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The effects of EDTA and pulsed Nd:YAG laser on apical leakage of canal obturation

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The purpose of this study was to evaluate the effects of EDTA and pulsed Nd:YAG laser on apical leakage of canal obturation. Forty-eight single-rooted teeth were used in this study. The teeth were instrumented up to a size 40 K-file and irrigated with 2.5% NaOCl between each file size. And the teeth were divided into 4 groups. In group A, the root canals were irrigated with a final flush of 5ml 2.5% NaOCl as a control group. The teeth in group B were irrigated with a final flush of 5ml 17% EDTA. The teeth in group C and D were irradiated by pulsed Nd:YAG laser (laser parameters were set at 1W, 100mJ, 10Hz, and 2W, 100mJ, 20Hz respectively).

In each group, 10 teeth for apical leakage test were obturated with gutta-perchas and calcium hydroxide sealer by lateral condensation method and immersed in india ink for 7 days. The transparent specimens for evaluation of apical leakage were prepared. The teeth were demineralized, dehydrated, and rendered transparent. The specimens were observed by stereoscopy and degrees of apical leakage from an apical stop were measured and statistical analysis was performed.

In each group, unobturated 2 teeth were observed by scanning electronic microscopy to evaluate morphologic changes of root canal walls.

The results were as follows:

1. Apical leakage was observed in 50% of samples in group A, 30% of samples in group B, 20% of samples in group C, and 10% of samples in group D.
2. The teeth in group B had less leakage than group A, but there was no statistically significant differences ($p > 0.05$).
3. The teeth in group C, D had less leakage than group A, and there was statistically significant differences ($p < 0.05$).
4. The teeth in group C, D had less leakage than group B, there was no statistically significant differences ($p > 0.05$).
5. There was no significant differences in apical leakage between group C and group D ($p > 0.05$).

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Morphologic analysis of C-shaped root using 3-D reconstruction

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C-shaped canal configuration is very difficult to treat because that clues about preoperative canal anatomy cannot be ascertained from clinical crown morphology and limited information can be derived from the radiographic examination.

This study was done to get more informations about the root and canal configuration of C-shaped root by 3-dimensionally reconstructing for the purpose of enhancing success rate of endodontic treatment.

30 mandibular molars with C-shaped root were selected. Teeth had been extracted from periodontal problems with sound crown and root portion, including teeth with caries lesion limited crown portion only.

Gross tissue and calculus were removed with an ultrasonic hand scaler. Six photo images from occlusal, apical, mesial, distal, buccal, lingual directions and radiographic view were taken as preoperative ones to compare them with 3-D image. After crown reduction to the level 1~2mm over pulpal floor was performed, teeth were stored in 5.25% sodium hypochlorite solution for removal of pulp tissue and debris. They were cleaned under running water, allowed to bench dry and embedded in a self-curing resin. This resin block was serially ground with a microtome (Accutom- 50, struers, Denmark) and the image of each level was 0.25mm. Photographs of serial sections through all root canal were digitized using Adobe Photoshop 5.0 and then minimum thickness of open and closed sites were measured (open site is the surface containing occluso-apical groove : closed sites were measured (open site is the surface containing occluso-apical groove : closed site is opposite). After digitization using 3-D Doctor (Able software Corp, USA), 3D classification of C-shaped roots was performed from this 3-D reconstructed image.

The results were as follows:

1. Most C-shape rooted teeth showed lingual groove (28/30). According to Vertucci's classification, type I, II, III, V, VII were observed.
2. New canal types such as 1-2-3-2, 2-3-2, 2-3-2-3, 1-2-3-2-1 were shown.
3. There was little difference in minimum thickness on coronal and apical portions, but open site were thinner than closed site on mid portion.

Conclusively, 3D reconstruction method could make the exact configurations of C-shape root possible to be visualized and