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TheraCal LC as Direct Pulp Capping Agent Benevolence to Dentistry

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ABSTRACT

The purpose of this in-vivo study is to delineate the use of Theracal LC as a direct pulp capping agent in permanent teethafter small pulpal exposure during caries excavation. After clinical and radiographic examination in both the cases, the teeth were diagnosed with reversible pulpitis. Caries was removed and TheraCal LC was applied to the exposed area followed by composite restoration. The patient's spontaneous symptoms had resolved in both the cases after 1 week follow-up. Six months follow-up exemplified maintenance of pulp vitality, clinical function, as well as the absence of pain to tenderness and cold; periapical radiograph showed normal periodontium. Henceforth, these favourable results indicated that TheraCal LC can be successfully used as direct pulp capping agent.

Keywords: TheraCal LC; Direct Pulp Capping; Pulp Vitality; Reparative Dentin

INTRODUCTION

Preserving the pulpal health of teeth that are still functional is the utmost responsibility of the clinician. The utmost challenge in the present era of restorative dentistry is the remineralization of hypomineralized carious dentin and thus protecting and preserving the vital pulp. Diagnosing a pulpal condition is necessary prior to treatment planning.When the pulp is visibly exposed due to trauma or an iatrogenic insult such as accidental exposure during tooth preparation or caries removal, direct pulp capping can be carried out as a possible remedy.

Direct Pulp Capping is the procedure in which the small exposure of the pulp encountered during cavity preparation or following a traumatic injury or due to carieswith a sound surrounding dentin is dressed with an appropriate biocompatible radio-opaque base in contact with the exposed pulp tissue prior to placing a restoration. It aims to rebuild the structure and function of the pulp-dentin complex by promoting the growth of a dentin bridge to repair exposed pulp that has been irreversibly damaged[1].Earlier, an exposed pulp was considered to be a doomed organ. However with the application of calcium hydroxide in dentistry, pulp capping has proven to be effective in preserving the vitality of the pulp. Success rate ranges from 30-85% in two- to 10-year retrospective studies[2,3]. For instance, calcium hydroxide has long been considered a "Gold Standard" pulp capping agent. Despite being utilised as a direct pulp capping material for centuries, calcium hydroxide has unpredictable outcomes, based on long-term studies. The main disadvantage of calcium hydroxide is the formation of tunnel defects inside the freshly built dentin bridge, which provides a pathway for microbial invasion.

Consequently, calcium hydroxide was replaced by Mineral trioxide aggregatein the present day scenario which was introduced by Torabinejad in early 1993. Studies have shown that compared to calcium hydroxide, MTA improves the formation of dentin bridges more rapidly, which promotes pulp healing and increases clinical operation success rates[4,5]. Yet, MTA also has several drawbacks, such as a longer setting time that makes it challenging to apply, poor handling qualities, expensive material costs, and the potential for oral tissue discoloration[6].Therefore, new calcium silicate-based materials like TheraCal LC have been developed to improve the drawbacks associated with MTA.According to an in-vitro study by Gandolfi and colleagues[7], TheraCal LC showed lower solubility and a higher calcium-releasing ability than MTA or Dycalduring the entire 28-day testing period. This article will provide a general discussion on direct pulp capping procedures using a novel light-cured resin-modified product TheraCal LC.

Case I

A 29 year old male patient working in a local pharmaceutical company reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of sensitivity in the lower left back teeth region since 4 weeks. The patient experienced momentary pain lasting for 2-3 secondson consuming cold beverages which was relieved once the stimulus was removed. There was no history of sensitivity to hot food and the tooth responded positively to pulp sensitivity test with ethyl chloride spray, thus indicating that the tooth was vital. Percussion test was negative. Intra oral periapical radiograph revealed radiolucency on the occlusal aspect of 36 involving enamel, dentin and approaching the mesial pulp horn (fig 1b). The medical history of the patient was non-contributory and 36 was diagnosed with reversible pulpitis. After explaining the treatment procedure and obtaining signed informed consent from the patient, caries excavation was initiated with a number #6 Tungsten Carbide bur and a high-speed hand piece with water coolant

under rubber dam isolation. After removal of hard carious lesion, the remaining soft infected dentin was removed with a spoon excavator leading to pin point pulpal exposure (fig 1c) was observed. The cavity was cleaned with 0.9% normal saline and dried with sterile cotton pellets. Haemostasis was achieved in 2-3 minutes using 2.5% sodium hypochlorite. The pulpal bleeding was easily and quickly controlled (fig 1c). On the site of pulpal exposure, 1.5–2 mm thick layer of Theracal LC was placed (fig 1d). Finally, the tooth was restored with composite resin on the same day (fig 1e).

The patient was recalled after twenty four hours; one month, three and six months for clinical and radiographic follow up.

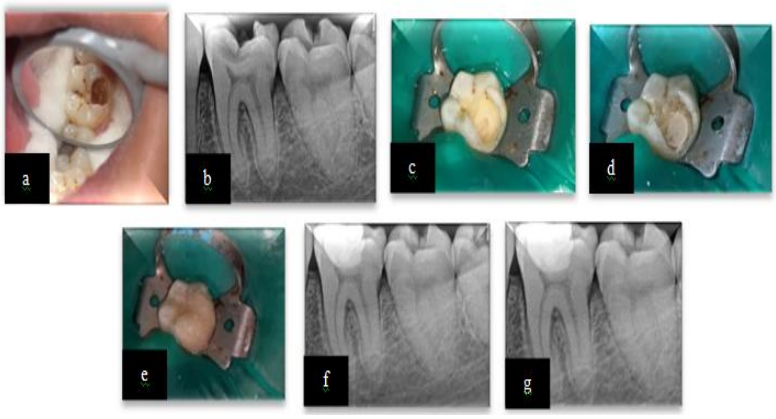

Fig.1a) Pre-operative clinical picture of tooth 36 b) Preoperative radiograph c) Pinpoint exposure d) TheraCal LC placed on the exposure site e) Restoration with composite resin f) 6-month follow up radiograph g) 1-year follow up radiograph.

Case 2

A 31 years old female patient reported to the Department of Conservative Dentistry and Endodontics with chief complaint of sensitivity in the upper left back region from past seven days. The patient experienced sharp pain on consumption of cold beverages which lasted momentarily and was relieved a few seconds later. On clinical examination, there was decay in 24 (fig 2a). Clinically, the overall depth of the cavity was 2 mm with the deepest portion having a depth greater than 2.5mm. Intraoral periapical radiograph revealed radiolucency involving the enamel, dentin and approaching the distal pulp horn (fig 2b). 24 responded positively to pulp sensitivity test with ethyl chloride spray, thus indicating that the tooth was vital. The medical history of the patient was non-contributory and the tooth was diagnosed with reversible pulpitis.

Caries excavation was planned followed by vital pulp therapy in 24. The treatment plan was explained to the patient and signed informed consent was obtained. Rubber dam was used to obtain a fluid tight seal for the restorative procedure. Caries excavation was initiated with #4 round bur. The carious part was removed and pin point bleeding was observed from the floor of the cavity (fig 2c). Haemostasis was achieved within 2 minutes using cotton pellet dipped in 2.5% sodium hypochlorite. TheraCal LC was placed over the exposure site (fig 2d) and restored with composite resin (fig 2e).

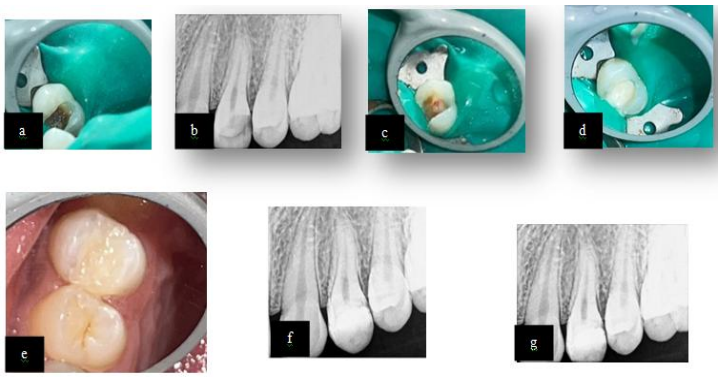

Fig.2 a) Pre-operative clinical picture of tooth 24 b) Preoperative radiograph c) Pinpoint exposure d) TheraCal LC placed on the exposure site e) Restoration with composite resin f) 6-month follow up radiograph g) 1-year follow up radiograph.

DISCUSSION

Conservation of vital pulp is essential in modern era of endodontics. Case selection plays a vital role in determining the success of vital pulp therapy and so do the materials. There are several materials that have been used as direct pulp capping agents over the years, the first being the gold foil used by Phillip Pfaff in 1756. With the passage of time various materials have evolved such as calcium hydroxide, zinc oxide eugenol cement, corticosteroids, polycarboxylate cement, collagen, growth factors such as platelet rich fibrin and concentrate growth factors, glass ionomer cement, mineral trioxide aggregate, biodentine etc.

However the standard material for pulp capping of normal vital pulp tissue is calcium hydroxide which has an anti-bacterial effect because of its high pH[8,9]. Bonding directly with adhesives over exposed pulps has been shown to result in significant inflammatory responses[10]. Resin modified glass ionomer (RMGI) and calcium hydroxide are, to date, the most popular materials used. Calcium hydroxide has been proven to induce hard tissue proliferation. However, inherent disadvantages such as high solubility, tunnel defects, poor adhesion, susceptibility to side effects of etching and lack of compressive strength resulted in a quest for better pulp capping materials[11].

Replacing calcium hydroxide with MTA as pulp capping agent gave an applauding response due to rapid and improved formation of dentin bridge which promotes pulp healing owing to greater success rates. However its drawbacks lead to search of newer pulp capping material which is cost-effective, easy to handle and can result in better outcomes. One such material with the requisite properties is TheraCal LC which is first radiopaque, HEMA-free, light curable flowable resin containing “apatite stimulating” calcium silicates. TheraCal LC’s hydrophilic resin formula is unique and is permeable to dentinal fluid but relatively insoluble to resist dissolution. It may act or resemble a scaffold for dentin formation. Its biocompatibility and ability to assist in the formation of apatite plays a critical and positive role in pulpal protection[7,12].

In present case TheraCal LC was used in place of MTA after proper case selection and pulp testing. Cold test was performed in both the cases, as it is a more definite pulp sensibility test compared to Electric Pulp Testing. Also chances of false negative or false positive results are minimum compared to EPT.

TheraCal LC is dispensed via its flowable syringe directly onto moist affected dentin or exposed pulp tissue. Hand mixing, instrument placement, or triturating is not needed. It is light cured at 20-second impulses in up to 1-mm increments. The rapid calcium release assists in stimulating the tooth’s natural healing process. Thus, it is evident that vital pulp therapies not only require proficiency but also materials which are biocompatible and can help in retaining the vitality of the pulp. “Seal to heal” is the ultimate goal of effective dentin protection. Adequate sealing of affected dentin aids in the naturally occurring dentin/pulpal healing response.

CONCLUSION

Within the limitations of the present case reports, it can be concluded that TheraCal LC can be a cost-effective, patient friendly alternative to the standardised material like calcium hydroxide and MTA; considering the successful follow-up of 1-year in the present case. However materials with such new composition need a comprehensive evaluation in vitro and in vivo for its effective results in clinical field.

REFERENCES

[1]. Asgary S, Ahmadyar M. W‘Vital pulp therapy using calcium-enriched mixture: An evidence-based review. J Conserv Dent. 2013;16(2):92– 8.
[2]. Horsted P, Sondergaard B, Thylstrup A, Attar KE, Fejerskov O. A retrospective study of direct pulp capping with calcium hydroxide compounds. Endod Dent Traumatol. 1985;1(1):29–34.
[3]. Hahn C, Liewehr F. Relationships between Caries Bacteria, Host Responses, and Clinical Signs and Symptoms of Pulpitis. J Endod. 2007; 33(3):213–9.
[4]. Weandelin, Shabahang S, Wright K, Torabinejad M. Identification of Hard Tissue After Experimental Pulp Capping Using Dentin Sialoprotein (DSP) as a Marker. J Endod. 2003;29(10):646–50.
[5]. Bogen G, Kim JS, K L. Bakland Direct pulp capping with Mineral Trioxide Aggregate: An Observational Study. J Am Dent Assoc. 2008; 139:305–15.
[6]. Macwan C, Deshpande A. Mineral trioxide aggregate (MTA) in dentistry: A review of literature. J Oral Res Rev. 2014;6(2):71–4. doi:10.4103/2249-4987.152914.
[7]. Gandolfi MG Siboni F Prati C Chemical-physical properties of TheraCal, a novel light-curable MTA-like material for pulp capping. *IntEndod J*. 2012456571–579.
[8]. Barthel CR, Levin LG, Reisner HM, Trope M. TNF-alpha release in monocytes after exposure to calcium hydroxide treated Escherichia coli LPS. J IntEndod. 1997;30:155–9.

[9]. Kitasako Y, Ikeda M, Tagami J. Pulpal responses to bacterial contamination following dentin bridging beneath hard-setting calcium hydroxide and self-etching adhesive resin system. J Dent Traumatol. 2008;24(2):201–6.
[10]. Cehreli ZC, Turgut M, Olmez S, et al. Short term human primary pulpal response after direct pulp capping with fourth-generation dentin adhesives. *J ClinPediatr Dent*. 2000;25(1):65-71.
[11]. Camilleri J, Ford TRP. Mineral trioxide aggregate: a review of the constituents and biological properties of the material. IntEndod J. 2006;39(10):747–54.
[12]. Gandolfi MG, Siboni F, Taddei P, et al. Apatite-forming ability of TheraCal LC pulp capping material. Presented at: International Association of Dental Research (IADR). March, 2011; San Diego, CA. Abstract #2520.