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Endodontic Management of lower premolars with different canal configuration. Case reports

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Abstract: *Successful endodontic treatment requires an understanding of root canal anatomy and morphology. The abberant morphology of mandibular premolars has always been a challenge for the endodontist. The incidence of two canals in mandibular second premolars can be as low as 2.5% and in first premolars is 25.5% according to Vertucci .This article reports cases of mandibular premolars having different canal configuration (Vertucci type IV and Type V configuration).Article emphasizes the use of CBCT for predictive assessment and treatment of tooth presenting with such varying morphologies.*

I. Introduction

A thorough knowledge of the basic root canal anatomy and its possible variations is essential for achieving successful nonsurgical endodontic treatment[3]. The presence of an untreated or missed canal may be a reason of failure of endodontic treatment. Most difficult teeth to treat are mandibular premolars , probably because of the aberrations in their canal morphology[4].

These teeth usually have a single root and a single canal, but anatomic variations can occur[1]. Zillich and Dowsen showed that second or third canals are present in at least 23.1% of first mandibular premolars and in at least 12.1% of second mandibular premolars[5] .

Vertucci found that the mandibular first premolar has one canal in 74.0% of teeth, two canals in 25.5%, and three canals in 0.5% of teeth. The mandibular second premolar has one canal in 97.5% and two canals in 2.5% of teeth[5]. Case reports in this paper discusses the management of mandibular 1st and 2nd premolar with type IV and type V Vertucci classification respectively with the help of CBCT for correct endodontic diagnosis and management.

II. Case Reports

Case 1

A 32 year old female patient with a non-contributory medical history reported to the Department Of Conservative Dentistry And Endodontics . Her chief complaint was pain on chewing in the lower left back tooth region since 2 weeks .On clinical examination the tooth 34(FDI notation) showed temporary restoration with tenderness on vertical percussion suggestive of previously initiated root canal treatment. On radiographic examination there was presence of radiolucent lesion at the apex of 34. Radicular aspect of 34 showed blurred root canal outline suspecting the presence of multiple roots.

Local anaesthesia was administered and rubber dam was placed. Access was modified using a round diamond bur. two orifices were located one buccal and one lingual. Working length was determined radio graphically. Cleaning and shaping of the canals were done using hand hero shaper till 30 - 4%. A 2.5% sodium hypochlorite and 17%EDTA was used. The canals were obturated with 30 4%gutta percha and Zinc oxide eugenol sealer. A post obturation radiograph was taken.

Case 2

A 28 year old male patient comes to Department Of Conservative Dentistry And Endodontics with a history of discontinued root canal treatment 3 months back and was willing to continue the treatment now. On clinical examination the tooth 45 and 46 (FDI notation) showed temporary restoration suggestive of previously initiated root canal treatment with tenderness on vertical percussion. Preoperative radiograph revealed bifurcation of canal in the middle third of the root of 45 with instrument separation and widening of periodontal ligament space. To determine the exact canal configuration CBCT was advised. CBCT revealed mandibular 2nd premolar having one single canal branching into two separate canals at the level of middle third of the root and ending as two separate foramens at the apical third. (Vertucci Class V).

Anaesthesiawas obtained and the access cavity was widened. . A K –file size 6 was placed and a second precurved 6 file was placed along the side of the first file .In this case, the fractured instrument could not be visualised The decision was made to try to bypass the instrument rather than try to retrieve it.Bypassing was started by introducing a size 08 D-Finder (Mani Inc.) to the instrument. The D-Finder was used for probing and

searching for a way to bypass the instrument. After a few tries, I was able to get the D-Finder past the instrument (Fig. 3). Working length was established

The canals were negotiated upto 15 K files in the same manner. Cleaning and shaping was done with K-files up to 30 size the canals were irrigated with 2.5% sodium hypochlorite and 17%EDTA. Canals were obturated and post obturation radiograph was taken.

III. Discussion

Knowledge of pulp anatomy is essential for success of endodontic treatment and a lack of sound knowledge can lead to treatment failure [10]. The morphologies of the roots and canals of the mandibular first and second premolars can be complex and variable. Due to this variation in morphology, the endodontic treatment of mandibular premolars is a challenging task[5].

Slowey indicated that the mandibular premolars are difficult to treat endodontically due to variations in canal anatomy[3]. Vertucci found that the mandibular first premolar has one canal in 74.0% of teeth, two canals in 25.5% and three canals in 0.5% of teeth. The mandibular second premolar has one canal in 97.5% and two canals in 2.5% of teeth [5].

Vertucci did a study on Turkish population among male and female patient and found that men (43%) showed two or more canals more frequently than female patients (15%) in the study[3]. The incidence of more than 1 root, more than 1 canal, and more than 1 foramen is less frequent in the mandibular second premolars than in the first premolars[11]. The incidence of two separate and distinct root canals in mandibular second premolars was reported to be 2.5% by Vertucci [3] .

Jojo Kottoor study on root anatomy and canal configuration of human mandibular premolars and found that in Caucasian, Indian and middle eastern population mandibular second premolars showed a higher prevalence of multiple canals (14-17%)[6]

Failure to locate the extra canals is one of the main reason for the endodontic failure[12]. A thorough knowledge of tooth morphology, interpretation of angled radiographs, proper access preparation and a detailed exploration of the interior of the tooth are essential for a successful outcome of treatment.

Radiographs taken at different horizontal angulations facilitate searching for additional roots and canals. An additional canal should be suspected if a radiolucent line is present mesial or distal to the main canal[3]. The methods commonly used to study root canal anatomy include radiography, clearing techniques, direct observation with a microscope, 3D reconstruction and macroscopic sectioning[5].

Conventional radiography has the problem of superimposition; moreover, this technique results in a two-dimensional representation of a three dimensional object[5].

Advancements in the field of radiology have led to the use of computed tomography (CT) for imaging teeth. Eder et al. reported that CT is a viable tool for the evaluation of unclear root canal configurations. A cone-beam computed tomography can also be used to study root canal morphologies as this non-destructive technique provides three-dimensional pictures[5].CBCT which is a three dimensional imaging helps in understanding as well as identifying the complex pattern of tooth as well as the canal anatomies.

This will make the endodontic treatment more successful comparing with the two dimensional radiographs.CBCT identifies and confirms the presence of additional roots and canals[11]. Thus it makes the diagnosis easier to complete the endodontic procedure satisfactorily

IV. Conclusion

Variations in the number of roots and root canals may occur in any teeth. Any clinician doing root canal treatment should be aware of this and should be on the outlook for aberrant anatomy during each step of root canal treatment. This case report also emphasises the same.

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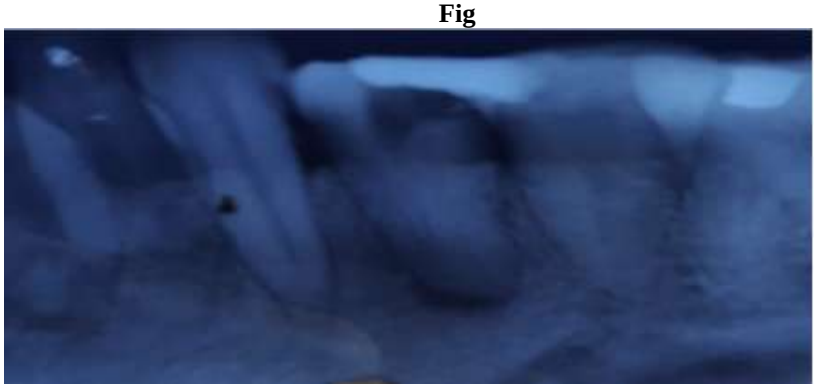
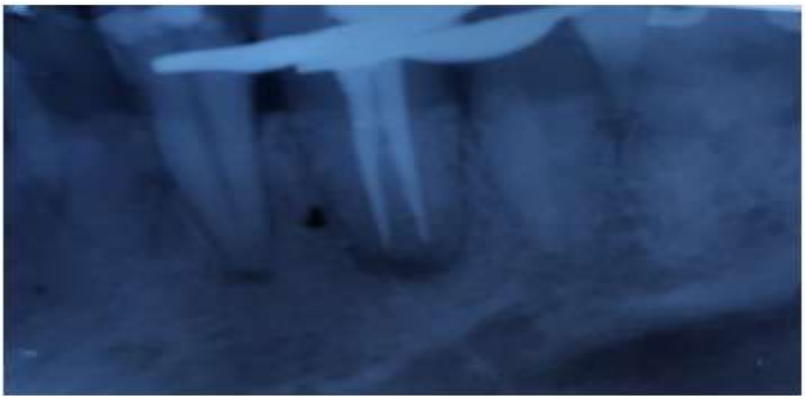
Fig



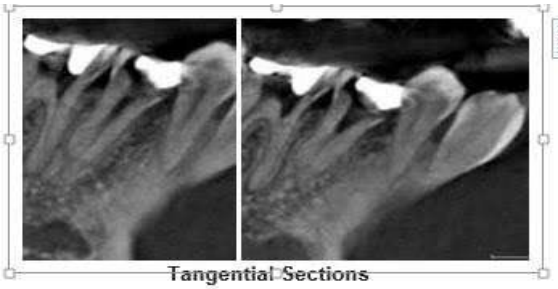
CASE1: PRE-OP

CASE 1: WORKING LENGTH

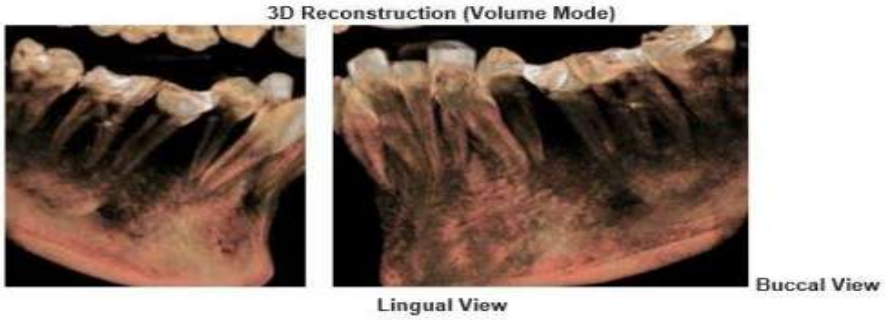
CASE1: MASTER CONE



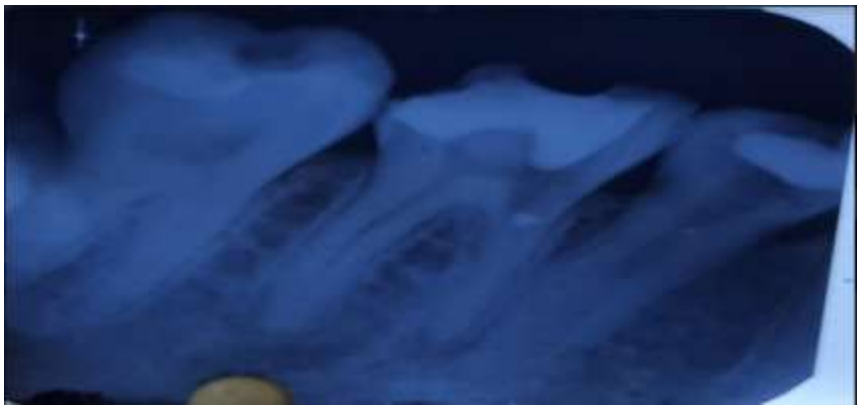
CASE1: OBTURATION



Case 2 Cbct Axial



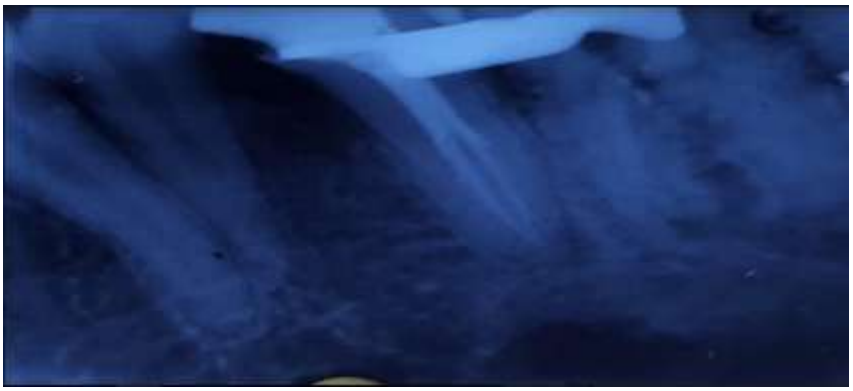
Case 2 Cbct Vol.



Case 2 pre-op.

Case 2 Working Length

Case 2 Master Cone.



Case 2 obturation.