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An *In vivo* study using IRM as a retrograde filling material

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Abstract
The purpose of this study is to evaluate periapical healing using IRM as a retrograde filling material. Twenty patients who had indications for apicoectomy and root end filling material were evaluated clinically and radiographically for one year, at an interval of 3 months, 6 months 9 months. Intermediate restorative material was frequently used as a retrofilling in the past and now it is being replaced by newer materials like MTA and Biodentine. IRM was used in this study, as it is economical and numerous studies in literature showed no statistical difference in periapical healing when MTA and IRM was used as retrofilling.

Keywords: IRM, MTA, Retrofilling, periapical healing

1. Introduction

The principal aim behind an endodontic treatment is to eliminate microorganisms from the root canal system and fill the intracanal space with proper materials to achieve a hermetic seal between root canal system and periodontium. This hermetic seal prevents colonization of bacteria that could maintain or promote a periapical pathosis [1]. In some cases, conventional endodontic treatment and retreatment are not efficient enough to treat the underlying etiology and a surgical endodontic intervention is required which includes surgical debridement of periapical infected area, root end preparation and sealing the root end with retrograde root end filling material [2].

According to Lewis, the resistance of infection occurs because of failure of an antimicrobial agent and of components of immune system to penetrate the full depth of the biofilm, and the development of tolerant genes that are exchanged amongst microorganisms. Therefore, intransigent extraradicular infections, if present, must be treated by means of periradicular surgery [8]. The ideal root end filling material must be nontoxic, non mutagenic, biocompatible and insoluble. Amalgam, gutta-percha, zincoxide eugenol, IRM, Super EBA, glass ionomer cement, composite and MTA have been used for such purpose [14].

In the light of the results of several studies that have been investigated, IRM showed adequate performance as a retrofilling. In this study, IRM was used as a retrograde filling material. IRM consists of a powder containing greater than 75% ZnO and approximately 20% polymethacrylate mixed in equal parts with a liquid that contains greater than 99%eugenol and less than 1% acetic acid [4]. IRM seals better than amalgam. IRM appears to be tolerated in the periradicular tissue, but it has no dental hard tissue regeneration capacity [5].

The present study was conducted in the Department of Conservative Dentistry and Endodontics, Government Dental College, Calicut.

2. Materials and Methods

IRM (Dentsply) is modified zinc oxide eugenol cement reinforced with poly methyl methacrylate**.** It consists of a powder containing greater than 75% ZnO and approximately 20% polymethacrylate mixed in equal parts with a liquid that contains greater than 99% eugenol and less than 1% acetic acid [4].

2.1 Inclusion and Exclusion Criteria

Twenty patients between the age group of 15-35 years were selected. Patients were healthy and free of any systemic diseases. All the selected patients had periapical lesions in the maxillary anterior region. All the selected patients had at least one of the indications for periapical surgery like (1) Failed conventional root canal filling with pain and sinus tract (2) Periapical lesions of teeth with open apex which had a history of failed apexification (3) Roots affected with calcific degeneration and associated periapical lesions (4) Patients with brief period of time available for completion of therapy for teeth with periapical lesions. A complete periodontal examination was carried out and all were devoid of periodontal pockets. All the patients received one session of scaling to reduce gingival inflammation and minimize periodontal disease. The following exclusion criteria were used: teeth with pathosis associated with vertical root fractures, teeth with coronal perforations, and teeth with periodontal bone loss detected with a periodontal probe (greater >5mmprobing depth) [13].

2.2 Radiographic Criteria

Pre-operative radiograph of all selected cases showed well defined periapical radiolucency. The size of each periapical radiolucency was measured in millimeter both vertically and horizontally at maximum- extent of lesion. Only lesion with size greater than 10mm in diameter in the radiograph were included in this study.

2.3 Procedure

After patient had signed the informed consent form each one was prepared for surgery. Routine blood and urine examinations were carried out. Thorough oral prophylaxis was done and oral hygiene instructions were given. Occlusal adjustments were made to remove interferences when necessary. The root canals of involved teeth were prepared prior to surgery. In already filled teeth the existing gutta percha was removed and the canals were well prepared and cleansed with sodium hypochlorite and new root canal fillings were placed with gutta-percha using lateral condensation method after taking working length. For all cases of wide open apices root canal fillings were done at the time of surgery. All patients were advised to take an NSAID prior to surgical procedure in order to reduce post operative pain and swelling. Patients were advised to rinse with 0.2% chlorhexidine mouthwash prior to surgery to minimize the number of microbes in the mouth. Effective infection control procedures and barrier techniques were used. The surgical areas were anaesthetized by infiltration anesthesia using 2% xylocaine with 1:80000 adrenalin. After isolating the area with gauze sponge, a rectangular flap was designed with two vertical and a sulcular incisions. The vertical incisions were put one tooth lateral to the involved teeth. The mucoperiosteal flap was then carefully elevated and reflected by using retractors. In most of the cases, access to the root tip area was not required as a result of bony destruction. In other cases, the bony access to the root tip was prepared by cutting bone with a micromotor and a round bur at slow speed, using light brushing strokes, using light pressure and avoiding prolonged contact of the bur with the osseous surface [13]. Proper water spray was also used to protect tissues from thermal injury. After obtaining suitable bony access, the periapical curettage was performed to remove the diseased tissues surrounding the root apex with sharp curettes. The curetted tissue was placed in 10 % formalin solution for histopathological examination. In teeth with open apex, the root canal was dried and obturated at this time. The excess filling material which extends beyond the apex was removed. The root apex was then resected with a high speed fissure bur with a slight labial bevel. A standard cavity of 3mm was then prepared at the resected root tip by using a small inverted cone bur. After drying the cavity, IRM was mixed with the distilled water supplied along with it, mixed as per the manufacturer's instruction and placed into the cavity. Flap was repositioned and suturing was done.

2.4 Follow up

The patients were followed up for clinical and radiographic examination. Clinical parameters like pain on palpation, pain on percussion, mobility of the involved teeth, presence of draining sinus, swelling were evaluated at time intervals of 1 week, 3months, six months and nine months. Radiographic sign of healing was the reduction in size of periapical lesion and evidence of trabecular bone formation.

3. Results

Table 1: Radiographic evaluation of healing

Trabecular Bone formation					Reduction in size				Trabecular Bone formation					Reduction in size			
No	**P**	**A**	**B**	**C**	**P**	**A**	**B**	**C**	**No**	**P**	**A**	**B**	**C**	**P**	**A**	**B**	**C**
1	A	A	S	IS	-	-	+	+	11	A	S	IS	IS	-	+	+	+
2	A	S	S	IS	-	+	+	+	12	A	S	IS	IS	-	+	+	+
3	A	S	IS	CH	-	+	+	+	13	A	A	S	IS	-	-	+	+
4	A	IS	CH	CH	-	+	+	+	14	A	S	IS	IS	-	+	+	+
5	A	IS	IS	IS	-	+	+	+	15	A	A	IS	IS	-	-	+	+
6	A	IS	CH	CH	-	+	+	+	16	A	S	IS	CH	-	+	+	+
7	A	S	IS	CH	-	+	+	+	17	A	S	IS	CH	-	+	+	+
8	A	S	IS	CH	-	+	+	+	18	A	S	IS	IS	-	+	+	+
9	A	A	IS	IS	-	-	+	+	19	A	A	S	IS	-	-	+	+
10	A	S	IS	CH	-	+	+	+	20	A	A	IS	CH	-	-	+	+

Table 2: Grading of Trabeculations

0	No Radiographic changes	A
1	Change present in less than 50%	S
2	Changes predominant in more than 50%	IS
3	Complete healing	CH

Reduction in size + change in size - No change in size
P= Preop A = 3 months B = 6months C = 9 months

4. Discussion

According to Gardner and Dorn, an ideal root end filling material should be easy to manipulate, radio opaque, dimensionally stable, non-absorbable and should be stable in the presence of blood and tissue fluids. It should also adhere to the walls of the preparation and seal the root canal system. The material should be nontoxic, well tolerated by the periradicular tissues and promote healing. In addition, it should not corrode or be electrochemically active. To date no material has been found to satisfy all the requirements of an ideal root end filling material [6]. Unlike orthograde root canal filling materials, root canal filling materials are placed in direct contact with vital periapical tissues. The tissue response to these materials therefore becomes important and may influence the outcome of surgical endodontic treatment. The deposition of cementum on the cut root face is considered a desired healing response and a prerequisite for the formation of a functional periodontal attachment [1]. Cementum deposition occurs from the circumference of the root end and proceeds centrally toward the resected root canal. The cementum provides a biologically seal, in addition to the physical seal of the root end filling, thereby creating a double seal [11].

IRM is modified zinc oxide eugenol cement reinforced with poly methyl methacrylate**.** It consists of a powder containing greater than 75% ZnO and approximately 20% polymethacrylate mixed in equal parts with a liquid that contains greater than 99% eugenol and less than 1% acetic acid [2]. The main virtues of the cement are its plasticity and slow setting time in the absence of moisture. IRM has also

reported to have good sealing potential because of the small volumetric shrinkage on setting. According to Harty, IRM can be used as a retrofilling material, when mixed in a higher powder to liquid ratio than that for a temporary restoration. Its radio opacity is 5.3mm of aluminium. The advantage of IRM is easy availability, inexpensive, and easy to manipulate. IRM has been used as a retrograde root end filling material before MTA was invented in the early 1990s [15]. As a retrograde filling material, IRM has been reported to have good long term follow up results. In both a 10 year retrospective study, 6and a prospective study with a 12 month follow up [17], the success was reported to be 91%.

Studies reveal that IRM showed the sealing ability of IRM is better than Amalgam [14]. Trope *et al.* in a histological study confirmed good tissue response to IRM [16]. In comparison to silver amalgam, IRM showed lesser leakage [7]. Studies also showed that super EBA induces good healing response with a minimal amount of inflammation at the root apex [10]. Chong *et al.* and Lindeboom *et al.* compared IRM and MTA as root end filling material in single rooted teeth and mesiobuccal roots of maxillary molars. The results of both studies showed more favourable results with MTA, although they found no significant statistical difference between the two materials [3, 9]. When IRM and super EBA were compared, researchers found that 91% success rate was for IRM and 82% for super EBA. There was no statistical significance in the healing outcome between the two groups [16].

In our study, all the cases showed complete healing after 9 months, but the results was not statistically significant due to the less number of cases. But the five year follow up studies done by Shahina parvez *et al.* IRM proved to be a very good retrograde filling material [12].

In our study, the success for radiographic healing was taken into account based on the study by Von Arx *et al.* [18] The criteria are as follows: When-the radiograph demonstrated complete healing of the former radiolucency and no clinical signs or symptoms were present, it was regarded as success. When incomplete radiographic healing of at least 50% of the pre-existing lesion with absence of clinical signs and symptoms, it was regarded as improvement. When less than 50% of radiographic healing with presence of clinical signs and symptoms, it was regarded as failure.

5. Conclusion

IRM has been used as a retrograde root end filling material before MTA was invented in the early 1990s. The high powder liquid ratio when mixing the IRM material gives a high physical strength and a considerably easier manipulation. In a 10 year retrospective study and a prospective study with a 12 month follow up, the success rate was reported to be 91%. These results show that IRM can also be used as a root end filling material even though newer materials have evolved.

6. References

1. Andreasen JO. Cementum repair after apicoectomy in humans, Acta Odontol Scand. 1973; 31:211-221. (pubmed)
2. Bernabe PFE. Healing process after apicoectomy and retrofilling. Influence of the material and root canal conditions: dog teeth study. (doctoral thesis)Faculty of dentistry of Bauru, University of Sau Paulo, 1981, 124.
3. Chong BS, Pittford TR, *et al.* A prospective clinical study of MTA and IRM when used as rootend filling materials in endodontic surgery. Int Endod J, 2003; 36:520-526. (pub med)
4. Cohen S, Burns RC. Pathways of pulp.8th edition New Delhi, Harcourt Private limited, 2002, 718-21.
5. Crookes WG, Anderson RW, *et al.* Longitudinal evaluation of the seal of IRM root end fillings, J Endodon. 1994; 20:250.
6. Dorn SO, Gartner AH. Retrograde filling materials: a retrospective success –failure study of amalgam, EBA and IRM. JEndod. 1990; 16:391-393.
7. Higa RK, Torabinejad M, Millam PJ. The effect of storage time on the degree of dye leakage of root end filling materials. Int Endod J. 1994, 27-252-6.
8. Siqueira JF. Aetiology of root canal treatment failure. Whyb well treated teeth fail. International Endodontic Journal. 2001; 34:1-10.
9. Lindhe Boom, *et al.* Comparative prospective randomized clinical study of MTA and IRM as root end filling materials in single rooted teeth in endodontic surgery. Triple. 2005; 100:495-500.
10. Oynick J, Oynick T. A study of new materials for retrograde filling. J Endod. 1978; 4:203-6.
11. Regan JD, Gutmann JL, *et al.* Comparison of Diaket and MTA when used as root end filling materials to support regeneration of the periradicular tissues. Int Endod J. 2002; 35:840-847. (pubmed)
12. Shahina Parvez, *et al.* Intermediate Restorative Material: As a retrofilling Material. International journal of preventive and clinical dental research, jan-march. 2018; 5(1):82-85.
13. Silvio Taschieri, *et al.* Endodontic surgery with ultrasonic tips: one year follow up. Oral surg, Oral med, Oral pathol, Oral radiol, endod. 2005; 100:380-7.
14. Smee G, Bolanos OR, Morse DR, Furst MI, Yesilsoy C. A comparative leakage study of P-30 resinbonded ceramic, Teflon, amalgam and IRM as retrofilling seals. J Endod. 1987; 13:117-21.
15. Torainejad M, Pittford TR, *et al.* Sealing ability of MTA when used as rootend filling material. J Endod. 1993; 19:591-595.
16. Trope M, *et al.* Healing of apical periodontitis in dogs after apicoectomy and retrofillingwith various filling materials. Oral surg. Oral Med Oral pathol Oral Radiol Endod. 1996; 81:221-8.
17. Walivaara DA, Abrahamsson P, Fogglin M, *et al.* Super EBA and IRM as rootend fillings in periapical surgery with ultrasonic preparation: Aprospective randomised clinical study of 206 consequetive teeth. Oral surgey, Oral med. Oral Pathol, oral radiol, Endod. 2011; 112:258-263.
18. Von Arx, *et al.* Periradicular surgery of molars. International Endodontic Journal. 2001; 34:520-525.