A Comparative Study of Three Different Techniques of Placing Calcium Hydroxide as Intra-Canal Dressing

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ABSTRACT

Background and objectives: Calcium hydroxide used in modern root canal therapy as intra-canal dressing. It is used due to its antimicrobial effect. In this study trhree different techniques of placing calcium hydroxide as intra-canal dressing are used to determine the most effective method of using calcium hydroxide as intra-canal dressing.

Materials and methods: Eighteen mandibular premolars were randomly collected, root prepared and filled with calcium hydroxide paste in one of three techniques (1) using file and absorbent paper point with vertical compaction (2) using special syringe with vertical compaction (3) using lentulo drill with vertical compaction. Radiographs were taken to evaluate paste compactness.

Results: The placement of calcium hydroxide with lentulo drill aided by vertical compaction showed the lowest number of empty spaces followed by using special syringe with vertical compaction and the highest number of empty spaces was shown by using file aided by absorbent paper point and vertical compaction.

Conclusions: The use of lentulo drill aided by vertical compaction gave the best result of using calcium hydroxide paste as intra-canal dressing.

Keywords: root canal filling, intra canal medication, calcium hydroxide.

INTRODUCTION:

Calcium hydroxide has been used in dentistry for almost a century[1]. In modern root canal therapy calcium hydroxide is the most commonly utilized intra canal dressing.[2] The use of intra canal dressing increases the power of sanitization process achieved by cleansing and shaping the root canal, making this medication an important aspect of root canal treatment [3,4]. Calcium hydroxide used as intra-canal dressing due to its antimicrobial effect within the root canal which is used by inhibition of bacterial enzymes. The antimicrobial properties of calcium hydroxide resulted from its high PH which also determines a high release of hydroxyl ions [5,6]. The biological effect of pH on enzymatic activity of anaerobic bacteria studied because enzymatic sites are located on the cytoplasmic membrane which is also responsible for such vital functions metabolism, cellular growth and division, participation in the last stages of cell wall formation, lipid biosynthesis, electron transportation and oxidative phosphorylation.Some authors believe that hydroxyl ions from calcium hydroxide develop their mechanism of action on the cytoplasmic membrane. [7,8] The effect of the high pH of calcium hydroxide alters the integrity of the cytoplasmic membrane through chemical damage to organic components and transport of nutrients. [9,10]. Several different techniques for placing calcium hydroxide into root canals have been proposed. Anthony and Senia proposed the use of an injection syringe or Lentulo drill aided by effective lateral condensation[4] as this technique easy and give excellent results. The use of a Messing gun also was described for placing calcium hydroxide paste into root canal suggesting the simplicity and efficacy of this method[11].A special endodontic syringe with long G-27 needle was used due to

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simplicity and easy of placement calcium hydroxide into root canal [11]. Kleier etal described the placement of calcium hydroxide by using files, absorbent paper points and vertical compaction to ensure paste compactness inside root canal [9]. Another study suggested the use of different clinical methods for placing calcium hydroxide (amalgam carriers, Lentulo drill, injectable pastes and McSpadden compactors), pointed out that the clinician should know how to evaluate the situation and choose the most suitable method to promote the expected results[12,13]. Another study compared between three methods of application calcium hydroxide as intra-canal dressing using (1) lentulo drill (2) endodontic file (3) special syringe. The best results were obtained with lentulo drill [14.] The correct filling of the root canal is necessary for calcium hydroxide paste to act effectively as it can spread uniformly inside root canal with lentulo drill [1,15], that is why lentulo drill was chosen to be used in this study. The aim of this study was to compare different techniques of placing calcium hydroxide paste as intracanal dressing.

MATERIALS AND METHODS:

Eighteen human mandibular premolars were collected and divided into three groups randomly. The specimens were kept in normal saline for 7 days. Access opening was made for each tooth and a file size 15 placed inside the canal and a periapical radiograph (SD-SPEEDX-Medex, France) was taken for each tooth to determine the working length and the working length verified to be 1mm shorter of the apical foramen, (Figure 1).

Figure (1): working length determination.

then the teeth were prepared using the step-back technique by a K-type files (Dentsply, Switzerland) starting with initial file and progressing to three larger files at working length 1 mm shorter than apical foramen, the last file used is called master file ,then three files larger than master file were used to enlarge the canal with decreasing working length 1 mm with each larger size of files. The cervical third was flared using a no.4 Gates-Glidden drill. Sodium hypochlorite (1% ,5ml)was used as irrigating solution with instrumentation and then dried using absorbent paper point (DiaDent,Korea). All 18 root canals were filled with calcium hydroxide paste (ultradent Inc. USA). Three techniques were used for filling the root canals: 1 = placement with last file and absorbent paper point; 2 = placement with the special syringe that is supplied with calcium hydroxid paste kit; 3 = placement with lentulo drill, and vertical compaction was perfomed with three techniques by using vertical plugger. In group 1, 6 root canals were filled by push and pull movements with counter-clockwise rotation of the last file used in the preparation,the paste was condensed and compressed using files, absorbent paper points and vertical compaction until the cervical third was filled, (Figure 2). Teeth were then radiographed in order

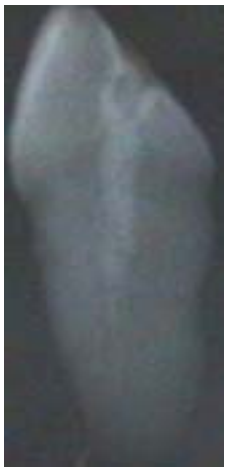

Figure (2): calcium hydroxide placed using last file.

to compare the compactness of calcium hydroxide paste. In group 2, 6 root canals were filled using the special syringe gauge 22 (Endo Eze Tips. USA). The syringe introduced in the canals 2mm shorter than the working length and calcium hydroxide paste deposited and the needle withdrawn slowly until the canal filled then vertical compaction was performed, (Figure 3).

Figure (3): Calcium hydroxide placed using the special syringe.

After that a radiograph was taken to evaluate paste compactness.
In group 3, 6 root canals were filled using no.30 Lentulo drill. An excess amount of calcium hydroxide paste was placed in pulp chamber. The drill was introduced 4mm shorter than the apical foramen and activated with a constant speed in a push-pull movement for 10 seconds to check for cervical third filling.The Movements were repeated more than once until the cervical third was filled. At this point vertical compaction was performed, (Figure 4).

Figure (4): Calcium hydroxide placed using lentulo drill.

After that a radiograph was taken for each tooth to evaluate paste compactness. All radiographs were made with the same machine (IMS) at a 4cm film focus distance and 0.5 second exposure. All radiographs presented good quality image with satisfactory contrast and sharpness. Graded square-lined transparency was used to evaluate paste compactness, (Figure 5).

Figure (5): Graded square transparency used to evaluate paste compactness.

Techniques were evaluated considering the number of squares with empty spaces observed in the radiograph with graded square-lined transparency. The parameter established was the number of squares completely filled in comparison with those with empty spaces.The mean values and standared deviation of empty and filled spaces where calculated and data analyzed with ANOVA test.

RESULTS:

The results of this study showed that the placement of calcium hydroxide with last file used in canal preparation aided by absorbent paper point and vertical compaction presented the lowest numbers of filled spaces followed by using special syringe with vertical compaction and the best technique was by using Lentulo drill. With vertical compaction, (Table 1) and (Table 2).

Table(1): Descriptive statistics for the groups

Sample No.	Filled Spaces	Empty Spaces	Percentage of Filled		
* G1: L.P.V					
1	7	8	46.70%	Sum	376.57
2	11	5	68.75%	Mean	62.76
3	11	2	84.62%	Count	6
4	2	13	13.30%	Max.	86.70%
5	13	2	86.70%	Min.	13.30%
6	13	4	76.50%	Variance	0.079597
				Standard Deviation	0.28213
**G2: S.V					
1	13	2	86.70%	Sum	481.46
2	12	6	66.70%	Mean	80.24
3	14	3	82.35%	Count	6
4	13	2	86.70%	Max.	86.70%
5	12	2	85.71%	Min.	66.70%
6	11	4	73.30%	Variance	0.006987
				Standard Deviation	0.083586
***G3: L.V					
1	12	1	92.30%	Sum	522.88
2	11	2	84.61%	Mean	87.15
3	10	3	76.92%	Count	6
4	16	0	100%	Max.	100%
5	13	2	86.70%	Min.	76.92%
6	14	3	82.35%	Variance	0.00652
				Standard Deviation	0.080746

Table(2): ANOVA test for groups' comparison

Groups	Count	Sum	Mean	Variance	Standard deviation	Min.	Max.	Lower limit	Upper limit
Last file, paper point, vertical plugger	6	376.57	62.76	0.07959	±0.28213	13.30	86.70	68.75	86.70
Special syringe, vertical plugger	6	481.46	80.24	0.00698	±0.083586	66.70	86.70	73.30	86.70
Lent-spiral, vertical plugger	6	522.88	87.15	0.00652	±0.080746	76.92	100.00	82.35	92.30
ANOVA *Source of Variation*	*SS*	*df*	*MS*	*F*	*P-value*	*Sign.*			
Between Groups	0.0019	2	0.90624	3.68232	0.044292	Sign.			
Within Groups	0.0144	15	0.09263						
Total	0.0163	17	0.99887						

DISCUSSION:

Sigudsson and stancill with Webber etal agree with the result of this study regarding the use of lentulo drill for placement of calcium hydroxid paste into root canal because it can spread the paste uniformly into root canal as the force of pushing is rotational movements and less amount of paste is displaced out of the canal during removal of lentulo drill[14,16]. Regarding the comparison between the use of different instruments to fill root canal with calcium hydroxide, Loops et al[5] stressed that the difference may be related to geometric shape of instruments. The file size 50 has larger section than the lentulo no. 30 and when removed from root canal displaces some of the paste out of the canal increasing the percentage of empty spaces and as the force used with file is manual it will spread calcium hydroxide less forcibly when compared with lentulo rotary drill. Beside calcium hydroxide paste acquired a hydro-soluble character (high viscous) and thus its placement was more difficult with a file alone and required the use of absorbent paper points and vertical compaction to aid in compression[15]. Width and curvature of the root canal can influence complete. or incomplete filling. Obviously the wider and straighter the root canal, the easier will be the introduction[13,14] so as the canals used in this study were straight canals the lentulo rotary drill can easily introduced inside the canal and spread calcium hydroxide uniformly and gave good results. Regarding the use of the special syringe that gave results better than the last file and absorbent paper point in this study as it is easily introduced inside the root canal and deposited calcium hydroxide and removed without displacing out the paste [5]. Sigurdsson and stancill suggested that the use of syringe did not give results as lentulo drill because the latter is a rotary instrument , spread the paste more forcibly and uniformly inside the root canal [14].

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