

## A Retrospective Analysis of the Root Morphology of Maxillary and Mandibular Third Molars

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### Abstract

The anatomy of third molars is highly unpredictable. The purpose of this study was to identify the root and canal anatomy of maxillary and mandibular third molars among the Indian population. Two hundred maxillary and two hundred mandibular extracted third molars were included in the study. Out of the 200 maxillary third molars 56% had single/fused roots, 24% had two separate roots, 13% had three separate roots and 7% had four separate roots while out of the 200 extracted mandibular third molars 12% had a single or fused root, 86% had two roots and 2% had three roots. Majority of maxillary third molars had three canals 55% followed by four canals 22.5%, two canals in 11.5%, one canal in 9% and least of all five canals in 2% teeth. 67% mandibular third molars had three canals, two in 16% with lesser frequency of four canals in 14.5%, one canal in 2% and five canals in 0.5% teeth. Understanding the root morphology of third molars will aid in formulating a better treatment plan.

**Keywords:** Maxillary Third Molar; Mandibular Third Molar; Roots

### Introduction

Maxillary and mandibular third molars have a large variation in anatomy. Treatment of maxillary and mandibular third molars poses a challenge to dental practitioners due to difficult access that is further increased if the tooth has dilacerated or multiple flared roots. This study was carried out with the objective of recording the root number, root pattern and canal type of third molars that underwent extraction due to non-restorable deep caries, failed endodontic treatment, abnormal eruption or impaction. To our knowledge no study has been carried out to determine the root number, pattern and canals pattern of maxillary and mandibular third molars among the Indian population.

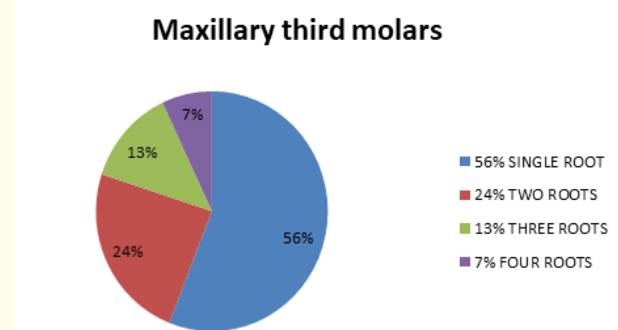
### Material and Methods

400 patients who underwent maxillary and mandibular third molar extraction due to unrestorable caries, failed endodontic treatment, abnormal path of eruption or impaction were included in this study in which after noting the root number and pattern the access cavity preparation was done to record the number of canals for future reference.

### Result

The inspection of 200 extracted maxillary third molars (Pie-chart 1) revealed that 56% (112) had single/fused roots (Figure 1), 24% (48) had two separate roots (Figure 2), 13% (26) had three separate roots (Figure 3) and 7% (14) had four separate roots (Fig-

ure 4). Out of the 56% teeth having a single fused root 38% had two fused roots, 53% had three fused roots and 9% had four fused roots.



Pie-chart 1: Maxillary third molars root percentage.



Figure 1: Fused roots of maxillary third molar.



Figure 2: Two rooted maxillary third molar.



Figure 5: Fused roots mandibular third molar.



Figure 3: Three rooted maxillary third molar.

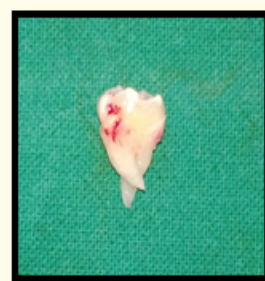


Figure 6: Two rooted mandibular third molar.



Figure 4: Four rooted maxillary third molar.



Figure 7: Three rooted mandibular third molar.

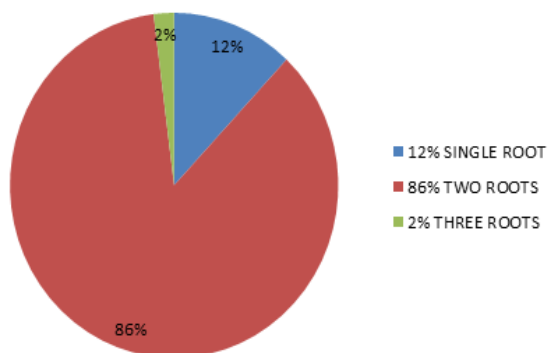
Majority of maxillary third molars had three canals 55% (110) followed by four canals 22.5% (45), two canals 11.5% (23), one canal 09% (18) and least of all five canals in 2% (4) teeth.

For the mandibular third molars out of a total of 200 teeth (Pie-chart 2) 12% (24) had a single or fused root (Figure 5), 86% (172) had two roots (Figure 6) and 2% (4) had three roots (Figure 7).

Most of mandibular third molars had three canals 67% (134) and two canals 16% (32) with lesser frequency of four canals 14.5% (29), one canal 2% (4) and five canals 0.5% (1).

9% of the maxillary teeth had dilacerated roots while 14% of the mandibular teeth had dilacerated roots.

Mandibular third molars



Pie-chart 2: Mandibular third molars root percentage.

### Discussion

Maxillary third molars have the greatest variation in tooth morphology among all the teeth in natural dentition followed by the mandibular third molars. This study was aimed at understanding the root morphology of maxillary and mandibular third molars so that proper treatment plan can be formulated. The maxillary third molar roots are usually fused functioning as one large root, and they are shorter cervico-apically. The fused roots generally taper to the apex which shows slight distal inclination. The maxillary third molar with fused conical roots is the easiest to extract out of all root patters due to easy path of removal and favourable root anatomy and are the easiest to treat endodontically. The difficulty usually increases as the number of roots in-

creases with the increase in the number of canals due to difficult access and visibility with four roots being the most difficult. The failure rate of maxillary third molar root canal treatment is high due to the difficult access, varied root number, shape and morphology. On Intra oral periapical radiographs it is not always possible to diagnose the root number due to overlap of roots mostly seen in cases of three to four roots. Study done by Sidow SJ in 150 maxillary molars revealed that 15% percent had one root, 32% had two roots, 45% had three roots, and 7% had four roots. A study by A L Alavi among Thai patients of maxillary third molars revealed that 51% had three separate roots while 49% had fused or conical roots. The results of both these studies and the one done by us have different outcomes indicating that the anatomy of maxillary third molars is highly variable. From an endodontic perspective after access cavity preparation it was noted that majority of maxillary third molars in our study had three canals 55% followed by four canals 22.5%, two canals 11.5%, one canal 9% and least of all five canals 2% which is varying in multiple studies. Thus a proper workup is necessary prior to attempting endodontic treatment in maxillary third molars to prevent failure of the treatment due to the operator's initial diagnostic mistake. The root pattern of mandibular third molars as demonstrated in our study was quite similar to the data reported by Sidow SJ, *et al.* in 150 mandibular molars who reported that 17% had one root, 77% had two roots, 5% had three roots, and 1% had four roots and by Maryam Kuzekanani, *et al.* in 150 molars who reported that 21% had one root, 73% had two roots and 5.5% of the teeth had three roots. The data on root patterns of mandibular third molars in all studies indicate that the majority of the teeth had 2 roots. In our study from the endodontic perspective majority of mandibular third molars had three canals in 67% and two canals in 16% with less frequency of four canals in 14.5%, one canal in 2% and least of all five canals in 0.5% which is in sync with other studies. The data collected from our study has led to the conclusion that the anatomy of mandibular third molars was more predictable than maxillary third molars [1-6]. There is a huge variation in the data reported in different studies thus a larger multicentre study is required with a larger sample size.

## Conclusion

Among all the natural teeth maxillary third molar has the most variation in tooth root morphology. Thus, careful treatment planning should be done by preoperative diagnostic x-rays before attempting endodontic treatment or extraction in order to prevent a traumatic experience for both the patient as well as the doctor.

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