

Influence of plugger penetration depth on the area of the canal space occupied by gutta-percha

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I. Objectives

The purpose of this study was to evaluate the ratio of gutta-percha area in the canal after canal obturation with Continuous Wave of Condensation Technique with varying depths of plugger penetration.

II. Materials and Methods

Forty extracted human teeth with single canal were divided into four groups of ten teeth each. Root canals were prepared up to size 40 of 0.06 taper with ProFile®. After drying, canals of three groups were filled with Continuous Wave of Condensation Technique with System B™ and different plugger penetration depths of 3, 5, and 7 mm from the apex. Canals of one group were filled with lateral condensation technique as a control. Canals were filled with non-standardized master gutta-percha cones of medium size and Sealapex®. Coronal two-thirds of the canal was filled with the use of Obtura II™ in Continuous Wave of Condensation Technique.

After storing in a humidior at 37°C and 100% humidity for 24 hours, the filled teeth were cross-sectioned at 1, 2, and 3 mm levels from the apical foramen with a microtome. The sections were immediately photographed under a stereomicroscope, and stored in a computer using a CCD camera and a commercial digitizing image program. The periphery of the prepared root canal and all areas of gutta-percha cone, eliminating areas of sealer or voids, were traced and the ratio of gutta-percha area in the canal was analyzed using Auto®Cad 2000.

Data of gutta-percha area ratio were analyzed with one-way ANOVA, and Duncan's multiple range test.

III. Results

1. At apical 1 mm level, groups of plugger penetration to apical 3 and 5 mm showed significantly higher gutta-percha ratio than those of apical 7 mm and lateral condensation ($p < 0.05$).
2. At apical 2 mm level, groups of plugger penetration to apical 3 and 5 mm showed significantly higher gutta-percha ratio than those of apical 7 mm and lateral condensation ($p < 0.05$).
3. At apical 3 mm level, groups of plugger penetration to apical 3, 5 mm and lateral condensation showed significantly higher gutta-percha ratio than those of apical 7 mm ($p < 0.05$).

IV. Conclusions

It is concluded therefore that, under the conditions of the present study, deeper plugger penetration depth results in more favorable and efficient obturation in Continuous Wave of Condensation Technique.