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EFFECT OF TAPER DESIGN AND APICAL PREPARATION ON THE QUALITY OF FILLING OF CALCIUM HYDROXIDE INTRA CANAL MEDICAMENT DELIVERED INTO SEMI CURVED CANALS BY THREE DIFFERENT TECHNIQUES: A RADIOGRAPHIC ANALYSIS

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ABSTRACT

Using an effective method for completely filling canals with calcium hydroxide paste may enhance its extent complex root canal system. Calcium hydroxide is still placed into canals by classical master apical file or lentulospiral. We have taken the present study with the aim to evaluate the efficacy of ultrasonic U file, lentulospiral, M4 headpiece and master apical file in placing calcium hydroxide into canals. In eighty extracted mandibular premolars canal preparation was done up to master apical file of F3. Samples were divided into four equal groups. Calcium hydroxide paste was places with an ultrasonic U file, #30K file attached on M4 handpiece, #30 Luentulospiral and #40 Master apical gutta percha. Radiographs were taken and scored by two examiners. Kruskal-Wallis analysis of variance test was used to determine statistical differences. Results of the present study showed that Ca(OH)2, delivered by ultrasonic U file and by lentulospiral provided satisfactory fillings than M4 activation of file and master apical gutta percha.

Keywords: calcium hydroxide, placement technique, medicament filling,radiographic

Introduction

Many a times we need to place an intracanal medicament into root canals as an adjunct to chemomechanical preparation for the complete disinfection of the root canal system to reduce the endodontic micro biota and thereby favouring periapical tissue repair.[1]Calcium hydroxide is recommended for different clinical situations, such as root canal infections, root closure, and root resorption.[2]It was found that a homogenous dense dressing of calcium hydroxide for eight weeks eliminated almost all microorganisms from root canals.[3]Delivering the largest amount of $Ca(OH)_2$ into the root canal should enhance the elimination of bacteria. A calcium hydroxide dressing helps eliminate microorganisms that might otherwise prevent periapical healing. It may also provide a physical barrier to prevent recontamination of the root canal by periapical bacteria between treatment sessions.[4] Because of limited chair time, $Ca(OH)_2$ often is placed in minimally instrumented canals. When teeth with necrotic pulps are being treated, healing is dependent on the effectiveness of the temporary antibacterial dressing that is, on the degree of contact between the antibacterial agent and the microorganisms.[5]Thus, calcium hydroxide paste is placed as deep as possible apically and as compactly as possible along the entire canal. Calcium hydroxide is radiographically very similar to radicular dentin, therefore contrast materials such as barium sulphate are added to enhance radiopacity.[6,7] It makes radiographic evaluation of calcium hydroxide into canals a quick and clinically feasible method to check the extent and quality of filling root canals. Various techniques for the intracanal placement of $Ca(OH)_2$ have been advocated.[8,9] Using an effective method for completely filling canals with calcium hydroxide paste may enhance its

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extent complex root canal system. Calcium hydroxide is still placed into canals by classical master apical file or lentulospirals.[10] We have taken the present study with the aim to evaluate the efficacy of ultrasonic U file, lentulospiral, M4 hand piece and master apical file in placing calcium hydroxide into canals.

Materials and methodology

Eighty extracted mandibular premolars extracted for orthodontic reasons were used for the study. Teeth with open apex, developmental defects, teeth which had received restorative or endodontic therapy, abnormalities in root canal shape, resorption or calcified canals were excluded from selection sample. Curvature of canals was standardized at 30^{o} by means of Shneider canal curvature system. All the teeth were secured into sample collection tubes by embedding into addition silicone putty and mounted on a marble jig. All canals were treated by a single operator. For each canal, the working length (WL) was estimated at the level of the apical foramen using a #10 hand K-file (Dentsply-Maillefer, Ballaigues, Switzerland), and a glide path was established using ProGlider (Dentsply-Maillefer, Ballaigues, Switzerland). Cleaning and shaping was carried out using the Protaper rotary file system (DENTSPLY, Maillefer, Ballaigues, Switzerland) driven by the X-Smart electric motor (DENTSPLY, Maillefer, Ballaigues, Switzerland) recommended torque and speed for each file according to manufacturer instructions. Canal preparation was done up to master apical file of F3. The canals were irrigated between files with 5 % sodium hypochlorite and finally with 2 ml of 17% EDTA. F3 size paper points were used to dry the canals. Eighty samples were divided into 4 groups with 20 samples each. In Group 1 Calcium hydroxide paste was placed with an ultrasonic U file attached to Woodpeker scaler at higher power setting. In Group 2 medicament was placed with the help of #30K file attached on M4 hand piece. Samples in Group 3 were filled with calcium hydroxide with the help of a #30 Lentulospiral whereas rest of samples in Group 4 were filled by means of #40 Master apical gutta percha point. All the samples were stored in thermocycle for 24 hours for setting. After storage samples were radiographed and the resultant radiographs were evaluated for quality of paste fill according to Rivera and Willams[11] Criteria which involves (1) distance from the working length and (2) completeness of fill in the apical, middle, and coronal thirds. The fill was classified according to the working length and scored thus: 1, at the apex; 2, 1 to 2 mm short of the apex; and 3, more than 2 mm short of the apex. Completeness of fill in each third of the canal was scored as 1, no voids; 2, less than one-fourth void space; 3, one-fourth to one-half void space; and 4, greater than one-half void space.

Statistical analysis

Radiographs were scored blindly by two examiners and the mean value of two were calculated and tabulated in table 1 for the distance from working length and for completeness of fill in table 2. Kruskal-Wallis analysis of variance test was used to determine statistical differences between 4 groups as to length and completeness of fill.

Table 1: The scores for distance from the working length in each group

Group	n	Mean
Group 1	20	3.1
Group 2	20	2.3
Group 3	20	1.6
Group 4	20	2.2

Table 2: Completeness of fill (scores of Ca(OH)2 pastes in each third of the canals)

	Group	n	Mean
Apical third	1	20	4.3
	2	20	2.4
	3	20	2.1
	4	20	2.6
Middle third	1	20	3.3
	2	20	1.3
	3	20	2.0
	4	20	1.5
Coronal third	1	20	2.3
	2	20	1.4
	3	20	1.1
	4	20	1.5

Comparison of results in table 1 between different groups shows that there was statistically significant difference between group 1 and groups 2 and 3. For the results in table 2 showing completeness of fill in the apical third, statistically significant differences were found between group 1 and groups 2, 3, and 4 non-significant difference between groups 2, 3, and 4 ($P < .05$). Similarly differences were found to be statistically significant between group 1 and the other groups for middle third of roots. There were also statistically significant differences between group 1 and groups 2, 3, and 4 for the coronal filling of calcium hydroxide.

Discussion

Calcium hydroxide is most commonly used as an intracanal dressing which been used for controlling recalcitrant exudates from root canals, arresting inflammatory root resorption, inducing a calcific response, and promoting apexification. It is reported that the desired therapeutic effect of a $Ca(OH)_2$ depends on the dissociation of $Ca(OH)_2$ into the OH ion and the Ca^{++} ion.[12]There are several commonly used placement techniques for medicaments, including injection and lentulospiral application.[13,14]In this study, the delivery of $Ca(OH)_2$ by ultrasonic U file, M4 hand piece, lentulospiral and master apical file was compared. Counter clockwise rotation of K-files did not result in acceptable fills and was consequently not used in the present study.[15]Artificial canals in plastic blocks were used in the earlier studies.[16]We have taken natural single canal teeth for standardization and to simulate clinical conditions because the effect of dentine acting as a buffer and the surface tension of dentine were not mimicked in those studies.[17]Placement of calcium hydroxide into shaped canals without voids can be difficult to accomplish but may be verified on postoperative radiological examination. So we have taken digital radiographic method to determine canal filling and blind evaluation by two endodontists to check quality of medicament fill into canals. Our study found ultrasonic U file achieves almost complete filling of CaOH2 up to the working length with a greater density at apical third of roots followed by lentulospiral activation with almost comparable results. Most voids occurred in the coronal third. Reciprocating action of M4 is not able to deliver medicament up to root apices with less dense filling. Results of our study are in conflicting with those of Dumsha & Gutmann and Sigurdsson et al. [18,15] So based on these results if the clinician uses $Ca(OH)_2$ as an inter appointment medication, ultrasonic U file should be selected that will deliver the maximum amount of material for a given preparation.

Conclusion

In conclusion, the present study showed that $Ca(OH)_2$, delivered by ultrasonic U file or by lentulospiral provided satisfactory fillings and

also that U file is a superior activation method for placement of $Ca(OH)_2$

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