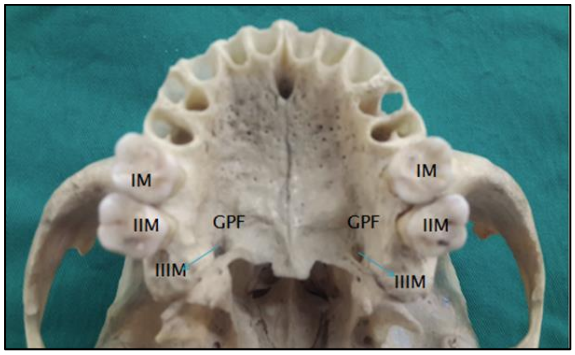


Figure 2: Relationship of GPF to maxillary molar tooth

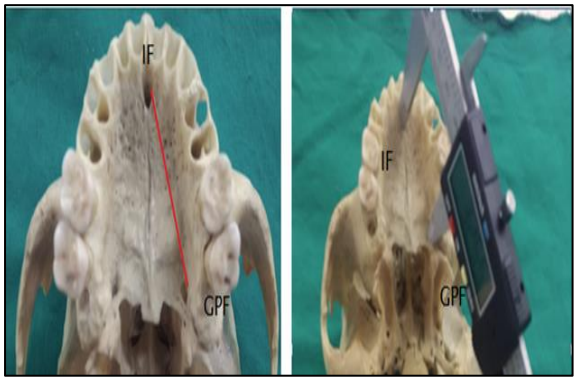
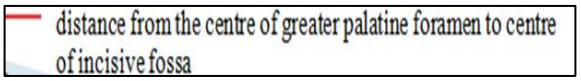


Figure 3: Mean distance of GPF from incisive FOSSA (IF)



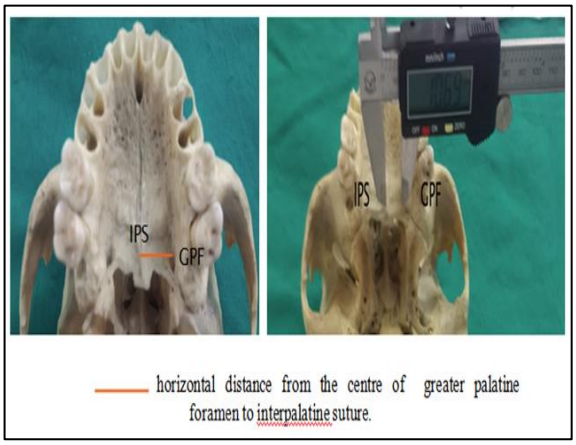


Figure 4: Mean distance of GPF from interpalatine suture (IPS)

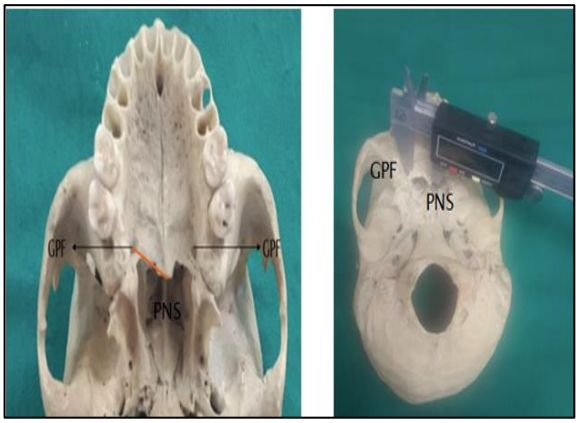


Figure 5: Mean distance of GPF to posterior Nasal spine (PNS)

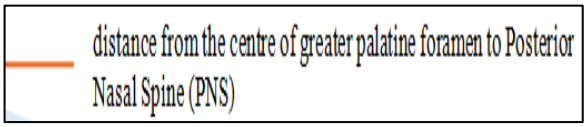


Table 1

SNO	STUDY	OVAL%		ROUND%		IRREGULAR%	
1.	Lopes P.T.C(2011)Brazil	76	78	21	20	3	2
2.	Ilayaperuma (2014)srilanka	77	76	21	23	2	1
3.	Varunchopra (2015)North India	96	97	3	2	1	1
4.	Sushobhana(2015)North India	74	73	20	21	6	6

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5.	Present study	88	91	10	6	2	3

Table 2

SNO	NAME OF THE STUDY	BETWEEN II AND III MAXILLARY MOLAR%		OPPOSITE TO III MAXILLARY MOLAR%		DISTAL TO III MAXILLARY MOLAR%	
1.	Ajmani (1994) north India	33	32	65	66	2	2
2.	Chrcanovic &custadio(2010) Brazil	6	8	55	54	39	38
3.	Vinay KV(2012)south India	18	13	81	85	1	2
4.	Sushobhana(2015)north India	8	11	78	76	0	0
5.	Present study	3	2	92	89	5	9

Table 3

SNO	STUDY	YEAR	RIGHT SIDE(mm)	LEFT SIDE(mm)
1.	Saralaya et al (south India)	2007	37.2	37.3
2.	Vinay KV et al(south India)	2012	36.6	35.9
3.	Nimigean.V et al(Europe)	2013	34.3	34.3
4.	Sushobhana et al(North India)	2015	37.4	36.8
5.	Present study	2023	36.5	36.8

Table 4

SNO	STUDY	YEAR	RIGHT SIDE(mm)	LEFT SIDE(mm)
1	Saralaya et al(India)	2007	14.7	14.7
2	Vinay KV et al(India)	2012	15.3	14.8
3	Nimigean.Vet al(Europe)	2013	14.2	14.3
4	Sushobhana et al(India)	2015	13.3	13.5
5	Present study	2023	14.5	14.8

Table 5

SNO	STUDY	YEAR	RIGHT SIDE(mm)	LEFT SIDE(mm)
1.	Saralaya et al (India)	2007	13.9	13.2
2.	Vinay et al(India)	2012	13.2	13
3.	Nimigean.V et al(Europe)	2013	13.5	13.6
4.	Sushobhana et al(India)	2014	13.6	13.4
5.	Present study	2023	13.8	13.1

Table 6

SNO	STUDY	YEAR	RIGHT SIDE(mm)	LEFT SIDE(mm)
1.	Saralaya et al (India)	2007	13.9	13.2
2.	Vinay et al(India)	2012	13.2	13
3.	Nimigean.V et al(Europe)	2013	13.5	13.6
4.	Sushobhana et al(India)	2014	13.6	13.4
5.	Present study	2023	13.8	13.1

RESULTS

From the present study, out of 100 human skulls examined, the predominant shape of the greater palatine foramen was found to be ovoid in 91%(R) and 88%(L) side, the most common location was found to be medial to the maxillary third molar tooth in 92%(R) and 89%(L), between second and third maxillary molar tooth in 3%(R) and 2%(L), distal to maxillary third molar tooth in 5%(R) and 9%(L) skulls, the mean distance from incisive fossa(IF) was 36.5mm(R) 36.8mm(L), from the midpalatal suture(MPS) was 14.5mm(R)14.8mm(L), from the posterior nasal spine(PNS) was 13.8mm(R) 13.1mm(L) respectively.

Table 1: Overall Frequency of ADRs

S.NO	PREDOMINANT SHAPE OF GPF	DISTANCE OF GPF FROM MMS	DISTANCE OF GPF FROM IF	DISTANCE OF GPF FROM PNS	GPF RELATIONSHIP TO MAXILLARY THIRD MOLAR
RIGHT SIDE	Oval (72%)	14.5mm	36.5mm	13.8mm	92%
LEFT SIDE	Oval (78%)	14.8mm	36.8mm	13.1mm	89%

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DISCUSSION

In the present study, the predominant shape of the greater palatine foramen was found to be oval in 72% on the right side and 78% on the left side. The results were found correlating with that of the studies of Lopes PTC et al which was 76% on the right and 78% on the left and Sushobhana et al which was 74% on the right and 73% on the left. In some skulls the shape may be round or irregular. Sometimes a lingula like projection may be seen associated with the foramen which poses difficulty while injecting needle into the foramen during anaesthetic procedures. The most common location of the foramen was found opposite to maxillary third molar in 92% on the right side and 89% on the left side and these results were correlating to the studies of Vinay KV et al, Methathrathip et al and Kim HJ et al which were found as 91%, 93% and 94.4% respectively. The second most common location of the foramen was found to be between maxillary second and third molar in 23% on the right and 22% on the left and the least common location was found distal to maxillary third molar. Thus the maxillary molars were used as an reliable indicator in determining the exact location of the foramen.

It was observed from the present study that the mean distance of the foramen from the incisive fossa was 36.5mm on the right side and 36.8mm on the left side. These results were correlating with that of the studies performed by sushobhana et al, Vinay KV et al and Ajay Kumar et al whose values were 37.4mm on the right side and 36.8mm left side,36.6mm on the right side and 35.9mm on the left side respectively and slightly lower than the results of Vidulasri et al study of 37.9mm on the right side and 37.3mm on the left side. The mean distance of the foramen from the midline maxillary suture was noticed in the present study as 14.5mm on the right side and 14.8mm on the left side and the results were found similar to the studies conducted by Nimigean et al, Saralaya et al and Ashwini et al which were 14.2 mm on the right side and 14.3mm on the left side,14.7 mm on either side respectively. The results were slightly lower than that of the studies done by Jaffar and Hamadah et al and Ajmani et al which were 15.7mm on both sides and 15.4mm on both sides respectively.

From the present study, it was determined that the mean distance of the foramen from the posterior nasal spine was 13.8mm on the right side and 13.1mm on the left side. The results of the present study were found correlating the previous studies of Nimigean et al, Saralaya et al and Sushobhana et al which were 13.5mm on the right side and 13.6mm on the left side,13.9mm on the right side and 13.2mm on the left side,13.6mm on the right side and 13.4mm on the left side respectively. Hence in cases of persons with unerupted maxillary molars, the above mentioned anatomical bony landmarks may be helpful in determining the location of the foramen.

CONCLUSION

Hence the knowledge of position of greater palatine foramen and its variations is essential for anaesthetists to perform successful nerve block. It also helps the maxillofacial and dental surgeons to desensitize the hard palate and to harvest
gingival mucoperiostral grafts around the foramen without damaging the neurovascular structures emerging through it.

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