

Original Research

Comparison between calcium hydroxide mixtures and mineral trioxide aggregate in primary teeth pulpotomy

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ABSTRACT:

Background: To evaluate and compare calcium hydroxide mixtures and mineral trioxide aggregate in primary teeth pulpotomy. **Materials & methods:** A total of 20 subjects were enrolled. The number of pulpotomies done were 30. The age of patients was 4 to 6 years. The tooth included in the study was deciduous mandibular first molar. The materials used in the pulpotomy procedure were divided into groups. Calcium hydroxide (CH) with saline, calcium hydroxide with polyethylene glycol (PEG) and mineral trioxide aggregate were included in the study. Each group contained 10 tooth. Radiographic examination of pulpotomized teeth was done at 3 and 6 months after the treatment. Data was collected and result was analysed using chi- squared test and SPSS software. **Results:** Both clinical and radiographic analyses showed 100% treatment success using MTA, at all follow-up appointments. Whereas in calcium hydroxide+ saline and calcium hydroxide+ PEG showed radiographic evidence of failure in the treatment. The radiographic failure at 6 months in CH+ saline was 5 (50%) and in CH+PEG was 2 (20%). **Conclusion:** MTA is the best pulpotomy material to use as compared to calcium hydroxide mixtures.

Keywords: pulpotomy, primary teeth, mineral trioxide aggregate.

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INTRODUCTION

Pulpotomy is the accepted treatment procedure for primary molars with exposed coronal pulps inflamed by bacteria due to caries, traumatic injury, or another iatrogenic cause. ¹ The goal of pulpotomy is to remove infected coronal pulp tissue while preserving healthy radicular pulp, thereby promoting the integrity and retention of teeth until physiologic exfoliation. ² However, pulpotomy is applicable only when the inflammation of the pulp is limited to the coronal tissue and the remaining root pulp is vital. Various pulpotomy medicaments aiming at devitalization, preservation, or regeneration of the remaining pulp tissue have been used to date. The ideal pulpotomy medicament would be bactericidal and biocompatible, promote the healing of the root pulp, and be compatible with the physiological process of root resorption. ³ Because such a medicament or technique with all of those features remains unavailable, however, given the lack of clear evidence supporting the superiority of any particular treatment method,

research has continued to seek alternative pulpotomy agents that can provide better clinical efficacy without secondary effects. ⁴

MTA as an endodontic filling biomaterial has made a great impact in dental practices all around the world during recent two decades. ⁵ The major components of MTA and Portland cement are the same except for bismuth oxide. MTA is proposed to be used as a pulpotomy agent in primary and permanent teeth. ⁶ It is also claimed that MTA is a bio-inductive material that can induce hard tissue formation in direct contact with pulp. ⁷

Calcium hydroxide (CH) has been indicated as the most appropriate material in many clinical situations aiming to promote healing. However, the results obtained from pulpotomy using CH-based materials were inconclusive, as long-term clinical trials revealed an increase in failure rates along the follow-up appointments. ⁸ The success rate of CH as a pulpotomy material in primary teeth is poor in comparison to that observed in permanent teeth. The

caustic action of the high-pH formulations of CH reduces the size of the underlying dental pulp by up to 0.7 mm.⁹ In addition to the widespread clinical use of CH, studies have tested various CH formulations and mixtures of CH powder with different substances in an attempt to improve CH performance.^{10,11} Hence, this study was conducted to evaluate and compare calcium hydroxide mixtures and mineral trioxide aggregate in primary teeth pulpotomy.

MATERIALS & METHODS

A total of 20 subjects were enrolled. The number of pulpotomies done were 30. The age of patients was 4 to 6 years. The tooth included in the study was deciduous mandibular first molar. The materials used in the pulpotomy procedure were divided into groups. Calcium hydroxide (CH) with saline, calcium hydroxide with polyethylene glycol (PEG) and mineral trioxide aggregate were included in the study.

Each group contained 10 tooth. Radiographic examination of pulpotomized teeth was done at 3 and 6 months after the treatment. Data was collected and result was analysed using chi-squared test and SPSS software.

RESULTS

30 primary molars were included. Mean age of patients was 5 years. Both clinical and radiographic analyses showed 100% treatment success using MTA, at all follow-up appointments. Whereas in calcium hydroxide+ saline and calcium hydroxide+ PEG showed radiographic evidence of failure in the treatment. The radiographic failure at 6 months in CH+ saline was 5 (50%) and in CH+PEG was 2 (20%). The internal resorption rate with MTA was nil whereas at 6months the rate was higher with CH+ saline (50%). The internal resorption for CH+PEG was 2 (20%) at 6 months.

Table 1: Radiographic analysis

Treatment	3months		6months	
	Success	Failure	Success	Failure
MTA	10 (100%)	0 (0%)	10 (100%)	0 (0%)
CH+ saline	5 (50%)	5 (50%)	5 (50%)	5 (50%)
CH+ PEG	6 (60%)	4 (40%)	8 (80%)	2 (20%)

Table 2: Observation of internal resorption radiographically

Groups	3 months	6 months
MTA	0	0
CH+ saline	4 (40%)	5 (50%)
CH+ PEG	3 (30%)	2 (20%)

DISCUSSION

MTA is increasingly recognized as the preferred choice of material for primary molar pulpotomies due to its superior biocompatibility and sealing ability, as well as its dentinogenic and osteogenic potential.¹² Hence, this study was conducted to evaluate and compare calcium hydroxide mixtures and mineral trioxide aggregate in primary teeth pulpotomy.

In our study, 30 primary molars were included. Mean age of patients was 5 years. Both clinical and radiographic analyses showed 100% treatment success using MTA, at all follow-up appointments. Whereas in calcium hydroxide+ saline and calcium hydroxide+ PEG showed radiographic evidence of failure in the treatment. A study by Moretti AB et al, the effectiveness of mineral trioxide aggregate (MTA), calcium hydroxide (CH) and formocresol (FC) as pulp dressing agents in carious primary teeth. All teeth were restored with reinforced ZOE base and resin modified glass-ionomer cement. Clinical and radiographic successes and failures were recorded at 3, 6, 12, 18 and 24 month follow-up. Forty-three teeth were available for follow-up. In the FC and MTA groups, 100% of the available teeth were clinically and radiographically successful at all follow-up appointments; dentine bridge formation could be detected in 29% of the teeth treated with MTA. In the

CH group, 64% of the teeth presented clinical and radiographic failures detected throughout the follow-up period, and internal resorption was a frequent radiographic finding.¹³

Internal resorption is the most frequent reason for failure following pulpotomy with CH in primary teeth, which indicates that, despite pulp vitality, a silent chronic inflammation develops after treatment with CH and remains undiagnosed, thus triggering odontoclast activity.¹⁴ Inappropriate operative techniques may also result in internal resorption if a thick blood clot remains or pulp misdiagnosis occurs. Thus, bleeding control after coronal pulp amputation may significantly influence the outcome of pulpotomies with CH.^{15,16} In our study, the radiographic failure at 6 months in CH+ saline was 5 (50%) and in CH+PEG was 2 (20%). The internal resorption rate with MTA was nil whereas at 6months the rate was higher with CH+ saline (50%). The internal resorption for CH+PEG was 2 (20%) at 6 months.

Another study by Liu H et al, studied the effects of mineral trioxide aggregate (MTA) and calcium hydroxide (CH) for pulpotomy in primary molars. A randomised, bilateral self-controlled clinical trial was designed to compare the clinical effect of MTA and CH in pulpotomies in primary molars in 4- to 9-year-

old children. Clinical and radiographic examinations were performed to evaluate the treatment results at post-treatment recall. Seventeen pairs of self-controlled contralateral teeth were available for follow-up evaluations. The success rate of MTA was 94.1% (16/17), while the success rate of CH was 64.7% (11/17). Internal root resorption was the most frequent reason for failure in the CH group. Crown discolouration was common in the MTA-treated group.¹⁷

CONCLUSION

MTA is the best pulpotomy material to use as compared to calcium hydroxide mixtures.

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