

Clinical Evaluation of MTA - Clinical Cases

Mimoza Canga¹, Vito Antonio Malagnino²

¹Faculty of Public Health, Vlora 9400 Albania

²University "Gabriele d'Annunzio" 66100 Chieti, Italy

Abstract: ***Purpose:** clinical and radiological assessment of the MTA in permanent teeth in a single session. **Materials and methods:** In our study were included 30 permanent molars with reversible pulpitis which were treated with direct coverage with MTA. Clinical audit was conducted by the vitality test and was accompanied by radiological controls. **Results:** MTA is reliable and effective for treatment of permanent teeth at a mean period of 8.3 months control. **Conclusion:** MTA has demonstrated to be a very versatile and extremely trust worthy material.*

Keywords: mineral trioxide aggregate, permanent teeth, period of control, radiological controls.

1. Introduction

Mineral trioxide aggregate is a material that has been used worldwide in several clinical applications such as apical barriers in teeth with immature apex, repair of root perforations, root-end filling, pulp capping and pulpotomy. [2,4,8,14,15]. Mineral trioxide aggregate was believed to have the best outcome, but cost and handling properties were barriers to its use. MTA has been proposed as a potential drug in the teeth with reversible pulpitis in directly coverage due to excellent compatibility with tissues [10].

This material is successful because of its excellent ability such as closing ability, alkaline pH when strengthened and calcium ion deposition [9,17,20,21,24]. Different researchers have reported that MTA promotes proliferation of pulp cells induces the production of cytokines, strong tissue formation and synthesis of contained hydroxyapatite [11, 16]. In terms of biocompatibility, several studies showed lack of cytotoxicity when the MTA falls in contact with fibroblasts and osteoblasts [11, 16].

The appropriate restorations were functionally acceptable and aesthetically satisfying. The pulp revascularization allows the stimulation of the apical development and the root maturation of immature teeth. MTA is reliable and effective for treatment in the pediatric dentistry. This therapy has shown success in the treatment of immature teeth with periapical lesions [13,19]. Despite factors such as dental caries or traumatic injury the main aim remains the maintaining of the vitality of the pulp [7, 22, 23].

The main objective in the treatment of pulp is to maintain the integrity and health of the tooth and its supporting tissues. [6,18]. The complete coverage of the pulp is indicated in small tooth exposures with a normal pulp [3, 12]. Most provided direct pulp capping for patients of all ages but younger patients were perceived to have the best clinical outcomes [1,5,25].

2. Aim

Assessment of the MTA in direct coverage in permanent teeth exposed due to caries.

3. Materials and Methods

In our study have participated 30 patients to who were treated 30 permanent molars. The age of patients ranged from 20-45 years old, with an average 32.5 years, where 15 were male and 15 were female.

All cases presented with caries lesions, but without signs of irreversible pulpitis. Radiologic examination showed caries stretch close to pulpar room without signs of periradicular pathology.

All cases were diagnosed for reversible pulpitis. The teeth were treated under conditions of asepsis. Due to the complete removal of caries dental pulp was exposed at one point or more. The cavity was dried with a sterile cotton sphere and exposed areas were covered with a thick layer MTA to 2-3 mm. Control of hemorrhage was obtained in less than 3-5 minutes in all cases. Then the teeth were filled in with cement, composite and glassionomer within the same section. Also the permanent filling was applied during the same section. The control of the vitality of these teeth was done 24 hours after the treatment and after 6,8 and 12 months. During periodic examinations, the marginal integrity of fillings was evaluated also.

Statistical analysis was performed by SPSS 19.0 statistical package. The comparison is performed by Chi-square test. Clinical and radiological data are marked with codes.

4. Results

The value of $p = 0.05$ was considered significant.

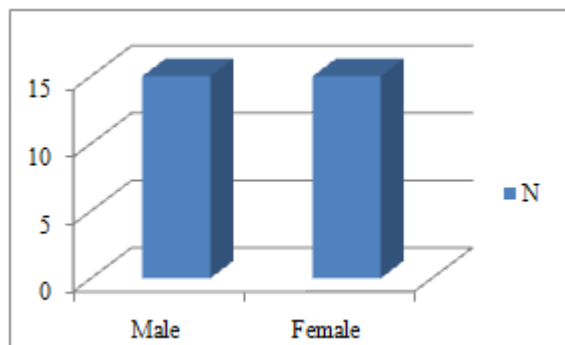


Figure 1: The distribution of patients according to the gender

18	26	8
19	28	12
20	29	12
21	21	8
22	20	6
23	42	6
24	45	12
25	33	8
26	38	8
27	31	12
28	28	8
29	32	6
30	22	8
	Mean=31.5	Mean= 8.3

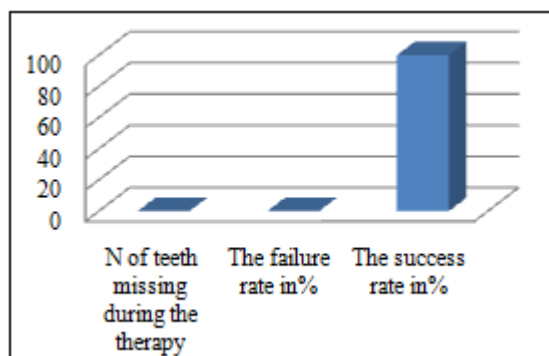


Figure 2: The data of patients and the results of direct coverage to 30 permanent molar.



Photo 1: Clinical sequence of mineral trioxide aggregate (MTA) capping of a mandibular molar in a 20 year old female.

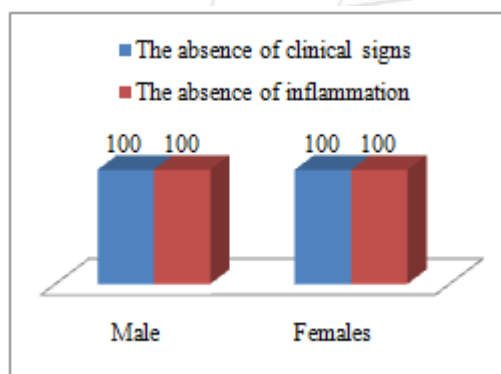


Figure 3: The success rate in %

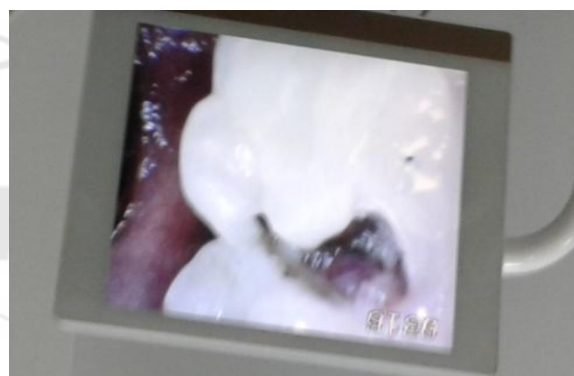


Photo 2: Treatment sequence of molar that was symptomatic on presentation in a 32 year old man

Table 1: All cases treated in this study were followed clinically and radiologically for 6,8,12 months

Nr.	Age (years)	The period of control (months)
1	20	6
2	27	8
3	32	12
4	44	6
5	45	6
6	22	8
7	26	8
8	27	12
9	45	12
10	42	12
11	22	8
12	27	6
13	29	6
14	32	6
15	40	6
16	38	6
17	32	8



Photo 3: Clinical sequence of mineral trioxide aggregate (MTA) capping of a mandibular molar in a 28 year old female.



Photo 4: Clinical sequence of mineral trioxide aggregate (MTA) capping of a mandibular in a 26 year old female.



Photo 5: Treatment sequence of molar that was symptomatic on presentation in a 45 year old male

5. Discussion

Clinical and radiological data were used in this study as criteria for assessing the performance of the MTA in permanent teeth. All teeth treated reacted positively to a median period of 8.3 months. When MTA was in contact with water, calcium oxide forms calcium hydroxide [8]. The mechanism of action of MTA was similar to that of calcium hydroxide but in comparison to MTA is provided a better enclosure with no bacteria[4],[8]. MTA presents a biologically active substrate for bone cells and stimulates the formation of interleukins [9],[10]. However the MTA is not osteoinductive, but is osteoconductive [14].

Recent studies have shown that MTA stimulates the formation of dentin are bridge adjacent to the dental pulp [17]. Dentinal bridge formation speaks about positive results of treatment [6]. However, this new structure is not always seen in radiological images and the only way to see it is the removal of the filling. But this procedure cannot be done for this reason.

Therefore in our study we used clinical and radiological data to assess the results. Studies have shown that the control of hemorrhage in direct coverage is very important in getting positive results regardless of the materials used [7],[12]. When the diagnosis is mainly based on objective data, radiological and clinical signs during the dental procedure the treatment of these teeth can foster normal development of roots.

6. Conclusion

Direct coverage with MTA can be successfully used in permanent teeth in aseptic conditions.

7. Acknowledgment

To perform and report this study was received no financial support from any companies or from a national or international funding source.

References

- [1] Andelin WE, Shabahang S, Wright K, Torabinejad M. Identification of hard tissue after experimental pulp capping using dentin sialoprotein (DSP) as a marker. *J Endod* 2003; 29(10):646-650.
- [2] Bogen G, Kim JS, Bakland LK. Direct pulp capping with mineral trioxide aggregate. An observational study. *JADA*, 2008, 139: 305-315.
- [3] Cox CF, Bogen G, Kogel HM, Ruby JD. Repair of pulpal injury by dental materials. In: Hargreaves KM, Goodis HE, editors. *Seltzer and Bender's dental pulp*. Chicago: Quintessence Publishing; 2002. p. 325-43.
- [4] Faraco, I.M., Holland, R.: Response of the pulp of dogs to capping-with mineral trioxide aggregate or a calcium hydroxide cement. *Dent. Traumatol.* 2001, 17:163.
- [5] Friedlander L, McElroy K, Daniel B, Cullinan M, Hanlin S. Direct pulp capping of permanent teeth in New Zealand general dental practice--a practice based research study. *N Z Dent J.* 2015 Jun;111(2):58-64.
- [6] Glass RL, Zander HA. Pulp healing. *J Dent Res* 1949; 28:97-107.
- [7] Havez AA, Cox CF, Tarim B, Otsuki M, Akimoto N. An in vivo evaluation of hemorrhage control using sodium hypochlorite and direct capping with a one- or two-component adhesive system in exposed non-human primate pulps. *Quintessence Int* 2002; 33(4):261-272.
- [8] Holland R, de Souza V, Nery MJ, Faraco Junior IM, Bernabe PF, Otoboni-Filho JA, Dezan Junior E. Reaction of rat connective tissue to implanted dentin tube filled with mineral trioxide aggregate, Portland cement or calcium hydroxide. *B/ Dent J.* 2001; 12:3-8.
- [9] Koh ET, Pitt Ford TR, Torabinejad M, McDonald F. Mineral trioxide aggregate stimulates a biological response in human osteoblasts. *J Biomed Mater res* 1997; 37(3):432-439.
- [10] Koh, E.T., McDonald, F., Pitt Ford, T.R., Torabinejad, and M.: Cellular response to mineral trioxide aggregate. *J. Endod.* 1998, 24:543-7.
- [11] Kato M, Kidokoro S, Kuroso K. A study on the amputation of pulp using sodium hypochlorite. *Jpn J Pediat Dent* 1978; 16:107-16.
- [12] Matsuo T, Nakanishi T, Shimizu H, Ebisu S. A clinical study of direct pulp capping applied to carious-exposed pulps. *J Endod* 1996; 22:551-6.
- [13] Martens L, Rajasekharan S, Cauwels R. Pulp management after traumatic injuries with a tricalcium silicate-based cement (Biodentine™): a report of two cases, up to 48 months follow-up. *Eur Arch Paediatr Dent.* 2015 May 31 PMID:26026789
- [14] Moreton TR, Brown Junior CE, Legan J, Kafrawy AH. Tissue reactions after subcutaneous and intrasosseous implantation of mineral trioxide aggregate

- and ethoxibenzoic acid cement. *J Biom Mat Res.* 2000; 52:528-33.
- [15] Myers K, Kaminski E, Miller. The effects of mineral trioxide Aggregate on the Dog Pulp. *J Endod*, 1996, 22: 198.
- [16] Moghaddame-Jafari S, Mantellini MG, Botero TM, McDonald NJ, Nor JE. Effect of ProRoot MTA on pulp cell apoptosis and proliferation in vitro. *J Endod* 2005; 31(5):387-391.
- [17] Nakata, T.T., Bea, K.T., Baumgartner, and J.C.: Perforation repair comparing mineral trioxide aggregate and amalgam using an anaerobic bacterial leakage model. *J. Endod.* 1998, 24:184.
- [18] Nagata JY, Lima T, Gomes B, Ferraz C, Zaia AA, Souza-Filho FJ, Soares AJ. Pulp revascularization for immature replanted teeth: a case report. *Aust Dent J.* 2015 Jul 29. doi: 10.1111/adj.12342
- [19] Namour M, Theys S. Pulp revascularization of immature permanent teeth: a review of the literature and a proposal of a new clinical protocol. *ScientificWorldJournal.* 2014;2014:737503. doi: 10.1155/2014/737503. Epub 2014 Oct 14.
- [20] Schwartz R S, Mauger M, Clement D J, Walker WA. Mineral Trioxide Aggregate: A new material for endodontics. *J Am Dent Assoc*, 1999, 30: 967-975.
- [21] Sarkar NK, Caicedo R, Ritwik P, Moiseyeva R, Kawashima I. Physiochemical basis of the biologic properties of mineral trioxide aggregate. *J Endod* 2005; 31(2):97-100.
- [22] Seltzer S, Bender IB. Pulp capping and pulpotomy. In: Seltzer S, Bender IB, editors. *The dental pulp*, 3rd edn. Philadelphia: J.B. Lippincott Company; 1984. p. 281-302.
- [23] Saeki K, Fujita Y, Shiono Y, Morimoto Y, Maki K. Pulp revascularization in immature permanent tooth with apical periodontitis using mineral trioxide aggregate. *Case Rep Med.* 2014;2014:564908. doi: 10.1155/2014/564908. Epub 2014 May 14.
- [24] Takita T, Hayashi M, Takeichi O, et al. Effect of mineral trioxide aggregate on proliferation of cultured human dental pulp cells. *IntEndod J* 2006; 39(5):415-422.
- [25] Wu W, Zhou J, Xu CT, Zhang J, Jin YJ, Sun GL. Derivation and growth characteristics of dental pulp stem cells from patients of different ages. *Mol Med Rep.* 2015 Jul 21. doi: 10.3892/mmr.2015.4106.

Author Profile

Dr. Mimoza Canga is laureate at the University Sapienza, Roma-Italy and has a PhD from the University of Tirana. Currently works in the University of Vlore, Department of Public Health, Vlore-Albania

Professor Vito Antonio Malagnino is laureate in the Faculty of the Medicine with excellent grades. He is specialized in odontostomatology in the University of Roma- Sapienza Italy. He is the chief of the endodontic in University "Gabriele D'Annunzio" Chieti ,Italy.