Article type: *Original article*

Comparative Evaluation of MTA and Biodentine as a Restorative Material In Deciduous Teeth

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Abstract

Introduction: Several medicaments have been used in pulpotomy procedures of primary teeth. The present study was conducted to compare MTA with biodentine as a restorative material in deciduous teeth. *Materials & Methods:* Specimens were prepared with MTA (group-I) and Biodentine (Group-II) with mold with 10 in each group using stainless steel ring molds. Polyethylene tubes of 1 mm long were filled with MTA and biodentine and placed in flasks containing 10 ml distilled water at 37°C. After 2 h, the flasks were removed from hot air oven, and the water was assessed for pH. Results were tabulated and subjected to statistical analysis.

Results: Each group had 20 teeth sample. In group I, MTA was used and in group II, biodentine material was used. The mean solubility value of MTA at 1st day was 1.55, at 4th day was 1.64, at 12thday was 2.15, at 30th day was 2.57 and at 45th day was 2.60. Similarly in group II at 1st day was 1.89, at 4th day was 2.11, at 12thday was 2.80, at 30th day was 3.61 and at 45th day was 5.34. pH at 2 hours was 9.28 in group I and 8.98 in group II, at 12 hours was 9.26 in group I and 9.39 in group II, at 24 hours was 9.20 in group I and 9.64 in group II, at 7 days was 8.76 in group I and 8.27 in group II, at 28 days was 7.62 in group I and 7.78 in group II. The difference was significant (P< 0.05). *Conclusion:* Authors found that both materials can be used in deciduous teeth. However, biodentine revealed higher solubility and pH as compared to MTA in deciduous teeth.

Key words: *Biodentine, Deciduous, MTA*

Introduction

Endodontic treatment of pulpaly involved primary teeth helps to preserve the teeth in non pathological state and to prevent unwanted movement of the neighboring teeth and consequent loss of space in the arch. Moreover, premature tooth loss can lead to malocclusion with aesthetic, phonetic and functional problems that may be transient or permanent teeth.[1] Pulpotomy and pulpectomy are two major treatment modalities for deciduous teeth. A pulpotomy is performed on a tooth with deep carious lesion, pulp exposure during the operatory process or after a traumatic pulp exposure.[1] Pulpotomy is a treatment procedure that may be performed in healthy radicular pulp tissue with healing potential after surgical removal of the infected or affected coronal pulp.[2] Pulpotomy therapy for the primary dentition can be classified according to treatment objectives as devitalization (mummification, cauterization), preservation (minimal devitalization, non inductive), and regeneration (inductive, reparative) procedure. Pulpectomy is complete removal of dental pulp.[3]

To maintain vitality of primary pulp, to promote healing of the pulp remnants and to maintain the tooth until its natural exfoliation time, numerous pulp medicaments have been used. Among several materials, biodentine and MTA are widely used. Biodentine is composed of powder and liquid.[4] The powder part

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includes tricalcium silicate, dicalcium silicate (3 CaO SiO_2 and 2 CaO SiO_2), and calcium carbonate ($CaCO_3$). Zirconium dioxide (ZrO_2) is added as contrast substance and calcium chloride present as liquid ($CaCl_2.2H_2O$) for rapid setting time and to improve strength. Mineral trioxide aggregate (MTA) has become more popular, as it has low solubility and good sealing ability.[5] The present study was conducted to compare MTA with biodentine as a restorative material in deciduous teeth.

Materials & Method

This *in vitro* study was perfromed in the department of Conservative Dentistry and Endodontics. The ethical clearancs was obtained from institutional ethical committee before staring the study.

Specimens were prepared with MTA (group-I) and Biodentine (Group-II) with mold with 10 in each group using 20 ring molds of stainless steel having inner diameter of 2.1 cm and a height of 1.6 cm. Mixing of MTA and biodentine was done according to manufacturer's directions. Following this, the molds were placed inside an incubator cabinet at 37°C.

The mass of dried glass bottles was measured. This procedure was repeated for 4, 12, 30, and 45 days. Polyethylene tubes of 1 mm long were filled with MTA and biodentine and placed in flasks containing 10 ml distilled water at 37°C. After 2 h, the flasks were removed from hot air oven, and the water was assessed for pH. Results were tabulated and subjected to statistical analysis. P value was considered significant at >0.05.

Results

Table I Distribution of teeth

Groups	Group I (MTA)	Group II (Biodentine)
Teeth sample	20	20

Table I shows that each group had 20 teeth sample. In group I, MTA was used and in group II, biodentine material was used.

Table II Assessment of mean solubility in both groups

Time	Group I	Group II	P value
1 day	1.55	1.89	0.01
4 days	1.64	2.11	
12 days	2.15	2.80	
30 days	2.57	3.61	
45 days	2.60	5.34	

Table II, shows that mean solubility value of MTA at 1st day was 1.55, at 4th day was 1.64, at 12thday was 2.15, at 30th day was 2.57 and at 45th day was 2.60. In group II for mean solubility was 1.89 at 1st day, 2.11 at 4th day, at 12thday was 2.80, at 30th day was 3.61 and at 45th day was 5.34. The difference was significant (P< 0.05).

Table III Assessment of pH in both groups

Time	Group I	Group II	P value
2 hours	9.28	8.98	0.01
12 hours	9.26	9.39	
24 hours	9.20	9.64	
7 days	8.76	8.27	
28 days	7.62	7.78	

Table III, shows that pH at 2 hours was 9.28 in group I and 8.98 in group II, at 12 hours was 9.26 in group I and 9.39 in group II, at 24 hours was 9.20 in group I and 9.64 in group II, at 7 days was 8.76 in group I and 8.27 in group II, at 28 days was 7.62 in group I and 7.78 in group II. The difference was significant (P< 0.05).

Discussion

MTA and biodentine have become materials of choice in deciduous teeth. Calcium oxide and silicon dioxide are the two main components of MTA. When these raw materials are blended, they produce tricalcium silicate, dicalcium silicate, tricalcium aluminate, tetracalcium aluminoferrite, and other mineral oxides.[6] Radio opacity can be improved with addition of bismuth oxide. Cement hydrates on addition of water, and form silicate hydrate gel. Initially gray MTA was introduced, and to improve esthetic, white MTA was developed later.[7]

High solubility and prolonged setting time more are the major disadvantages of MTA. Biodentine is consists of the powder component (tricalcium silicate, dicalcium silicate as a second core material, calcium carbonate, oxide as filler, iron oxide shade, and zirconium oxide as a radio-opacifier) and the liquid component (calcium chloride as a setting accelerator and a water reducing agent). There is ample evidence for positive effects of Biodentine on vital pulp cells, for stimulating tertiary dentin formation, and early formation of reparative dentin.[8] The present study was conducted to compare MTA with biodentine as a restorative material in deciduous teeth.

In present study, we divided teeth into 2 groups. In group I, MTA was used and in group II, biodentine material was used. Carti et al[9] conducted a study in which a total of 25 children with 50 human primary molar teeth aged between 5 and 9 years were selected. The patients were divided into 2 groups. Group I patients received MTA and group II patients received Biodentine. All treated teeth were restored with stainless steel crowns, followed by clinical and radiologic evaluation at 1, 3, 6 and 12 months. There was 96 and 80% of success rate on clinical and radiological evaluation in group I and 96 and 60% in Group II, respectively. There were no statistical significant differences among the groups ($P > 0.05$). There was decreased success rate on radiographic evaluation in the controls, but it was not statistically significant.

We found that mean solubility value of MTA at 1st day was 1.55, at 4th day was 1.64, at 12thday was 2.15, at 30th day was 2.57 and at 45th day was 2.60. Similarly in group II at 1st day was 1.89, at 4th day was 2.11, at 12thday was 2.80, at 30th day was 3.61 and at 45th day was 5.34. Zaror et al[10] performed pulpotomies in primary teeth using MTA and ferric sulphate (FS) and found that radiographic success was 85.71% for the MTA and 83.33% for SF.

We found that pH at 2 hours was 9.28 in group I and 8.98 in group II, at 12 hours was 9.26 in group I and 9.39 in group II, at 24 hours was 9.20 in group I and 9.64 in group II, at 7 days was 8.76 in group I and 8.27 in group II, at 28 days was 7.62 in group I and 7.78 in group II.

Conclusion

Authors found that both materials can be used in deciduous teeth. However, biodentine revealed higher solubility and pH as compared to MTA in deciduous teeth.

Source of Funding- Self

Conflict of Interest - No

Ethical Clearance- Taken from the institutional ethics committe

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