

Assessment of Sealing Ability of Furcation Repair Materials GC Fuji VII, MTA Plus and Biodentine: A Comparative Study

Padma Chandra^{1*} Rajesh Prasad²

¹Senior Resident, Department of Dentistry, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India.

²Medical Officer, Dental Community Health Centre, Nawadih, Bokaro, Jharkhand, India.

ABSTRACT

Background: Pulpectomy in primary teeth is considered difficult due to many reasons. An endodontic perforation is a pathologic or iatrogenic communication between the root canal space and the attachment apparatus. The repair of perforation defects has been achieved using different materials. Hence; the present study was conducted for assessing sealing ability of furcation repair materials GC Fuji VII, MTA Plus and Biodentine.

Materials & methods: A total of 40 freshly extracted mandibular first molars were included. Only those specimens were excluded that were extracted because of periodontal reasons. The surfaces of all the 40 mandibular molars were hand scaled to remove all adhering debris. The study was done using three repair materials namely GC Fuji VII, MTA Plus and Biodentine to seal the furcation perforations in the pulpal floor. The samples were then covered completely with two successive layers of nail varnish followed by a perforation in the pulpal floor. Afterwards; all the specimens were divided into four study groups with 10 samples in each group. Group A: Perforation defects were repaired with MTA Plus; Group B: Perforation defects were repaired with Biodentine. Group C: GC Fuji VII and Group D: Control group. All the sections were then cut into equal halves and were observed under Stereomicroscope.

Results: Mean microleakage among the GC Fuji VII group, Biodentine group, MTA plus group and control group was 2.31, 2.35, 1.86 and 3.01 respectively. While analysing statistically, it was seen that mean microleakage was significantly higher among the specimens of the BIODENTINE group and GC Fuji VII in comparison to MTA PLUS group.

Conclusion: MTA Plus is the best of the three materials used for furcation repair. It showed the least amount of microleakage.

Keywords: Biodentine, Repair, Sealing ability .

INTRODUCTION

Pulpectomy in primary teeth is considered difficult due to many reasons. An endodontic perforation is a pathologic or iatrogenic communication between the root canal space and the attachment apparatus. The perforations are very often iatrogenic due to excessive use of the dental bur in the pulp chamber. The repair of the root perforations must be done

immediately on occurrence to reduce the possibility of infection at the perforation site.¹⁻³

The repair of perforation defects has been achieved using different materials. These materials include silver amalgam, calcium hydroxide, glass ionomer cement (GIC), zinc phosphate cement, resin-modified GIC, indium foil, Gutta-percha, light cure calcium hydroxide, tricalcium phosphate, dentin

Received: Feb. 7, 2021; Accepted: Mar. 18, 2021

*Correspondence Dr. Padma Chandra.

Department of Dentistry, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India.

Email: Not Disclosed

chips, hydroxyapatite, super ethoxy benzoic acid, light cure composite resin, and calcium-enriched mixture cement.^{4- 6}Hence; the present study was conducted for assessing sealing ability of furcation repair materials GC Fuji VII, MTA Plus and Biodentine.

MATERIALS & METHODS

The present study was conducted for assessing sealing ability of furcation repair materials GC Fuji VII, MTA Plus and Biodentine. A total of 40 freshly extracted mandibular first molars were included. Only those specimens were excluded that were extracted because of periodontal reasons. The surfaces of all the fifty five mandibular molars were hand scaled to remove all adhering debris. The study was done using three repair materials namely GC Fuji VII, MTA Plus and Biodentine to seal the furcation perforations in the pulpal floor. The samples were then covered completely with two successive layers of nail varnish followed by a perforation in the pulpal floor. Afterwards; all the specimens were divided into four study groups with 10 samples in each group. **Group A:** Perforation defects were repaired with MTA Plus; **Group B:** Perforation defects were repaired with Biodentine. **Group C:** GC Fuji VII and **Group D:** Control group. After the restoration of perforation, the access preparation of all teeth were filled with composite and all the teeth were coated with two successive applications of nail enamel except for 1-2mm around furcation area. The coated teeth were then immersed in 2% methylene blue dye for 48 hours at normal room temperature. Then, the sample were removed out of the dye and thoroughly washed under running water for 40 minutes to remove all residues of methylene blue dye. All the sections were then cut into equal halves and were observed under Stereomicroscope. All the results were recorded and analysed by SPSS software.

RESULTS

Table 1: Microleakage.

Group	Mean	Std. Deviation
GC FUJI	2.31	0.35
MTA PLUS	1.86	0.58
BIODENTINE	2.35	0.34
Control	3.01	0.86
p- value	0.00 (Significant)	

Mean microleakage among the GC Fuji VII group, Biodentine group, MTA plus group and control group was 2.31, 2.35, 1.86 and 3.01 respectively. While analysing statistically, it was seen that mean microleakage was significantly higher among the specimens of the BIODENTINE group and GC Fuji VII in comparison to MTA PLUS group.

DISCUSSION

Maintaining the integrity of the natural dentition is important for proper function and natural esthetics. Endodontic therapy can play a vital role in achieving this goal. Occasionally mishaps occur during endodontic treatment. One of them is perforation of root canal wall, which can significantly impact the long-term prognosis of the tooth. Furcation perforation refers to a mid-curvature opening into the periodontal ligament space and is the worst possible outcome in root canal treatment. It has been reported that perforations were the second greatest cause of failure. Several materials have been proposed for sealing of perforations. These materials include Zinc-oxide Eugenol cement (Intermediate Restorative Material, Super- Ortho Ethoxy Benzoic Acid), Glass ionomer cement, Resin cements, Resin – modified Glass ionomer cement and Mineral Trioxide Aggregate. However, the divergent outcomes have demonstrated that so far no material has satisfied all the ideal requirements.^{6- 9}

Mean microleakage among the GC Fuji VII group, Biodentine group, MTA plus group and control group was 2.31, 2.35, 1.86 and 3.01 respectively. While analysing statistically, it was seen that mean microleakage was significantly higher among the specimens of the BIODENTINE group and GC Fuji VII in comparison to MTA PLUS group. Sinkar RC evaluated the sealing ability of ProRoot MTA, RetroMTA, and Biodentine as furcation repair materials using dye extraction leakage method. Thirty-five mandibular molars were randomly divided into four groups according to the material used for perforation repair. Group I — ProRoot MTA (10 samples), Group II — RetroMTA (10 samples), Group III — Biodentine (10 samples), and Group IV (Control) — left unrepaired (5 samples). All samples were subjected to orthograde and retrograde Methylene blue dye challenge followed by dye extraction with concentration 65% nitric

acid. Biodentine showed least dye absorbance while RetroMTA showed highest dye absorbance values when compared with other repair materials. It was observed that Biodentine showed better sealing ability when compared with other root repair materials.¹⁰ Samuel A et al compare the sealing ability of mineral trioxide aggregate (MTA) and Biodentine™ when used to repair the furcal perforations in primary molars using scanning electron microscope (SEM). The study sample comprised forty recently extracted primary molars. These teeth were placed in a 5.25% sodium hypochlorite solution for 24 h and washed with tap water. Access cavities were made using a round bur in high-speed handpiece. Perforations were made in the center of the floor of the pulpal chamber using a 0.5 mm round bur. The teeth were randomly assigned into two experimental groups based on the material used to seal the perforation: Group A – MTA and Group B – Biodentine™. The packed materials were allowed to set for 24 h. The samples were sectioned longitudinally and the extent of marginal adaptation was measured by SEM. All teeth exhibited microleakage, but Biodentine™ showed significantly less leakage (0.149) compared to MTA (0.583). Biodentine™ showed lesser microleakage compared to MTA and thus may be a good alternative to MTA.¹¹

CONCLUSION

MTA Plus is the best of the three materials used for furcation repair. It showed the least amount of microleakage.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Alhadainy HA, Himel VT. Evaluation of the sealing ability of amalgam, Cavit, and glass ionomer cement in the repair of furcation perforations. *Oral Surg Oral Med Oral Pathol*. 1993;75:362–6.
2. Arens DE, Torabinejad M. Repair of furcal perforations with mineral trioxide aggregate: Two case reports. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 1996;82:84–8.
3. Hamad HA, Tordik PA, McClanahan SB. Furcation perforation repair comparing gray and white MTA: A dye extraction study. *J Endod*. 2006;32:337–40.
4. De-Deus G, Reis C, Brandão C, Fidel S, Fidel RA. The ability of Portland cement, MTA, and MTA Bio to prevent through-and-through fluid movement in repaired furcal perforations. *J Endod*. 2007;33:1374–7.
5. De-Deus G, Petruccielli V, Gurgel-Filho E, Coutinho-Filho T. MTA versus Portland cement as repair material for furcal perforations: A laboratory study using a polymicrobial leakage model. *Int Endod J*. 2006;39:293–8.
6. Hashem AA, Hassanien EE. ProRoot MTA, MTA-Angelus and IRM used to repair large furcation perforations: Sealability study. *J Endod*. 2008;34:59–61.
7. Camps J, Pashley D. Reliability of the dye penetration studies. *J Endod*. 2003;29:592–4.
8. Kumar Y, Singh F, Jindal N, Aggarwal R, Aggarwal K. An in vitro evaluation of sealing ability of resin modified glass ionomer cement, mineral trioxide aggregate and biodentine as a furcation repair material: analysis of confocal laser microscopy. *Journal of dental and medical sciences* 2016;15(3):26-30.
9. Khandelwal A, Karthik J, Nadig R.R, Jain A. Sealing ability of mineral trioxide aggregate and biodentine as the root end filling material, using two different retro preparation techniques –an in vitro study. *Int J Contemp Dent Med Rev*, Vol.2015, Article ID:150115,2015.
10. Sinkar RC, Patil SS, Jogad NP, Gade VJ. Comparison of sealing ability of ProRoot MTA, RetroMTA, and Biodentine as furcation repair materials: An ultraviolet spectrophotometric analysis. *J Conserv Dent*. 2015;18(6):445-448. doi:10.4103/0972-0707.168803
11. Samuel A, Asokan S, GeethaPriya PR, Thomas S. Evaluation of sealing ability of Biodentine™ and mineral trioxide aggregate in primary molars using scanning electron microscope: A randomized controlled in vitro trial. *Contemp Clin Dent*. 2016;7(3):322-325.

