

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 25 subjects were enrolled. The number of pulpotomies done were 30. The age of patients was 4 to 8 years. 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 6 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. **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 defined as surgical removal of the coronal pulp; it is a universally accepted treatment to retain primary teeth with pulp exposure due to trauma or caries, unless tooth saving is deemed impossible. Currently, pulp devitalization, preservation or regeneration are considered as various treatment approaches using numerous materials including formocresol (FC), ferric sulfate, zinc oxide eugenol, calcium hydroxide (CH), mineral trioxide aggregate (MTA), Portland cement and calcium enriched mixture (CEM) cement.^{1,2} The procedure of pulp preservation or regeneration is based on the rationale that the remaining pulp is either healthy or if inflamed capable of healing after surgical amputation and dressing with a proper biomaterial.³ In other words, the main aim of pulpotomy is to retain a functional tooth in the oral cavity by preservation of the radicular pulp until its exfoliation.⁴ It has been shown that time of eruption and orientation of permanent teeth may be effected when their corresponding primary teeth have undergone pulpectomy.⁵

MTA is most helpful in these circumstances, allowing the operator to perform difficult therapies in a highly secure and predictive way compared to other

materials.⁶ Even if different techniques have been proposed,⁷ up to day there is no scientific evidence that makes clear which is the most appropriate material to be used in deciduous elements pulpotomy, only the MTA seems to have specific characteristics as to be considered as an appropriate material: its biocompatibility, its ability to harden in a humid environments and its sealing properties.⁸ 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.⁹ 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.¹⁰ 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.^{11,12} 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 25 subjects were enrolled. The number of pulpotomies done were 30. The age of patients was 4 to 8 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 6 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 3 (30%). The internal resorption rate with MTA was nil whereas at 6months the rate was higher with CH+ saline (40%). 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	6 (60%)	4 (40%)	5 (50%)	5 (50%)
CH+ PEG	7 (70%)	3 (30%)	7 (70%)	3 (30%)

Table2: Observation of internal resorption radiographically

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

DISCUSSION

MTA as an endodontic filling biomaterial has made a great impact in dental practices all around the world during recent two decades.¹³ 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.¹⁴ It is also claimed that MTA is a bio-inductive material that can induce hard tissue formation in direct contact with pulp.¹⁵ In our study, 30 primary molars were included. Mean age of patients was 6 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 Silva LLCE et al, evaluated the effect of calcium hydroxide (CH) associated with two different vehicles as a capping material for pulp tissue in primary molars, compared with mineral trioxide aggregate (MTA). Forty-five primary mandibular molars with dental caries were treated by conventional pulpotomy using one of the following materials: MTA only (MTA group), CH with saline (CH+saline group) and CH with polyethylene glycol (CH+PEG group) (15 teeth/group). Clinical and periapical radiographic examinations of the pulpotomized teeth were performed 3, 6, and 12 months after treatment. The MTA group showed both clinical and radiographic treatment success in 14/14 teeth (100%), at all follow-up appointments. By clinical evaluation, no teeth in

the CH+saline and CH+PEG groups had signs of mobility, fistula, swelling or inflammation of the surrounding gingival tissue. However, in the CH+saline group, radiographic analysis detected internal resorption in up to 9/15 teeth (67%), and inter-radicular bone resorption and furcation radiolucency in up to 5/15 teeth (36%), from 3 to 12 months of follow-up.¹⁶ In our study, the radiographic failure at 6 months in CH+ saline was 5 (50%) and in CH+PEG was 3 (30%). The internal resorption rate with MTA was nil whereas at 6months the rate was higher with CH+ saline (40%). The internal resorption for CH+PEG was 2 (20%) at 6 months.

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.¹⁷ 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.^{18,19}

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.²⁰

CONCLUSION

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

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