ABSTRACT

Introduction: Gutta-percha has been widely accepted for years as the "gold standard" filling material to obturate root canals due to its biocompatibility, dimensional stability, thermoplasticity, and ease of removal. However, there is a major flaw in canal obturation with gutta-percha and sealer in that it is unable to create a dependable seal of the root canal system. In an effort to improve canal obturation, new techniques and materials have been developed. In 2003, the Pentron Corporation introduced Resilon™, a synthetic polymer-based soft resin bonded root canal obturation system. This is marketed under different brand names, one of which is RealSeal™. **Objectives:** This study compared RealSeal™ with gutta-percha using either lateral compaction or warm vertical compaction by evaluating (i) time taken for obturation, (ii) the apical extrusion of filling materials, (iii) the canal area occupied by the core filling material, sealer and voids at three cross-sectional levels, and (iv) adaptation of obturation materials to root canal walls by scanning electron microscope (SEM) examination. **Materials and Method:** Single canals in 64 mandibular premolars were instrumented, irrigated and divided into four equal groups. They were root filled as follows: lateral compaction/RealSeal™ (LC/R), lateral compaction/gutta-percha with AH-Plus™ (LC/GP), warm compaction/RealSeal™ (WC/R) and warm compaction/gutta-percha with AH-Plus™ (WC/GP). Time taken for obturation was evaluated using one-way ANOVA for any differences between groups. Apical extrusion was evaluated and a chi-square test was done to analyze its association with the type of filling material and technique used. One specimen from each group, randomly chosen for SEM examination, was longitudinally sectioned so that the dentine-filling interface could be evaluated. The remaining teeth were sectioned horizontally at 1 mm (L1), 3 mm (L3) and 6 mm (L6) intervals from the obturated canal terminus. Cross-sectional areas of core filling materials, sealers and voids were measured using a Leica Qwin Colour

(RGB) image analysis system. Data were analyzed using independent sample ***t***-test, Mann-Whitney U test and two-way ANOVA. **Results:** At L1, for LC, only RealSeal™ core material showed a significantly higher area compared to GP ($p<0.05$). At L3, there were significant differences between LC/R and LC/GP for filling core materials, sealers and voids ($p<0.05$). However at L6, there were no differences between LC/R and LC/GP ($p>0.05$). For WC/R and WC/GP, there were no significant differences at all levels ($p>0.05$). Both techniques showed no significant differences for canal obturation with RealSeal™ at L1 and L3 ($p>0.05$). However, at L6, obturation quality was significantly better with WC than LC ($p<0.05$). For obturation with gutta-percha, there were no differences between the two techniques at L1 ($p>0.05$). However, at L3 and L6, WC was significantly better than LC ($p<0.05$). The average time for LC/R (12.12 minutes) and LC/GP (11.30 minutes) was approximately twice as long as for WC/R (6.63 minutes) and WC/GP (6.32 minutes). RealSeal™ and gutta-percha techniques showed no significant difference in the occurrence of apical extrusion ($p>0.05$). Under SEM, for gutta-percha, a uniform gap was observed between the sealer and gutta-percha and also between the sealer and dentine. However for RealSeal™, there was no evident gap. **Conclusions:** Canal obturation with RealSeal™ was comparable to obturation with gutta-percha at all levels using WC and at the 6 mm level for LC. However, LC/R was better for greater amount of filling core materials at the 1 mm and 3 mm levels and for reducing the sealer voids at the 3 mm level, than at other regions. Both techniques showed comparable obturation quality with both types of materials at the apical level (1 mm). However, at more coronal levels of the canal, WC was better than LC, especially for obturation with gutta-percha. There was no difference in the occurrence of apical extrusion among the obturation groups. WC/R and WC/GP were faster than LC/R and LC/GP. SEM observation at different magnifications showed that RealSeal™ seemed to adapt better to dentine as compared to gutta-percha and AH-Plus™.

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DECLARATION

I certify that this dissertation has been based on my own independent work, except where acknowledged in the text or by reference.

No part of this work has been submitted for a degree or diploma to this or any other university.

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