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Preserving pulp vitality with different types of pulpotomy medicaments: A report of case series

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ABSTRACT

Deciduous teeth are the best known space maintainers. They are important to be preserved until their exfoliation and eruption of successor teeth. The procedure for pulpotomy is performed to preserve the vitality of pulp in cariously exposed primary teeth. Pulp could be exposed due to various reasons such as traumatic injuries, iatrogenic exposure and large carious lesions. Therefore, for preserving the vitality of pulp dentin complex, pulpotomy can be performed with suitable medicament. There are a lot of controversies for the use of different medicaments and which is ideal for pulpotomy. Pulpotomy has been suggested as a viable treatment for pulp exposures with pulpitis in several case series. If performed with adequate isolation and correct procedure, it gives promising prognosis.

Keywords: Pulpotomy, Pulp vitality, MTA, Formocresol, Calcium hydroxide, Biodentine

1. INTRODUCTION

Pulpotomy is the procedure where coronal pulp is amputated surgically thereby preserving the vital healthy radicular pulp followed by the placement of suitable medicament (Yousef H Al Dlaigan, 2015). According to AAPD guidelines 2009 the procedure of Pulpotomy is performed in a primary tooth with extensive caries but without evidence of radicular pathology when caries removal results in a carious or mechanical pulp exposure (Alireza Sarraf Shirazi et al., 2009). If caries removal process leads to pulp exposure, usually pulpotomy is done as direct pulp capping in cariously exposed primary teeth has poor prognosis (Kumar Praveen et al., 2014). Pulpotomy is a conservative therapy that is performed to remove the inflamed coronal pulp tissues followed by application of an effective and compatible medicament which encourages the tissue in the root canals to remain vital (Miguel-angel Simancas-Pallares et al., 2010). Different type's medicaments have been used till date in thirst for the most appropriate one. These include formocresol,

calcium hydroxide, zinc oxide eugenol, ferric sulphate, glutaraldehyde, collagen, mineral trioxide aggregate, biodentine, bone morphogenic protein, freeze dried bone and many more. Now a day it is also done with the help of electrosurgery and lasers.

2. CASE REPORT 1

A 5 years old patient visited to the department with chief complaint of food lodgement and sensitivity in lower right back region of jaw since 6 days. The patient used to experience slight pain and sensitivity in the same region while removing the lodged food. There was no relevant history of any major illness, allergies, hospitalization and blood transfusion reported by parents. It was the first visit of the child to the dental office. The oral hygiene maintenance was done by the child under the supervision of the mother. On examination it was found that the child has complete set of deciduous dentition. The child had deep occlusal caries in lower right deciduous second molar (Figure 1 and Figure 2). On radiographic examination, it was observed that the radiolucency was involving enamel, dentin and approaching pulp. There was recession of distal pulp horn of the same tooth suggestive of pulpal inflammation (Figure 3).

Figure 1 Maxillary arch

Figure 2 Mandibular arch

Figure 3 Radiograph with 85

Dental treatment was initiated with complete oral prophylaxis. Formocresol pulpotomy was planned with lower right second molar. It was done in single sitting (Figure 4). Patient was observed for symptoms for next 5 days and after that placement of stainless steel crown was planned (Figure 5 and Figure 7). Maxillary arch appears completely normal (Figure 6). Patient was advised to be on follow up after every 3 months. Maintenance of adequate oral hygiene was suggested to the patient with strict diet modifications.

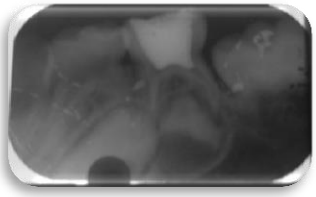

Figure 4 Formocresol pulpotomy

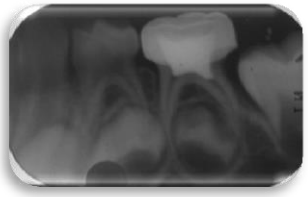

Figure 5 Stainless Steel Crown

Figure 6 Maxillary arch

Figure 7 Mandibular arch (post operative image)

Case report 2

A 5 and a half years old patient visited to the department with chief complaint of decayed teeth in her upper right back region of jaw. There was no pain and tenderness associated with that tooth. There was no relevant history of any major illness, allergies, hospitalization and blood transfusion reported by parents. It was the first visit of the child to the dental office. The oral hygiene maintenance was done by the child under the supervision of the mother. On examination it was found that there was deep proximal caries with maxillary right first molar and occlusal caries in left first molar (Figure 8). The dentition is deciduous.

Figure 8 Maxillary arch showing deep proximal

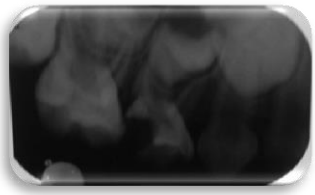

Figure 9 Radiograph with 54, 55 caries with 54 and occlusal caries with 64

On radiographic examination, it was observed that the radiolucency was involving enamel, dentin and approaching pulp. There was recession of distal pulp horn of the same tooth which is suggestive of pulpal inflammation (Figure 9). Dental treatment was initiated with complete oral prophylaxis. Maxillary right first molar was planned for calcium hydroxide pulpotomy followed by stainless steel crown (Figure 10) and Maxillary second molar for indirect pulp capping procedure followed by stainless steel crown (Figure 11).

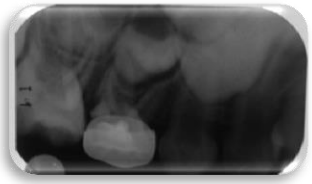

Figure 10 Calcium hydroxide pulpotomy followed by stainless steel crown

Figuure 11 Post operative view of maxillary arch showing stainless steel crown in place

Case report 3

A 6 and a half years old patient visited to the department with chief complaint of pain in his lower right back region of jaw. The medical history of the patient was not relevant. The past dental history of the patient revealed that he had undergone pulp therapy followed by stainless steel crown restoration for lower left first molar. The oral hygiene maintenance was done by the child under the supervision of the mother.

Figure 12 Mandibular arch

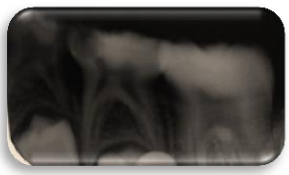

Figure 13 Radiograph with 84, 85

On examination, mandibular right first molar shows deep proximal caries. Tenderness on percussion was positive. There was history of food lodgement in the same area. Mandibular right second molar shows mesial caries and food lodgement (Figure 12). Tenderness on percussion was negative. On radiographic examination, mandibular right first molar revealed presence of radiolucency involving enamel, dentine and pulp suggestive of pulp pathology. Mandibular second molar showed radiolucency on mesial aspect of crown involving enamel, dentine and approaching pulp (Figure 13).

The dental treatment was started with complete oral prophylaxis. Mandibular first molar was planned for the pulpectomy followed by stainless steel crown and mandibular second molar for pulpotomy using MTA (Mineral Trioxide Aggregate) followed by stainless steel crown (Figure 14, 15 and 16).

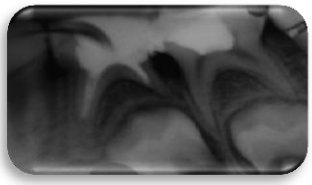

Figure 14 pulpectomy with 84 MTA Pulpotomy with 85

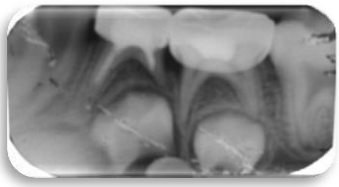

Figure 15 Radiograph showing Stainless steel crowns

Figure 16 Postoperative image of mandibular arch showing SSC crowns

Case report 4

A 7 years old patient visited to the department with chief complaint of pain in lower left back region of jaw since 2 months and food lodgement in lower right back region of jaw. The pain was continuous in lower left back side. There was no relevant history of any major illness, allergies, hospitalization and blood transfusion reported by parents. It was the first visit of the child to the dental office. On examination, deep proximal caries was associated with lower left first molar and tenderness was positive. Mandibular lower right first molar had distal caries with food lodgement. There was no pain and tenderness associated with that tooth (Fig. 17). On radiographic examination, radiolucency was seen on distal aspect of lower right first molar involving enamel, dentine and approaching pulp (Fig. 18). The dental treatment was planned beginning with oral prophylaxis. Mandibular left first molar was planned for extraction followed by band and loop space maintainer. Mandibular right first molar was planned for pulpotomy using Biodentine (Fig. 19) followed by stainless steel crown (Fig. 20).

Figure 17 Mandibular arch showing distal Caries with first molars on both sides

Figure 18 Radiograph with 84

Figure 19 Pulpotomy using Biodentine

Figure 20 Postoperative view of mandibular arch

3. DISCUSSION

In recent years, pulpotomy therapy has been evolved slowly over the first 40 years. It is performed along three lines: devitalization, preservation, and regeneration. Devitalization is done where the intent is to destroy vital tissue that is typified by agents like formocresol and electrocautery. Preservation associated to the retention of maximum amount of vital tissue which is exemplified by agents such as glutaraldehyde and ferric sulphate. Regeneration refers to the stimulation of a dentin bridge formation, which can be initiated with calcium hydroxide (Ranly, 1994). There have been lot of materials researched and made available for the same. Placement of suitable cement over the intact stump of radicular pulp for fixation, mummification or stimulation for repair of remaining pulp is a vital step (Al-Dlaigan, 2015; Albariqi, 2020).

Buckley introduced pulpotomy using formocresol in 1904. Since then various modifications have been tried and advocated regarding the formulation and techniques of formocresol pulpotomy. Buckley's formula of formocresol contains components such as formaldehyde 19%, Cresol 35%, glycerine 15%, and water with pH of 5.1. Formocresol prevents tissue autolysis by binding to the peptide group of side chain of amino acid. It is a reversible process which takes place without changing of basic structure of protein molecules in the remaining pulp (Praveen et al., 2014).

Calcium hydroxide has the capacity of regeneration. Several researches have demonstrated its capacity of regenerating dentine formation. The high pH of calcium hydroxide wounds the pulp in a manner that permits the intrinsic reparative cascade to begin and form the reparative dentine. The main draw-back of this agent is internal resorption. 70% success rate was reported by Zander with the use of thick paste of Ca (OH) and water (Praveen et al., 2014). Therefore, the thirst for newer materials has resulted in best alternative options like MTA and biodentine. Mineral trioxide aggregate was introduced by Torabinejad and White in 1995. It is a type of hydraulic calcium silicate cements which consists of tricalcium silicate, bismuth oxide; tetra calcium alumina-ferrite and calcium-sulphate dehydrate. When mixed with water it leads to the formation of colloidal gel. The major advantages of MTA include biocompatibility, bactericidal action, induction of cementogenesis; sealing ability; dentinogenesis and osteogenesis make it the preferred choice for numerous clinical treatments (Parisay et al., 2015).

Biodentine is the recent material that has been introduced as an "dentine replacement" material having a dentin like property which allows it to fill up the cavity maintaining good marginal seal that is important for prognosis of teeth undergone pulpotomy. It comes in the form of powder and liquid. The powder is consists of "tricalcium silicate", calcium carbonate (filler) and zirconium oxide (radio pacifier)". The liquid is a solution containing "calcium chloride with a water-reducing agent" (El Habashy, 2020).

The present case series describes the procedure of pulpotomy using different agents and importance of newly introduced materials. The technique is a crucial part in this procedure as there should be the good marginal seal for the success of this procedure that helps the tooth to remain vital till the time of its exfoliation.

4. CONCLUSION

Pulpotomy is the procedure helpful in preserving the vitality of pulp. The recent materials have been proven to be more advantageous over the previous ones. As per the cases performed it has been observed that maintaining adequate isolation and performing the procedure with correct technique, the prognosis of the teeth improves thereby providing the conservation of teeth in natural form. MTA and Biodentine have good marginal sealing ability as compared to other materials. Recently, the best option is moving towards the electrosurgery and lasers.

Conflict of Interest

The authors declare no conflict of interest.

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Informed consent

Written & Oral informed consent was obtained from the parents of the patient included in the study.

Data and materials availability

All data associated with this study are present in the paper.

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