A comparative study to evaluate the sealing ability of a prisma dycal placed in cervical root perforation versus other materials (in vitro study)

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ABSTRACT

Background: Calcium Hydroxide preparations are used extensively in dentistry, and one of these aspects is treatment of root perforations. The purpose of this in vitro study was to compare the sealing ability of a prisma (visible light cure dycal), amalgam with varnish and chemical cure dycal are used to repair lateral root perforations.

Materials and Methods: Thirty extracted human maxillary anterior teeth were used; each tooth was sectioned longitudinally into facial and palatal halves .The perforations were made into each half tooth at the cervical third of the root. The samples were divided into three groups; group I was repaired with prisma, group II repaired with chemically cured dycal and group III with varnish and amalgam .The teeth halves were placed in methylene blue dye for one week period then linear dye penetration was measured from where the repair materials were made.

Results: The results showed that a prisma (visible light cure dycal) demonstrated less dye penetration than other groups, the difference was statistically significant ($p<0.01$) from other groups, non significant differences ($p>0.05$) were present between amalgam with varnish and the chemically cured dycal.

Conclusion: Calcium Hydroxide including the visible light cured and the chemically cured, and the amalgam with varnish, each possess a therapeutic potential for treating known and undetected root perforations. Percentage of leakage was more in amalgam with varnish group than prisma and Kerr Dycal.

Keywords: Root perforation, microleakage, dye penetration. **(J Bagh Coll Dentistry 2005; 17(3): 1 - 3)**

INTRODUCTION

Successful endodontics depend, in part, on accurate diagnosis and appropriate treatment planning, and because the prognosis for a tooth worsen, when a perforation occur [(1)], this potential procedural accident and its prevention should be identified as part of the treatment planning process [(2)].The cervical perforation of the canal is most often caused during the process of locating and widening the canal orifice or inappropriate use of Gates Glidden bur [(3)].

Investigators have based the prognosis of an endodontic perforation on its location, biocompatibility of the materials used for repair, and the ability of repair materials to provide a seal [(4)]. Several repair materials have been evaluated to treat perforations.

Calcium Hydroxide preparations are used extensively in dentistry, and a recently introduced product Prisma (visible light cure dycal) has passed all the recommended and secondary tests for biocompatibility; it can be flowed into place and adequately cured with 4 mm light wards.[(5)]

Amalgam has been shown to be a successful repair material; it appears that long term success of a perforation repair is dependent on a material with low solubility. The purpose of this study was to compare the sealing ability of Prisma, amalgam with varnish, and chemical dycal used to repair lateral root perforation in vitro.

MATERIALS AND METHODS

Thirty extracted human maxillary anterior teeth were placed into 5% of Sodium Hypo - chlorite at room temperature for 30 minutes, to clean root surface and remove debris .Each tooth was sectioned longitudinally into labial and palatal halves using Isomet saw, each tooth half was depressed into a putty of vinyl polysiloxane impression material up to the cut surface in order to simulate periodontal ligament.

The perforations were made into each half with no.2 round bur, the bur was entered at the pulpal surface and exited at the root surface at the cervical third of the root. The perforations angled apically to simulate a clinically misdirected bur during access preparation (1).

Ten of the halves (10 perforations) were repaired with prisma (L.D. Caulk, Co., Milford, DE) and other perforations were repaired with chemically cured dycal (Kerr Corporation,

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Italy) and the last perforations were repaired with two layers of varnish (Copalite;Bosworth,Skokie,IL) applied with a paper point and then filled with amalgam (Tytin;Kerr/Divisional Sybron,Corp.). A piece of filter paper was moistened with physiological saline and placed between the mold and the tooth so that the repair materials would be in contact with moist environment.

The Prisma dycal was placed with a light protected 1mm syringe with 25 gauge endodontic irrigation needle and cured for 60 seconds, with visible light cure (Visilux, Vivadent); prisma can be flowed into space and adequately cured with 4mm wards, these materials were mixed according to manufacturer's instructions. The specimens were left untouched in the moist environment at room temperature for 24 hours .For each specimen all the surfaces of the half tooth was coated with sticky wax except 1-2mm around the repair materials on the root surface . All the specimens were submerged in 2% methylene blue dye for one week at room temperature. An Isomet saw was used to make cuts parallel to the long axis of the tooth and through the perforation.

Linear dye penetration was measured from where the repair materials were made from the outer most contact with dentin / cementum to the maximum depth of penetration along the perforation by using dissecting microscope (Wild, Heerbrugg, Switzerland) with micrometer gauge.

RESULTS

The data of this in vitro study are demonstrated in figure 1 and table 1

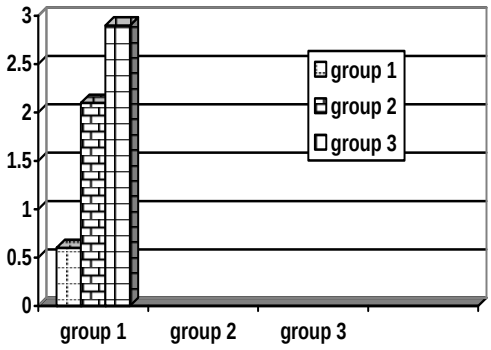

Figure 1: Bar chart graph to compare the mean leakage for groups

Table 1: The mean leakage in (mm) for the experimental groups

Groups	Type of materials	Specimen No.	Mean leakage(mm)
1	Prisma (visible light - cure dycal)	10	0.6
2	Chemical dycal (Kerr corp.)	10	2.1
3	Varnish and amalgam	10	2.9

One way analysis of variance was used to compare the mean leakage for the experimental groups .The difference between group I as compared with groups II and III was statistically significant ($p<0.01$) but not significant ($p>0.05$)between groups II and III.

DISCUSSION

In all specimens the dye penetration occurred , the dye not only penetrated along the dentin-repair material interface but also through the entire length of the dentinal tubules that communicated with the perforation a finding that agreed with Fogel [6].The use of methylene blue dye is an accepted method for the evaluation of dental materials leakage [7].The visible light cure dycal (Prisma) has shown less dye penetration than other groups this may be due to that Prisma dycal has shown a nearly three fold increase in compressive strength and at least a three fold decrease in water solubility when compared with other hardening Calcium Hydroxide preparations[8].

The working and setting times of a Prisma dycal are not sensitive to humidity or moisture; it is also capable of bonding with composite resin [1]. Chemical cure Dycal are used in this study to compare with that of visible light cure dycal in microleakage measurement Group III amalgam with varnish has shown the highest amount of leakage as compared with groups I and II. This finding may be due to that the amalgam is a condensable material non flowable material; however, amalgam is very durable and effective when adequately condensed.

When a perforation is repaired with amalgam from within the tooth, the potential exists for extruding excess material during condensation; its physical presence in the periodontal ligament space can contribute to chronic inflammation. In this regard, a flowable

material could have an advantage over a condensable one [9].

Therefore, root perforations are significant complications of endodontic treatment. However, when teeth are of strategic value, perforation repair is clearly indicated [10]. The most important factor to determine the likelihood of success of treatment of perforations is the time elapsed since occurrence of the perforation, or, more exactly, the question whether the wound site is already infected or not [11].

REFRENCES

1. Dazey S, Senia ES. An in vitro comparison of the sealing ability of materials placed in lateral root perforations. J Endo 1990; 16(1):219-23.
2. Seltzer S, Senia IH, August D. Periodontal effects of root perforations before and during endodontic procedures. J Dent Res 1970; 49: 332-9
3. Ingle JI, Back land L. Endodontics 5th ed.London, BC Decker Inc., 2002, p. 772
4. Weine FS. Endodontic therapy 4th ed. St. Louis: CV Mosby Co.1998, p. 262
5. Holand R, De Sousa V. Ability of new Calcium Hydroxide root canal filling materials to induce hard tissue formation. J Endo 1985; 11: 535-9
6. Fogel BB. A comparative study of five materials for use in filling root canal space. Oral Surg 1977; 43: 284-99
7. Kaplon SD, Tanizilli DP. A comparison of the marginal leakage of retrograde technique. Oral Surg 1982; 53: 385-95
8. Cohen S, Burns RC. Pathways of the pulp 6th ed. St. Louis, Mosby year book; 1994. p. 219
9. Allam LR. Treatment of stripping perforations. J Endo 1996; 22: 699
10. Breault LG, Fowler EB, Primack PD. Endodontic perforation repair with resin-ionomer, a case report. J Contemp Dent Pract 2000; 1(4): 22-7
11. Bargholz C. Perforation repair with MTA: a modified matrix concept. J Endo 2005; 38: 59-69.