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Case Report

Treatment outcome of full pulpotomy using Biodentine in cariously exposed vital permanent teeth: A case report

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ABSTRACT

Preserving the vitality of pulp can never be overemphasized. Conventionally, pulp exposures were root canal treated but it results in loss of vitality of pulp. Vital pulp therapy maintains tooth vitality, functionality and to render tooth asymptomatic. Pulpotomy using Calcium silicate based cements could be a good alternative for RCT for management of symptomatic mature permanent teeth with carious pulp exposure, however large scale clinical trials are highly encouraged to confirm this hypothesis.

1. Introduction

The inflamed non savable pulp can be managed by minimally invasive approach known as Vital pulp therapy.[1,2] VPT aims to maintain tooth vitality, functionality, maintains propioceptive defence mechanism of remaining pulp and minimizes the incidence of tooth fracture.[3] This minimally invasive approach has gained popularity and is encouraged as the inflamed pulp has regenerative and healing potential. Furthermore, clinical signs and symptoms of irreversible pulpitis does not mean that pulp is histologically inflamed or damaged beyond repair and because the pulp has still healing potential, therefore VPT can be recommended as a treatment option.[2] The non-savable inflamed portion of pulp should be removed to the level of entire coronal portion while maintaining the health of remaining radicular pulp. Considering the healing potential of pulp-dentin complex, teeth diagnosed with irreversible pulpitis can be managed by removing the inflamed non savable portion of pulp by pulpotomy which helps in healing of remaining pulp tissue.[2] Success of VPT depends upon the use of appropriate materials and procedure.[4]

Full pulpotomy or coronal pulpotomy can be defined as removal of entire coronal portion of pulp to the level of canal orifices while maintaining the health of remaining radicular portion of pulp. This procedure helps in removing infected and inflamed tissue rendering healing of remaining pulp tissue.

Dental pulp has the ability to repair itself through process known as dentinogenesis. Migration, proliferation and differentiation of progenitor cells into odontoblasts occurs during dentinogenesis. The newly differentiated odontoblasts replace the damaged odontoblasts and reparative dentinogesis occurs which helps to maintain the vitality and functionality of pulp tissue.There is consensous that treatment of pulp exposure requires use of bioactive materials that promote pulp tissue repair.[4]

In past, Calcium hydroxide cement was considered as gold standard for vital pulp therapy due to its physiochemical characteristics. This biomaterial presents a satisfactory results with success rates upto 80%.[5] Developed in 1990s, Mineral trioxide aggregate based cement was used initially as a retrograde material. MTA helps in proliferation and differentiation of pulpal cells and helps in formation of mineralized tissue after pulp exposure.[6] Recently, tricalcium silicate based cements have evolved. This calcium silicate based, has composition

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similar to mineral trioxide aggregate cements, but has better setting times due to addition of calcium chloride in it. The material is charaterized by its dissolution in calcium chloride and when it comes in contact with the tissues it leads to the formation of hydroxyapatite.[7] Biodentine is a tricalcium silicate based cement with lower cytotoxicity and better bioactivity and is considered as pulp capping agent. Biodentine possess several advantages including good sealing ability, good compressive strength, short setting time, biocompatibility.[8] The following case report describes the procedure of Biodentine pulpotomy in cariously exposed vital permanent teeth.

2. Case Report

A 21 year old male patient reported to the department of conservative dentistry and endodontics wih the chief complaint of pain w.r.t right lower back tooth region that occurs in response to cold and disappears after the removal of stimulus.

On clinical and radiographic examination, deeply carious lesion was found involving enamel, dentin and pulp in right mandibular first molar. No extraoral sweeling or tenderness was found with respect to that region. Based on clinical, radiographic findings and pulp sensibility tests, the tooth was diagnosed to have symptomatic reversible pulpitis.

The treatment modality choosen was full pulpotomy using biodentine, calcium silicate based cement and the treatment modality was explained to the patient as an alternative to conventional RCT. Patient was informed and an informed written consent form was obtained from the patient.

Inferior alveolar nerve block was used to anesthetize the tooth and Lignocaine hydrochloride 2% with 1:80,000 epinephrine was used and then the tooth was isolated using rubber dam. Then the tooth was disinfected with 3% sodium hypochlorite. Cavity preparation was done using high speed handpiece and coronal tissue was removed till the pulpal floor using sterile round bur (Figure 3).

Bleeding from all canals indicated presence of vital pulp tissue.

Hemostasis was achieved by application of cotton pellet moistened with sodium hypochlorite (NaOCl 2.5%) for 3 – 5 minutes over pulpal wound. Then, Biodentine was mixed according to manufacturer's instructions and placed in 2-3 mm layer above the pulpal wound (Figure 4). After 12 minutes of initial setting of biodentine, a layer of RMGIC was placed in same visit and then light cured for 20 seconds. Then a permanent restoration will be placed in same visit and then postoperative radiograph will be taken after placement of restoration. Then 2 days after the procedure patient was contacted on phone to record intensity of pain and then patient was evaluated for clinical and radiographic examination. Patient was called at an interval of 3, 6, 9 and 12 months. Patient did not reported any pain/ tenderness to percussion/ mobility and the soft tissues around tooth were normal. No periapical radiolucency was seen during subsequent follow up visits.

2.1. Follow up

The follow up period for the above case report presented was for duration of 3 months, 6 months, 12 months respectively and a favourable prognosis was seen after pulpotomy procedure. (Figures 5, 6, 7, 8 and 9)

The evaluation of cases after subsequent followup was met with a positive outcome.

Radiographic evaluation revealed an intact PDL space and a normal trabecular pattern of bone.

All the patients included in case report are still under systematic followup.

2.2. Full pulpotomy using biodentine

Fig. 1: Pre operative radiograph

Fig. 2: Pre operative

Fig. 3: Access opening for pulpotomy

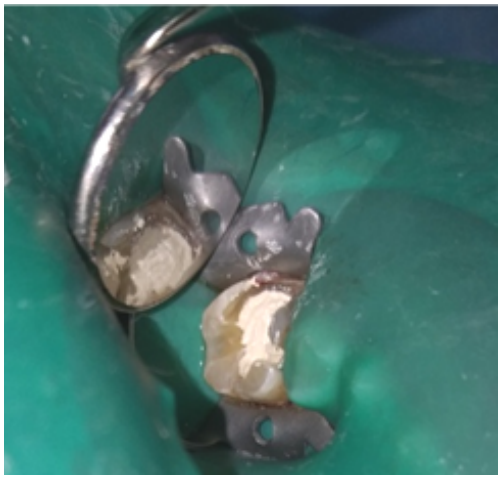

Fig. 4: Biodentine placement

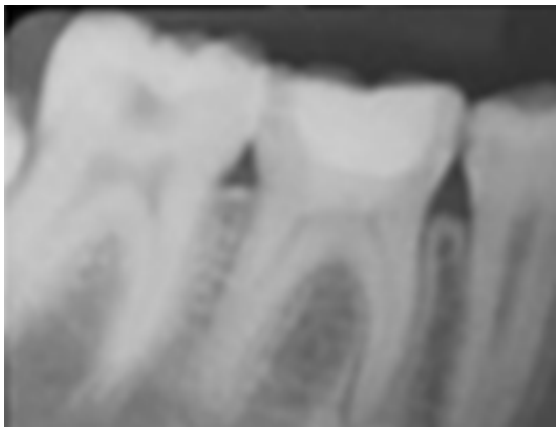

Fig. 5: Immediate post operative radiograph

Fig. 6: Post operative 3 months follow up

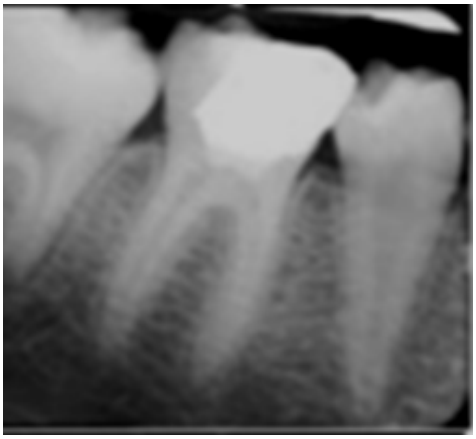

Fig. 7: 6 months follow up

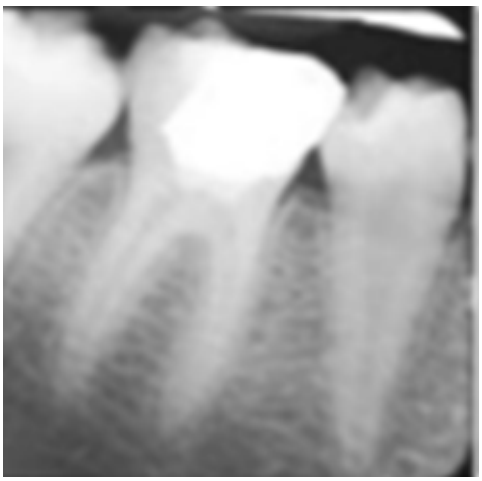

Fig. 8: 12 months follow up

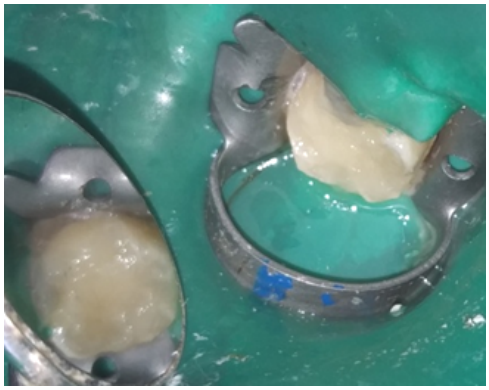

Fig. 9: Post operative

3. Discussion

The vitality of pulp dentin complex iS considered as a priority and fundamental to the health of teeth for the management of cariously exposed vital permanent teeth. VPT has been considered as a minimally invasive approach for management of teeth with inflamed pulp as compared to conventional RCT. Pulpotomy is significantly less expensive and less complicated procedure when compared to RCT. Therefore, patients suffering from pulpitis who cannot afford who cannot afford RCT, a full pulpotomy can be considered as a realistic alternative approach to save their teeth.

The result of our case report corroborates these findings. The clinical and radiographic criteria of success considered is absence of clinical signs/ symptoms including pain on palpation, percussion, absence of sinus tract, absence of deep periodontal pockets, pulpal responsiveness to vitality is considered as clinical success.

Absence of internal/external resorption, normal periodontal ligament, formation of mineralized bridge under capping material or narrowing of root canal space were the criteria for radiographic success.

The material used for VPT should be biocompatible, induce hard tissue formation and should create a tight seal. Bioactivity is the key factor which makes calcium silicate based cements suitable for VPT. Biodentine is a tricalcium silicate based cement and is an endodontic repair material.[9] Biodentine is bioactive material which encourages hard tissue regeneration and provoke no signs of moderate/ severe pulpal inflammatory response. This material has ability to maintain a successful marginal integrity due to formation of hydroxyapatite crystals at surface which enhances sealing ability. Due to its superior sealing potential there is no risk of microleakage which may cause pulp to become infected/ necrotic/jeopardize the success of vital treatment procedures. The bioactivity of biodentine is due to its ability to increase OD-21 cell proliferation and biomineralization.[10]Biodentine increases TGF-β1 secretion from pulp cells. TGF- β1 is a growth factor which plays an important role in angiogenesis, recruitment of progenitor cells, cell differentiation and mineralization.[11]

Biodentine has shown favourable clinical performance with good sealing properties, better marginal adaptation and donot show discolouration. Biodentine is a well tolerated dentine substitute for posterior teeth. Biodentine can be considered as dentine replacement material.[12]

The similar procedure was performed in other cases with similar pulpal pathology with permanent molars.

4. Conclusion

In the present case report the success rate of above case can be in accordance with the biocompatible behaviour and high mechanical properties and good sealing ability of biodentine and composite restoration ensures a tight coronal seal. Apart from the material of choice, the age, general health, diagnostic criteria, oral hygiene practices, economics, patient motivation, compliance were focused on during case selection while opting for pulpotomy modality of treatment over conventional endodontics.

Other contributing factors towards the success of treatment performed include strict aspetic protocols, rapid coverage of exposed pulp stumps, bacterial tight coronal double seal. Thus, the art of decision making to provide conservative, viable and safe treatment alternative such as pulpotomy over conventional RCT can be treatment option.

Within the limits of our present clinical study based on the outcomes achieved in follow up visits, it can be concluded that this minimally invasive vital pulp therapy procedure can improve the standard of care delivered to the patients. The correlating success across the treated cases was seen and thus it can be concluded that there is a potential scope of regenerative pulpotomy approaches in inflamed pulp in adult permanent teeth. However, long term follow up and further clinical trials are still required to considerate as main stay of treatment.

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6. Conflict of Interest

The authors declare they have no conflict of interest.

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