

Management of a Non-Vital Central Incisor Tooth with Three Root Canals

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Abstract: A macrodont permanent central incisor tooth with unusual root canal morphology became non-vital 18 months following trauma. Two root canals were initially identified and filled, but the patient continued to have symptoms and radiographic examination indicated apical periodontitis. Careful radiographic and clinical examination revealed a third root canal, which was subsequently treated, resulting in the resolution of symptoms and periapical healing.

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Clinical Relevance: Careful radiographic and clinical examination should allow identification of additional root canals which may compromise treatment if undetected.

Maxillary central incisor teeth can vary in their root canal morphology. Although multiple canals are extremely rare, accessory canals may occur in over 60% of cases and may be impossible to instrument and clean.¹ Multiple canals usually occur as a result of abnormal dental development, including double roots, fusion, gemination and dens invaginatus.² There have been a few reports of maxillary central incisors with two root canals within a single root in the absence of dens invaginatus, fusion or gemination.^{3,4} This case report describes the challenges of endodontic treatment in a maxillary central incisor with three root canals within a single root, in the absence of any of the aforementioned conditions.

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CASE REPORT

A healthy 10-year-old girl was referred to the University Dental Hospital of Manchester, Unit of Paediatric Dentistry, for the management of a non-vital upper right permanent central incisor tooth. There was a history of trauma to the tooth 18 months prior to the development of symptoms. The tooth had been mobile but did not require splinting. On presentation to the clinic, the main complaint was of spontaneous and intermittent toothache of one-month duration. Clinical examination revealed a macrodont upper right permanent central incisor tooth (Figure 1). The tooth was slightly tender to percussion and sensitive to ethyl chloride. There was no pathological mobility but palpation over the apex was tender. Radiographic examination on a standard viewer revealed that the tooth had a large root and there was a periapical radiolucency associated with the apex (Figure 2). Despite the positive response to ethyl chloride, a diagnosis of an apical abscess was made and endodontic

treatment commenced.

After buccal infiltration with lignocaine (2%) with 1:80,000 epinephrine, a rubber dam was placed and the upper right permanent central incisor tooth was accessed. Initially, a standard-sized access cavity was produced in the palatal surface of the macrodont crown. This was extended mesially and distally to access the two root canals. The pulp in the distal of the root canals was non-vital. The pulp in the mesial root canal was hyperaemic and very sensitive, and could not be extirpated. The root canals were therefore dressed with a steroid/



Figure 1. Macrodont, slightly discoloured *ll*.



Figure 2. Periapical radiograph of the macrodont *ll*.

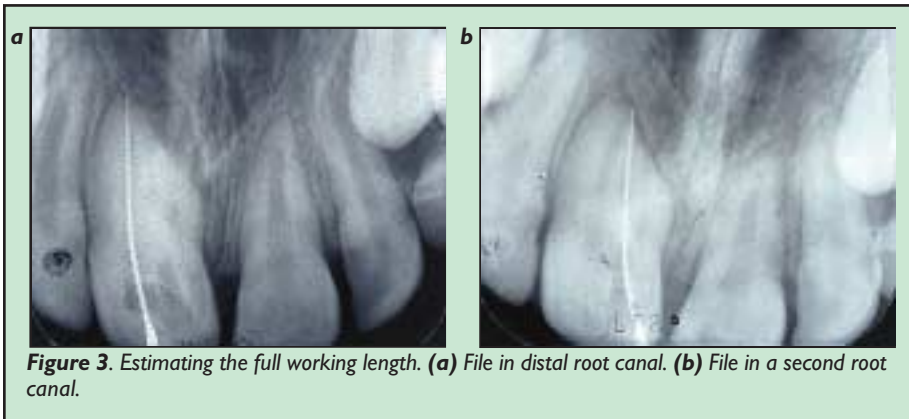


Figure 3. Estimating the full working length. (a) File in distal root canal. (b) File in a second root canal.



Figure 4. Periapical radiograph to check the placement of the root filling.



Figure 5. Periapical radiograph of the 1/1 showing a third root canal and associated radiolucency.

antibiotic paste (*Ledermix* paste, Blackwell Supplies Ltd, Gillingham, Kent) and the access cavity sealed with reinforced zinc oxide eugenol cement. The *Ledermix* was sealed into the pulp

chamber with the aim of reducing the inflammation of the hyperaemic pulp in order that local anaesthetic would be effective at the next visit. Two weeks later, the pulp in the mesial root canal was successfully extirpated under local anaesthesia. Diagnostic radiographs indicated that both canals were of equal length, this being 19 mm (Figure 3). The canals were filed using Hedstroem files and irrigated with physiological saline. This was repeated until the canals were clean. Although the root canals were narrow, the apices were still open. Both root canals were dressed with calcium hydroxide paste (*Hypocal*, Ellman International Inc., New York, USA).

Over the next year, the child attended for five visits. Fresh calcium hydroxide paste dressings were placed in the root canals at each visit. By the fifth visit, both root canals had developed complete barriers across their apical foramen.

Root canal obturation was accomplished in both canals using zinc oxide eugenol sealer and lateral condensation of gutta percha (Figure 4). The access cavity was sealed using acid etch composite.

At a subsequent 2-month review appointment, the patient reported no symptoms. At a further review, 6 months later, the patient had developed a sinus labial to the macrodont tooth. Radiographic examination showed a periapical radiolucency slightly more mesial to the one that had occurred previously (Figure 5). Close examination suggested the presence of a third root canal mesial to the other two canals. With hindsight, examination of previous radiographs (Figures 3b and 4) showed

the presence of the third root canal. Digital subtraction radiographs were taken as a baseline record. The tooth was accessed and the third canal located. Following a diagnostic radiograph, the tooth was dressed with calcium hydroxide paste (*Hypocal*) and zinc oxide eugenol temporary dressing. On review 3 months later, there were no further symptoms and the labial sinus had disappeared. Further digital radiographs were taken and digital subtraction showed that the radiolucency was healing and bone was being laid down. This is demonstrated by an increase in bone density which is represented on Digital Subtraction Radiography by a light grey area (Figure 6).⁵ The third canal was filled with zinc oxide eugenol sealer and gutta-percha using a lateral condensation technique. At review one year later the tooth had remained symptom-free with no clinical or radiographic signs of pathology (Figure 7).

DISCUSSION

When performing endodontic treatment, the clinician must always be prepared for unexpected root canal morphology. Careful radiographic examination may lead to identification of additional



Figure 6. Digital Subtraction Radiography image of the macrodont. The light grey area (arrowed) shows that the bone density has increased, indicating healing.

canals. In this case, the symptoms recurred after the initial root filling as a result of the infection from the necrotic tissue in the third root canal reaching the periapical tissues. Treatment of the infection in the third canal resulted in resolution of the symptoms.

It is not usual practice in paediatric dentistry to use magnification or microscopy to detect root canals because these are usually so wide that identification is obvious. However, in this case, it may have been prudent to utilize these aids.

CONCLUSION

This case report describes the endodontic treatment challenge posed by the management of a central incisor

with three root canals. Knowledge of dental anomalies and careful pre-treatment evaluation is essential for diagnosing unusual canal morphology.

REFERENCES

1. Kasahara E, Yasuda E, Yamamoto A, Anzai M. Root canal system of the maxillary central incisor. *J Endodont* 1990; **16**: 158–161.
2. Mangani F, Ruddle CJ. Endodontic treatment of a 'very particular' maxillary central incisor. *J Endodont* 1994; **20**: 560–561.
3. Cabo-Valle M, Gonzalez-Gonzalez JM. Maxillary central incisor with two root canals: an unusual presentation. *J Oral Rehab* 2001; **28**: 797–798.
4. Reid JS, Saunders WP, Macdonald DG. Maxillary permanent incisors with two root canals: a report of two cases. *Int Endodont J* 1993; **26**: 246–250.
5. Yoshioka T, Kobayashi C, Suda H, Sasaki T. An observation of the healing process of periapical lesions by digital subtraction radiography. *J Endodont* 2002; **28**: 589–591.



Figure 7. Final periapical radiograph showing good bony healing and the three filled root canals.

BOOK REVIEW

Periodontal Diseases – A Manual of Diagnosis and Maintenance. By Hans R. Preus and Lars Laurell. Quintessence Publishing Co. Ltd., New Malden, 2003 (89pp., £33). ISBN 1-85097-072-6.

In this manual, the authors attempt to provide an update in periodontology, and thereby encourage dental clinicians to diagnose and treat periodontal diseases, and to discuss new and old principles. They include chapters on diagnosis, initial therapy, mechanical treatment, use of antibiotics, surgical techniques, follow-up and maintenance. The contents page is very detailed and one wonders whether it would have been simpler and more effective if an index had been provided. The headings could then be shortened and would be more readily accessible. The authors touch on the problems with the existing classification of periodontal diseases, and adopt the view that there are a number of clinically indistinguishable forms of periodontal disease (periodontitis). A number of colour photos are provided to illustrate the point that 'every patient has his/her own special periodontitis', but this is

not immediately conveyed through the photos and legend, which only indicate age and gender and not clinical data. The authors imply that having clinical data may not enable us to distinguish different periodontal diseases because they may manifest in the same way, and that more than one disease may occur at the same time. This approach, however, may confuse the reader who would probably benefit from a brief description of current concepts and then read how the authors view periodontal diseases. This would also be in keeping with the authors' aims. The reference to disease activity is similarly confusing, as one might view disease progression in a number of ways, all of which are related to time.

The authors go on to emphasize the importance of correct diagnosis and how this can be achieved by microbiology and immunology. However, there is little discussion of the problems associated with determining the role of microbes in the pathogenesis of periodontal disease and, similarly, the possibility that uncultivable organisms may also play a role in disease. Selection of antibiotics is only likely to be possible if one can culture and determine antibiotic sensitivities. Furthermore, whilst one

may identify immunological conditions that render patients more susceptible to infection, it is another matter to use immune responses for diagnostic purposes, particularly since we have a poor understanding of what the important antigens are in periodontitis.

The sections on patient motivation and instrumentation are described well and concisely, highlighting common problems and their possible solutions. The best part of the manual is found in the section on surgery and use of antibiotics. This gives a thorough summary of main issues in a readable form. The photos are clear and illustrate surgery well, however, a few boxes summarizing procedures might have been more useful.

In conclusion, if this manual is to succeed in updating general practitioners on current developments, practices and trends, the opening chapters need to be presented in a more structured manner, indicating what the current concepts in diagnosis and treatment are before presenting alternative and innovative ideas.

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