



BIODENTINE PULPOTOMY IN CARIOUSLY EXPOSED PULP – A CASE REPORT

Dental Science

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ABSTRACT

Carious exposure of an inflamed vital pulp in a young permanent tooth presents a significant clinical challenge to maintain vitality. Vital pulp therapy (VPT) is the treatment of choice for traumatized or carious teeth with vital pulp exposure. Studies with regards to management of permanent teeth with carious exposure and treatment with vital pulp therapies such as adult permanent tooth pulpotomy are scarce. However, permanent tooth pulpotomy with the new calcium-silicate based cements (Mineral Trioxide Aggregate and Biodentine) can help preserve the tooth pulp vitality and promote healing and repair foregoing the more invasive root canal therapy procedure. The present case report focuses on the treatment of a cariously exposed left maxillary first molar with the novel technique of coronal pulpotomy using biodentine. 1 year review showed favourable and predictable result.

KEYWORDS

Vital Pulp Therapy; Coronal Pulpotomy; Biodentine

INTRODUCTION

The primary goal of vital pulp therapy is to maintain pulp vitality, generating dentinal bridge formation and apical closure.[1] It has also been shown that under optimal conditions, vital pulp therapy (rather than removal) can be carried out successfully on a mature tooth. Endodontic management of young permanent teeth presents several problems such as larger apical diameter versus smaller coronal canal diameter making debridement difficult; lack of an apical stop makes obturation impossible; and thin root canal walls become root prone to fracture [2]. In this context significance of vital pulp therapy becomes more evident.

The treatment of teeth with carious pulp exposure has been a controversial issue in endodontics[3]. However, clinical success rate was found to be high recently when bioceramic materials have been used for vital pulp therapy of cariously exposed permanent teeth diagnosed with reversible pulpitis [4].

In carious exposures of young permanent teeth, the inflamed coronal portion is removed to preserve the vitality of the remaining radicular portion as an alternative procedure over conventional root canal therapy. This is referred to as pulpotomy [5]. The inflamed but vital pulp may have a chance to return to a healthy, functional status after pulpotomy. [6]

The present case report demonstrates management of a symptomatic young permanent tooth using biodentine complete pulpotomy technique.

CASE REPORT

A 22-year old female patient reported to the Department of Conservative dentistry and Endodontics, GDC Thiruvananthapuram with the chief complaint of pain in left back tooth region since 4-5 days. On clinical examination, there was presence of a large occlusal carious lesion involving the left maxillary first permanent molar [Figure 1]. The patient had a history of mild to moderate pain on intake of hot and cold fluids since 4-5 days with no history of any previous

pain. There was no history of swelling or medications. There was no tenderness on percussion and no associated sinus opening adjacent to the involved teeth. The tooth was fairly intact, restorable, and showed respond to thermal (cold test [pulflofluorange, Pharma Dental Handelsges]) and electric pulp testing (Parkell Farmingdate). Periapical radiograph of maxillary left first permanent molar showed caries (radiolucent area) approaching the pulp chamber and completely formed root apices [Figure 2]. There was no evidence of periapical pathology, interradicular bone resorption, internal resorption, pulp calcification and pathologic external root resorption suggesting pulpal degeneration.

A provisional diagnosis of reversible pulpitis was determined based on clinical and radiographic examination. Preventive endodontics with “pulpotomy,” using biodentine in a single visit was planned for #26.

The procedure was explained to the patient and consent was obtained. The tooth was isolated using rubber dam under local anesthesia (2% lignocaine with epinephrine 1:100,000, Pharma Health Care Product, Mumbai). A conventional access cavity was made with a high-speed sterile diamond burs using copious water spray. Amputation of the coronal pulp was performed with a sharp, spoon shaped excavator (Dentsply Maillefer) to the level of root canal orifices. The pulp chamber was irrigated with 5.25% sodium hypochlorite (NaOCl) to remove inflamed pulp tissue and then haemostasis was achieved in 5-10 minutes [Figure 3a].

After hemostasis was achieved, freshly mixed biodentine was gently condensed into the pulpal cavity with a thickness of approximately 2mm [Figure 3b]. Biodentine was covered with light curing glass ionomer (Vitrabond 3M ESPE Dental Products, Canada). The remaining tooth structure was etched with 37% phosphoric acid (3M ESPE, St. Paul, MN, USA) for 15 s. The etched solution was rinsed with air/water spray and dried. The bonding agent (Single bond 3M ESPE) was applied and cured for 10 s, and restored with composite resin (3MESPE, St. Paul, MN, USA). The margins were light cured for 40 s and then polished using diamond stones and a composite polishing

kit (Shofu Dental Corporation, Kyoto, Japan) [Figure 3c]. Post operative radiograph was taken [Figure 4].

At three, six, twelve and eighteen months, follow-up of the tooth showed absence of any periapical pathology with normal periodontal ligament space. The tooth was fully functional and the patient was asymptomatic.



Fig. 1

Fig. 2



Fig. 3

(a)

(b)

(c)



Fig. 4

Figure 1: Pre operative photograph,
Figure 2: Pre operative radiograph,
Figure 3a: Removal of coronal pulp,
Figure 3b: Placement of biodentine in the pulp chamber,
Figure 3c: Placement of composite restoration,
Figure 4: Post operative radiograph

DISCUSSION

With the advancement in progression of healing of materials and techniques along with better understanding of healing of pulp in recent years, coronal pulpotomy has gained importance and is practiced as an alternative to RCT for carious exposure of teeth with vital pulps [7]. Coronal pulpotomy treatment involves removal of entire coronal pulp tissue leaving the radicular pulp vital. On the remaining radicular pulp, a suitable biocompatible material is packed to protect the pulp from further insult and initiate healing and repair [8]. It has been shown that the cariously exposed vital pulp after the elimination of bacteria can return to a healthy status. [6]

In partial pulpotomy, it is difficult to determine the disease progression clinically, thus we chose coronal pulpotomy in this case. Success of coronal pulpotomy is based on diagnosis of the pulpal conditions, complete isolation during the procedure along with the disinfection, haemorrhage control from the pulp chamber and maximum sealing of the pulpal complex by using a well sealing pulp cap material and proper final restoration to ensure adequate seal and prevent bacterial leakage towards the remaining pulp in the canal. [9] NaOCl has been demonstrated to be effective in achieving both disinfection and haemorrhage control [10].

Pulpotomy can be carried out with various materials based on their biocompatibility, sealing ability and antimicrobial efficacy on coming in contact with the dental pulp. Latest bioactive materials such as Mineral Trioxide Aggregate (MTA) and Biodentine, Calcium Enriched Mixture (CEM) has excellent biocompatibility and sealing abilities with the added advantage of inducing proliferation of the pulp cells.

In comparison to MTA, Biodentine provides better sealing ability with a reduced setting time [11]. Biodentine causes increased calcium and

TGF- β 1 secretion from pulp cells which induce angiogenesis, cell differentiation and mineralization [12, 13]. The mechanism of action of Biodentine is its ability to induce odontoblast differentiation and enhanced proliferation, migration and adhesion of human pulp stem cells, when placed in direct contact with the dental pulp [14]. Another major advantage of Biodentine over MTA is its reduced cost.

The healing of the dental pulp may be associated to the placement of an immediate full coronal restoration, thereby reducing the chances of microleakage and bacterial invasion. Most of the failures in vital pulp therapy and endodontic treatment are attributed to micro-leakage at the coronal tooth-restoration interface [15].

Based on the European society of Endodontology, success is considered when there is absence of clinical symptoms, absence of radiographic changes and radiographic evidence of reparative dentin formation. In our study the patients were followed up for six months and all the patients were asymptomatic. It has been stated that minimum six months follow up is adequate for evaluation [16].

CONCLUSION

In accordance to the favorable results of our case, a reasonable argument supporting mature tooth pulpotomy in cases of reversible pulpitis can be stated. Biomaterials such as biodentine with pulp healing properties may challenge the complete philosophy of our conventional endodontic treatment. Case selection including age, status of pulp and control of bleeding, remains an important criterion for the same. However, a longer follow up is necessary to evaluate biodentine pulpotomy in carious exposures.

ACKNOWLEDGMENT

This article would not have been contemplated without the important academic and clinical contribution and support of staffs of Department of Conservative dentistry and Endodontics, GDC Trivandrum.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Nosrat A, Asgary S. Apexogenesis Treatment with a New Endodontic Cement: A Case Report. *J Endod* [Internet]. 2010;36(5):912-4. Available from: [http:// dx.doi.org/ 10.1016/j.joen.2009.11.025](http://dx.doi.org/10.1016/j.joen.2009.11.025)
- Bakland LK. Traumatic dental injuries. In: Ingle JJ, Bakland LK, editors. *Endodontics*. 4th ed. Baltimore: Williams and Wilkins; 1994. p. 803
- Linsuwanont, et al. "Treatment Outcomes of Mineral Trioxide Aggregate Pulpotomy in Vital Permanent Teeth with Carious Pulp Exposure: The Retrospective Study". *Journal of Endodontics* 43.2 (2017): 225-230.
- Alqaderi H., et al. "MTA pulpotomy as an alternative to root canal treatment in children's permanent teeth in a dental public health setting". *Journal of Dentistry* 42.11 (2014): 1390-1395.
- Cveck M. A clinical report on partial pulpotomy and capping with calcium hydroxide in permanent incisors with complicated crown fracture. *J Endod*. 1978;4(4):232-7.
- Chueh L and Chiang C. "Histology of Irreversible Pulpitis Premolars Treated with Mineral Trioxide Aggregate Pulpotomy". *Operative Dentistry* 35.3 (2010): 370-374.
- Alqaderi H., et al. "Coronal pulpotomy for cariously exposed permanent posterior teeth with closed apices: A systematic review and meta-analysis". *Journal of Dentistry* 44 (2016): 1-7.
- Eghbal MJ, Asgary S, Ali Bague R, Parirokh M, Ghodousi J. MTA pulpotomy of human permanent molars with irreversible pulpitis. *Aust Endod J*. 2009; 35:4-8.
- Galani M., et al. "Comparative evaluation of postoperative pain and success rate after pulpotomy and root canal treatment in cariously exposed mature permanent molars: A randomized controlled trial". *Journal of Endodontics* 43.12 (2017): 1953-1962.
- Kunert GG., et al. "Permanent teeth pulpotomy survival analysis: retrospective follow-up". *Journal of Dentistry* 43.9 (2015): 1125-1131.
- Singh H, Kaur M, Markan S, Kapoor P. Biodentine: A promising dentin substitute. *J Interdiscipl Med Dent Sci*. 2014; 2:140.
- Han L, Okiji T. Bioactivity evaluation of three calcium silicate-based endodontic materials. *Int Endodon J*. 2013; 46(3):808-14.
- Laurent P, Camps J, About I. Biodentine TM induces TGF- β 1 release from human pulp cells and early dental pulp mineralization. *Int Endodon J*. 2012; 45(5):439-48.
- Zanini M, Sautier JM, Bernal A, Simon S. Biodentine induces immortalised murine pulp cell differentiation into odontoblast-like cells and stimulates biomineralisation. *J Endodon*. 2012; 38(9):1220-26.
- Massler M. Preserving the exposed pulp. *J Pedodont*. 1978; 2:217-27.
- European Society of Endodontology. "Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology". *International Endodontic Journal* 39 (2006): 921-930.