

## Mandibular First Premolar with Three Root Canals: - Two Case Reports

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**Abstract:** These two case reports present a relatively uncommon clinical case of mandibular first premolar with one root and three root canals. The buccal canal divides in coronal one third region, rather apical. Lingual canal which is unusual finding was broad, easy to locate and treat than two buccal canals which were difficult to prepare & obturate especially third buccolingual canal.

**Keywords:** First Premolar, Single Root, Three Canals

### I. Introduction

It is generally accepted that a major cause of failure of the root canal therapy is an inability to locate & treat all the canals of root canal system. The clinical impact of missed anatomy can be clearly demonstrated with a larger number of retreatment case reports available in the literature. In the majority of these cases, failure of endodontic therapy is associated with untreated canal space localization. And treatment of this missed anatomy typically leads to complete clinical & radiographic healing.<sup>1</sup>

Many of the problems encountered during endodontic treatment occur because of an inadequate understanding of the pulp space anatomy of the tooth. Both students & clinicians need to familiarize themselves with the irregularities, complexities & aberrations which are likely to occur within the pulp space.<sup>2</sup> The mandibular first premolar may cause great problems during treatment because of the relatively frequent existence of a bifurcated canal dividing in the middle or apical third (Type IV) into buccal and lingual branch.<sup>3</sup>

For many years this was considered to have only one root with single canal.<sup>3</sup> Now studies revealed that mandibular first premolar has many variations in canal morphology. In mandibular first premolar incidence of one canal is 69-83%, two canals is 14-28% and three canals is 0.4 to 1.2%.<sup>4,5,6,7,8,9,10,11</sup> Uncommon but possible morphological anomalies of the mandibular first premolar are two canals in two roots, three canals in three separate apical roots three canals in one root and a single main canal that splits into three separate canals & ends into three separate apical foramina.<sup>12,13,14</sup> Thus occurrence of three canals with three separate apical foramina & three canals with two separate foramina in mandibular first premolar is very uncommon

These present cases becomes unusual because generally canals split in apical third region. Here in these cases canal divides in the coronal third or middle root region & ends into three separate foramina apically in one case and two separate foramina in second case. In both cases buccal canal divides into two coronally and lingual canal remains separate till apically These cases also becomes unusual because here lingual canal which is usually difficult to locate & treat, located easily & was easy to clean & obturate also. Buccal canals, especially buccolingual canal was very difficult to locate, clean & obturate

### II. Case Report 1

A 50 year old male patient reported to the Department of Conservative Dentistry and Endodontics of VSPM's DCRC Nagpur with the chief complaint of pain with 34. Clinical examination revealed deep proximal caries with carious exposure. Tenderness was positive with no mobility or swelling. Vitality tests showed no response to cold and electric pulp testing. Radiographic evaluation revealed an unusual complex root canal anatomy which showed the presence of two canals with no periapical radiolucency. (fig.1). Conventional root canal therapy was planned for the tooth 34. Patient was informed regarding the treatment plan and the unusual root canal anatomy.

After complete excavation of caries, a bucco-lingual access cavity was prepared with a long tapered bur. Initially two root canal orifices were found. To our surprise, the lingual canal was located very easily with a no. 15 K file. Buccal canal was difficult to locate. A no. 10 K file was used to locate the buccal canal. Surprisingly, the lingual canal was broader than the buccal canal. To differentiate both the canals, a radiograph was made with a H file in the lingual canal and a K file in the buccal canal. Two radiographs were made. A doubt was raised in one of the radiographs about the presence of an additional canal which was there in the pre-operative radiograph. The one buccal canal which we got was different from the canal which was there in pre operative radiograph ( fig.2) Thus Third canal searched and located through buccal canal orifice which was placed buccolingually with much difficulty. As the instruments were not going at a time, a radiograph with all

the three instruments in the three canals could not be made.(fig.3) The third canal which was even difficult to locate was instrumented with hand files only. The buccal and lingual canals that were found in the beginning were cleaned and shaped using hand K files and rotary nickel-titanium ProTaper files upto size S<sub>2</sub>. These canals were sequentially irrigated using 2.5% NaOCl and 17% EDTA. Routine irrigation protocol was also followed for the third buccal canal. Finally all the canals were irrigated with Chlorhexidine digluconate. Calcium hydroxide was used as an intra-canal medicament and the access cavity was sealed with IRM between appointments.

In the next visit after 8 days, the tooth was asymptomatic and thus, routine steps of BMP were followed. Once it had been established that there are 3 canals, it was important to obtain a straight line access to all the canals which was very difficult in this case. We could not get a straight line access to the third canal. While following routine biomechanical preparation steps, a no. 25 H file accidentally broke in the third buccal canal at the apical level. Unsuccessful efforts were made to remove the file or bypass it. Two main canals were obturated with 6% GP points and the third unusual canal with 2% GP points with the lateral condensation technique.

Post-obturation radiographs from different angles were made.(fig.4&5) The patient was dispatched with IRM dressing. Post-endodontic restoration was done after 2 days as the patient was absolutely asymptomatic. The patient was reviewed after a month and was found to be asymptomatic. A three-month recall radiograph showed satisfactory healing and was advised to get his tooth crowned. (fig 6)

### **III. Case Report 2**

A 47 year old female patient reported to the Department of Conservative Dentistry of VSPM's Dental College and Research Centre, Nagpur with the chief complaint of pain with 43&44. Clinical examination revealed a deep occlusal cavity with gutta percha filling in the pulp chamber in 44.& cement filling with 43. There was severe tenderness with both 43 and 44.

Radiographic evaluation revealed satisfactory root canal filling with 43, while root canal filling was short of apex with 44 with periapical radiolucency with both 43 and 44. (fig 7) .Patient's dental history revealed root canal therapy done in the same hospital by an intern student one month back and patient has had pain since then with 43 and 44.

Re-root canal therapy with 44 first; if no relief, then with 43 would be planned. Patient was informed regarding the treatment plan. As an emergency treatment, root canal filling was removed with 44 and patient dispatched with analgesic course if required. Patient came after 2 days with the complaint of pain with 43 and 44 if not covered by analgesics.

In clinical examination still tenderness was positive with 43 and 44. Re-root canal therapy with 43 also planned and informed to the patient accordingly. Root canal filling was removed with 43 and the patient dispatched with an open dressing with 43 and 44.

In next visit after 2 days, the patient was still complaining of pain with both 43 and 44.on clinical examination 44 was much more tender than 43. Then the thought of additional unlocated canal came in our mind. Thus access opening extended lingually.with 43 & 44.there was no lingual canal with 43.But with 44 lingual canal located very easily. Initially treated buccal canal was short. Thus, with the help of EDTA tried for complete location of buccal canal with 15 no. K file. In search of remaining short buccal canal, we got separate new buccal canal through buccal canal orifice extended completely apically. Initially treated short root canal by intern could not be extended apically. (fig 8)

All three canals prepared biochemically with routine protocol. Patient dispatched with IRM and calcium hydroxide as an intracanal medicament.In recall after 2 days there was no pain with both teeth.43 was totally asymptomatic & there was slight tenderness with 44. Thus the patient kept under observation & called after 5 days. In next visit after 5 days, both the teeth were asymptomatic. Thus 43 and all three canals of 44 obturated with lateral condensation technique. Radiographs from different angles made. (fig 9&10) Post-endodontic restoration given after 7 days as the patient was absolutely asymptomatic. Follow up x-ray after one month and after 3 months made which showed satisfactory healing and patient was advised to go for full coverage.(fig 11,12)

### **IV. Discussion**

Mandibular premolars are probably the most difficult to treat endodontically. The varied anatomy & morphology in mandibular first premolar implies cleaning & shaping of the canals difficult. The 'C' Shaped root canal occurred predominantly in the 6 mm apical section with one or two canals coronally. Identification of this unique apical canal configuration& the high incidence of multiple canals in mandibular first premolar may explain endodontic treatment failure in this tooth group.<sup>15</sup>

In mandibular premolar with three canals the cervical half of the root is generally wider than usual, with little or no taper. Root canals may not be evident radiographically or may look unusual or root canal space

may disappear half way through the roots. Careful interpretation of the radiograph for periodontal ligament space may suggest the presence of an extra root or canal. Mesial & distal angled views will often reveals the presence of a bi/trifurcation of the root canal.<sup>16</sup>

Because of the difficulties involved in preparing & filling this system, some cases required alternative to the most routine therapy. In several instances Weine used minimal canal enlargement & then canal filling with chlorpercha. Attempting to widen these canals needed for routine lateral condensation may lead to severe alternation of canals shape & resultant problem.<sup>17</sup> This has been proved in our case 1 in which in third buccal canal which was difficult to locate and accidental breakage of instrument took place at apical third level. And this was the reason of instrumenting this additional canal with hand instruments, unlike the other two which were instrumented with rotary protaper.

Direct access to the buccal canal usually is possible, whereas lingual canal is very difficult to find. The lingual canal tends to diverge from main canal at a sharp angle. In many cases the lingual canal cannot even be located and only the buccal is treated and filled. And a situation prone to failure.<sup>17</sup> Exactly opposite to this in these unusual cases lingual canal was straight & broad & thus easily located, cleaned & obturated. The first buccal canal was also comparatively easily located than second buccal canal (bucco-lingual) which was diverged from main buccal canal at sharp angle. In case 1 Many investigators revealed about 'C' shaped canal configuration which is present at apical third level.<sup>7,10,11,15</sup> In these cases canal bifurcates in the coronal or middle third of the root only, which is also unusual finding.

Knowledge of the normal or unusual configuration of the pulp and possible variations is highly critical for success in endodontics. It is absolutely essential for an operator to form mental picture of the pulp in cross-section & from the coronal aspect to the apical foramina<sup>15</sup>. Each canal may contain irregular & hidden configuration that should be taken into account during endodontic treatment. Instruments must access these hidden regions and clean & shape them as maximally as possible to avoid or minimize treatment failure.<sup>18</sup> Treatment of this missed anatomy leads to clinical & radiographic healing in both the cases specially in retreatment of second case.

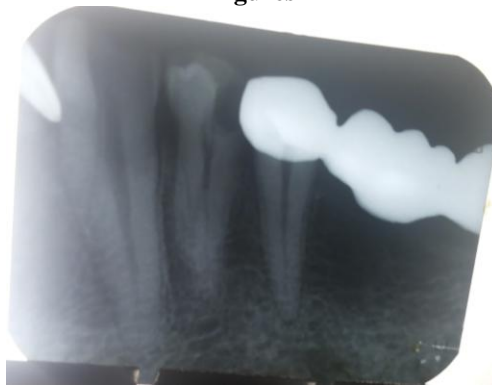
## V. Conclusion

The Mandibular premolars are very difficult to treat. They have high flare up & failure rate. A possible explanation may be the extreme variations in the root canal morphology in these teeth.<sup>17</sup> The frequency & risk of missed canals are strictly linked with the complexity of root canal system in these teeth. Thus through knowledge of the complex canal morphology in mandibular premolar will help clinicians to treat these difficult cases.

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**Figures**



**Fig 1: Pre operative radiograph**



**Fig.2 : Diagnostic radiograph 1**



**Fig.3 : diagnostic radiograph 2**



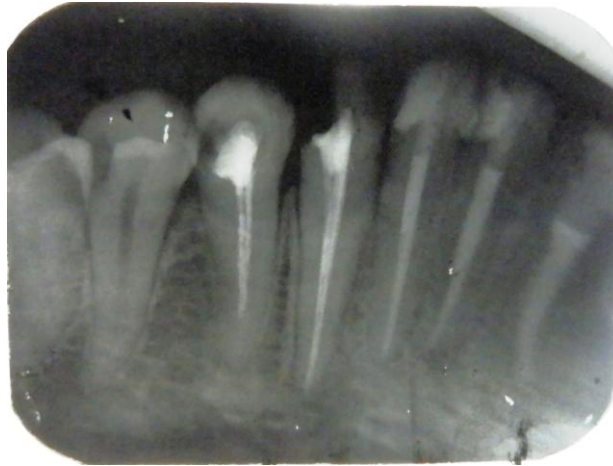
**Fig 4. Obturation 1**



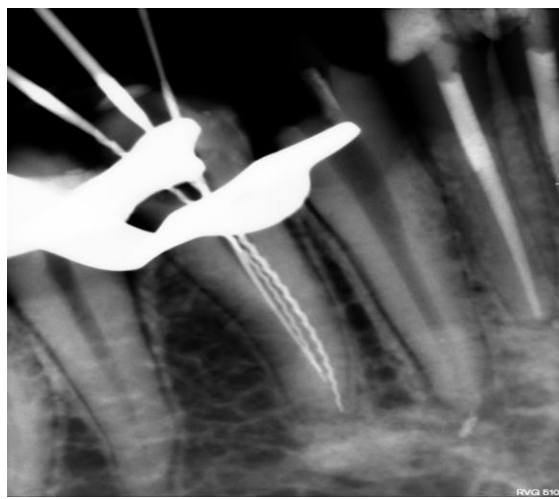
**Fig 5. Obturation 2**



**Fig 6. Follow up**



**Fig 7. Pre-operative radiograph**



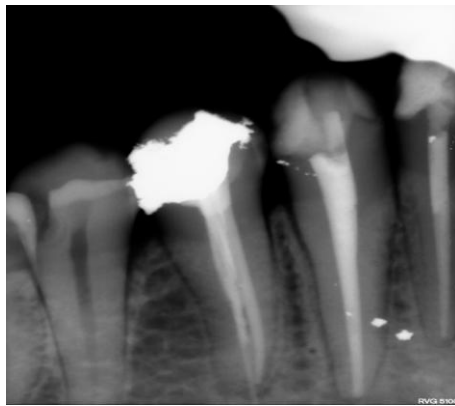
**Fig 8. Diagnostic radiograph**



**Fig 9. Post obturation 1**



**Fig 10. Post Obturation 2**



**Fig 11. Follow up after 1month**



**Fig 12. Follow up after 3months**