**Original research**

# Analyzing the Greater Palatine Foramen and Evaluating Its Significance for Maxillary Nerve Block Based On Its Precision, Patency, Form and Location- In Vitro Observational Study

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**ABSTRACT**

**Background**: The articulation of the maxilla and hard palate is where the greater palatine foramen (GPF) is seen. The GPC (greater palatine canal) continues upward and posteriorly and has an entrance in the pterygopalatine fossa. After leaving the foramen rotundum, the maxillary nerve reaches the pterygopalatine fossa, where it may be blocked with a high degree of success and minimal risk. This nerve block is essential for a number of oral surgical operations.

**Aim**: The purpose of the study was to precisely identify the larger palatine foramen's patency, form, and location in Indian participants so that it might support the intraoral maxillary nerve block technique.

**Methods:** The molar relationship and the patency and form of the larger palatine foramen were evaluated in 60 dry skull bones from adult adults of both genders. The gathered data were evaluated statistically.

**Results**: The study's findings showed that, in 91% of the examined skulls, the larger palatine foramen was located bilaterally opposite the third molars on every skull. 54% of the skulls were discovered to be oval in form, and 96% of them were determined to be patency.

**Conclusion**: The study's comparison and analysis of the data demonstrated that the racial perspective can affect the larger palatine foramen's patency, shape, and location.

**Keywords**: Greater palatine canal, Greater palatine foramen, Maxillary nerve, maxillary nerve block, pterygopalatine fossa, regional blocks

**Keywords:** Benfotiamine, oxidative stress, Diabetes mellitus.



## INTRODUCTION

Because of the Indian individuals' consistent patency, form, and location of the larger palatine foramen, the study also demonstrated that achieving maxillary nerve block through this foramen is safer and simpler. introductory The larger palatine foramen is often found towards the back of the hard palate, where the palatine bone and maxilla bone articulate (hard palate). An gap in the inferior wall of the pterygopalatine fossa is seen when the larger palatine foramen advances posteriorly and upward.[1] The maxillary nerve travels via the foramen rotundum to the pterygopalatine fossa following its escape from the middle cranial fossa. The maxillary nerve may get obstructed when it leaves the foramen rotundum.[2] In order to provide a painless intraoperative field during various oral surgical operations including tooth extraction and other surgeries done in the maxillary area, the maxillary nerve block plays a crucial role. A maxillary nerve block can be obtained using either an intraoral or extraoral approach.[3] Two methods are available for administering the intraoral route for the maxillary nerve

block with local anaesthesia: via the larger palatine foramen or by utilising a high tuberosity technique around the tuberosity.[4] To achieve the maxillary nerve block, a local anaesthetic is injected into the pterygopalatine fossa, which allows the larger palatine canal to be approached via the greater palatine foramen. The larger palatine foramen is the recommended intraoral route for maxillary nerve block since it is linked to less difficulties than the high tuberosity method, which frequently result in over-needle insertion and haemorrhage.[5] Furthermore, if the larger palatine foramen and greater palatine canal are correctly understood anatomically, the greater palatine foramen method has a high success rate.[6] The most recommended technique for maxillary nerve block to provide the appropriate anaesthesia throughout different procedures carried out in the maxilla area is the greater palatine foramen approach and treatment. For therapeutic and diagnostic operations carried out in a variety of neuralgias, including trigeminal neuralgia, this block is also essential.[7] A maxillary nerve block is used to provide local anaesthesia in the hemi-maxilla, which includes the teeth, mouth, and nose. Compared to the four injections given, the maxillary nerve block results in full hemimaxilla anaesthesia with little needle penetration and deposition of anaesthetic volume.[8] The needle for the greater palatine canal approach is positioned on the palate near to the maxillary second tooth while the patient's mouth is wide open. The hard palate is then contracted by the needle, depositing a tiny amount of anaesthetic medication. After five minutes, the anesthetic's effects become apparent. The needle is then replaced, advanced through the foramen to the canal, and a local anaesthetic substance is injected the needle is gradually withdrawn.[9] Depending on the race of the person being evaluated, the placement of the larger palatine foramen varies greatly. The goal of the current investigation was to determine the larger palatine foramen's exact location in order to facilitate the intraoral approach for the maxillary nerve block through the foramen.

## MATERIALS AND METHODS

The goal of the current anatomical investigation was to precisely identify the larger palatine foramen's patency, form, and location in Indian participants so that it might support the intraoral maxillary nerve block technique. The study was conducted at... from.. to.. with approval from the institution's ethical committee. The Institute's Department of Anatomy provided the dried human skulls needed for the investigation. 60 dried skulls from human individuals were evaluated for the study, regardless of the skulls' gender. Skulls with discernible larger palatine foramens and those devoid of severe disease, erosion, or deformation met the inclusion criteria. By evaluating the third molar eruption in the skulls under evaluation, the inclusion criteria were met and the skulls were classified as adult skulls. Skulls that had a difficult time being identified as belonging to adult people, those with accompanying bone diseases, those with deformation or related pathology, or any other type of skull were not taken into consideration for the study. The molar connection was found in all 60 skulls following the final inclusion of the skulls to be evaluated in this study. An evaluation of the larger palatine foramen's patency and form came next. The molar connection was noted by two examiners who were experts in the topic. By making basic observations, the same examiners also noted the bigger palatine foramen's form. any difference in the larger palatine foramen's shape or the molar connection. Using the orthodontic wire as the probe, a 24-gauge orthodontic wire was used to evaluate the larger palatine foramen's patency. Following a statistical analysis of the collected data, the findings were presented as numbers and percentages. In order to determine the specific location of the larger palatine foramen, which can aid in the intra-oral approach, the data were collated and findings were created for the maxillary nerve block through the greater palatine foramen.

## RESULTS

The goal of the current anatomical investigation was to precisely identify the larger palatine foramen's patency, form, and location in Indian participants so that it might support the intraoral maxillary nerve block technique. 60 dried skulls from human individuals were evaluated for the study, regardless of the skulls' gender. Distal to the third molar, opposed to the third molar, and opposite to the second molar are the three places for which the molar relationship for the larger palatine foramen in this study was evaluated and categorised. The findings of the study demonstrated that in 3.33% (n=2) of the left-side skulls and 10% (n=6) of the right-side skulls, the molar connection in the larger palatine foramen was distal to the third molar.

According to Table 1, it was discovered that the molar relation was opposite to the third molar in 93.3% (n=56) of the left side and 86.6% (n=52) of the right side skulls, and it was opposite to the second molar in 3.33% (n=2) of the left and right side skulls respectively.

When the larger palatine foramen was measured in the 60 skulls included in the research, 16.6% (n=10) of the left-side skulls and 10% (n=6) of the right-side skulls showed the slit form. Of the sixty skulls, 33.3% (n=20) had a circular form on the right and left sides, respectively.

Table 2 shows that the larger palatine foramen was oval in form in 50% (n = 30) of the left-side skulls and 56.6% (n = 34) of the right-side skulls.

About the larger palatine foramen's patency in the 60 skulls examined for this study, it was found that, of the left side of the skulls, patency was seen in 93.3% (n=56) of the human dry skulls and absent in 6.6% (n=4) of the skulls. On the right side of the 60 skulls examined in this study, however, it was observed that 96.6% (n=58) of the human dry skulls had patency, whereas only 3.33% (n=2) did not have it evaluated in the present study as shown in Table 3.

**TABLES**

| S. No | Side | Molar relationship | | |
|---|---|---|---|---|
| | | Distal to the 3rd molar n (%) | Opposite to the 3rd molar n (%) | Opposite to the 2nd molar n (%) |
| 1. | Left side | 2 (3.33) | 56 (93.3) | 2 (3.33) |
| 2. | Right side | 6 (10) | 52 (86.6) | 2 (3.33) |

**Table 1: Molar relationship of the greater palatine foramen**

| S. No | Side | Shape | | |
|---|---|---|---|---|
| | | Slit | Round | Oval |
| 1. | Left side | 10 (16.6) | 20 (33.3) | 30 (50) |
| 2. | Right side | 6 (10) | 20 (33.3) | 34 (56.6) |

**Table 2: Shape of the greater palatine foramen in the study skulls**

| S. No | Side | Patency | |
|---|---|---|---|
| | | Yes | No |
| 1. | Left side | 56 (93.3) | 4 (6.6) |
| 2. | Right side | 58 (96.6) | 2 (3.33) |

**Table 3: Patency of the greater palatine foramen in the study skulls**

## DISCUSSION

The purpose of the current study was to precisely identify the larger palatine foramen's patency, form, and location in Indian participants in order to facilitate the intraoral maxillary nerve block technique. The molar relationship and the patency and form of the larger palatine foramen were evaluated in 60 dry skull bones from adult adults of both genders. The gathered data were evaluated statistically. The study's findings demonstrated that, in the majority of the evaluated skulls, the molar relation was found to be distal to the third molar in 10% (n=6) of the right side's skulls and 93.3% (n=56) of the left side's skulls, as well as 86.6% (n=52) of the right side's skulls and was opposite to the second molar in 3.33% (n=2) skulls on the left side and right side each. These results were consistent with the previous studies by Ajmani ML[10] in 1994, Saralaya V et al[11] in 2007, Westmoreland EE et al[12] in 1982, and Hassanali J et al[13] in 1984 where authors reported the molar relation opposite to 3rd molar in 64.70%, 74.60%, 76%, and 57% of skulls in their respective studies.

In terms of the shape of the greater palatine foramen in the study skulls, the oval shape was most frequently observed, appearing in 50% (n=30) of the skulls on the left side and in 56.6% (n=34) of the skulls on the right side. The round shape was least common, appearing in 33.3% (n=20) of the 60 skulls on both the left and right sides, and the slit shape was least common, appearing in 16.6% (n=10) of the left side and 10% (n=6) of the right side. These findings were consistent with earlier research by Methathrathip D[14] in 2005, Cheung LK et al.[15] in 2008, and Langenegger JJ et al.[16] in 1983, which found that the oval form of the larger palatine foramen was the most typical. During the maxillary nerve block procedure, it may be challenging to negotiate the greater palatine canal through the greater palatine foramen since this shape was the least prevalent in the skulls. Regarding the larger palatine foramen's patency in the human dried skulls examined in this study, it was found that, of the 46 human dried skulls examined, 93.3% (n=56) had patency on the left side, while the remaining 6.6% (n=4) did not exhibit any patency. But out of the 60 skulls examined in this study, 96.6% (n=58) of the human dried skulls had patency that could be observed on the right side and could not be seen in 3.33% (n=2) human dried skulls evaluated in the present study. These findings were consistent with the findings of the 1983 Malamed SF et al[17] study, which stated that 97.55% of the greater palatine foramen was patent. The patency results show that around 5% of people may have blindness in the larger palatine foramen, and this should be taken into account while administering maxillary nerve block to Indian participants.

## CONCLUSION

The maxillary nerve block is widely used in cases of congenital repair of the cleft palate, maxillary cancer,

extensive trauma to the maxilla, infection, abscess cases, and situations where pain relief is required after surgeries in the maxilla region. It is also useful in situations where local anaesthesia cannot be injected.

When combined with appropriate anatomical information regarding the patency, shape, and location of the greater palatine foramen, maxillary nerve block through the greater palatine foramen and the greater palatine canal is an effective and safe procedure. The results of this study demonstrated that individual differences can exist in the larger palatine foramen's patency, shape, and location. Because of the Indian individuals' consistent patency, form, and location of the larger palatine foramen, the study results further demonstrated that the maxillary nerve block through this foramen is a simple and safe procedure.

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