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Demystifying pulpotomy in adult dentition: Case reports

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Abstract

Vital pulp therapy for a carious exposure in a mature permanent tooth may be a reasonable alternative to root canal therapy or extraction. Mineral Trioxide Aggregate (MTA) or Biodentine are bioactive materials which are alternatives to traditionally used calcium hydroxide. They offer advantages like easy to manipulate, shorter setting time and relatively inexpensive. Pulpotomy, a conservative treatment modality for irreversible pulpitis is a newer concept in adult dentition. In properly selected cases, may contribute to the long-term maintenance of tooth vitality. It is a biomimetic material having a positive effect on vital pulp cells and stimulates tertiary dentine or reparative dentine formation in direct contact with vital pulp tissue. This article presents two case reports, using Biodentine, which is a promising material having the potential to maintain pulp vitality in patients judiciously selected for vital pulp therapy.

Keywords: vital pulp therapy, pulpotomy, Biodentine, bioceramic materials

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Проведение пульпотомии у взрослых: описание клинических случаев

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Резюме

Витальная терапия пульпы при кариозном поражении зрелого постоянного зуба может быть разумной альтернативой эндодонтическому лечению или удалению зуба. MTA и Biodentine являются альтернативами гидроксиду кальция. Эти материалы обладают такими преимуществами, как легкость в использовании, более короткое время отверждения и относительно низкая стоимость. Пульпотомия как метод лечения необратимого пульпита – относительно новая концепция, которая, при правильном подборе случаев, может способствовать долгосрочному сохранению витальности зуба. Она положительно влияет на жизнеспособные клетки пульпы и стимулирует образование третичного или репаративного дентина при непосредственном контакте с жизнеспособной тканью пульпы. В данной статье представлены два клинических случая, в которых использовался Biodentine, перспективный материал, способный сохранять витальность пульпы у пациентов, тщательно отобранных для витальной терапии пульпы.

Ключевые слова: витальная терапия пульпы, пульпотомия, Biodentine, биокерамические материалы

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INTRODUCTION

Therapeutic strategies for vital teeth with pulp exposure due to deep caries are directed towards salvaging of pulpal vitality. For over a century vital pulp treatments of indirect and direct pulp capping procedures have been abundantly described [1].

American Association of Endodontists in 2021 published a position statement on vital pulp therapy (VPT). They stated that irreversibly inflamed pulp tissue has the capacity to heal if the microorganisms are eliminated, even in mature permanent teeth [2]. However, some authors have documented that in irreversible pulpitis cases, most of the pulpal tissue may not be infected or inflamed [3; 4].

VPT is the choice of treatment following carious pulp exposure in immature teeth, having a favorable outcome due to pulpal blood supply and the healing potential of pulp tissue. Full pulpotomy procedure is a debated modality in mature teeth for treatment of cariously exposed pulp. However, there are limited long term studies on the outcome of VPT in mature teeth with irreversible pulpitis. This makes it challenging to present it as a predictable treatment option to patients [5].

The decision making regarding the choice of treatment in cariously exposed tooth remains a clinical dilemma. Root canal treatment or vital pulp therapy (VPT) are two modalities to manage such cases. Currently, there are no conclusive guidelines outlined for the management of carious exposure of mature permanent teeth. Hence an evidence- based approach should be applied.

This article elaborates two case reports on miniature pulpotomy and full pulpotomy using Biodentine with 24 hours, 48 hours, 15 days, 1 month and 3 months follow – ups.

CASE DESCRIPTION

Case I – Miniature Pulpotomy

A 24-year-old female reported to the OPD with a complaint of pain in the lower right back region of the jaw. The history revealed pain on consuming cold beverages which ceased on the withdrawal of stimulus. On intra-oral examination deep proximal caries was seen with respect to 46. No pain on palpation or sinus tract was noted. Pre-operative radiograph was taken which presented intact lamina dura suggesting no periapical pathology (Fig. 1).

Pulp sensibility test was positive. Pulpotomy treatment option was suggested to the patient. The procedure was explained in details and patient consent was taken. The tooth was anaesthetized using 0.6 ml lignocaine with adrenalin (Lox 2%, Neon). Under rubber dam (Hygienic, Coltene) application the overlying dentine on the exposed pulp was excised to a depth of less than or equal to 1 mm (Fig. 2). Irrigation with saline and application of pressure pack gently using saline cotton pellets for upto 5 min was done to control the bleeding. Chlorhexidine 2% (Dentochlor,Ammdent) was used to disinfect the cavity. Then freshly mixed Biodentine™ (Septodont) was placed instantly over the exposure with cement carrier, which was allowed to set for 10–15 min. Cavity was then restored with resin modified glass ionomer cement (RMGIC) [Vitremer, 3M], which was light cured for 30–40 sec. (Fig. 3).

Case II – Full Pulpotomy

A 20-year-old female reported with a complaint of pain on mastication in the lower left back region of the jaw. On clinical examination a deep occlusal carious lesion was seen associated with 36 (Fig. 4).

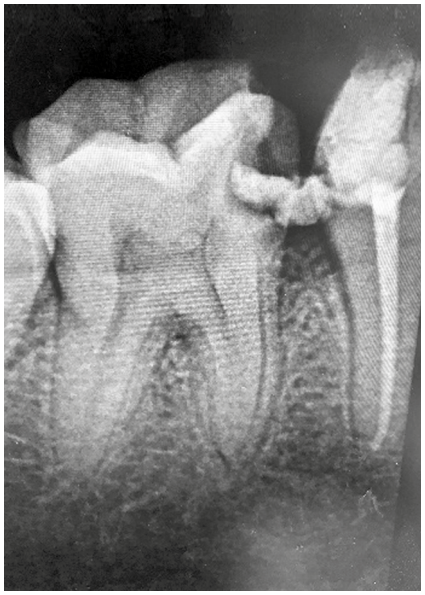

Fig. 1. Initial
Рис. 1. Изначальная ситуация

Fig. 2. Miniature pulpotomy
Рис. 2. Мини-пульпотомия

Fig. 3. Restoration
Рис. 3. Восстановление

There was no pain on palpation or sinus tract. Pulp sensibility test was carried out which was positive. Radiographic examination revealed no periodontal ligament space widening, no periapical radiolucency. An informed consent was taken after explaining the pulpotomy procedure. Profound anaesthesia was obtained using 0.6 ml lignocaine (1:200,000 adrenaline). Rubber dam was applied and the whole coronal pulp was excised (Fig. 5).

The chamber was irrigated with saline along with gentle application of small sterile cotton pellets for 5 minutes to control the bleeding. Disinfection of cavity was done using 2% chlorhexidine on cotton pledget for 1 min. Freshly mixed Biodentine™ (Septodont) was immediately placed over the exposed radicular pulp and was allowed to set for 20 minutes and then the cavity was sealed with RMGIC (Vitremer 3M) (Fig. 6).

In both the cases, periodic follow – ups were carried out at 24 hours, 48 hours, 7 and 15 days,1 month and 3 months. The following evaluation parameters were checked: Pain, palpation, tenderness to percussion, swelling and sinus tract, which were all negative at all given time periods.

DISCUSSION

The dental pulp is a unique connective tissue due to its capacity of healing because of the rich vascular network/stem cells, which can actively contribute to the regeneration process following inflammatory events. It plays a very crucial role and it is equipped with a barrier system to shield the teeth from bacterial intrusion. Hence it is valuable to preserve the vitality of an exposed pulp by using VPT [6].

VPT is indicated to preserve and to maintain the vitality of pulpally involved teeth. This procedure is done mainly in those teeth which have traumatic or accidental exposure with noperiapical lesion. The outcome of a VPT depends on proper case selection, good knowledge of pulp anatomy, biocompatible material, using sterile technique [6].

Three types of pulpotomy can be performed depending on the extension of the caries. In full/coronal/cervical pulpotomy, the whole coronal pulp from the pulp chamber is excavated, wherein partial/shallow pulpotomy (Cveks) removal of inflamed pulp tissue beneath an exposure to a depth of 1–3 mm is done. In miniature pulpotomy procedure, the superficial inflamed layers are removed (~1 mm) using minimal enlargement of the exposure site. This helps in decreasing the hyperemia and maintains the healthy coronal pulp, which again helps in controlling the bleeding. The seal obtained from pulp capping material in miniature pulpotomy seems to be adequate due to minimal removal of the sound dentine [7].

The different materials for VPT like Calcium hydroxide, mineral trioxide aggregate (MTA), Biodentine, Calcium Enriched Mixture (CEM), adhesives, RMGIC are being used. Calcium hydroxide became recognized as a valuable pulpotomy material, but has several disadvantages as it can cause a serious pulpal damage. MTA also has some drawbacks such as a long setting time, high cost, and potential of discolouration [8]. Hence Biodentine has proved to be a good material for VPT procedures.

A prospective study by Taha and Abdulkhader evaluated the outcome of Biodentine (Septodont, Saint Maur des Fosses, France) pulpotomy in young permanent teeth with carious exposure.Twenty permanent molar teeth in 14 patients with carious pulp exposure were treated with Biodentine pulpotomy. They concluded young permanent teeth with carious exposure can be treated successfully with full pulpotomy using Biodentine, and clinical signs and symptoms of irreversible pulpitis are not a contraindication [9].

Biodentine was introduced by the Septodont's Research Group and was commercially available in 2009. It was specially designed as a replacement for dentine [8]. It is one of the recently developed tricalcium silicate-based materials and could be used for deep and wide coronal tooth decay, restoration of deep cervical and root lesions, direct pulp capping, repair of the root perforations, and as a root-end filling material. The most important advantages of Biodentine over MTA are its good handling properties as a result of its higher viscosity and its much shorter setting time [6].

In primary molars, pulpotomy has been the most advocated vital pulp procedure with extensive caries. This concept is being introduced in adult dentition.

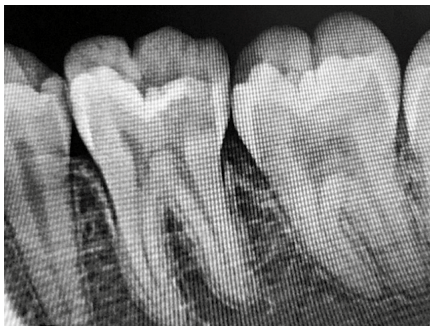

Fig. 4. Pre-operative Radiograph
Рис. 4. Предоперационная рентгенограмма

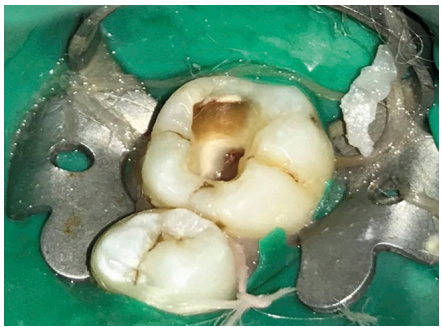

Fig. 5. Full pulpotomy
Рис. 5. Полная пульпотомия

Fig. 6. Restoration
Рис. 6. Восстановление

The success of a pulpotomy depends on multiple factors and more importantly, it is very technique sensitive. Accuracy in diagnosis, caries excavation method, pulp dressing material, quality of the final restoration and operator experience are some of the influencing factors in successful outcome [10]. Isolation of operating field is of paramount importance.

Coronal pulpotomy has many advantages like minimally invasive, is cost-effective, relatively simple and less time-consuming for patients and the operator. Highest level of evidence ie systematic reviews on coronal pulpotomy inferred a high success rate compared to root canal therapy. Hence, an evidence-based, safe and predictable treatment is that of coronal pulpotomy which can be offered to adult patients in teeth with irreversible pulpitis, as a substitute to root canal therapy [11].

Singh et al compared clinical and radiographic performance, post-operative pain, and intake of anti-inflammatory drugs after partial pulpotomy with calcium hydroxide, MTA, Biodentine, and Emdogain as pulp capping agents in adult permanent molars with final diagnosis of reversible pulpitis. There was no difference in both clinical and radiographic outcome among the four capping agents [12].

Cushley et al in 2019 stated that success rates of 97.4% and 95.4% clinically and radiographically were observed at 12 month patient recall after complete coronal pulpotomy of permanent teeth affected by irreversible pulpitis due to caries. However, there was a reduction in success rate ie 93.97% clinical and 88.39% radiographic at 36 months, implying a similar outcome with nonsurgical root canal treatment (NSRCT) [13].

With the advent of new materials like hydraulic calcium silicate cements, more predictable treatment outcomes are possible. These materials possess favourable physico-chemical characteristics like high pH, mineralization of intratubular dentine, prevention of biofilm, decline in pro-inflammatory mediators and reduction in pain after dental procedures involving pulp [14]. These effects of immunomodulation of biomaterials provide much needed osteogenic as well as bioactive properties [15].

Documented literature suggests that success rates range from 85–100% at 1–2 years, when permanent teeth with or without symptoms in an irreversibly inflammed pulp are managed with VPT using bioceramic materials [16].

Philip and Suneja suggested that the day is probably not too far when pulpotomy can be routinely offered as the first line of treatment for vital mature permanent teeth diagnosed with irreversible pulpitis [17].

CONCLUSION

Young permanent teeth with carious exposure can be treated successfully with full pulpotomy using Biodentine. However, it is important to note that case selection plays a major role in success of treatment. This case report suggests that pulpotomy procedure is a viable option.

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Himali Desai – has made a substantial contribution to the concept or design of the article; the acquisition, analysis, or interpretation of data for the article; drafted the article or revised it critically for important intellectual content and approved version to be published.

Sanjyot Mulay – has substantially contributed to the concept or design of the article; acquisition, analysis and interpretation of data for the article; drafted the article and revised it critically for important intellectual content; approved version to be published.

Soumya Shetty – has contributed to the design of the article; drafted the article and revised it critically for intellectual content; approved version to be published.

Anita Tandale – has drafted the article and revised it critically for intellectual content; approved version to be published.

ВКЛАД АВТОРОВ

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