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Endodontic Management of Mandibular First Molars with Radix Entomolaris

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Abstract

The first mandibular molar presents in the majority of cases two root, one mesial with two root canals and one distal with one or two root canals. To show three roots in this tooth is a rare occurrence. This type of anatomy is called radix entomolaris when the additional root has a lingual position; or radix paramolaris when it has a buccal position.A good understanding of the endodontic anatomy is one of the keys witch insure the success of the endodontic treatment. The practitioner must pay attention of this anatomical variation to avoid some errors when he realizes the endodontic therapy.

Keywords: Radix entomolaris; Mandibular first molar; Anatomical variation; Endodontic treatment.

Introduction

The success of the endodontic therapy is conditioned by the Shilder's triad; the root canal must be shaping and cleaning by a combined chemo-mechanical action of an antibacterial solution and endodontic files. The root canal can be then filled by a 3-dimensional obturation followed by hermetic and functional coronary filling (1).

A good understanding of the endodontic anatomy is one of the keys witch insure the success of the endodontic treatment. Typically the first mandibular molar presents two root, one mesial with two root canals and one distal with one or two root canals (2, 3). In the rare case, the first mandibular molar could have a third root in a disto-lingual position, this anatomical variation is called radix entomolaris (4). The radix entomolaris was reported for the first time by Carabelli (5). Its incidence is higher in Asian population and seems be more frequent in the first mandibular molar than the second mandibular molar (6-8). Through two case reports, we are going to illustrate and discuss the endodontic management of the radix

entomolaris to avoid errors of diagnosis and treatment, and to optimize the success of the root canal treatment.

Case Reports

Case 1: Type II

A 42-year-old Moroccan male consulted the endodontic service of the dentistry faculty of Rabat. The patient didn't report any systemic or oral diseases; he complained a history of acute pain which was spontaneous and continuous in the right posterior inferior area. The first mandibular molar 46 showed large cavity decay, and was negative for the pulp sensibility test (cold); the palpation and percussion tests were negative.

The radiographical examination showed carious demineralization which reached the pulp area and a radiolucency in the apical and the furcation area. A supernumerary root was suspected on the radiograph.

Based on the clinical and radiographic examination, the diagnosis of chronic apical periodontitis was retained. The root canal treatment was recommended.

After isolating the tooth under a rubber dam; the access cavity was opened and two mesial and two distal canal orifices were located using the Rhein endodontic explorer. The first distal canal orifice was located on the buccally side and the second distal canal orifice on the lingual position. The root canals were explored with K-file ISO 10 (Dentsply Maillefer, Ballaigues, Switzerland) and the working length (WL) was established radiographically with K-files ISO 15 (Dentsply Maillefer, Ballaigues, Switzerland). The presence of type II of radix entomolaris was confirmed with the radiography.

The shaping of the root canal was made by NiTi Protaper Universal files with a crown down concept at 300 rpm and 2,4N/cm of torque by using a speed-controlled motor (X-Smart; Dentsply Tulsa Dental, Tulsa, OK). The preparation was applied on the buccal side of the root canal to avoid any perforation on the lingual isthmus area. The flutes of instruments were cleaned after each pecks.

Irrigation was performed with 2ml of 2.5% sodium hypochlorite (NaOCl) between each instrument during the preparations of root canals. When preparation was achieved, irrigation was applied by 2ml of ethylene diamine tetra acetic acid 15% (EDTA® PrevestDenPro®) activated manually with the master cone F1 at the WL-1mm for 2 minutes. A final irrigation with 5ml of NaOCl 2,5% activated manually with a F1 gutta cone for 2 minutes.

In another appointment, radiograph with F1 gutta percha master cones was realized. After drying of the canal with a paper towels, the sealing of the root canal was made by cold lateral condensation of gutta-percha cones against the mesial and the distal walls. After checking the root filling with a control radiograph, a vertical compaction with a blue Machtou pusher was applied to complete the root filling. The access cavity was restored with glass ionomer cement and a micro-hybrid composite.

Case 2: type III

A 35-year-old Moroccan female consulted the endodontic service of the dentistry faculty of Rabat. The patient didn't report any systemic or oral diseases; she complained a history of acute pain which was spontaneous and intermittent in the right posterior inferior area. The first mandibular molar 46 showed large cavity decay, the palpation of the apical area and the percussion were slightly painful, the thermal stimulus (cold) was negative.

In radiographical examination we noticed carious demineralization which in contact with the pulp area and a periapical radiolucency. A supernumerary root was suspected on the radiograph.

Based on the clinical and radiographic examination, the diagnosis of chronic apical periodontitis was retained. The root canal treatment was recommended.

After isolating the tooth under a rubber dam; the access cavity was opened and two mesial and one distal canal orifices were located using the Rhein endodontic explorer. The distal canal orifice was located on the buccally side witch let us suspect the presence of a second distal canal orifice. The unusual location of the second orifice far to the disto-lingual suspected a supernumerary root, the presence of type III of radix entomolaris was confirmed on the radiograph. The root canals were explored with K-file ISO 10 (Dentsply Maillefer, Ballaigues, Switzerland) and the working length was established radiographically with K-files ISO 15 (Dentsply Maillefer, Ballaigues, Switzerland) placed on the root canals.

The shaping of the root canal was made by NiTi Protaper Universal files with a crown down concept at 300 rpm and 2,4N/cm of torque by using a speed-controlled motor (X-Smart; Dentsply Tulsa Dental, Tulsa, OK). The preparation was applied on the buccal side of the root canal to avoid any perforation on the lingual isthmus area, and the flutes of instruments were cleaned after each pecks.

Irrigation with 2ml of 2.5% sodium hypochlorite (NaOCl) between each instrument was performed during the shaping of root canals. When preparation was achieved, irrigation was applied by 2ml of ethylene diamine tetra acetic acid 15% (EDTA® PrevestDenPro®) activated manually with a F1 gutta cone for 2 minutes. A final irrigation with 5ml of NaOCl 2,5% activated manually with a the master cone at the WL-1mm for 2 minutes.

The patient returned after 2 weeks to complete the treatment, the tooth was asymptomatic. A radiograph with F1 gutta percha master cones was realized. After drying of the canal with a paper points, the canals were sealed by cold lateral condensation of gutta-percha cones against the mesial and the distal walls. After checking the root filling with a control radiograph, a vertical compaction with a blue Machtou pusher was applied to complete the root filling. The access cavity was restored with glass ionomer cement and a micro-hybrid composite.

A clinical and radiographic follow up was established, the radiographic of control six months later showed a recovery from injuries and disappearance of the periapical radiolucency and the stability of the sealing of the obturation.

Discussion

The prevalence of radix entomolaris is rare; its presence is mostly outside the eye of the general practitioner. The radix entomolaris is encountered more frequently on the first mandibular molar than the second with prevalence between 0.9 and 20% depending on the ethnic origins. This anatomical variation is common in Asian populations.

A good knowledge of the endodontic anatomy of the mandibular molars is essential to keep in mind the possible presence of this anatomical variation. Diagnosis of this configuration should be done before and during endodontic treatment to avoid any iatrogenic errors or complications.

A good clinical inspection of the molar crown could detecting a possible complex anatomy or atypical form, especially at the level of the furcation area which could suggesting the presence of a third root.

Radiographic examination is essential and allows collecting a maximum of information. Wang and al. (9) recommended taking three periapical radiographs, one orthogonal periapical radiograph and two 25° mesial and distal angulation radiographs. These radiographs inform the practitioner about the number of roots and endodontic anatomy with some limitation. The cone-beam computed tomography can also be very useful thanks to the data it provides through the coronal and sagittal and axial

images. Exploration of the third dimension that escapes conventional X-rays became possible (10, 11).

According to De Moor's classification (12), the radix entomolaris can be classified into three types: type I with a straight root canal, type II with an initially curved entrance of the root canal and the continuation as a straight and finally type III with a curved orientation in the coronal third of the root canal and a second buccally curvature from the middle third. The first and second clinical cases treated respectively type II and III of radix entomolaris.

Concerning the endodontic management of molars with a radix entomolaris, adaptation of the endodontic access chamber is necessary in order to better visualize all the canal orifices and to allow a direct access to the canals. Visual aids like magnifying loupes or operating microscope can be interesting (13). The initial exploration with 10 K-files assisted by the x-radiograph allows to detect and evaluate the curvatures and to confirm the presence of the radix entomolaris.

The shaping and disinfection of the entire endodontic system is then essential for successful endodontic treatment. Special attention should be paid to the distal furcation separating the two distal roots, which is usually low. Thus, it will be necessary to avoid any strip perforation of the root canals during shaping. The instruments must be carrying against the security wall. Likewise, it will be necessary to avoid any root perforation during the preparation of post placement if a corono-radicular reconstitution is indicated.

The radix entomolaris is characterized by a round section, an average apical diameter of 0.03, an accentuated curvature and in general a shorter length compared to the others roots (14).

During the canal shaping, the practitioner must negotiate curvatures to avoid any risk of instrumental fracture. Manual preliminary access with stainless steel files could reduce the risk of instrumental fracture and secure the passage of NiTi rotary sequence thereafter. The use of opener and pathfiles allows the elimination of interference located on the canal orifices and therefore allow direct and free access of the endodontic instruments to the apical two-thirds of the root canals. Also, the choice of treated NiTi like M-Wire or CM-Wire gives instruments greater flexibility and avoids cyclic fatigue fractures; the use of large diameter instruments should be avoided to minimize the risk of torsional fracture (15, 16). The endodontic system will be hermetically filled to perpetuate the result obtained by the shaping and the disinfection of canals. This will be followed by a coronal restoration which must be hermetic and functional.

Conclusion

Although the incidence of radix entomolaris is rare, this anatomical variation must be well known to practitioners. A good knowledge of this configuration allows its good endodontic management by avoiding any procedural errors. The therapeutic management begins with the diagnosis of radix entomolaris and then an adaptation of the access cavity to allow direct and free access of endodontic instruments. The radix entomolaris most often has accentuated curvatures and therefore the shaping step should take into account this feature in order to avoid any risk of instrumental fracture.

Case 1

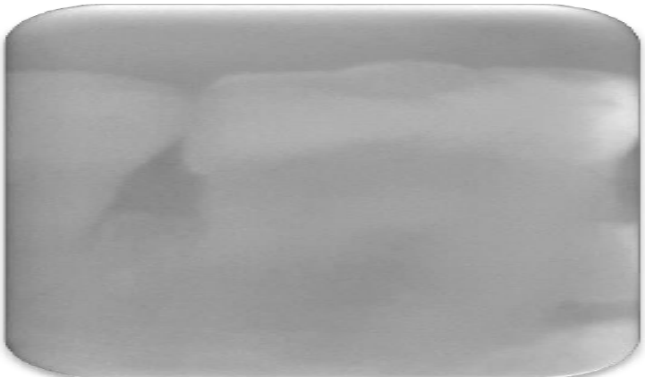

Figure 1: Initial radiography of the 46

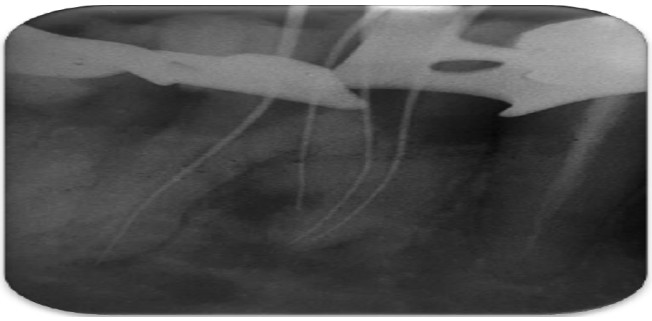

Figure 2: Radiography with K files on the canal of the 46

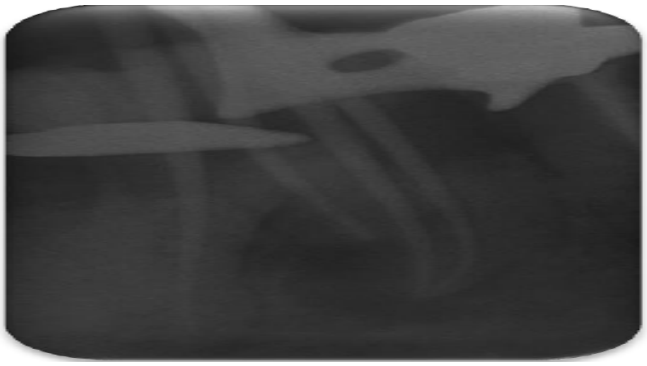

Figure 3: Radiography with masters gutta cones

Figure 4: Radiography of root filling of the 46

Case 2

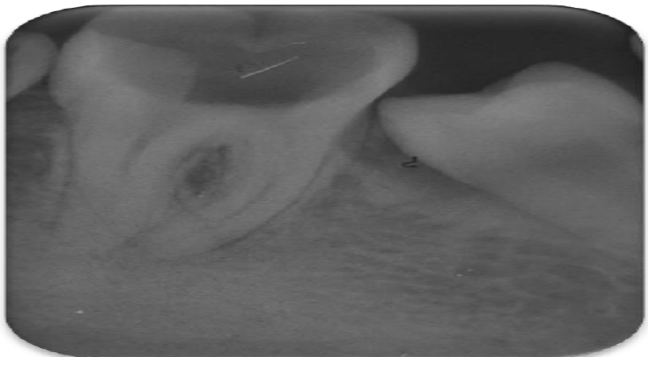

Figure 5: Initial radiography of the 46

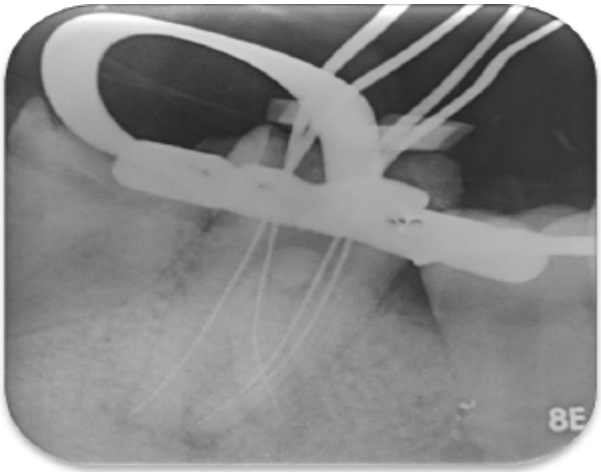

Figure 6: Radiography with K files on the canal of the 46

Figure 7: Radiography with masters gutta

Figure 8: Radiography of root filling of the 46

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