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ORIGINAL ARTICLE

Evaluation of Success of Pulpotomy in Mature Permanent Teeth with Carious exposure using Mineral Trioxide Aggregate

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ABSTRACT

Aim: To evaluate the radiographical success of pulpotomy in cariously exposed mature permanent teeth using mineral trioxide aggregate.

Methods:This Descriptive case series was conducted at the Department of Operative Dentistry, de'Montmorency College of Dentistry/ Punjab Dental Hospital, Lahore from December 2015 to December 2016.A total of 75 cases were included using non-probability consecutive sampling..Patients of both genders with age range from 15 to 26 years were considered. Performance of procedure and evaluation of success was done in terms of absence of periapical radiolucency on periapical radiographs.Data was entered and analyzed with IBM SPSS 20. Level of significance was kept at *p*-value ≤ 0.05

Results: Out of 75 patients, 41 were females and 34 were males. Mean age of patients included in this study was 20.5 ±3.60. Follow up at 6 months showed 92% success, with 69 cases showed absence of periapical radiolucency on periapical radiograph. There was no significant relation of success with age and gender of patient with *p*- value greater that 0.05.

Conclusion: It is concluded from current study that the protocol of pulpotomy using Mineral trioxide Aggregate (MTA) in mature permanent teeth with carious exposure of pulp is encouraging and can be recommended for the treatment of mature permanent teeth with carious exposures.

Keywords: Pulpotomy, Mineral trioxide aggregate, periapical radiolucency

INTRODUCTION

Dental caries shows high worldwide prevalence particularly in adults, according to epidemological studies.[1]Before exposure of pulp, carious process goes hand in hand with inflammation of the pulp. Inflammation severity escalates as the carious lesion advances towards the dental pulp.[1]If left untreated caries headway to extensive lesions, persuading inflammatory reactions in dental pulp. This leads to pulp necrosis, abscess formation and eventual loss of tooth[2]. Nevertheless, dental pulp has an inbred ability to heal if the challenge is uprooted and the tooth is aptly restored[1,2,3].

Dental pulp undergoes mild to severe inflammation as a sequela of dental caries[4]. Histological studies have found inflammation to be confined within 2mm of exposure site[5]. Coronal pulp mostly undergo inflammation, while the radicular pulp remain uninflammed and normal.Coronal and radicular pulp becomes entirely involve at late stages of the caries process.Thus, the cariously exposed pulps could be conserved by resecting only the infected and diseased dental pulp tissue below the microbial front by vital pulp therapy procedure[6].

In order to maintain the tooth pulp vital it is essential to maintain the vascularity and nutrition to tooth[7,8,9]. Vital pulp therapy aims to preserves the vitality and functionality of the tooth and render the tooth symptom free[8]. European Society of Endodontology issued a position statement in 2019. The statement is that symptom free teeth with carious pulp exposures having deep lesions could benefit from conservative vital pulp treatment[3,6]. Thus, the preservation of teeth can improve patient's quality of life[10].

Pulpotomy is one of the vital pulp therapy (VPT).This involves the surgical removal of coronal pulp.The remaining vital radicular pulp is covered with appropriate material.That material protects the radicular pulp from further injury and aid healing[11,12,13]. Thus paragon material for pulpotomy should trigger the extant dental pulp to return to robust tissue. It should promote dentin tissue formation. It should hold out against ceaseless bacterial leakage[1,14]. Historically, Calcium Hydroxide was used as a gold standard material. However studies have showed declining results over time being variable and unpredictable[1,5]. MTA has adequate structural integrity and is resistant to dissolution. It induces a more homogenous, localized, and thicker dentin bridge than Calcium Hydroxide[15,16]. Guidlines by American Academy of Pediatric Dentistry and several authors have suggested MTA as a more favorable material over calcium Hydroxide[15]. Although numerous studies have been done on pulpotomy procedure in primary molars and immature permanent teeth using MTA, but limited data of local studies in favour of pulpotomy procedure in mature permanent teeth using MTA is available.Thus the rationale of current study is to promote the procedure of pulpotomy in cariously exposed mature permanent teeth using MTA with confidence in future.

The objective of study was to evaluate the radiographical success of pulpotomy in cariously exposed mature permanent teeth using mineral trioxide aggregate.

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MATERIALS AND METHODS

The study was carried out on patients visiting outpatient department of de 'Montmorency college of dentistry / Punjab dental hospital from 20th December 2015 to 20th December 2016 following approval from the institution's Ethical Committee. Male and female patients aged 15 to 26 years were included in study. Restorable mature permanent mandibular molars with deep carious lesion, closed apices radiographically and pulpal inflammation confining to coronal pulp (only which will be evident upon excavation clinically, if bleeding stops within 5 minutes) were included. Tenderness on percussion or palpation, presence of Sinus tract / fistula and pathological mobility of the tooth were excluded. A total of 75 cases were included using non-probability consecutive sampling after obtaining an informed consent from all patients. Detailed history for each case was recorded after clinical examination.

Treatment protocol was carried out in 2 dental visits. After anesthetizing and tooth isolation with rubber dam, carious lesion was removed with slow speed large round bur. High speed round diamond bur with ample irrigation was used for removal of coronal pulp upto pulp chamber floor and orifices.Sterile cotton pellet was damped in 5.25% NaOCl. These cotton pellets were used to provide haemorrhagic control.Film of, MTA (ProROOT MTA) mixed in sterile saline was laid down on root canal orifices with plastic instrument. Thickness of 2-4mm of MTA was achieved by condensing mildly with sterile moistened cotton pellet. Temporary filling of CAVIT was placed over moistened cotton pellet.

In second visit after 1 day, MTA was checked for hardening by small rounded burnisher after removal of CAVIT and cotton pellet. Tooth was restored with amalgam. Post-operative radiograph was taken immediately after the procedure using it as a reference. All patients were called for follow up after 6 months and were evaluated. The case was labelled as successful if absence of periapical radiolucency on periapical radiographs was observed at the end of 6 months.

Data Analysis: Data was entered and analyzed with IBM SPSS 20. Mean and standard deviations were evaluated for quantitative variables like age of patient. P-value ≤ 0.05 was termed significant based on the application of post-stratification Chi Square Test.

RESULTS

Of the total seventy-five (75) patients sample size in this study, the mean age was 20.5 (SD =±3.60) whereas 45.3% were males (n=34) and 54.7% were females (n=41).Follow up at 6 months showed 92% success, with 69 cases showed absence of periapical radiolucency on periapical radiograph as shown in Table-I.

No significant difference was seen between age and success with p-value greater than 0.05 as shown in Table-II.

There was no significant relation found between gender and success with p-value greater than 0.05 as demonstrated in Table-III.

Tabular results are as follows:

Table 1: Frequency distribution of success of the pulpotomy procedure

Success	Frequency	%age
Yes	69	92.0
No	6	8.0
Total	75	100.0

Table 2: Analysis of age and succsess

Age (years)	Success		Total	P-value
	Yes	No		
15-20	33	3	36	0.919
21-26	36	3	39	
Total	69	6	75	

Table 3: Analysis of gender and success

Gender	Success		Total	P-value
	Yes	No		
Male	32	2	34	0.538
Female	37	4	41	
Total	69	6	75	

DISCUSSION

International Caries consensus Collaboration meeting held in Leuven, Belgium in 2015.This recommends that prime aim in treating deep carious lesion should be the perpetuation of pulpal health.[17] Deep carious lesions are the most wonted cause for pulp invasive treatments such as root canal treatments in adults.[18] Traditionally deep caries have been managed with either complete removal of caries and in incident of exposure of pulp with Root Canal Treatment (RCT)[2]. RCT is technically more complex, incursive and exorbitant than pulpotomy, having undesirable corollaries such as tooth fracture, discoloration and vestigial periapical inflammation leading to infection[3]. Data provided by epidemological studies showed failure rates of inadequately performed RCT ranging from 24% to 66%.[19]Thus RCT reduces the life of endodontically treated teeth, especially molars[20].

The Foremost principle of Operative Dentistry is to preserve the vital pulp and to offer a biologically based concept that maintains the pulp's development, proprioception and defensive functions[2]. Forby, "restoration cycle" can be reduced by teaching less aggressive dentistry thus declining overtreatment. This preserves the tooth structure and enhances the affordability of treatment[2].

Primary objective of the pulpotomy is to conserve the integrity and vitality of the tooth. Pulpotomy is performed to maintain the vitality of the radicular pulp before it becomes non vital and require extirpation and root canal therapy.[8,20]

In the present study pulpotomy of mature permanent tooth using MTA was performed. The procedure followed in this study was found in accordance with the procedure carried out by Taha et al on mature permanent teeth with carious pulp exposure[5].

Haemorrhage control is essential for pulpotomy. As it dictates the success of VPT[19]. Extent of bleeding from pulp may be a better index of inflammatory status of pulp.Prolonged bleeding diminishes the healing capacity of pulp and thus requires treatment modification[8]. Most broadly used haemostatic agents during pulpotomy is slight mechanical pressure application with a cotton pellet damped with saline over the pulp exposure site. Anaestheic

solutions having epinephrine, 30% hydrogen peroxide, ferric sulphate, 2% chlorhexidine, MTAD and NaOCl (0.12-5.25% conc.) are used as haemostatic agents for VPT procedures[21].

In this study hemostasis was achieved by sterile cotton pellet damped in 5.25%NaOCl as done by Qudeimat et al. on permanent molars with clinical signs suggestive of irreversible pulpitis.[22]Application of NaOCl minimizes bacterial count and lodgement of dentin debris into pulp as compared to normal saline, which was also proved by one randomized clinical trial done by Tuzuner on primary molar tooth[23].

MTA was used as a pulp capping material for this procedure. High success rate have been reported in the study done by Imad Hassan Barngkgei. P in which MTA was used as a pulpotomy agent for mature permanent teeth[20]. Use of bioactive materials encourage differentiation of odontoblast-like cells. This restrain the inflammation and encourages repair. Pulp cap material should provide good marginal seal.Poor upshots have also been associated with insufficient microbial control and constant microleakage.[1] Taha et al demonstrated higher success rate for MTA than Calcium enriched mixture cement[24]. Comparatively success rate for pulpotomy procedure using modern restorative materials range from 82% to 95%[19].

A retrospective carried out by demarco and coworkers deduced that there is remarkable interconnection between coronal restoration quality and success of pulpotomy[6]. Investigators confirmed high risk of failure if permanent restoration remit for more than 2 days similar to Barthel et al[17]. Penetration of bacterial and their by products through defective coronal restoration leads to failure of pulpotomy procedure as illustrated by Cox et al.[6]In current study permanent coronal restoration was placed after 24 hrs similar to Alqaderi study carried on permanent teeth of children in public health setting[9].

Results of some studies consider pulpotomy procedure to be controversial in adults with carious pulp exposure,as healing capacity is considered to be higher in younger pulps as compared to old.However the results of study done by Saeed Asgary showed patients age doesn't affect the success rate of pulpotomy.[25]In current study age range of patients was 15-26 years with mean age of 20.5±3.60 years similar to studies done by Caliskan, Eghbal et al, Bjorndal et al, Solomon. They considered patients falling in the above mentioned age range, showed success rate of upto 82%[19].

In the present study the success rate of pulpotomy with MTA is 92%. This result is comparable to many other studies. High success rate of 100% have been reported in the study done by Imad Hassan Barngkgei in which MTA was used as a pulpotomy agent for mature permanent teeth.[20] Similarly Simon et al., performed pulpotomy on permanent molar teeth using MTA and showed 82% success at the end of 24 months[19]. A systematic review by Li et al. reported clinical success rate of 95% with MTA pulpotomy in a study evaluating the comparison between MTA vs CaOH at 12 months[12]. Aguilar and Linsuwanont compared different types of vital pulp therapies in a systematic review and found MTA pulpotomy with the highest success rate of 96.6% at three years of follow-up[12]. Comprehensive systematic review by Alqaderi et al. evaluated the success rate of cervical pulpotomy in mature permanent teeth with irreversible pulpitis. Overall success rate at one year was 94% and 92% at two years[12].

Results of all aforementioned studies are in accordance with our study, hence supporting it. Few differences in results may be due to small sample size. The results of current study are significant, so this procedure can be carried out in our local population with confidence in future.

CONCLUSION

It is concluded from current study that the protocol of pulpotomy using Mineral trioxide Aggregate (MTA) in mature permanent teeth with carious exposure of pulp is encouraging and can be recommended for the treatment of mature permanent teeth with carious exposures.

Conflict of interest: None

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