Clinical case

Retreatment of a lower second molar endodontic presenting with complex anatomy

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ABSTRACT

The purpose of this work is to present the management of a retreatment with complex anatomy, with the presence of broken instrument and filling material difficult to clear.

We present the case of a patient with pain in an endodontically treated 37. The diagnostic tests showed the presence of apical periodontitis because of previous treatment failure due to complex anatomy and sub-obturation of the canals. Upon opening, the presence of an extra root was confirmed, in which a broken file and a material similar to the composite used to fill the distal root was found. Due to the broken files, ledges and filling materials, it took three appointments to reach the working length of the entire root canal system. An irrigation protocol with 4.25% hypochlorite, 17% EDTA and 4.25% hypochlorite activated with Endoactivator was used. It was filled with the B&L®system. Follow-up at 13 months revealed healing of the previous apical periodontitis. Moreover, the tooth presented adequate function and esthetic.

In conclusion, deep understanding of the internal anatomy of the teeth and their possible variations is essential. The broken instruments and alterations in the original anatomy are the primary obstacles to overcome for a successful endodontic retreatment, which should be the first option when confronting a primary treatment failure.

KEYWORDS

Endodontics; Retreatment; Entomolaris, second lower molar.

INTRODUCTION

The purpose of endodontic retreatment is to prevent and, when necessary, cure apical periodontitis. In order to achieve this objective, endodontics is based on biological principles that consist mainly of eradicating microorganisms from the root canal system[1].

A fundamental difference between initial treatment and retreatment is the need to eliminate the filling material that may be present, managing existing obstructions or any other impediments. Only when the entirety of the root canal system is made patent can the deficiencies of the previous treatment be corrected[2].

The main factors related to failure of an endodontic procedure are the extent of the filling material, the quality of the filling, complexity of anatomy, deficient cleaning and conformation and iatrogenic procedural errors[3, 4].

Many of the difficulties encountered during treatment of root canals are due to anatomical variations[5,6]. We must be aware of the internal morphology of[7, 8] permanent teeth, as well as the possible anomalies that can be found. The success of the case depends to a large extent on these factors.

Despite the large number of publications on alterations in root canal morphology, few studies on the anatomy of second lower molars have been carried out[9,10]. These studies generally describe three canals in the interior (two mesial and one distal), but with a considerable amount of variability with regards to the number and location. Based on the race of the study subjects, there can be an increased incidence of the "C" configuration in the root canal system. These facts confirm that an opening conditioned by the occlusal morphology does not guarantee the unveiling of all of the canals[11].

One of the anatomical variants that we can find in lower molars is the presence of an extra root located lingually. First cited in the literature in 1844, it is known as radix entomolaris (RE). In European populations, it has been reported[12] in 3.4% of lower molars[12]. The probability of a third root in second lower molars is less than that of first molars. Some articles

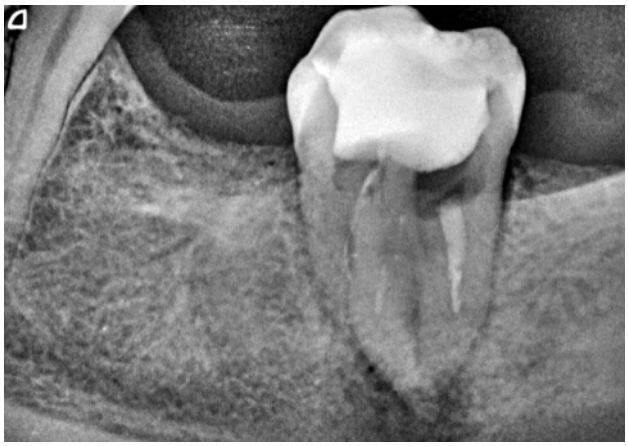


Figure 1. Initial radiograph.

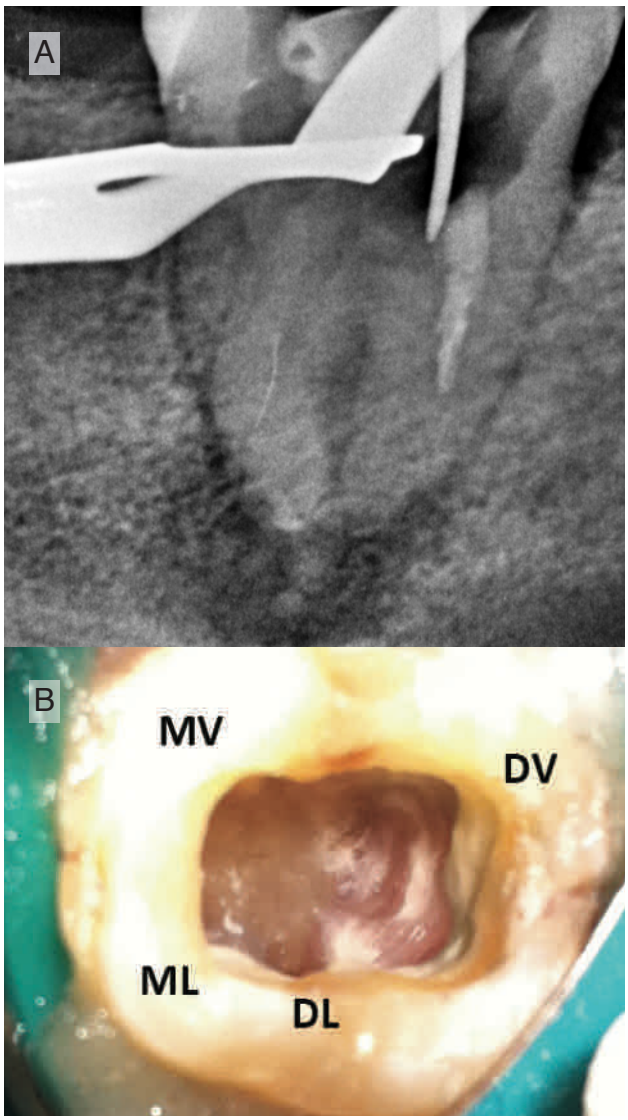


Figure 2. A) Confirmation of the trajectory of the distal root. B) Photo of the filling of the distal root.

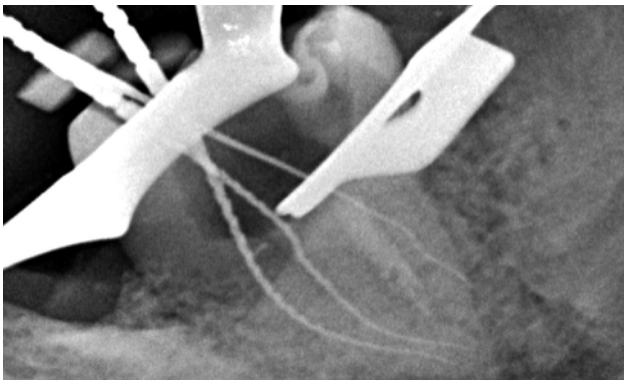


Figure 3. Patency of the mesial canals.

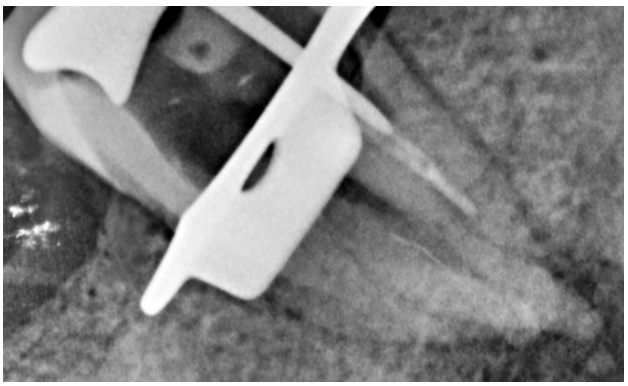


Figure 4. Confirmation of the trajectory of the distal root.

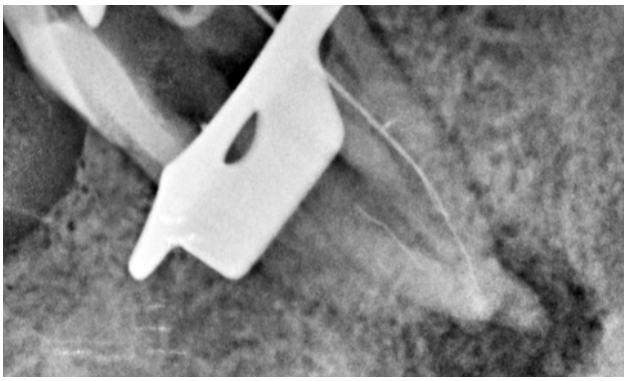


Figure 5. Patency of the distal root.

Figure 6. Broken instrument in the extra root (DL).

do not even mention it. In a recent publication by Plotino et al.[13] 161 second lower molars were analyzed using in vivo three-dimensional radiographs, finding only 3 cases of an extra root.

In the case described here, we present the retreatment of a symptomatic second lower molar with ledges, a broken instrument and complex anatomy due to the presence of an extra lingual root that, according to the Carlsen and Alexandersen classification, is classified as the AC type due to the central position between the mesial and distal root components[12].

CLINICAL CASE

We present the case of a patient without previous medical history presenting with pain and inflammation in a left second lower molar treated endodontically one year before (Figure 1). The patient referred that she went to another dentist who attempted to perform retreatment and ended up recommending extraction. Diagnostic tests showed the presence of acute apical periodontitis due to failure of the previous treatment and a complex anatomy and sub-obturation of the canals. The patient was offered the possibility of being retreated. Various objectives were established:

1. Open the mesial root, with alteration of the normal anatomy.
2. Treat the extra root, with a fractured instrument in its interior.
3. Open the distal root, the coronal third of which is filled with a material similar to composite.

The patient gave consent given her desire to preserve the tooth. Each of these objectives was completed at separate visits given the high degree of difficulty.

After opening, the presence of an extra root was confirmed. It was located on the lingual wall, centered between the mesial and distal canals, in which a broken file was found. In addition, a material similar to composite used to fill the distal root was found (Figure 2). At the first visit, after a long session, the

Figure 7. Patency of the distolingual root.

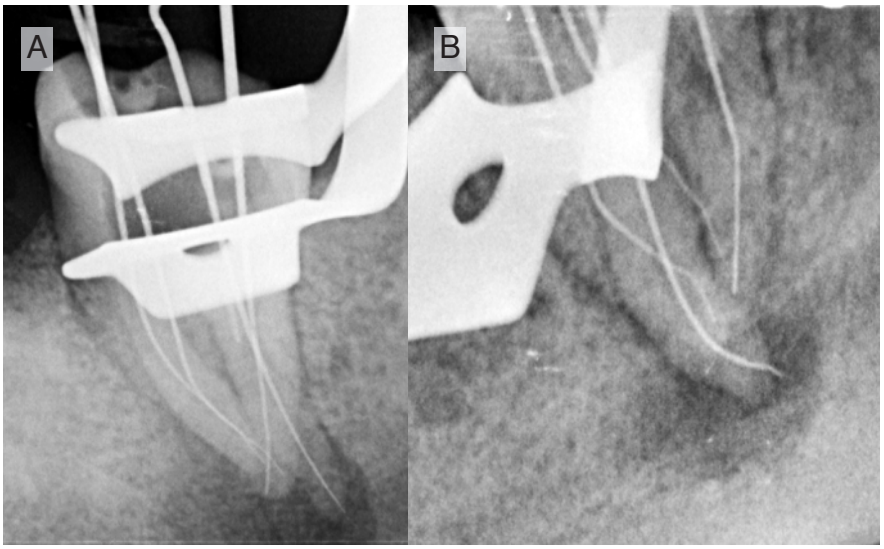


Figure 8. Measurement of the canal: A) Distoradial projection. B) Mesioradial projection

working length of the mesial canal was achieved (Figure 3). Following access rectification, reaching the mesial wall and proper preflaring, precurved number 08 and number 10 K-files® (Dentsply-Maillefer, Ballaigues, Switzerland) were used to open the root. Solvent was not used in this case because removal of the gutta-percha remnants was not difficult. However, it was truly difficult to bypass the deformation in the canal due to previous manipulation and the curvature present in the apical third. It was decided to delay treatment for a second visit.

Then, the distobuccal root was unblocked where a resin material compatible with composite had been introduced up to the radicular middle third. This material was removed slowly with the help of ultrasonics. Radiographs were taken to confirm that the correct axis of the root was being followed at all times (Figure 4). Once all of the composite was removed, we found it difficult to bypass a ledge that was present at this point (Figure 5). Finally, the distobuccal canal was opened with precurved 08 and 10 files that were essential during the entire retreatment. Due to the prolonged time and complexity of the case, it was necessary to continue at a third visit. The patient agreed given that she had been informed about the high difficulty of the case.

The extra root (distolingual) was addressed in this last session in which a broken instrument was found (Figure 6). Given the lack of magnification and the position of the file, located in a curvature within the radicular middle third, the objective was to try and bypass it rather than remove it from the canal. The procedure was similar to that in the mesial root, starting with repositioning of access to the root, proper coronal widening, followed by the use of various fine precurved files until the fragment was bypassed. Once this first objective was achieved, we found again alterations of the original anatomy with ledges located on its external wall. Several thin files, patience, time and a lot of cooperation from the patient was needed until the definitive working length

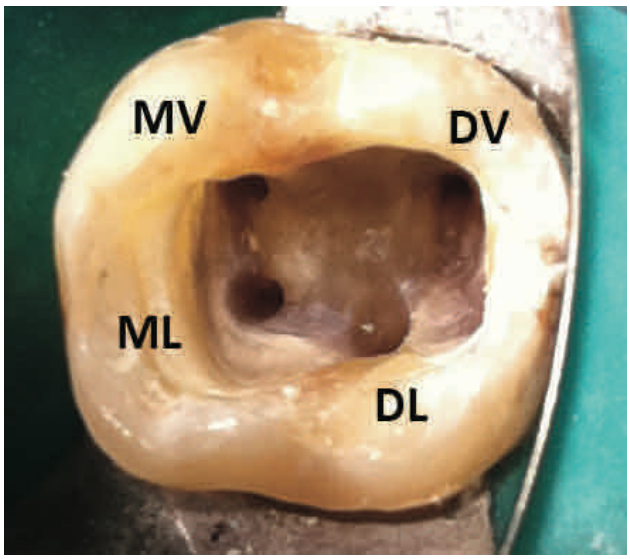


Figure 9. Chamber photo of the unblocked canals.

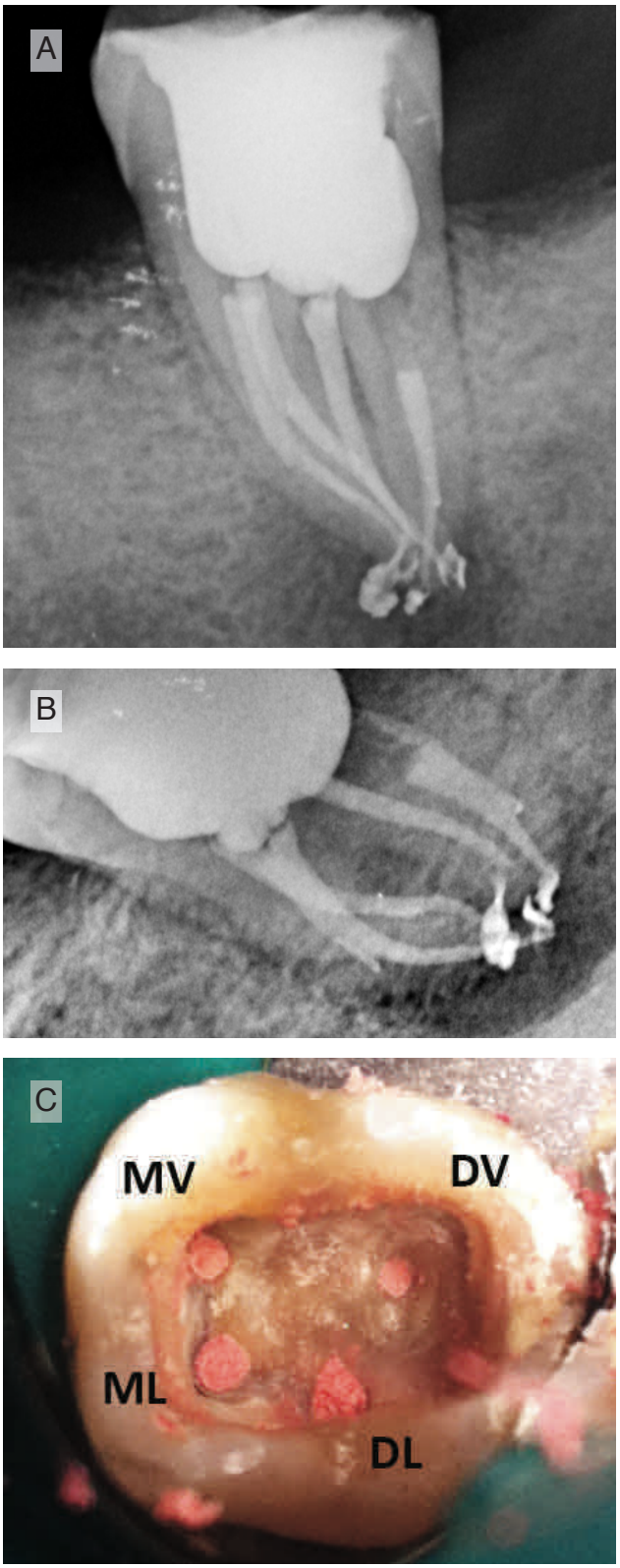


Figure 10. A) Orthoradial projection of condensation. B) Mesioradial projection where ledges can be seen. C) Photo of the entrance to the filled canals.

was achieved (Figure 7).

Once access to the apical foramen was achieved, the working length of all canals was reached with the use of a Raypex 6® apex locator (VDW, Munich, Germany) and once the measurement was radiographically confirmed (Figure 8), mechanical instrumentation was carried out with manual files up to a 20 k file® (Dentsply-Maillefer). The mesial canals were instrumented with Mtwo® (VDW) rotating files up to 30.06. The distal roots were manually worked due to the presence of ledges. Mtwo® rotating files were then introduced manually up to 25.06 in DL (distolingual) and 40.04 in DV (distobuccal).

Cleaning and disinfection of the radicular canals was carried out during the entire treatment with 4.25% sodium hypochlorite and the procedure was finalized with a protocol of 4.25% sodium hypochlorite, 17% EDTA solution and sodium hypochlorite again, all activated with Endoactivator® (Advanced Endodontics, Santa Barbara, CA) in 30-second cycles. Once the root canal system was patent, instrumented and disinfected (Figure 9), thermoplastic filling was carried out. The help of a calibrated cold spray (Sybron Endo, Sybron Dental, Orange, CA) was necessary in order to be able to precurve the Autofit® tips with 4% conicity and allow them to be positioned over the working length because if they had been introduced straight, they would have bended at the anatomical alterations inside the root canal.

Condensation was done with the help of a size A digital spacer (Dentsply-Maillefer) and accessory tips in order to ensure good compaction of the gutta-percha in the interior of the canals. The continuous-wave technique described by Buchanan[14] was then applied using heat with the B&L® Alpha System (B&L Biotech USA, Inc., Bala Cynwyd, PA, USA.) up to 4 mm less than the working length, followed by vertical condensation with a manual plugger. Filling of the coronal 2/3 of the canals was carried out using gutta-percha injection with the B&L® Beta System (Figure 10). The distal radiographic projection clearly shows the existing ledges in the distobuccal, distolingual and mesiobuccal canals, given that the thermoplastic filler has perfectly filled these alterations of the original anatomy.

Figure 11. Provisional restoration.

Figure 12. Reconstruction with cuspid cap.

At a fourth visit, the patient was asymptomatic with no inflammation or pain. Reconstruction of the tooth was performed using a cusped cap based on the criteria by Dietschi et al[15]. (Figure 13). Direct composite was performed, allowing the tooth to be protected from a possible fracture at a low cost to the patient while we follow the endodontic retreatment. A final radiograph was taken once the treatment was completed as baseline to compare with future follow-ups (Figure 13). The patient was seen again at 6 and 13 months (Figure 14) where resolution of the previous apical periodontitis and formation of new bone tissue are visible.

DISCUSSION

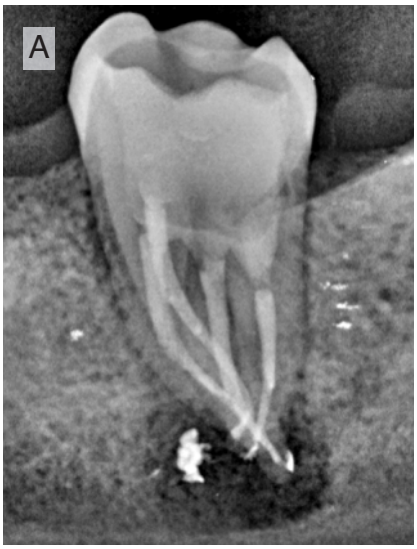
Various publications report an 80% success rate in endodontic treatment[16,17]. With regards to retreatment, one study by Torabinejad et al[18] states that the rate of successful retreatment is 78.8%, over teeth that have lost or notably decreased their radiolucidity.

In order for retreatment to work, the etiological factors must be addressed. To achieve this objective without extracting the affected tooth, treatment guidelines must be established. We must weigh the risks and benefits[19]. In general terms, the benefits "are treatments[20] that in some way lead to the patient's wellbeing, health or both."

The risks to keep in mind when evaluating the case are: crown restoration, the presence or absence of a post, obstacles to the radicular canal, nearby anatomical[21] structures, accessibility[21]...

Once the viability of the tooth and the risks and benefits have been weighted, it is very important to inform the patient in order to make them aware of the difficulty of the case and the prognosis. In this case, the patient wanted to keep her tooth at all costs.

A common controversy in retreatments is whether or not to use solvents to resoften the gutta-percha. Traditionally, chloroform was the solvent of choice[22] because it is the most effective[22]. However, concerns have been raised about its cytotoxicity when it contacts the periapical tissues; it has been classified as a[23,24] carcinogen and it is potentially risky for dental personnel. However, there is [24] limited evidence of its carcinogenicity[24]. For a less toxic alternative, there are other solvents on the market such as eucalyptol, xilene/xilol, trichloroethane, tetrahydrofuran, methylene chloride, halothane and orange[25] oils. In general, all solvents are toxic to some degree and their use should be limited or avoided if they are not nec-



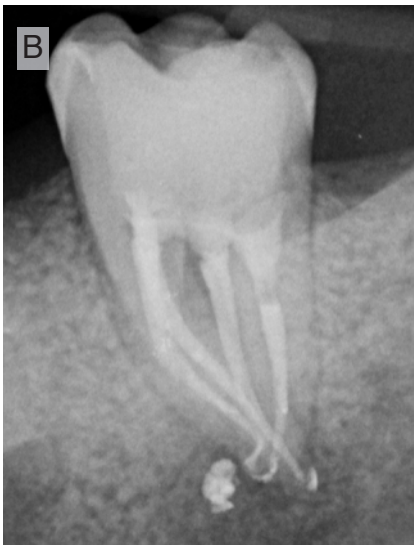


Figure 13. Final radiograph: A) Orthoradial. B) Distoradial.

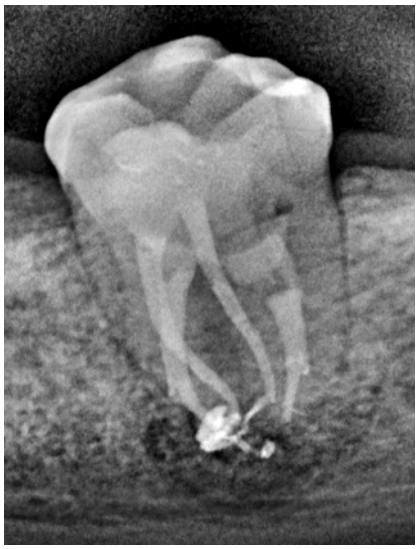


Figure 14. 13-month follow-up.

essary[26]. In the case presented above, the use of solvents was not necessary because the remnant guttapercha in the canals was not difficult to remove. The difficulty derives primarily from the deformation of the canals caused by previous treatments. The most difficult material to remove was the composite located in the distal root, so the use of ultrasonics was employed.

Breakage of instruments in the interior of the root is an unfortunate occurrence that can make cleaning and disinfection procedures in the canal difficult and affect the treatment prognosis[27]. In the case presented, we decided to bypass the file instead of trying to remove it from the root canal system because it was located in an extra root, which is usually narrow and curved, and there was a high probability of damaging the structure when removing the fragment. At this point, the advantages provided by the operative microscope would have made the job easier, but no magnification system was used in this case.

Attempts to remove the broken instruments were influenced by various factors such as the anatomy of the root, the location of the instrument and the operator's skill. Nevertheless, there could be complications that may compromise the viability of the tooth. Bypassing the fragment located in the middle/apical thirds or beyond the curvature of the radicular canal may be the proper treatment option since it meets the treatment objective for the radicular canal: adequate cleaning, conformation of the canal system followed by good filling[28]. Therefore, this practice has been categorized as a successful[29,30] approach.

One source of controversy has been the direct replacement of the tooth with an implant, as had been previously proposed to the patient. If we review the literature, Becker[31] reports that the reasons for extracting a compromised tooth and replacing it with an implant are: an unfavorable crown, insufficient root length, questionable periodontal status and status of the surrounding dentition. In our case, none of these criteria had been met. If we add to this the survival rate cited above for retreatment of single teeth (78.8%)[13], we do not believe that an implant would be the first choice. Using this conservative treatment option, the patient's symptoms could be alleviated and proper aesthetics and function of the second lower molar were achieved at a much lower cost compared to an implant. In addition, the patient was advised to replace the missing first lower molar with a supported crown implant.

CONCLUSIONS

Retreatment should be the first option in cases of endodontics with apical periodontitis whenever restoration of the tooth has a good prognosis.

A deep understanding of the internal anatomy of the teeth and their possible variations is essential in order to successfully carry out endodontic treatment.

The broken instruments and alterations in the original anatomy are the primary obstacles for a successful endodontic retreatment.

BIBLIOGRAPHY

1. 0rstavik D, Pitt Ford TR. Apical periodontitis: microbial infection and host responses. In: 0rstavik D, Pitt Ford TR, eds. Essential Endodontology: prevention and treatment of apical periodontitis. Oxford: Blackwell Science. 1998:1- 8.
2. Chong BS. Managing Endodontic Failure in Practice. London. Quintessence Publishing, Co. Ltd. 2004: 1-10.
3. Ruddle CJ. Non surgical endodontic retreatment. In: Cohen S, Burns RC, editors. Pathways of the pulp. 8th edition. St. Louis: Mosby-Year Book. 2002.
4. Ruddle CJ. Microendodontic nonsurgical retreatment. Dent Clin North Am 1997; 41(3): 429-54.
5. Malagnino V, Gallotini L, Passariello P. Some unusual clinical cases on root canal anatomy of permanent maxillary molars. J Endod 1997; 23: 127-8.
6. Soares JA, Leonardo RT. Root canal treatment of three rooted maxillary first and second premolars-a case report. Int Endod J 2003; 36: 705-10.
7. Slowey RR. Radiographic aids in the detection of extra root canals. Oral Surg Oral Med Oral Pathol 1974; 37: 762-72.
8. Christie WH, Peikoff MD, Fogel HM. Maxillary molars with two palatal roots: a retrospective clinical study. J Endod 1991; 17: 80-4.
9. Vertucci FJ. Root canal anatomy of the human permanent teeth. Oral Surg Oral Med Oral Pathol 1984; 58: 589-99.
10. Caliskan MK, Pehlivan Y, Sepetcioglu F, Turkun M, Tuncer SS. Root canal morphology of human permanent teeth in a Turkish population. J Endod 1995; 21: 200-4.
11. Gorduysus O, Nagas E, Cehreli ZC, Gorduysus M, Yilmaz Z. Localization of root canal orifices in mandibular second molars in relation to occlusal dimension. Int Endod J 2009; 42: 973-7.
12. Carlsen O, Alexandersen V. Radix entomolaris: identificaation and morphology Scand J Dent Res 1990; 98: 363-73
13. Plotino G, Tocci L, Grande NM, Testarelli L, Messineo D, Ciotti M, Glassman G, D'ambrosio F, Gambarini G. Symmetry of root and root canal morphology of maxillary and mandibular molars in a white population: a cone-beam computed tomography study in vivo. J Endod. 2013; 39: 1545-8.
14. Buchanan, L. S. The continuous wave of obturation technique: centered condensation of warm guttapercha in 12 Seconds. Dent Today; 1996; 1: 60-7.
15. Dietschi D, Bouillaguet S, Sadan A. Vias de la Pulpa. 10th ed. Madrid: Editorial Elsevier. 2014. 777-07
16. Siqueira JF Jr. Aetiology of root canal failure: why well treated can fail. Int Endod J 2001; 34: 1-10.
17. Concato J, Shah N, Horwitz RI. Randomized, controlled trials, observational studies, and the hierarchy of research designs. N Engl J Med 2000; 342: 1887-92.
18. Torabinejad M, Corr R, Handysides R, Shabahang S. Outcomes of nonsurgical retreatment and endodontic surgery: a systematic review. J Endod 2009; 35: 930-7.
19. Selbst AG. Understanding informed consent and its relationship to the incidence of adverse treatment events inconventional endodontic therapy. J Endod 1990; 16: 387- 90.
20. Kvist T. Endodontic retreatment. Aspects of decision making and clinical outcome. Swed Dent J 2001; 144 (Suppl):1-57.
21. Friedman S. Considerations and concepts of case selection in the management of post-treatment endodontic disease (treatment failure). Endod Topics 2002; 1: 54-78.
22. Tamse A, Unger U, Metzger Z, Rosenberg M. Guttapercha solvents a comprative study. J Endod 1986; 12: 337-9.
23. Wennberg A, 0rstavik D. Evaluation of alternatives to chloroform in endodontic practice. Endod Dent Traumatol 1989; 5: 234-7.
24. Zakariasen KL, Brayton SM, Collinson DM. Efficient and effective root canal retreatment without chloroform. J Can Dent Assoc 1990; 56: 509-12.
25. Duncan HF, Chong BS. Removal of root filling materials. Endod Topic 2008; 19: 33-57.
26. Barbosa SV, Burkard DH, SpangbergLSW. Cytotoxic effects of gutta-percha solvents. J Endod 1994; 20:6-8.
27. Strindberg L. The dependence of the results of pulp therapy on certain factors: an analytic study based on radiographic and clinical follow-up examination. Acta Odontol Scand 1956; 14 (Suppl 21):1-175.
28. Madarati AA, Hunter MJ, Dummer PM. Management of intracanal separated instruments. J Endod 2013; 39: 569-81.
29. Hulsmann M, Schinkel I. Influence of several factors on the success or failure of removal of fractured instruments from the root canal. Endod Dent Traumatol 1999; 15: 252-8.
30. Al-Fouzan KS. Incidence of rotary ProFile instrument fracture and the potential for bypassing in vivo. Int Endod J 2003; 36: 864-7.
31. Becker W. Immediate implant placement: diagnosis, treatment planning and treatment steps for successful outcomes. J Calif Dent Assoc 2002; 33: 303-10.