The Deceptive Mandibular Premolars

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Introduction

It is generally recognized that incomplete instrumentation of the root-canal will lead to failure of endodontic therapy. Frequently, root-canals are left untreated because the dentist fails to identify their presence, particularly in teeth that have anatomical variations or addition root-canals. Additional root canals may be detected by clinical investigation of the floor of the pulp chamber but are sometimes found radiographically. Therefore a thorough knowledge of the floor of the pulp chamber is imperative if the practitioner is to achieve a high rate of success.

The Type IV canal is one such variation of the root canal system. The Type IV canal as given by Weine is one in which a canal bifurcates into two or three separate canals most commonly in the middle 1/3rd and rarely in the apical 1/3rd of the root.[9]

Bresica (1961) considered the first mandibular premolar to be the most variable in the entire dentition. Hess found 'a suspicion of the division of the root canal' in 2.3% mandibular first premolars and 0.7% of the mandibular second premolars.[5] Vertucci (1978) found two canals at the apex in 25.5% and three canals at the apex in 0.5% of the mandibular first premolars. Another study by Vertucci *et al* showed that the second premolar had one canal at the apex in 97.5% and two canals in 2.5% of the teeth studied.[8]

Problems Faced while Treating The Type IV Canal and Their Management

Clinical and Radiographic Diagnosis

It is important to be able to determine radiographically as closely as possible, the morphology of these teeth. For this reason, although possibly not accurate, the radiographic finding is clinically relevant and is determining the only way of determining the number of roots and root canals before treatment.

In the type IV canal cases, the canal usually becomes narrower suddenly or deviates from its actual path and a faint bifurcation may become apparent. In some cases where the root bifurcates in the middle 1/3rd, a faint outline of the periodontal ligament may be seen radiographically interposed between the two bifurcations or roots. When intending to carry out root canal treatment on a mandibular tooth, it is important that a radiogrpah is taken from more than one angle in the horizontal plane.[5]

Access Cavity

When confronted with unusual anatomy good illumination and magnification can make treatment easier. With the aid of an operating microscope, the location of the orifices can become much easier.[4] The condition of two separate roots each with one canal, is rarely present although these teeth usually have one root.

A single canal dividing into two or three canals may be suspected clinically, when the pulp chamber does not appear to be aligned in its bucco-lingual relationship and the access cavity deviates from its normal configuration. In case of two canals the buccal canal should be approached from the lingual direction and conversely the lingual canal from the buccal.

Length Determination and Biomechanical Preparation

The use of an apex locator prior to taking a working length estimation radiograph improves the chances of estimating the correct root canal lengths the first time; especially when canals are likely to be superimposed on a radiograph.

The coronal enlargement is preferably carried out with Gates Glidden drills so as to properly locate and negotiate the canals, as they divide. The biomechanical preparation should preferably be carried out using greater taper Ni-Ti instruments with EDTA, in a crown down manner using balanced force technique. Greater taper Ni-Ti instruments are sufficiently flexible to be used in complex curved canals and obviate the need for step-back flaring of the apical preparation.[4] Such a technique makes instrumentation easier and prevents many of the procedural errors that can occur with filing techniques.

To prevent blockage during BMP the access cavity be ideally flooded with irrigants ensuring that dentin chips are maintained in suspension and not packed into the apical region of the root canal system.

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Obturation

A vertically compacted warm gutta percha technique is preferred to obturate this root canal system because of its predictability in complex anatomical situations. The sectional technique with vertical compaction can also be used to obturate the canal system successfully. Attempting to widen these canals to sizes needed for routine lateral condensation leads to severe alteration of the canal shape and resultant problems.

Prosthetic and Surgical Considerations

Mandibular premolars with two roots make better abutments when used for a bridge. Mandibular premolars should never be extracted without making a radiographic diagnosis. These multirooted teeth if rotated during extractions, are likely to undergo root fracture.

The proximity of neurovascular structures to these teeth can result in temporary paraesthesia from a fulminating inflammatory process when an acute periapical abscess does occur with the mandibular second premolar. Exacerbations in this region, seem to be more intense and resistant to non-surgical therapy, than other parts of the mouth.

Referral

When the technical difficulty of the endodontic procedure exceeds the expertise of the practitioner, specialist referral may be required.

Case Reports

Case I

A 28 year old female patient reported with acute pain in the mandibular I premolar. The tooth had an irreversibly inflamed pulp resulting from deep proximal caries. The radiograph showed a complex Type IV root canal system. Access opening was done. The two separate canals bifurcating in the middle 1/3rd of the root were negotiated and biomechanical preparation proceeded in a crown down manner using Ni-Ti manual instruments and NaOCL and EDTA as irrigants. After cleaning and shaping was completed master cone radiograph was taken to check the apical fit the two canal were then obturated separately by sectional technique employing vertical compaction of gutta percha in the same visit.

Case II

A 42 year old male patient reported with acute periapical abscess with mandibular I premolar. Radiograph showed the presence of a Type IV canal system. Access opening and BMP was done in a similar crown down manner and a calcium hydroxide dressing placed. The obturation was done at the second visit using sectional method after verifying the apical fit of the master cone.

Case III

A 35 year old male patient was referred for treatment of a mandibular left I premolar. The existing obturation was removed using a gutta percha solvent and H files. The two canal were re-negotiated and instrumented in a crown down manner using NaOCL and EDTA as the irrigants. The two canal were obturated using sectional gutta percha technique.

Case IV

A 48 year old male patient reported with distal caries and acute pulpitis in the mandibular left second premolar. The radiograph showed the presence of a single wide canal in the coronal 1/3rd narrowing and deviating mesially, with the distal division indistinct. After making an access cavity, coronal enlargement and pulp extirpation three distinct canal divisions were negotiated and instrumented in crown down manner. The obturation was done using sectional method.

Fig. 1a : Case I - Pre operative.

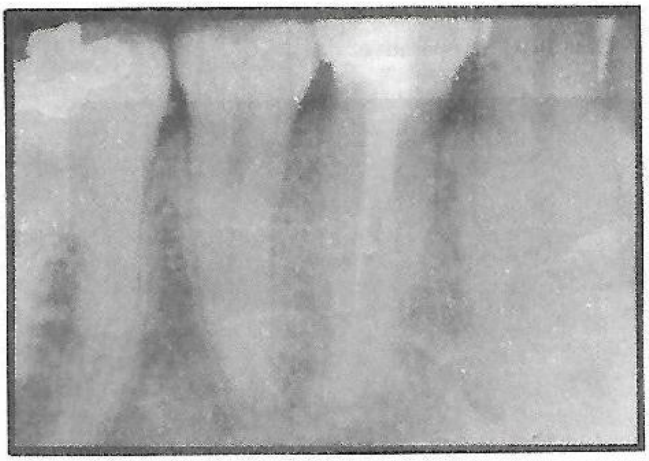

Fig. 1b : Case I - Post operative.

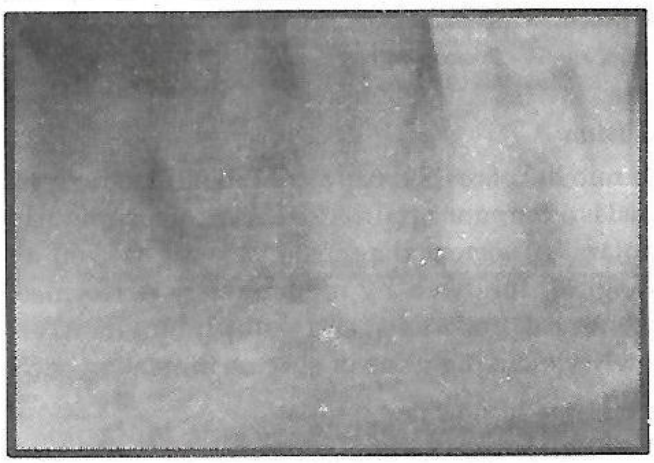

Fig. 2a : Case II - Pre operative.

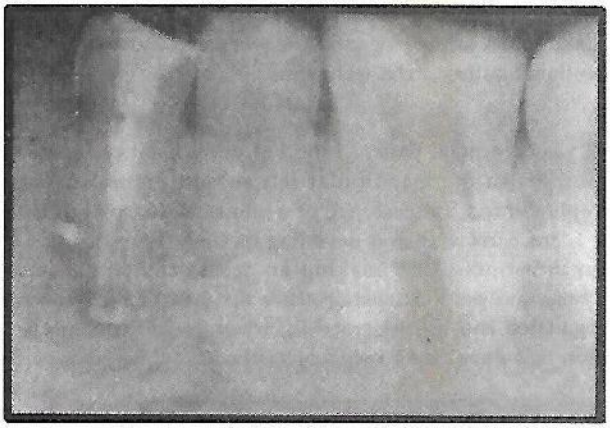

Fig. 2b : Case II - Post operative.

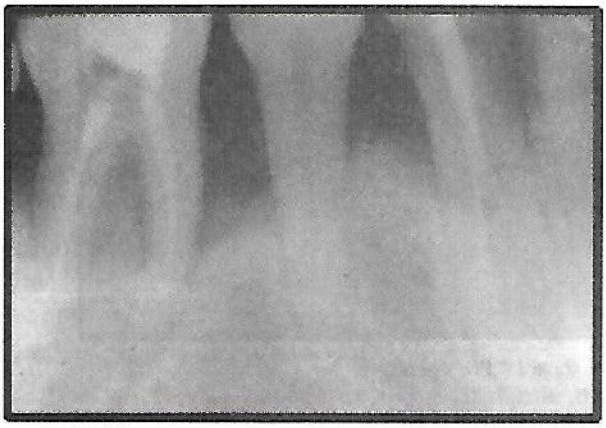

Fig. 3a : Case III - Pre operative.

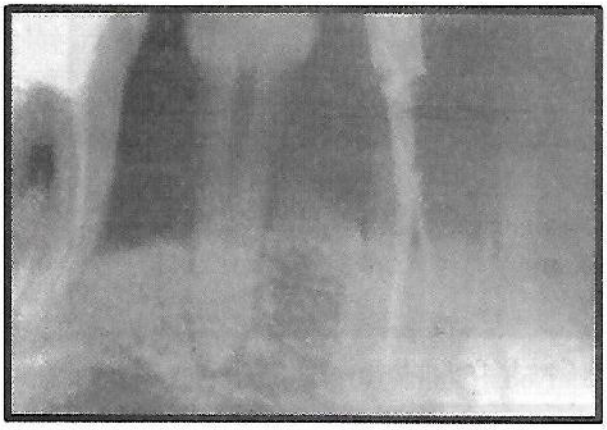

Fig. 3b : Case III - Post operative.

Conclusion

The number of cases encountered show that the Type IV canal is a common occurrence in case of mandibular premolars. A correct diagnosis, clinical as well as radiological, followed by meticulously performed biomechanical preparation and skillful obturation can definitely yield a high rate of success in treating such deceptive anatomies.

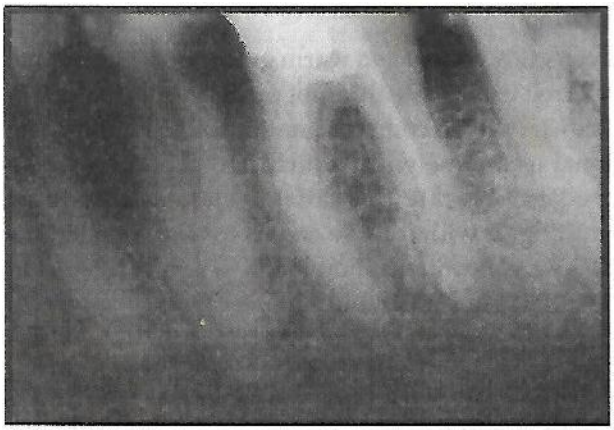

Fig. 4a : Case IV - Pre operative.

Fig. 4b : Case IV - Post operative.

References

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