Original Article

Efficacy of bio-dentine and mineral trioxide aggregate in pulpotomies of cariously exposed vital permanent teeth

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Objective: The efficacy of Biodentine and mineral trioxide aggregate in pulpotomies of cariously exposed vital permanent teeth.

Methodology: A total of 60 patients were selected randomly, and after consent, local anesthesia was administered with 2% lidocaine with adrenaline 1:80,000. After rubber dam isolation and caries excavation, coronal pulp tissue removed and hemostasis achieved. Patients were divided into two groups with 30 in each group; biodentine and mineral trioxide aggregate (MTA). In group I pulpal wound was covered with Biodentine and rest of the cavity was restored with glass ionomer cement (GIC). In group II, 2 mm layer of MTA was placed on pulpal wound and then covered with a soaked cotton pellet and sealed with GIC. All Patients were called after 24 hours and after 7 days to assess postoperative discomfort and for permanent restoration. After 6 weeks patients were assessed for effectiveness of treatment. Any spontaneous or lingering dull pain was interpreted as failure.

Results: Out of 60 patients, 60% were female and 40% male. Mean age of the patients was 30.92±7.301 years. Pain assessment after 24 hours of treatment, was absent in Biodentine group 63% and in MTA group 67%, which is statistically in-significant (p=0.787). Pain after 7 days of treatment for both groups was absent in 83% in Biodentine and 80% in MTA group, which is statistically in-significant (p=0.785). Biodentine was effective in 82% patients and MTA in 76% with no significant difference in both groups (p=0.560).

Conclusion: The Biodentine was more effective as compared to MTA in pulpotomies if cariously exposed vital permanent teeth. (Rawal Med J 202;45:875-878).

Keywords: Biodentine, mineral trioxide, pulpotomy.

INTRODUCTION

Dental caries is an infectious disease and the most common cause of pulpal inflammation. The inflammatory response is a complex series of events. As long as physiological feedback mechanisms that counteract the inflammatory reaction occurring in the pulp, it has the ability to restrict pulp inflammation to the site of injury.[1] If the pulp is not severely damaged, the vitality of inflamed pulp can be maintained with vital pulp therapy procedures.[2] Pulpotomy is removal of coronal pulp and then application of suitable material or medicament over remaining radicular pulp to protect the pulp from further injury and enhance healing.[3] Historically, pulpotomy has been routinely used for cariously exposed primary molars. Pulpotomies performed in immature permanent teeth to maintain tooth vitality and promote further root development have also been investigated with favorable results ranging from 93-100%.[4-6]

Permanent teeth with irreversible pulpitis contain putative stem cells and their vitality can be maintained successfully with vital pulp therapy procedures.[7,8] Recent studies on pulpotomies of mature permanent teeth with irreversible pulpitis using Mineral Trioxide Aggregate (MTA) and Biodentine had success rate 94-100% and 54.6%, respectively.[9,10]

Formocresol and ferric sulphate have been traditionally used as dressing materials after pulpotomies in carious primary molars.[11] Calcium hydroxide has been the material of choice for pulpotomies in immature permanent teeth. Calcium hydroxide is biocompatible, antibacterial, however, it has certain physical limitation such as non-

adherence to dentin, and dissolution in tissue fluids.[12] Previous studies have shown great difference in the success rates of MTA and Biodentine used in pulpotomies of cariously exposed immature vital teeth. The rationale of this study was to assess the efficacy of biodentine and MTA in pulpotomies of cariously exposed vital permanent teeth in terms of clinical sign and symptoms.

METHODOLOGY

After the ethical approval, an experimental study was conducted in Department of Operative Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro from September 2017 to January 2018. A total 60 patients were included in the study and sample size was calculated through WHO calculator on the basis of previous statistics available P1= 54.5% (Biodentine) and P2= 100% (MTA). Patients included were either gender, with age range of 18 to 50 years, cariously exposed vital permanent teeth with preoperative pain recorded through visual analogue scale, (VAS ≥ 1). Exclusion criteria included pregnant patients, history of significant medical disease, any known allergy, immature permanent teeth those necrosed pulp and third molars. Any periapical pathology on intraoral periapical radiograph (IOPA) was also excluded.

After written informed consent, local anesthesia of lidocaine 2% with adrenaline 1:80,000 was administered. The teeth were isolated with rubber dam and inflamed pulp tissue removed to the level of canal orifice using a large round bur in a slow speed air motor or spoon excavator. Hemostasis was achieved by application of small pieces of moist sterile cotton pellets for 5 minutes.

Teeth were divided into two experimental groups by using lottery method, Biodentine (n=30), and MTA (n=30). In group I, the blood clot free pulpal wound was covered with Biodentine (Septodont, Saint Maur des Fosses, France) and rest of the cavity was restored with GIC (Ketac Molar; 3M ESPE, Seefeld, Germany). In group II clot free pulpal wound was covered with approximately 2 mm thick layer of MTA (Dentsply, Tulsa Dental, Tulsa, OK) and then covered with a wet cotton pellet and sealed with GIC.

After 24 hours, patients were asked via telephone and asked to mark their pain level on VAS scale given to them on their first visit. Patients in both groups were recalled for the assessment and placement of the final composite restoration after 7 days. Effectiveness of treatment was recorded after 6 weeks. Any spontaneous or prolonged lingering dull pain was interpreted as failure.

Statistical Analysis: SPSS version 20 was used for analysis. Chi square test was applied by taking $p \leq 0.05$ as a significant value with Power of study 80%.

RESULTS

Out of 60 patients, 36 (60%) were female and 24 (40%) male. Mean age was 30.92±7.30 years (range 22-47). After 24 hours of treatment there was no significant difference (p=0.787) in presence of discomfort/tenderness after 24 hours of treatment between Biodentine group (36.7%) and MTA group (33.3%) can be seen in (Table 1).

Table 1. Pain after 24 hours of treatment.

Treatment groups		Pain after 24 hours		Total
		Presnet	Absent	
	Biodentine	11	19	30
		36.7%	63.3%	100.0%
	MTA	10	20	30
		33.3%	66.7%	100.0%
Total		21	39	60
		35.0%	65.0%	100.0%

Table 2. Pain after 7 days of treatment.

Treatment groups	Pain after 7 days		Total
	Present	Absent	
BIODENTIE	5	24	29
	17.2%	82.8%	100.0%
MTA	6	24	30
	20.0%	80.0%	100.0%
Total	11	48	59
	18.6%	81.4%	100.0%

Table 3. Effectiveness of materials.

Treatment Groups	Effectiveness of materials		Total
	Effective	Not Effective	
Biodentine	23	5	28
	82.1%	17.9%	100.0%
MTA	22	7	29
	75.9%	24.1%	100.0%
Total	45	12	57
	78.9%	21.1%	100.0%

After 7 days of treatment, 82.8% patients were pain free in Biodentine group as compared to 80.0% patients in MTA group (p=0.785) (Table 2). One patient was lost to 7 days follow up in Biodentine group. There was no significant difference (p=0.56) in effectiveness between Biodentine group (82%) and MTA group (76%) (Table 3). One patient lost to six weeks follow up in MTA group and two patients in Biodentine group.

DISCUSSION

Treatment of symptomatic vital permanent teeth is generally performed with root canal therapy. Addition to the time consumption it leads to the removal of excessive tooth structure and make tooth non-vital, thus leading to the frequent fracture of such teeth.[13] In deep carious lesions, pulp inflammation is restricted to the coronal tissue of the pulp, leaving the pulp tissue uninfected in the deeper portion of the pulp. Various biomaterials have been used in vital pulp therapy procedure of cariously exposed teeth.

In this study, comparison of Biodentine with MTA was assessed in pulpotomies of cariously exposed symptomatic vital permanent teeth. Pain was absent in majority of cases (63%) and (67%) of patients in Biodentine and MTA groups, respectively which was statistically not significant. This is in agreement with the study by Soni, in which patient had shown no postoperative discomfort after pulpotomy.[14] Pain after 7 days was absent in majority of cases (83% and 80%) of patients of Biodentine and MTA group respectively, that is also not significant which is in agreement with previous studies reported by Eghbal et al [3] and Barngkgei et al.[15]

Mean age of the patients in this study was 30.93±7.301 years. These are in agreement with the studies by Fong and Davis and Bokhari et al who showed that dental pulp of aged patient had a reduced ability to overcome the inflammatory insult because it typically becomes more fibrous with reduced vascular supply as compared to dental pulp of young patients which has larger pulp space and abundant blood supply with increased cellular content and rapid inflammatory response.[16,17]

In present study, Biodentine was more effective as pulpotomy agent in 82% of cases as compared to MTA which was 76% of cases with no significant difference between both materials. These results are comparable with the study results of Nowicka et al, who studied the response of Biodentine in vital pulp therapy procedures of permanent molars, postoperatively no any discomfort on follow up was reported and histologically no any pulp inflammatory response was revealed.[10]

Pulpotomies with MTA have been reported with high success rate ranged from 93%-100%.[18] Study by Matsuo et al found similar success rate in vital pulp therapy procedures with MTA.[19] In a review by Aguilar and Linsuwanont, 99.4% success rate was reported in permanent teeth.[8] The success rate of MTA of present study may not compared with the study results of Asgary and Ehsani and Simon et al who demonstrated more success rate by performing pulpotomy with new endodontic cement in permanent molars with established irreversible pulpitis.[20,21] Limitation of the study is small sample size and the clinical findings were only the method used to assess the efficacy of materials.

CONCLUSION

Biodentine was more effective as compared to MTA used in pulpotomies of cariously exposed vital permanent teeth.

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