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Dental Science

"MORPHOLOGICAL VARIATION OF THE MANDIBULAR FIRST PREMOLAR"

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ABSTRACT Understanding the root canal system's anatomy is crucial for successful endodontic treatment. Misinterpretations can lead to misdiagnosis, missed canals, and instrument breakage. The complexity of root canal morphology presents challenges for clinicians. Henceforth, while dealing with anatomically complex premolar patients, accurate root morphology identification is essential for both preventing procedural errors and providing efficient endodontic therapy. The current manuscript gives the insight view of a case report 55 year old female presenting clinical management of mandibular first premolar having two roots bifurcated at the mid-root level.

KEYWORDS : *Bifurcated, Mandibular first premolar, Root canal*

INTRODUCTION:

Root canal morphology is complex and variable hereafter, a thorough understanding of root canal morphology is necessary making it crucial for successful endodontic therapy. The literature documented a broad variety of root canal system variations.[1] Recognizing variations in root canal anatomy is essential for diagnosis and treatment. External surfaces often mask internal anatomy, making it difficult to diagnose and treat and successful endodontic therapy depends on cleaning, shaping, and obturation of the entire root canal system.[1] Mandibular premolars are the most challenging teeth to treat endodontically, with a higher failure rate of 11.45%.[2,3] In the literature, mandibular first premolars are usually described as single-rooted teeth. One morphologic difference that could be the cause is the two-rooted premolar.[4] Although they are uncommon, two-, three-, and four-rooted forms have also been documented.[5] The other possible reasons behind the failure in mandibular 1st premolar are due to anomalous variations, narrow mesiodistal dimensions, lack of visibility, and apical third trifurcations.

CASE REPORT:

A 55 year old female patient reported to the department of conservative dentistry and endodontics at Pacific Dental college & Hospital, Udaipur with the chief complaint of pain in the lower right back tooth region since 10 days. Patient's medical history was found to be noncontributory. Oral examination revealed occlusally carious tooth involving pulp along with attrition in relation to #44. The tooth was tender on percussion. The buccal and lingual mucosa was normal. There was no intra or extraoral swelling/sinus present. The pulp sensibility test showed negative result.

Pre operative radiograph was taken and on radiographic examination periapical radiograph was taken and it revealed occlusal radiolucency involving to pulp with an unusual anatomy of two roots, and also there was widening of the periodontal ligament space, indicating periapical pathology and the requirement for endodontic treatment [Fig. 1]. Also, there was an alveolar bone loss till middle one-third of the tooth [Fig. 1]. Based on examinations clinically, radiographically and pulp vitality tests, the diagnosis of acute apical periodontitis was made and endodontic therapy was commenced.

An inferior alveolar nerve block was given to anaesthetise the tooth by using a 2% lignocaine hydrochloride solution that contained a 1:180,000 adrenaline (Lignox 2% A, Warren, Indoco). A rubber dam was used to isolate the tooth. A round diamond bur was used in a high-speed airotor handpiece to prepare the access cavity. K-flex files (Dentsply Maillefer, Ballaigues, Switzerland) were used to negotiate the two canals by using Ingle's approach and K files and periapical radiographs were taken for determining the working length [Figure 2 A &B]. A large quantity of 2.5% sodium hypochlorite, 17% ethylene diamine tetra acetic acid (EDTA), and saline were used to disinfect the canal. The crown-down approach was used to clean and shape the canals. The master cone was verified radiographically. Furthermore, the canals were obturated by single cone technique with gutta percha using AH plus sealer. following the drying of the canals with sterile paper points (Dentsply, Maillefer, Ballaiques, Switzerland) and postoperative radiograph was taken after the obturation [Figure 3].

DISCUSSION:

Understanding root and canal morphology and potential variations is crucial for successful nonsurgical root canal treatment, which includes negotiation, cleaning, shaping, and obturation in all the three dimensions.

The utmost important considerations while treating teeth endodontically are extracanals and roots and should always be taken into an account as they are only responsible for endodontic failures. Cleaning and shaping the mandibular first premolar's root canal morphology might be challenging.[7] Ingle defined the canal's form as circular at the apical third, round or oval at the mid-root level, and ovoid at the cervical level.[8] Nonetheless, it is evident that there are numerous possible variations in the form of the mandibular first premolar's root canal system.

The handling of the endodontic issue of a mandibular first premolar with two roots that are bifurcated at the mid-root level is the subject of the case report that is being presented here.

Weine defined four fundamental types of root canal systems.[9] Vertucci in his academic work discovered eight pulp canal configurations and a large number of complex root canal networks.[10] According to Slowey, bifurcation or trifurcation of the canal should be suspected when the root canal shadow abruptly stops in the radicular region on a radiograph.[11]

Additionally, if the root outline is obscured, the lingual canal may be extremely challenging to locate, direct access to the buccal canal is typically feasible if two canals are present. The lingual canal often diverges from the main canal, making its orifice difficult to guide files. In 2011, Atul Jain and Bahuguna studied root canal morphology in a Gujarati population, identifying various canal systems based on Vertucci's Classification. The study found type I canal systems in 93 teeth.[12]

Velmurugan et al. utilized decalcification and cleaning to determine root canal architecture of mandibular first premolar teeth in an Indian population, revealing various canal patterns according to Vertucci's classification.[13]

Numerous diagnostic techniques are crucial, including taking several radiographs, carefully inspecting the pulpal floor with a pointed explorer, and improving visualisation using a dental operating microscope. The canal staining and clearing technique is the gold standard for studying root canal anatomy, but it's not in vivo. Advanced radiographic imaging methods like SCT, microCT, and CBCT provide in-depth knowledge of pulp space anatomy and rare aberrations. Conventional radiographs are used as diagnostic tools in this case.[14-16]

High-quality preoperative radiographs taken at various angulations and then closely examined to identify the presence of additional root canal are necessary to get the predicted results.

Consequently, careful radiological interpretation, attentive clinical examination of the chamber floor, in-depth understanding of root canal anatomy and its variations. An effective root canal treatment outcome requires both an access opening and sufficient magnification.

CONCLUSION:

This case study highlights how crucial it is for the practitioner to have a comprehensive understanding of the internal root canal anatomy and to use the updated procedures both before and after treatment. Successful endodontic treatment is facilitated by advanced equipment, such as a dental operating microscope, NiTi file systems, ultrasonics, a more recent obturating system, etc. Misdiagnosis of abnormal anatomical variations leads to treatment failure, while accurate diagnosis ensures successful treatment.

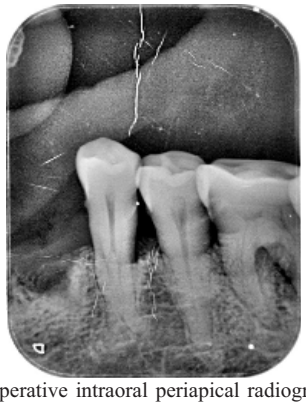

Figure 1: Pre-operative intraoral periapical radiograph revealed an unusual anatomy of two roots and widening of periodontal ligament space.

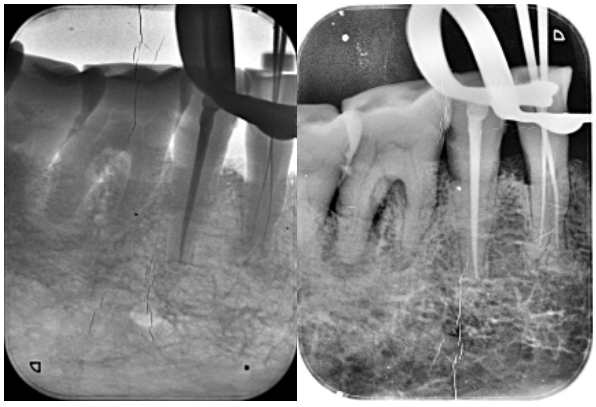

Figure 2A: Radiograph reveals working length determination in mandibular right first premolar of the patient

Figure 2B: Radiograph reveals Master cone determination in mandibular right first premolar of the patient

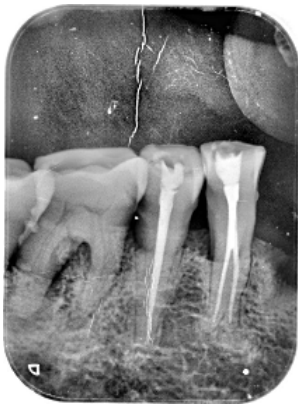

Figure 3: Post-operative radiograph of the mandibular right first premolar in the patient

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