

Extraneous Canals in Endodontics: A Series of Case Reports

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Abstract

The intricacies of the root canal system directly affect the clinical outcome of the endodontic treatment. Thorough knowledge of all the possible aberrations of the canal anatomy plays a vital role in the treatment success. The current paper presents, a series of clinical cases of additional canals in incisors, maxillary and mandibular molars. It discusses the signs suggestive of additional canals and consequent modifications in treatment procedures necessary to improve the prognosis of the teeth.

Keywords: Extra canals; Endodontic therapy

Introduction

The main goal of root canal therapy are the concomitant association of proper diagnosis and access cavity preparation, thorough biomechanical preparation and three dimensional obscuration [1]. Ingle lists the most frequent cause of endodontic failure as apical percolation and subsequent diffusion stasis into the canal. Variation in root canal anatomy such as presence of extra canal, multiple foramina, apical delta, furcation accessory canals etc. are common findings [2]. Ignorance of internal anatomy of tooth leads to failure of root canal treatment because of the lack of proper cleaning and three dimensional sealing [3-4].

It is generally accepted that a major cause for the failure of endodontic therapy is an inability to recognize the presence of and to adequately treat all the root canals [5]. According to Washington study it was concluded that, unfilled canals were associated with 3% of endodontic failures [6].

Case report 1

A 17-year-old female patient reported to our department with a chief complaint of continuous and radiating pain in the right upper back teeth region for several days. On clinical examination, a temporary restoration was found in relation to right maxillary first molar which was done a month ago. The tooth showed exaggerated response to thermal test without any edema or fistula associated. The preoperative peri-apical radiograph

showed residual caries around restoration approximating the pulp. Concluding the clinical and radiological findings, the diagnosis was made as chronic irreversible pulpitis and the tooth was prepared for nonsurgical endodontic therapy. After administration of local anesthesia using 2% lignocaine with 1:100000 epinephrine, tooth was isolated with a rubber dam and a conventional endodontic access opening was made. After the gross removal of pulp tissue located in the chamber, three orifices were observed – palatal, mesiobuccal and distobuccal located in regular locations. Subsequently during the final examination of the pulpal floor, a bleeding point was noticed just palatal to the already located mesio buccal orifice which was confirmed to be extra canal with DG 16. The conventional triangular access cavity preparation was modified to “cloverleaf model” in order to provide straight line access to the additional mesiobuccal canal. Then working length was estimated using ingles method and conventional radiography. The canals were instrumented initially till #20 K flexesFiles (Axis/Sybron endo) under copious irrigation with 3% NaOCl, 17% EDTA and Saline. Enlarged till #25 6% protaper universal rotary system (Dentsply Maillefer, Ballaigues). During cleaning and shaping both the mesiobuccal canals were found to merge with each other because of their close proximity which allowed the placement of single cone #25 6% GP point followed by lateral condensation. Obturation was completed with AH plus sealer (Dentsply Maillefer, Ballaigues, Switzerland) and gutta-percha points in relation to rest of the canals (Figure 1).

Case report 2

A 36 year old female patient reported with a chief complaint of severe throbbing pain and swelling in the lower right back teeth region since 15 days. She also admitted similar episodes in the past which relieved on medication. On clinical examination, a deep carious lesion was found in relation to the right first mandibular lower molar with obliteration of the vestibule. The tooth was tender to percussion. Analgesics and antibiotics were advised to the patient and recalled after 3days. On the next visit, a preoperative radiograph was taken and extensive periapical radiolucency was found surrounding the mesial and distal roots. The diagnosis was made as chronic irreversible pulpitis and non-surgical endodontic therapy was planned for the tooth. . After administration of local anesthesia using 2% lignocaine with 1:100000 epinephrine, tooth was isolated with a rubber dam and a conventional endodontic access opening was made 4 orifices were located – mesiolingual, mesiobuccal, distobuccal and distolingual located in regular locations with an additional orifice mid-way on the line connecting the mesiobuccal and mesio lingual canals with the help magnification loupes. Working length was estimated using by means of an electronic apex locator (Root ZX; Morita, Tokyo, Japan) and then confirmed by a radiograph followed by cleaning and shaping till #30 4% HERO SHAPER rotary system (Micro Mega, Benseneon, France) under copious irrigation with 17% EDTA, 3% NaOCl and saline. Then calcium hydroxide intra canal medicament (Apexcal, IvoclarVivadent) was placed and closed with temporary restoration and recalled after 3days. On the subsequent visit, the tooth was obturated with # 30 4% gutta-percha and zinc oxide eugenol sealer (pulp canal sealer, Sybron endo) and post endodontic restoration was completed (Figure 2).

Case report 3

A 28 year female patient presented with a fractured restoration and asymptomatic tooth. On clinical examination, there was extensive distal proximal caries adjacent to a dislodged restoration in relation to the lower right first mandibular lower molar. Thermal sensitivity test and vital pulp test indicated pulp necrosis. Neither fistulae nor edema was observed. On investigation with radiographs in different angulations, there was a deep carious lesion approximating pulp with an additional root along with the mesial and distal roots. A clear widening of the periodontal ligament was also seen around the roots. Local anesthesia was administered and the tooth was isolated under rubber dam. Access cavity was prepared; the first distal canal was located slightly away from the center more buccally. Then the access cavity preparation was modified from a triangular shape to a trapezoidal form and another canal was located in the same line on the lingual side with DG- 16 endodontic explorer and patency of canals was made with 15 number K -file (Mani Japan). Working length was determined radio graphically. Cleaning and shaping

was done with M2 Niti rotary system (VDW, Munch, Germany). Glyde was used as a lubricant and the irrigants used were 3% sodium hypochlorite, 17% EDTA and normal saline. Obturation was performed using #25 6% GP and Zinc oxide eugenol sealer in single cone technique (Figure 3).

Case report 4

A 14yr old boy reported to our department with pain in the lower front teeth since a week. On clinical examination, lower left lateral incisor was tender to percussion and did not respond to vitality test. Radio-graphically there was peri-apical radiolucency surrounding the root. Access cavity was prepared under local anesthesia with 2% lignocaine with 1:10000 epinephrine. After extirpating the pup tissue and locating a canal, the pulp chamber was filled with 3%NaOCl and interestingly bubbles were seen surfacing suggestive of a hidden canal (champagne test). On careful probing, 2 canals were located one buccally and other lingually. Working length was determined and cleaning and shaping was carried in step down technique with manual k-flex files(Sybron endo, West Collins, CA, USA) under irrigation with 3% NaO Cl 17% EDTA and saline. Obturation was completed in lateral condensation technique using 2% gutta percha and AH plus sealer and permanent restoration was done with composite (Figure 4).

Case report 5

A peculiar case of additional canals was encountered when a 23 year old female patient reported to our department with fractured upper front teeth following a fall from staircase. On clinical examination, a fractured upper right lateral incisor with pulp exposure was found. The tooth gave a negative response to vitality test. Radio-graphically, widening of periodontal ligament was seen. Access cavity was prepared under local anesthesia with 2% lignocaine with 1:10000 epinephrines. Unlike the usual presentation of single canal centrally in the pulpal floor, 2 canals were located one buccally and other lingually. Working length was determined and cleaning and shaping was carried in step down technique with manual k-flex files(Sybron endo, West Collins, CA, USA) under irrigation with 3% NaO Cl 17% EDTA and saline. Obturation was completed in lateral condensation technique using 2% gutta percha and AH plus sealer (Figure 5).

Discussion

A thorough understanding of the morphology of the pulp cavity is essential for successful endodontic therapy. The operator must be aware of the presence of the extra canals in teeth, while treating them. There are various methods, which helps in exploring the presence of additional canals. Clinically, the presence of tactile sensation of catch on the canal wall during instrumentation of an unobstructed main canal, the presence of continuous bleeding in teeth despite after complete instrumentation [7] and Radio-

graphically, the presence of an apical rarefaction on the lateral side of the root, the eccentric location of an endodontic file on a radiograph during working length determination, radiographs with different angulations, inconsistent apex locator readings, a sinus track that traces laterally away from the main canal, may suggest the presence of such canals [8].

Other methods by which additional canals can be identified are - use of intra oral camera, use of magnification with loupes, Dental operating Microscope, Rod lens Orascope and Endoscope, Champagne test, Dentinal mapping, ultrasonic tips, Endodontic probe (eg: DG16, CK17), use of staining dyes such as iodine in potassium iodide, ophthalmic dye or 1 % Methylene blue and advanced diagnostic methods like Tuned aperture computed tomography system of digital imaging was superior to conventional film in the detection of root canals in teeth [9].

It may be necessary to modify the conventional access cavity preparation for better visualization and instrumentation of additional canal, even at the expense of compromising crown structure [2]. Luebke has made a note that an entire wall need not be extended in the event that instrument impingement occurs owing to a severely curved root or an extra canal. In extending, only that portion of the canal wall needed to free the instrument, a cloverleaf appearance may evolve as outline form which, Luebke has termed as "Shamrock preparation" [10].

There are several techniques to obturate the root canals. However in these extra canals, along with the regular lateral compaction technique, hybrid technique has also been suggested to obturate the canals [11]. The use of vertical compaction with apical backfilling technique has been shown to allow the creation of an effective apical plug and an excellent adaptation of backfilling to apical gutta-percha and to root canals [12].

Conclusion

The series of case reports presented here emphasizes on the incidence of additional canals starting from the most commonly encountered maxillary first molars to rarely found maxillary lateral incisors. It evidently shows that each case presented

to the clinician should be carefully examined clinically and radio-graphically for additional canals which contributes to the predictability and success of the overall treatment. Further-more, focus on advanced diagnostic imaging aids like CBCT helps the clinician to understand and explore all the complexities of the root canal systems.

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