AL-AZHAR
Dental Journal
For Girls

The Official Publication
of The Faculty of Dental
Medicine For Girls,
Al-Azhar University
Cairo, Egypt.

Print ISSN 2537-0308 • Online ISSN 2537-0316

ADJ-for Girls, Vol. 8, No. 4, October (2021) — PP. 681:687

Comparative Evaluation of Fresh Aloe Barbadensis Plant Extract and Mineral Trioxide Aggregate as Pulpotomy Agents in Primary Molars

Dina M. Abdel-Ghany[1*], Mona H. Farid[2], Magda A. El Malt[3]

Codex : 18/21.10

azhardentj@azhar.edu.eg

http://adjg.journals.ekb.eg

DOI: 10.21608/adjg.2021.21191.1208

Pediatric Dentistry & Orthodontics
(Pediatric Dentistry, Orthodontics)

ABSTRACT

Purpose: A comparative evaluation of Aloe Barbadensis plant extract and Mineral Trioxide Aggregate as pulpotomy agents in primary molars. **Materials and methods:** Thirty eight Children, aged between 4 to 8 years old of both sexes, 20 girls and 18 boys were included in this study. Pulpotomy was made in primary molars, it was divided into two groups. The first group included 32 teeth indicated for pulpotomy with NeoMTA and the second group included 32 teeth indicated for pulpotomy treated with Aloe vera .Clinical and radiographic follow up were made for each child after 1,3 and 6 months. **Results:** NeoMTA showed higher clinical success results than Aloe vera after 3 and 6 months,Chi square test shown a significant difference statistically between groups in all of its clinical findings and in the overall clinical and radiographic success 6 months after treatment. **Conclution:** Upon comparison between Aloe vera and NeoMTA as a pulpotomy medications NeoMTA showed better results clinically and radiographically.

KEYWORDS

Aloe vera , MTA, pulpotomy, primary molars.

INTRODUCTION

Pulpotomy is the most commonly used treatment to retain deciduous teeth with carious involvement and with symptoms of reversible pulpitis which otherwise would be extracted. It is used for the preservation of the radicular pulp, avoiding pain, inflammation and maintains the tooth for better occlusion, development and esthetic [(1)].

NeoMTA ™ (NuSmile, Huston, USA) a pure MTA. Gel used for mixing as it makes easier mixing and application for pediatric patients.

- Paper extracted from Doctor Thesis Titled "Comparative Evaluation of Fresh Aloe Barbadensis Plant Extract and Mineral Trioxide Aggregate as Pulpotomy Agents in Primary Molars **"**.

1. Assistant Lecturer of Pedodontics and Oral Health, Faculty of Dental Medicine, October 6 University, Cairo, Egypt.
2. Professor of Oral and Dental Biology Department and the Former Dean of Faculty of Dental Medicine for Girls, Al-Azhar University Cairo, Egypt.
3. Associate Professor of Pedodontics and Oral Health, Faculty of Dental medicine for Girls, Al-Azhar University, Cairo, Egypt.

* Corresponding author email: dina_magh@hotmail.com

In addition, it doesn't discolor teeth and has a fast setting time. NeoFigMTA Plus (Avalon Biomed Inc., Bradenton, FL) developed which also possesses a powder-gel formulation and used in pulpotomy. They have several advantages as they do not stain the tooth structure by replacing bismuth oxide with tantalum oxide, easier application and with shorter setting time[2].

Plant medications became an alternative therapies which is considered as an important technological progress depending on its' chemical and pharmacological properties. The worldwide development of plant extracts in preventing and curing many physical problems. However, proper plant selection and manipulation for safe and effective usage based on scientific bases [3].

Aloe vera has many pharmacological actions as an anti-inflammatory, anti-arthritic, antibacterial and hypoglycemic effect in-vitro and in-vivo. Aloe vera has more than 75 active ingredients from its inner gel [4].

MATERIALS AND METHODS

Selection of the patients:

Thirty eight children, aged between 4 to 8 years old of both sexes, 20 girls and18 boys, 26 bilateral cases and 18 unilateral cases were selected. The screened children were selected from the outpatient clinic of Pedodontic Department. The children must be in good general health, cooperative and have no history of systemic illness or hospitalization. Research Ethical Committee Approval from Faculty of Dental Medicine Al- Azhar University, Girls Branch was obtained (REC17-088).

Informed written concent:

Parents or legal guardians of participants were asked to sign a consent which notified them about type of study and any procedure that was done to their children.

Inclusion criteria

Clinical criteria:

Tooth should be vital, pain if present should neither be spontaneous nor persistent, tooth should be restorable, hemorrhage from the amputation site should be pale red and controlled. The patient should not receive antibiotics for one week at least prior to the treatment.

Radiographic criteria:

No root or bone resorption and healthy periodontium.

Exclusion criteria

Clinical criteria:

Existence of abscess or fistula in relation to the tooth or caries penetrating floor of pulp chamber.

Radiographic criteria:

Evidences of internal resorption or presence of any interradicular bone loss or radiographic signs of calcific globules seen in pulp chamber.

Methodology:

Clinical and radiographic examination:

Before treatment a detailed medical and dental history was obtained in chart,then clinical and radiographic examination were carried out. Preoperative periapical radiographs of the teeth were obtained by a standardized paralleling technique by an xcp posterior film holder and an intra oral sensor size 1. An x- ray machine set at 70Kvp, 8mA. An exposure time of 0.4 seconds and a digital x-ray system (Vita scan Dental perio, Durr Dental AG Bieitigheim, Germany).

The designed tooth was anaesthetized and then a rubber dam was applied to isolate the tooth and with saliva ejector placed throughout the treatment. Caries was removed with a high speed round

carbide bur and soft caries was removed with spoon excavator. Access cavity was done on the selected teeth and the entire roof was removed with (#330) carbide bur. The pulp chamber was excavated properly with saline and then hemostasis was done by wet cotton pellets. Upon removal of cotton pellet, if hemostasis was achieved, the tooth was randomly indicated for either:

The first group (GroupI) included 32 primary teeth indicated for pulpotomy with NeoMTA by NuSmile USA.

The second group (GroupII) 32 primary teeth indicated for pulpotomy treated with Aloe vera.

GroupI (32 teeth): Using NeoMTA as a pulpotomy agent. Mixing of NeoMTA was done according to manufactures' instructions, one spoon scoop of NeoMTA powder was mixed with one drop of gel into a thick paste and then placed onto the pulp stumps then wet cotton was placed for its setting, it was followed by the placement of glass ionomer cement restoration followed by stainless steel crowns then post-operative x-ray was taken.

Group II (32 teeth): Aloe vera plant was tested in the Agriculture Research Center in Dokki to be tested that it is from the same species.

Preparation of Aloe Vera gel:

Before commencement of each procedure, the gel-sap liquid was obtained from the pulp of a fresh leaf of the plant. A leaf was carefully teased out from the stem of the plant. The whole leaf was carefully and thoroughly cleaned under running water and then allowed to dry. The intact surfaces of the leaf were next cleansed with 70% alcohol using cotton gauze, avoiding contamination. A slice was made on the base of the leaf, close to its attachment to the stem and stored in distilled water for 1 h to eliminate aloin [5]. The leaf was cut through and the gel from the pulp was scooped into a container then the gel was drawn into a syringe and covered then Aloe-vera gel loaded in syringe was placed over each root stump. This was then followed by placement of gelatin sponge and then glass ionomer cement followed by stainless steel crowns [5] then post- operative x-ray was taken.

Follow up:

Clinical and radiographic evaluations were performed after completion of the treatment and at 1month, 3months and 6months. A recall sheet was applied for each patient. The treated cases were considered successful when they have the subsequent criteria:

A. Clinical criteria:

Absence of pain, absence of tenderness to percussion, absence or decrease of mobility and absence of swelling.

B. Radiographic criteria:

Absence of radiolucency, absence of widening of periodontal ligament space and no root resorption.

RESULTS

I. Effect of Time Within The Same Group

Group I (NeoMTA group):

Regarding the clinical evaluation, Time had a significant difference statistically effect on pain, tenderness on percussion, abscess and on the overall cumulative clinical success (p=0.002), NeoMTA showed higher clinical success results than Aloe vera after 3 and 6 months .

Regarding the radiographic evaluation, Time had no significant effect on overall radiographic success (p=0.06), NeoMTA showed higher radiographic success results than Aloe vera after 3 and 6 months.

Group II (Aloe Vera group):

Regarding the clinical evaluation, Time had a significant difference statistically effect on all clinical outcome findings between groups and on

the overall cumulative clinical success (p=0.010), Aloe vera showed a higher clinical success rate than NeoMTA after the first month.

Regarding the radiographic evaluation, time had a significant effect on all the radiographic outcomes between groups and on the overall radiographic success (p=0.002), Aloe vera showed a higher radiographic success rate than NeoMTA after the first month.

II. Comparison between groups after 6 months:

Regarding the clinical evaluation (Fig.1), There is a significant difference statistically between groups in all of its clinical findings and in the overall clinical success 6 months after treatment (p=0.002), (Table 1, Fig.2).

Figure (1) Follow up after six months showed no signs of swelling on the right side treated with NeoMTA and swelling on the left side treated with Aloe vera.

Table (1) *Clinical evaluation 6 months after treatment and significance of difference between groups (chi square test).*

Clinical evaluation (6 months after treatment)	Group I (NeoMTA)		Group II (Aloe Vera)		X^2	P-value
	N	%	N	%		
• **Pain**	0	0.00	8	25.00	9.391	0.002*
• **Tenderness to percussion**	0	0.00	8	25.00	9.391	0.002*
• **Tooth mobility**	0	0.00	5	15.63	5.510	0.019*
• **Abscess**	0	0.00	8	25.00	9.391	0.002*
• **Clinical success**	27	84.38%	19	59.38%	9.391	0.002*

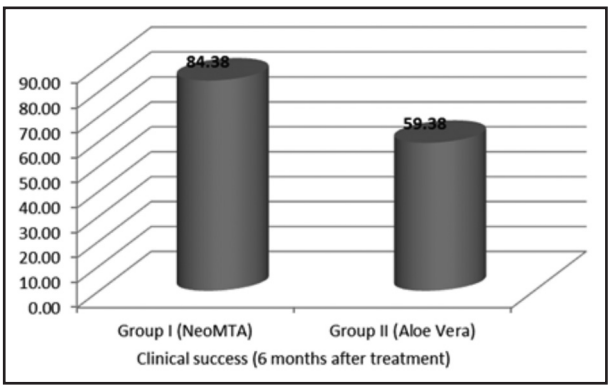

Figure (2) Column chart showing percentage of clinical success six month after treatment in all groups.

Regarding the radiographic evaluation (Fig.3), there is a significant difference statistically between groups internal resorption ,external resorption, furcation radiolucency, widening in the periodontal membrane space and in the overall radiographic success 6 months after treatment, (Table 2, Fig.4).

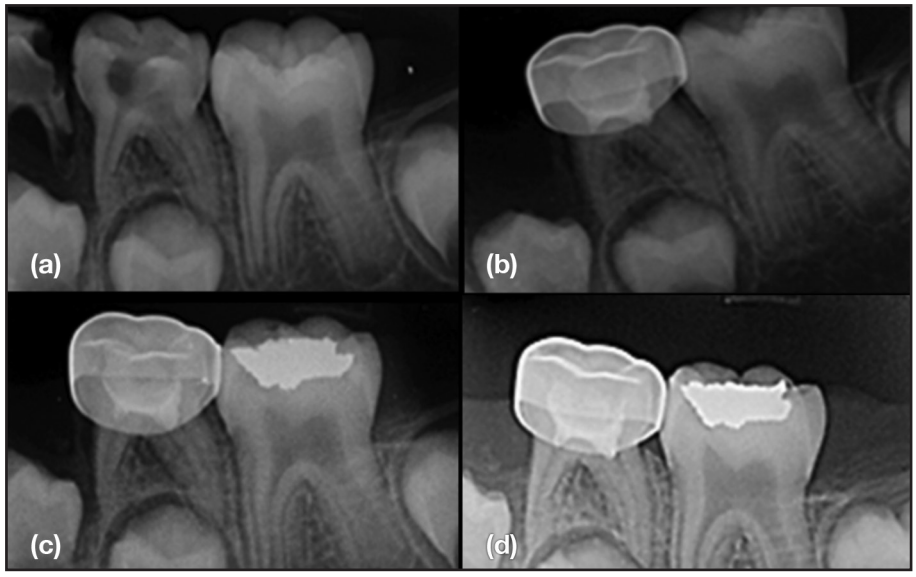

Figure (3)
a) Preoperative x-ray.
b) Postoperative after one month follow up of NeoMTA on lower E
c) After three months follow up.
d) After six months follow up.

Table (2) *Radiographic evaluation 6 months after treatment and significance of difference between groups (chi square test).*

Radiographic evaluation (immediately)	Group I (MTA)		Group II (Aloe Vera)		X^2	P-value
	N	%	N	%		
-Internal root resorption	0	0.00	8	25.00	9.391	0.002*
-External root resorption	0	0.00	5	15.63	5.510	0.019*
-Widening of the periodontal membrane space	0	0.00	14	43.75	17.122	0.000*
- Furcation Radiolucency	0	0.00	14	43.75	17.122	0.000*
- Peri-apical radiolucency	0	0.00	0	0.00	0.000	1.000
Radiographic success	29	90.63%	14	43.75%	18.184	0.000

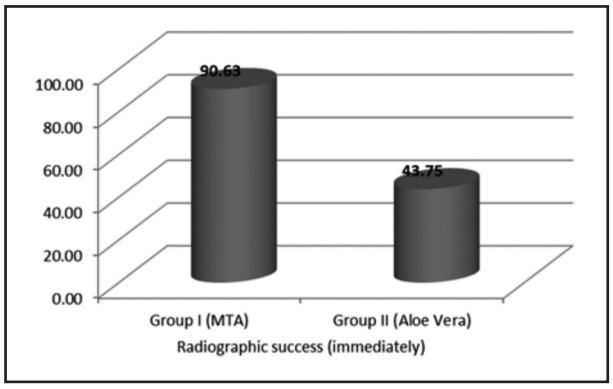

Figure (4) Column chart showing percentage of radiographic success six months after treatment in all groups.

DISCUSSION

Preservation of the deciduous teeth until their shedding time is important for appropriate development and growth of the child, proper development to develop good occlusion with good esthetic. Thus, pulpotomy procedure is an essential therapy for primary teeth with pulpal problems [6].

There are several reasons for choosing MTA in this study as it is a unique endodontic cement that became the material of choice in several procedures as repair for internal and external root resorption[7] apexification, to be used as a retrograde filling

material[8] or pulp capping of young permanent teeth[9]. But the price of NeoMTA may prohibit its usage in pediatric dentistry and therefore a natural, valid and inexpensive alternative suggested to be pulpotomy medicaments in deciduous teeth as Aloe vera was used. It is a derivative from nature, it is gods' given gift and thus natural products are always a source of attraction. Use of such products is increasing in fields of dentistry.

Aloe vera gel was used similar to a study that obtained the gel-sap liquid from the pulp of a fresh leaf of the plant Aloe vera because it exhibits a limited shelf-life due to the rapid oxidation process when it is exposed to external environment as well as due to the microbial interaction which further degrades the gel [10] then its constituents was carefully teased out from the stem of the plant. However other studies used freeze dried Aloe vera powder but it is an uneconomical and time consuming method [11].

In the present study, five cases treated with NeoMTA developed pain and signs of pulp degeneration after one month of the procedure. Widening of the periodontal ligament space and furcation and periapical radiolucency were shown radiologically. Similar results were recorded by a study [10] that evaluated the clinical and radiological outcomes of MTA pulpotomy in 11 deciduous teeth. The teeth were restored with MTA and then clinically examined every month for five months follow up period. Radiographs were taken before treatment, after one month of pulpotomy. Results showed that one pulpotomy case complained of postoperative pain and examination showed signs of pulp degeneration. Widening of the periodontal ligament space and furcation and periapical radiolucency were detected radiographically. In the present study, signs of pulp degeneration after one month may be considered as an indication of poor case selection as a result of the difficulties related with the diagnoses pulp diseases in children.

In the present study after one month of evaluation of Aloe vera, results showed two cases with clinical pain, swelling and mobility and radiographically three cases with furcation radiolucency. However, a study [10] evaluated the efficacy of Aloe vera gel on twenty primary molars as a healing agent in pulpotomy, then after one month duration patients were re-evaluated to check for any significant clinical symptom. Results showed that there aren't any sign of pain, mobility, or abscess formation in all of patients.

In this study, a comparison between the clinical and radiographic outcomes of Group I (NeoMTA) and Group II (fresh Aloe vera barbadensis plant extract) as pulpotomy agents on 64 primary molar teeth at 1, 3 and 6 months of time interval results showed that the clinical success rates between Group I (NeoMTA) and Group II (Aloe vera) at the end of the first month were 84.38% and 93.75% at the end of third month were 84.38 % and 84.38% and at the end of sixth month were 84.38% and 59.38%, respectively. Failures can be attributed to the changes produced inside the radicular pulp occur as a result of medicament pulp interaction. In contrast, another study[5] found that the clinical success rates between MTA and Aloe vera after one month were 96.4% and 24.1%, after three months were 100% and 57.1% and after six months were 100% and 75% the difference in the results may be related to the different number of sample size in that study .

In this study the radiographic outcomes of Group I (NeoMTA) and Group II (fresh Aloe vera barbadensis plant extract) as pulpotomy agents at 1, 3 and 6 months of time interval results showed that the radiographic success rates between NeoMTA and Aloe vera after one month were 90.6% and 93.9%, after three months were 90.63 and 84.38 % and after six months were 90.63 % and 43.75%, respectively. In contrast, a study [4] made a comparison between the clinical and radiological outcomes of MTA and fresh Aloe vera barbadensis plant extract as pulpotomy agents on primary molar teeth, showed that the radiographic success rates between Aloe vera and MTA at the end of the first month were

96.4% and 0%, at the end of third month were100% and 0%, at the end of sixth month were100% and 0% respectively, this may be contributed to the excellent sealing ability in our study. The high success rate of MTA pulpotomy can be attributed to the property of dentin bridge formation, excellent biocompatibility and alkalinity.

CONCLUSION

According to the methodology used and the clinical and radiological findings of the present study, NeoMTA was found to have a higher success clinically and radiographically as a pulpotomy medication than Aloe vera.

REFERENCES

1. American Academy of Pediatric Dentistry. Guideline on pulp therapy for primary and young permanent teeth. Reference Manual. 2009; 33: 112-9.
2. Camilleri J."Hydration mechanisms of mineral trioxide aggregate".J Int.Endod.2007; 40: 462-70.
3. Garcia L, Cristiane S, Wilson M, Soraya M, Lopes RA, Biocompatibility assessment of pastes containing Copaiba oilresin, propolis, and calcium hydroxide in the subcutaneous tissue of rats. J Conserv Dent.2011; 14: 108-12.
4. Gupta K V, Malhotra S. Pharmacological attribute of Aloe vera: Revalidation through experimental and clinical studies, JAyu.. 2012; 33:193-6.
5. Kalra M, Garg N, Rallan M, Pathivada L, Yeluri R . Comparative Evaluation of Fresh Aloe barbadensis Plant Extract and Mineral Trioxide Aggregate as Pulpotomy Agents in Primary Molars: A 12-month Follow-up Study J Contemp Clin Dent .2017; 8: 106–11.
6. Reddy S, Ramakrishna Y. Evaluation of antimicrobial efficacy of various root canal filling materials used in primary teeth: A Microbiological Study. J Clin Pediatr Dent. 2007;31:193-8.
7. Jacobovitz M, de Lima RK. Treatment of inflammatory internal root resorption with mineral trioxide aggregate: A case report.J Int Endod.2008; 4: 905-12.
8. Sarris S, Tahmassebi JF, Duggal MS, Cross IA. A clinical evaluation of mineral trioxide aggregate for root-end closure of non-vital immature permanent incisors in children-a pilot study. J Dent Traumatol.2008; 24: 79-85.
9. Srinivasan V, Waterhouse P, Whitworth J. Mineral trioxide aggregate in paediatric dentistry. J Int Pediatr Den.2009;19:34-47.
10. Gala-Garcia A, Teixeira KI, Mendes LL, Sobrinho AP, Santos VR, Effect of Aloe vera on rat pulp tissue. J Pharm Biol.2008;46:302-8.
11. Khan, M.K.I., Ansar, M., Nazir, A., Maan, A. Sustainable dehydration of onion slices through novel microwave hydro-diffusion gravity technique. J Food Sci Technol. 2016;33, 327-32.