

## Case Report

### Endodontic treatment of maxillary 'radiculous': A Case Report

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#### ABSTRACT

Recognition of unusual canal configurations and variations are paramount because it has been established that the root with a single tapering canal and the apical foramen is the exception rather than rule (Abou-Rass M et al). We must have the proficiency and knowledge to identify and manage these variations with judicious use of magnification and diagnostic tools available to us. The purpose of this case report is to add to literature the occurrence of the 'radiculous' or three-rooted maxillary upper premolar and the guidelines to manage such a case.

#### INTRODUCTION

The visualization of the internal anatomic relationships of teeth is extremely essential before undertaking endodontic therapy. The internal anatomy of the maxillary first premolar is particularly complex due to the variations in the number of roots and canal configuration. The majority of maxillary first premolars have two root canals regardless of the number of roots. However, the incidence of three-canal maxillary first premolars has been reported to be 0.5-6%<sup>[1,2,3,4]</sup>. Vertucci and Gegauff found 5% of 400 maxillary first premolars to have three canals: 0.5% existed as three canals in a single root, 0.5% existed as two canals in one root and one canal in a second root, and 4% existed as one canal in each of three separate roots. The anatomy of maxillary premolars with three roots, mesio-buccal, disto-buccal and palatal is similar to that of adjacent maxillary molars, and therefore they are sometimes called small molars or 'radiculous'.<sup>[5,6]</sup> A thorough knowledge of tooth morphology, careful interpretation of angled radiographs, and adequate access to and exploration of the tooth's interior are prerequisites for treatment. In straight-on radiographs of maxillary premolars, Sieraski et al found that whenever the mesio-distal width of the mid-root image was equal to or greater than the mesio-distal width of the crown, the tooth most likely had three roots.<sup>[7]</sup> Magnification and illumination are indispensable aids and should be used effectively in the management of such teeth.

#### CASE REPORT:

A 38 year old female patient presented with the chief complaint of pain in the left upper back region of the jaw to the Department of Conservative Dentistry and

Endodontics, MS Ramaiah Dental College and Hospital, Bangalore. Clinically, a deep carious lesion was observed extending on the distal and occlusal aspect of tooth #24. The pre-operative radiograph showed a radiolucency involving the enamel and dentin and approximating the pulp.[Figure 1]No periapical changes were evident on the radiograph. Thermal pulp testing (heat test and cold test) resulted in a positive response. Therefore, clinical evaluation of the tooth was undertaken. The soft dental caries was removed with the help of a spoon excavator (EXC 33L, Hu-Friedy). Further caries excavation was carried out with a large round carbide bur at slow speed. Patient experienced an increase in the intensity of pain, thus an infiltration of local anaesthesia (Xylocaine) was administered. Further caries excavation resulted in a large pulpal exposure, thus root-canal treatment was decided upon as the definitive treatment.

An Endo access bur (Dentsply) was used for the access cavity preparation. The palatal orifice was located with relative ease. On extending the access cavity buccally on the occlusal aspect, no buccal orifice was found. According to Krasner and Rankow's Second Law of symmetry: "Except for maxillary molars, canal orifices lie on a line perpendicular to a line drawn in a mesiodistal direction across the centre of the pulp chamber floor". On studying the pre-operative radiograph more carefully, the anatomy of the root resembled that of a molar, thus a third root was suspected. The access cavity preparation was further extended disto-buccally on the occlusal aspect while viewing the cavity under a dental operating microscope. A buccal orifice was located with the help of DG 16 (EX DG 16- Hu-Friedy). At this point, 2 pre-curved files were inserted into the palatal and the orifice located on the buccal side and a digital radiograph (Vista Scan) was taken.[Figure 2] The radiograph clearly showed the outline of a third-root into which no file was inserted. Hence, the access preparation was further extended mesio-buccally on the occlusal aspect of the crown. Another orifice was found and located with the help of DG 16. The access cavity was thus triangular in shape representing the orifices of the three roots: palatal, mesio-buccal and disto-buccal and the three orifices were clearly visible under the dental operating microscope. Radiographs of the first maxillary premolar of the opposite arch also showed a similar 'radiculous' appearance. [Figure 3]

The working length was determined using an electronic apex locator (Apex ID, Sybron Endo). #10 K-files were used initially, followed by the use of #15 K-files in the disto-buccal and palatal canals and a #15 H-file in the mesio-buccal canal to reconfirm the working length radiographically.[Figure 4] The orifices were enlarged with the help of hand Protaper Universal file SX. Irrigation was done with 3% Sodium hypochlorite. Chemo-mechanical preparation was done upto hand Protaper Universal file F2 using EDTA (Omni-prep) along with copious irrigation with 3%

Sodium hypochlorite. A 17% solution of EDTA was used to remove the smear layer prior to obturation. A final rinse was done with sodium hypochlorite. The canal was dried with the help of paper points. Obturation was carried out using Gutta percha and Endoflas, a Zinc-oxide base sealer, which contains Iodoform.[Figures 5a and 5b] The excess Gutta percha was sheared off at the level of the canal orifice.

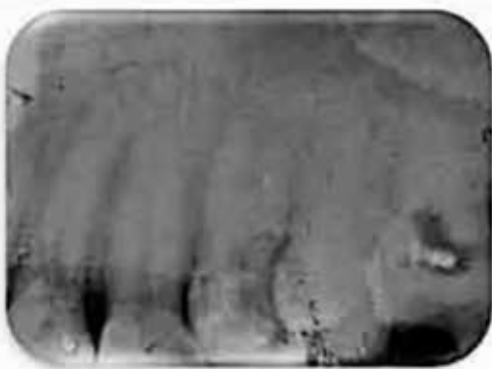


Figure 1: Pre-operative radiograph



Figure 2: Files in the palatal and Mesio-buccal orifice



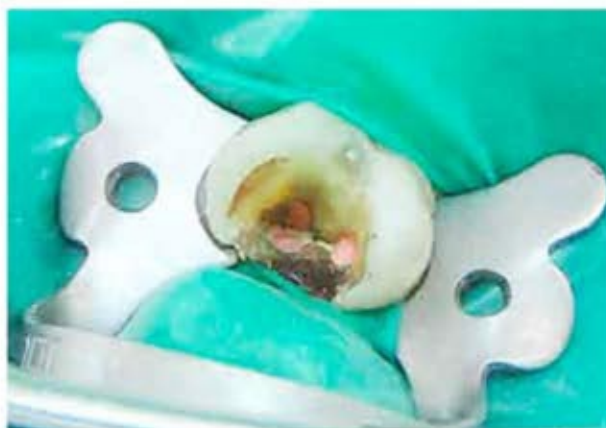
Figure 3: Radiograph of adjacent quadrant also showing ridiculous appearance of premolars



Figure 4: Working Length Determination



**Figure 5a: Obturation**



**Figure 5b: 3 separate orifices post-obturation**

## DISCUSSION

Precise three-dimensional determination of the internal structure of teeth, their form and number of root canals is a challenge. Treatment has shown that the pulp cavity is highly variable making each treatment unique. Therefore proper use of diagnostic aids and magnification is essential in the successful treatment of every case. Careful pre-operative evaluation of one or more periapical radiographs, exposed at different horizontal angulations of the X-ray cone is mandatory. These radiographs provide important information about root canal morphology, and hence should be carefully studied before treatment is initiated. It must also be kept in mind that the inclination of the x-ray tube significantly influences the ability to detect root canal systems present in the premolar teeth. For example, if the horizontal angulation is varied by either 20 or 40 degrees, the number of root canals seen in the maxillary first and second premolars and the mandibular first premolars coincides with the number of canals actually present.<sup>[8]</sup> Walton recommended the use of two diagnostic radiographs.<sup>[9]</sup> If a radiograph shows a sudden narrowing or even a disappearing pulp space, the canal diverges at that point into two parts that may either remain separate or merge before reaching the apex.<sup>[10]</sup> If an eccentric orifice is found, at least one more canal is present and should be searched for on the opposite side. A third canal should be suspected clinically when the pulp chamber does not appear to be aligned in its expected bucco-palatal relationship. In the treatment of three-rooted maxillary first and second premolars, the buccal orifices are close to each other and can be hard to locate. Balleri et al have suggested the preparation of a cut at the buccal-proximo angle from the entrance of the buccal

canals to the cavosurface angles to create a helpful, T-shaped access outline.<sup>[11]</sup> The use of good illumination and magnification can make the location of orifices much easier and hence the treatment easier. Carr affirms that the operating microscope has greatly improved the ability of the endodontist to visualize the internal anatomy of the root canal with greater clarity.<sup>[12]</sup>

## CONCLUSION

Successful root canal treatment is based on sound knowledge of the morphology of each tooth along with the variations that exist in it. Proper knowledge in conjunction with the use of proper diagnostic tools, magnification, illumination and use of appropriate endodontic instruments significantly improves the quality of treatment.

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