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# Repair of Furcation Perforation in Pediatric Patient

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Maintaining the integrity of the natural dentition is essential for full function and natural esthetics [1]. Endodontic therapy can play a vital role in achieving this goal.

Primary molar teeth are involved in mastication, speaking, esthetics and preserving space for the erupting permanent teeth therefore, keeping them till permanent teeth eruption is unavoidable [2]. Also any inflammation or procedures in primary teeth have an effect to some extent on the successor permanent teeth.

Technical problems do occur occasionally during endodontic treatment, one of which is perforation of the root canal wall. This can significantly impact the long term prognosis of the tooth. The clinician must be particularly concerned about avoiding perforations of the tooth during endodontic therapy, since a perforation will necessitate additional treatment. If a perforation occurs, the tooth does not necessarily require surgery, or extraction; in fact, it can be treated successfully in a conservative manner and continue to function as it did before the perforation till the time of shedding [3].

Furcal perforation can be induced by different reasons, including caries, resorption and the misdirection of the bur in preparing the access cavity of the pulp chamber and all these causes may lead to an inflammatory response in periodontal tissues [4,5]. Seltzer., *et al.* [6] showed that furcal perforation results in periradicular breakdown and eventual loss of periodontal attachment usually leading to loss of the tooth. His findings depicted the prognosis of furcal perforations to be poor and suggested that immediate repair of perforation results in a better prognosis.

Such perforations occur as an artificial communication between the pulpal space and periodontal ligament space through the floor of the pulp chamber. It has been reported as the second leading cause of endodontic failures following obturation and this constitute up to 9.6% of all unsuccessful cases [7].

Appropriate and immediate treatment is necessary in order to retain the involved tooth and for favorable prognosis to the successor one. Various surgical and nonsurgical methods have been evaluated for the repair of furcation perforations. Nonsurgical approaches by the placement of repair materials at perforation sites are preferred in cases where there is lack of surgical accessibility and in pediatric patients so as not to expose them to surgery [8].

The prognosis of root perforation depends on the size and location of perforation, duration of exposure to oral cavity and level of inflammation in the periodontium. The shorter the time interval between the perforation and repair, the smaller the size of perforation and the more apical its location, the greater the odds of treatment success. Aside from the recommended treatments for repair of root perforations, properties of the applied material are important as well [8,9].

Any delay in repairing results in the bacterial contamination of the perforation site which consequently leads to the gingival down-growth of the epithelium into the perforation area, inflammation, bone resorption, necrosis and eventual loss of the tooth and this affects the successor tooth [9,10].

Ideally, the material used for sealing of root perforations should be atoxic, non- resorbable, radiopaque and bacteriostatic and should have good sealability [11]. Also, it should have an osteogenic inductive capacity and biocompatibility [12].

Considering these characteristics and prerequisites, the use and/or effect of different materials for sealing of root perforations has been investigated [4-13].

Today, most preferred furcal perforation sealers are bioactive materials like Mineral Trioxide Aggregate (MTA), it is non-resorbable, anti-bacterial, osteoconductive, radio-opaque and biocompatible. Principle components of MTA are tricalcium silicate, tricalcium aluminate, tricalcium oxide, silicate oxide, mineral oxide, bismuth oxide [14,15], its sealing ability has been shown to be superior to amalgam, zinc-oxide eugenol, resin modified GIC and resin materials. Also cytotoxicity of MTA has been found to be less than Super Ethoxy Benzoic Acid [16].

It is derived from Portland cement and has been implemented successfully in the repair of lateral root and furcal perforations, apexogenesis and as a vital pulp capping agent [11-17]. MTA has many properties as inducing hard tissue formation adjacent to pulp, low toxicity, antibacterial effect and inducing cementogenesis [18,19].

Despite its many advantages, MTA has some drawbacks such as a long setting time (around 24 hours), less film thickness and flow, less compressive and flexure strength, non-bonding to enamel and dentin and discoloration of teeth. So, efforts have been made to overcome these shortcomings [3].

A new calcium silicate based bioactive restorative cement has been developed, put on the market under the name of "BIODENTINE™". The main component of the powder is a tricalcium silicate, with the addition of calcium carbonate ($CaCO_3$) and zirconium oxide ($ZrO_2$). The liquid is a solution of calcium chloride ($CaCl_2$) with a water reducing agent. Advantages of this material are chemico-mechanical bonding with tooth and the composite, high compressive and flexure strength [20].

Biodentine™, with its improved physical properties and shorter setting time (12-min), can be used as a dentine substitute in several clinical indications. It has emerged as a reliable bioactive material with various applications in Endodontics [21,22].

Firla [23] claimed that during the setting phase of Biodentine, calcium hydroxide ions are released from the cement. This results in a pH of about 12.5 and a basification of the surroundings. This high pH inhibits the growth of microorganisms and can disinfect the dentine.

Also, Biodentine™ can induce the synthesis of a dentin-like matrix by human odontoblast-like cells in the form of mineralization nodules that have the molecular characteristics of dentine [24]. Additionally, the Electron Microscope analysis has previously shown that this mineralized material was a specific deposition, which had the same mineral and organic composition of dentine. This can also stimulate cells growth and induce Hydroxyapatites (HA) formation on the surface of the material when exposed to the simulated body fluid [25]. HA have been shown to induce bone formation, growth and maintenance at the bone-material interface [26,27]. This is of prime importance during the process of healing as Silica can induce the mineralization function of cells by affecting cell proliferation and genes expression [28,29]. So, this new bioactive material Biodentine is taken as a one of the furcation perforation sealer in comparison with MTA [23].

Today, there is no reason to believe that the tooth will be lost prematurely because of the furcation perforation.

## Bibliography

1. American association of endodontists "Glossary of endodontic terms". 7th ed. Chicago, IL 2003

2. Fuks AB. "Pulp therapy for the primary dentition". In: Pinkham JR, Ca samassimo, Field jr, editors. Pediatric dentistry infancy through adolescence.4th ed. Elsevier: Saunders (2005): 379– 380.

3. Sanghvi T., *et al*. Comparative analysis of sealing ability of Biodentine and Calcium Phosphate cement against Mineral Trioxide Aggregate as a furcal perforation repair material (an in vitro study) NJIRM 4.3 (2013): 56-60.

4. Ferris DM and Baumgartner JC. "Perforation repair comparing two types of mineral trioxide aggregate". *Journal of Endodontics* 30 (2004): 422–424.

5. Imura N., *et al*. "Sealing ability of composite resin placed over calcium hydroxide and calcium sulphate plugs in the repair of furcation perforations in mandibular molars: a study in vitro". *International Endodontic Journal* 31 (1998): 79–84.

6. Seltzer S., *et al*. "Periodontal effects of root perforations before and during endodontic procedures". *Journal of Dental Research* 49.2 (1970): 332-339.

7. Ingle JI. "A standardized endodontic technique utilizing newly designed instruments and filling materials". *Oral Surgery, Oral Medicine, Oral Pathology* 14 (1961): 83–91.

8. Tsesis I and Fuss Z. "Diagnosis and treatment of accidental root perforations". *Endodontic Topics* 13 (2006): 95–107.

9. Ruddle CJ. "Nonsurgical endodontic retreatment". In: Cohen, Burns RC, editors.Pathways of the pulp. 8th ed. St Louis: Mosby Co. (2002): 917.

10. Hamad HA., *et al*. "Furcation perforation repair comparing gray and white MTA: a dye extraction study". *Journal of Endodontics* 32 (2006): 337–340.

11. Nakata TT., *et al*. "Perforations repair comparing MTA and amalgam using anaerobic bacterial leakage model". *Journal of Endodontics* 24 (1998): 184-186.

12. Sluyk SR., *et al*. "Evaluation of setting properties and retention characteristics of MTA when used as furcation perforation repair material". *Journal of Endodontics* 24 (1998): 768-771.

13. Juárez Broon N., *et al*. "Healing of root perforations treated with Mineral Trioxide Aggregate (MTA) and Portland cement". *Journal of Applied Oral Science* 14 (2006): 305-311.

14. Hashem AAR and Hassanien EE". Pro-Root MTA, MTA-Angelus and IRM Used to Repair Large Furcation Perforations:Sealabilty Study". *Journal of Endodontics* 34 (2008): 59-61.

15. Torabinejad M., *et al*. "Physical and chemical properties of a new root end filling material". *Journal of Endodontics* 21 (1995): 349-353.

16. Torabinejad M., *et al*. "Sealing ability of a mineral trioxide aggregate when used as a root end filling material". *Journal of Endodontics* 19 (1993): 591–595.

17. Srinivasan V., *et al*. "Mineral trioxide aggregate in paediatric dentistry". *International Journal of Paediatric Dentistry* 19 (2009): 34–47.

18. Oliveira MG., *et al*. "Comparative chemical study of MTA and Portland cements". *Brazilian Dental Journal* 18.1 (2007): 3–7.

19. Asgary S., *et al*. "Sealing Ability of Three Commercial Mineral Trioxide Aggregates and an Experimental Root-End Filling Material". *JEJ* 1 (2006): 101–105.

20. BIOACTIVE DENTINE SUBSTITUTE, wherever dentine is damaged, you can use Biodentine; brochure septodont.

21. Goldberg M., *et al*. "Emerging trends in (bio)material researches". In: Goldberg M, ed. Biocompatibility or cytotoxic effects of dental composites. Oxford, UK: Coxmoor Publishing (2009): 181–203.

22. Laurent P, Camps, About I. "Biodentine™ induces TGF-β1 release from human pulp cells and early dental pulp mineralization". *International Endodontic Journal* 45 (2012): 439-448.

23. Firla MT. "Dentin-Ersatzmaterial auf basis der Active Biosilicate Technology". DZW Kompakt 58 (2011): 10-12.

24. Camps J and Pashley DH. "Reliability of the dye penetration studies". *Journal of Endodontics* 29 (2003): 592– 594.

25. Nakata TT., *et al*. "Perforation repair comparing MTA and amalgam using an anaerobic bacterial leakage". *Journal of Endodontics* 24.3 (1995): 184-186.

26. Biodentine™ RD94 Publications and Communications 2005- 2009.

27. J Dejou., *et al*. "Physical, chemical and mechanical behavior of a new material for direct posterior fillings". *European Cells and Materials* (2005): 10-22.

28. G Koubi JC., *et al*. "A clinical study of a new Ca3SiO5-based material indicated as a dentine substitute". *Clinical Oral Investigations* (2009).

29. T Boukpessi., *et al*. BiodentineTM- RD, A portland cement, stimulates in vivo reactionary dentin formation". *Journée Scientifique du CNEOC Brest* (2009).

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