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ABSTRACT

The aim of this study is to investigate the quality of calcium hydroxide filling using different intracanal placement methods and different types of vehicles of calcium hydroxide in permanent teeth with simulated immature apices.

Conventional endodontic access cavity was prepared on 66 extracted sound premolars after removal of 2mm of apical roots. The tooth was mounted individually on a wax base and spectrophotometric curvette with an open base which was placed on the wax to enclose the tooth. Clear acrylic was then poured in. The specimens were cross-sectioned at two levels (level A (10mm from the base of the curvette) and level B (5mm from the base of the curvette)). Gates-Glidden bur up to size 5 was used to prepare the apical part of the teeth. Specimens were endodontically prepared using K-files up to size 90. They were then divided into three groups of 22 specimens according to the methods of placement ie. syringe, syringe and followed by lentulo spiral, and lentulo spiral only. The groups were further subdivided into 2 groups of 11 specimens, according to types of vehicle of calcium hydroxide ie. Pulpdent® Tempcanal™ (aqueous suspension calcium hydroxide) and Vitapex™ (oil suspension calcium hydroxide).

The quality of calcium hydroxide filling was investigated radiographically to examine the placement of the material in relation to the apex. The presence of material at the cross-sectioned of the specimens were examined at levels A and B using the Image Analyser. One specimen from each group was sent for 3-dimensional investigation using microcomputed tomography (MCT).

Radiographic assessment showed higher proportion of material extruded from the apex when lentulo spiral±syringe method of placement was used. However, statistical analysis showed no significant difference in quality of filling, regardless of types of vehicle of calcium hydroxide or methods of placement ($p=0.810$, $p=0.239$ respectively).

Cross-sectional investigation showed that the highest mean percentage of surface area was noted in Pulpdent® Tempcanal™ group, but no significant difference was noted between the two materials (p=0.127). Significant difference was noted for different methods of placement at level B only (p=0.005) and post-hoc Games-Howell test reveled that this difference was between the syringe and syringe+lentulo spiral method (p=0.035). No voids were noted in most of the specimens at level A and B when lentulo spiral±syringe method of placement was carried out for both materials. Higher proportion of specimens with voids adjacent to the wall of the canal was noted when syringe method only was used, irrespective of level of cross-sectioning and types of vehicles of calcium hydroxide. Statistically, significant difference was noted between methods of placement and presence/location of voids (p=0.000), but not between types of vehicles of calcium hydroxide and presence/location of voids (p=0.224).

Three-dimensional views using MCT gave more detailed and accurate results in comparison to the conventional radiographs. Almost similar percentages of surface area were obtained from both the MCT and conventional radiographic views in Vitapex™ group, irrespective of methods of placement and level of cross-sectioning. However, higher percentages of surface area were noted from the conventional radiographic views in comparison to the MCT views in Pulpdent® Tempcanal™ group, regardless of methods of placement and level of cross-sectioning.

In summary, the quality of filling from the radiographs was not dependent on the methods of placement and types of vehicle of calcium hydroxide. However the quality of filling from the cross-sectional investigation revealed that there was significant difference between the methods of placement. Three-dimensional views of investigation would be more reliable and accurate in this type of study.