

The effect of dentinal tubule erosion by application of 17% EDTA solution on the apical leakage

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I. Objectives

17% EDTA is known as an effective solution to remove smear layer. When it's applied for more than 1 minute, it shows dentinal erosion of intertubular and peritubular dentin. This study is to investigate the effect of dentinal tubule erosion with different time application of 17% EDTA solution on the apical leakage.

II. Materials and Methods

35 recently extracted human teeth with single canal, straight root, and closed apex were used in this study. Crowns were removed and the pulp tissue remnants were removed with a barbed broach. Canal patency was determined by passing a size 10 file through the apical foramen, and 1mm was subtracted from these measurements to establish the working lengths. The roots were flared with Gates Glidden burs to prepare the coronal third of the canals. Apical third were prepared by ProFile & ProTaper (Dentsply. Co., U.S.A) with ATR motor(Dentsply. Co., U.S.A) to an apical size # 40. After each step of instrumentation, 5.25% NaOCl solution was applied to the root canal, with a size 27-gauge tip needle.

After canal preparation, teeth were divided into three groups by final rinse. Group 1 was rinsed by 5ml, 5.25% NaOCl. Group 2 was rinsed by 5ml, 17% EDTA for 1 min. followed by 5ml, 5.25% NaOCl. Group 3 was rinsed by 5ml, 17% EDTA for 10 min. followed by 5ml, 5.25% NaOCl.

One tooth of each group was randomly chosen to examine SEM image. Longitudinal grooves were made on the buccal and lingual root surfaces without penetrating the canal. The roots were then split with a hammer and chisel into two halves. Each exposed half was dried by 80, 90, 100% ethyl alcohol, coated with palladium-gold, and viewed with a scanning electron microscope((JSM5200, JOEL, Co., Japan).

All canals were filled by continuous wave technique with System B(Analytic Endodontic, Co., U.S.A) and Obtura II (Obtura Co., U.S.A). All teeth were stored in a humidior with 100% humidity for 48 hrs to allow sealer to set. The root surface was coated with nail polish twice to within 2mm of the apex. Two teeth were served as positive and negative controls. One tooth had the entire root surface, including the apical foramen, covered with two coats of nail polish to confirm sealing ability of nail polish. The other tooth had its root surface naked to confirm penetrability of dye. After nail polish drying, all teeth were immersed in Black India ink for 3 days. After cleaning by tap water for 4 hours, nail polish were removed by scalpel. All teeth were cleared for evaluation using a modification of the nitric acid/methyl salicylate technique. Cleared teeth were evaluated for depth of dye penetration along the gutta-percha from the apical foramen. Under $\times 12.8$ magnification by dental microscope, linear microleakage were scored by this criteria.

0 = no leakage 1 = up to 1.0 mm 2 = 1.0 mm to 2.0 mm 3 = 2.0 to 3.0 mm 4 = above 3.0 mm

The results of the evaluation were subjected to statistical analysis using a Kruskal-Wallis test and Mann-Whitney test.

III. Results

1. Group 1 and 3 show significantly greater apical leakage than group 2.
2. There was no significance between group 2 and 3.

IV. Conclusions

It would be effective to apply 17% EDTA solution for 1 minute to decrease apical leakage.