

Comparative Evaluation Of Periapical Healing Using MTA And IRM As Retrograde Root End Filling Materials- An In Vivo Study.

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Abstract: The objectives of modern endodontic therapy are to clean and shape the root canal system removing all organic material and sealing the root canal with a three dimensional filling. Most endodontic failures occur as a result of leakage of irritants from pathologically involved root canals. Although, the conventional orthograde root canal therapy is the preferred method of treating diseased pulp, there are occasions when a surgical approach and placement of retrograde filling may be necessary, to prevent leakage of microorganisms and their byproducts into the periradicular tissues. The ultimate goal of any endodontic surgery is to create a perfect seal between root canal space and periodontium thereby aiding the regeneration of periapical tissues, including a complete repair of osseous defects. Dental materials based on tricalcium silicate have been developed recently and are as root end filling materials. Included in this category are Mineral Trioxide Aggregate (MTA), Biodentine™, Calcium Enriched Mixture. The present study was conducted to compare the clinical and radiographic healing when MTA and Biodentine™ were used as retro filling materials.

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I. Introduction

Most endodontic failures occur as a result of leakage of irritants from pathologically involved root canals. Although, the conventional orthograde root canal therapy is the preferred method of treating diseased pulp, there are occasions when a surgical approach and placement of retrograde filling may be necessary, to prevent leakage of microorganisms and their byproducts into the periradicular tissues. The ultimate goal of any endodontic surgery is to create a perfect seal between root canal space and periodontium thereby aiding the regeneration of periapical tissues, including a complete repair of osseous defects.

In addition, endodontic surgery is also done when conventional nonsurgical endodontic therapy is not able to achieve optimum results, such as in some clinical conditions as perforated canals, calcified canals, canals obstructed with broken instruments, dowel restorations, periapical cyst and in cases which remain symptomatic. The procedure consists of surgical exposure of the root apex, resection of root apex, retrograde cavity preparation and placement of a retrograde filling.

According to Gardner and Dorn, an ideal root end filling material should be easy to manipulate, radioopaque, 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.¹

Several substances have been used as root end filling materials. In this study, IRM was used as the control, instead of amalgam because of its clear disadvantages and MTA was used as the test 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. IRM seals better than amalgam. IRM appears to be tolerated in the periradicular tissue, but it has no dental hard tissue regeneration capacity

Recently, a new material MTA (mineral trioxide aggregate) was developed by Mahmoud Torabinejad at Loma Linda University. MTA is a powder composed of several mineral trioxides and bismuth oxides as radiopacifier. MTA has been claimed to seal off all the pathways between the root canal and the periradicular tissues. In addition, there is strong expression of the OCN gene after application of MTA, which helps in the growth of cementoblast like cells.³⁰ Cementum deposition is essential for the regeneration of periodontal

apparatus. Therefore, it would be of academic and clinical interest to compare the periapical healing provided by MTA with IRM when used as root end filling materials.

The reported success rate for endodontic surgery ranges from less than 50% to as high as 90 %. Both clinical and radiographic follow up evaluations are essential to determine successful outcomes after endodontic surgery. Because the patient is often clinically symptom free, the final case disposition is determined frequently by the radiographic findings only.

The present study was conducted in the department of Conservative Dentistry and Endodontics, Government Dental College, Calicut to compare the periapical healing when MTA and IRM were used as retro filling materials.

II. Material And Methods

Patient Selection: Forty patients with periapical lesions of anterior teeth were selected from the outpatient section of the Department of Conservative Dentistry and Endodontics, to participate in this study.

Inclusion criteria:

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 atleast 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.

Exclusion criteria:

Teeth with pathosis associated with vertical root fractures, teeth with coronal perforations, and teeth with periodontal bone loss detected with a periodontal probe (greater >5mm probing depth).⁸

Radiographic Criteria:

Pre-operative radiograph of all selected cases showed well defined periapical radiolucency .The size of each periapical radiolucency were measured in millimeter both vertically and horizontally at maximum- extent of lesion. Only lesion with size greater than 10mm in diameter in the radiograph was included in this study. Radiographic angulations were standardized for subsequent follow up during the period of study. Radiographs were taken by using film holder and paralleling technique. Standard angulations were used in each case. Factors were kept at 8mA and 60 kVp.

Procedure methodology:

Patient's data regarding age, sex, location of the lesion and associated signs and symptoms were recorded in the proforma. Complete surgical procedures were explained to the patient. 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.

Procedure:

Effective infection control procedures and barrier techniques were used. The surgical area 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.⁸ 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, MTA was mixed with the distilled water supplied along with it , mixed as per the manufacturers instruction and placed into the cavity using a plastic amalgam carrier in ten of the cases and IRM was placed in the cavity in the rest of the ten cases. (Control group). Flap was repositioned and suturing was done.

Post Operative Instructions And Medications:

1. Maintain the pressure pack (Moist gauze, soaked with saline) over the surgical site for a period of 10-15 minutes to achieve haemostasis.
2. Apply ice bag with firm pressure to the face directly over the surgical site for 6-8hrs following surgery. (alternatively 10 minutes on and 5minutes off)..
3. From the second post operative day onwards, rinse with antiseptic mouth wash (chlorhexidine 0.2% twice daily for 5 days following surgery).
4. Avoid any mechanical disturbances to the surgical site either in the form of vigorous brushing, raising the lip or retracting cheeks to inspect the surgical site.
5. Avoid strenuous activity for the rest of the day. Smoking and alcohol consumption should be avoided for three days following surgery.
6. Maintain an adequate diet with proper solid and fluid intake during the first 3 days following surgery.

Medications Given:

1. Amoxycillin 500mg tid for 5 days
 2. Ibuprofen paracetamol combination 300mg and 200mg thrice daily for three days.
- Patient was advised to report after 3 days for suture removal.

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.

Pain on palpation was assessed by palpating with fingers on the buccal and palatal aspects of the mucosal tissue overlying the roots of the treated teeth.

Pain was graded as Mild, Moderate, and Severe and was scored as follows:

Score 0 – absence of pain

Score 1 – Mild pain

Score 2 – Moderate pain

Score 3 – Severe pain ie intolerable pain.

Pain on percussion was assessed , depending up on the degree of pain elicited on a light tap with the handle of a mouth mirror as follows :

Score - 0: absence of pain on percussion

Score – 1; Mild

Score – 2: Moderate

Score – 3: Severe

Mobility of involved teeth was assessed by using the blunt handles of two mouth mirrors and was scored as follows.

Grade 1: First distinguishable sign of mobility greater than normal.

Grade 2: Horizontal tooth movement no greater than 1mm.

Grade 3: Horizontal tooth movement greater than 1mm, with or without rotation or vertical depressibility.

Presence of draining sinus, swelling scored in the observation chart as (+) and (-) according to the presence or absence of the conditions respectively.

Radiographically, the presence of trabecular bone formation and size of the lesion were evaluated by a radiologist from oral medicine and radiology department who was not aware of the material used.. Patients were evaluated at time intervals of three months, six months, and nine months.. The radiographs were examined in a viewer with a magnifying glass.(to note the presence and absence of trabeculations.).The radiographs were

digitalized and using the Adobe Photoshop , a grid of 1mm² was superimposed on the radiograph, to know the size of the lesion by recording the number of mm² that showed evidence of involvement.

Scores used in radiographic findings:⁴

0- No radiographic changes as compared to the post surgical radiograph.

1- Changes present. Radiographic evidence of trabeculae bone formation in less than 50% of the surgically created defect.

2 - Changes predominant. Radiographic evidence of trabecular bone in more than 50% of the surgically created defect.

3 - Normal. Normal radiographic appearance with normal periradicular osseous architecture and normal PDL space established at the resected root end.

By combining, the clinical and radiographic criteria, the success rate of periapical healing was evaluated in both groups .The criteria for healing classification as modified by Zetterquist et al (1991) and Jesssen (1995) , were used to evaluate the rate of healing.

The criteria is as follows:¹²

Success: the radiograph demonstrated complete healing of the former radiolucency and no clinical signs or symptoms were present.

Improvement : incomplete radiographic healing of atleast 50 % and absence of any clinical signs and symptoms.

Failure : less than 50% radiographic healing or presence of clinical signs and symptoms.

III. Observations And Results

To evaluate healing, clinically and radiographically, after periapical surgery using MTA and IRM as retrograde filling material, 20 patients were selected from outpatient section of Department of Conservative Dentistry and Endodontics, Govt. Dental College, Kozhikode. The study group consisted of 14 males and 6 females. All were of the age group 15-35 years. After selection they were randomly divided into two groups A and B. In group A the MTA was placed as the retrofilling material and in group B, IRM was placed as the retrofilling material.

Clinical Evaluation

Clinically the effectiveness of surgery were assessed by considering various signs and symptoms like pain on palpation and percussion, presence of draining sinus tract, mobility of involved teeth at time interval of one week, three months, six months, and nine months. One patient of group B failed to report after three months. All data were tabulated and statistical analysis was performed using a chi-square test (SPSS). The level of significance was set at $p < .05$.

Pain on palpation: It was observed that, preoperatively 5 patients of group A and 4 patients of group B had mild pain on palpation. 3 patients of group A and one patient of group B had moderate pain on palpation. At one week 10 cases of group A and 10 cases of group B had mild pain. One case from group A had mild pain at 3 months and from six months onwards, none of the cases had any pain on palpation.

On statistical evaluation, using the chi square test, (df-1, $P > 0.05$). Thus it is inferred that both the groups are having more of similar effects in attaining complete relief from pain on palpation (Table 1).

Pain on percussion: On evaluating it was observed that **preoperatively** 2 cases of group A and 2 cases of group B had mild pain on percussion whereas 6 cases of group A and 6 cases of group B had moderate pain on percussion and 2 patients of group A and 2 patients of group B at severe pain. **At one week** 8 cases of group A and 8 cases of group B had mild pain on percussion. Two cases of group A and 2 cases of group B had moderate pain. **At three months**, 1 patient of group A had mild pain on percussion and no patient from group B reported pain. From 6 months onwards none of the reported cases had any pain on percussion.

On statistical analysis, it was found that (df 2: $p > .05$ so pain on percussion in both groups was not significant statistically).

Disappearance of sinus tract: On evaluation, it was found that preoperatively 5 cases of group A and 5 cases of group B had sinus tract preoperatively, which was present even after 1 week in both groups . At three months none of the cases in both groups reported sinus. On statistical analysis it was found that disappearance of sinus tracts in both groups was not statistically significant, since $p > .05$ (Table 2).

Swelling: Preoperatively 10 cases of group A and 9 cases of group B had swelling. At one week. 4 cases of group A and 4 cases of group B had swelling. From one month onwards none of the cases showed swelling involving the treated area.

On statistical analysis, using chi square test (df 1 and ($p > .05$)) Thus it is inferred that the disappearance of swelling, on healing when using the two different materials was not significant (Table 3).

Mobility: 6 cases of group A and 7 cases of group B had grade 1 mobility preoperatively, and 4 cases of group A and 3 cases of group B had grade II mobility. At one week and three months 10 cases of group A and 10 cases of group B had grade I mobility. After 6 months, 4 cases of group A , and 5 patients of group B showed grade I

mobility). On statistical analysis, mobility and periapical healing in both groups was found to be insignificant ($p > .05$) (Table 4).

Radiographic evaluation: Radiographically, size of the lesion in comparison to the preoperative radiograph and the presence of trabecular bone formation were evaluated. These evaluations were done at the time intervals of 3 months, 6 months, 9 months.

Trabecular bone: In group A at 3 months, there was absence of trabeculae formation in two cases, trabeculae formation present in five cases and three cases showed predominant trabecular changes. In group B, there was absence of trabeculations in four cases, and six cases showed trabecular changes.

At 6 months in group A, two cases showed normal trabecular pattern (complete healing) and the six cases showed predominant trabecular changes and two cases showed trabecular changes in less than 50 % of the defect. Whereas in group B, two cases showed trabecular changes, seven cases showed predominant trabecular changes and one case failed to report.

At 9 months, in group A, six cases showed complete healing and four cases were in intermediate stage of healing, whereas in group B only two cases showed complete healing and the rest of the seven cases were in intermediate stage of healing.

On statistical analysis, the p value was .096 which is greater than .05 so it was inferred to be statistically insignificant (Table 7).

Size of lesion: When the size of the lesion was evaluated at three months, in group A 8 of the cases showed reduction in size whereas two showed no reduction. In group B, 6 cases showed reduction and 4 showed no reduction in size.

At six months and nine months respectively all the 10 cases showed reduction in size, whereas in group B 9 showed reduction in size, while one failed to report.

On statistical analysis the p value was $> .05$ so inferred to be statistically insignificant.

In group A and group B, there were no statistically significant differences related to trabecular formation and reduction in size of the lesion, since $p > .05$. These results should be interpreted cautiously in view of the limited statistical power of study and should be considered as strictly pertinent to the observed sample and cannot be generalized (Table 7).

Success rate of healing

In view of the above findings, according to Zetterqvist's criteria, the overall success rate in group A is 60% at 9 months and in group B is 22.2% at 9 months. (one patient in group B failed to report after 3 months).

IV. Result

		Mild	Moderate	Severe	Absent
Group A	Pre operatively	5	5	-	-
	1 week	10	-	-	-
	3 months	-	-	-	-
	6 months	-	-	-	-

		Mild	Moderate	Severe	Absent
Group B	Pre operatively	4	6	-	-
	1 week	10	-	-	-
	3 months	-	-	-	-
	6 months	-	-	-	-

TABLE 1.3 - CHI-SQUARE TESTS

	Value	Df	Asymp.Sig (2) sided)
Pearson Chi square	202 ^b	1	.653
N of Valid cases	20		

Table 2 - Disappearance of Sinus Tract

		Preop	1Week	3months	6 months	9 months
A	Absent	5	5	10	10	10
	Present	5	5			
B	Absent	5	5	10	10	10
	Present	5	5			

TABLE 2.1 - CHI-SQUARE TESTS

	Value	Df	Asymp.Sig (2) sided)
Pearson Chi square	10.000 ⁶	1	.08

TABLE 3 - SWELLING

		Preop	1Week	3months	6 months	9 months
A	Absent	-	6	10	10	10
	Present	10	4	-	-	-
B	Absent	1	6	10	10	10
	Present	9	4	-	-	-

TABLE 3.1 - CHI-SQUARE TESTS

	Value	Df	Asymp.Sig (2) sided)
Pearson Chi square	.741 ^e	1	.389

TABLE 4 - MOBILITY

		Preop	1Week	3months	6 months	9 months
A	Grade 1	6	10	10	4	-
	Grade 2	4	-	-	-	-
	Grade 3	-	-	-	-	-
B	Grade 1	7	10	10	5	-
	Grade 2	3	-	-	-	-
	Grade 3	-	-	-	-	-

TABLE 4.1 - CHI-SQUARE TESTS

	Value	Df	Asymp.Sig (2) sided)
Pearson Chi square	220 ^b	1	.499

TABLE 5 - TRABECULATIONS

		Preop	3months	6 months	9 months
A	Absent	10	2	-	-
	Changes present	-	5	2	-
	Changes predominant	-	3	6	4
	Complete Healing	-	-	2	6
B	Absent	10	4	-	-
	Changes present	-	6	2	-
	Changes predominant	-	-	7	7
	Complete Healing	-	-	-	2

Table 6 - Healing of Periapical lesion at 9 months

	Group A	Group B
Success	60%	22.2%
Improvement	40%	70%

In group B: 1 patient dropped out after 3 months

TABLE 7 - RADIOGRAGHIC EVALUATION

Group A									Group B								
Trabecular bone formation					Reduction in size				Trabecular bone formation					Reduction in size			
No	Pre-op	3 mts	6 mts	9 mts	Pre-op	3 mts	6m ts	9 mt s	No	Pre-op	3 mt s	6 mts	9 mts	Pre-op	3 mt s	6m ths	9mth s
1	A	A	S	IS	-	-	+	+	1	A	S	IS	IS	-	+	+	+
2	A	S	S	IS	-	+	+	+	2	A	S	IS	IS	-	+	+	+
3	A	S	IS	CH	-	+	+	+	3	A	A	S	IS	-	-	+	+
4	A	IS	CH	CH	-	+	+	+	4	A	S	IS	IS	-	+	+	+
5	A	IS	IS	IS	-	+	+	+	5	A	A	IS	IS	-	-	+	+
6	A	IS	CH	CH	-	+	+	+	6	A	S	IS	CH	-	+	+	+
7	A	S	IS	CH	-	+	+	+	7	A	S	IS	CH	-	+	+	+
8	A	S	IS	CH	-	+	+	+	8	A	S	IS	IS	-	+	+	+
9	A	A	IS	IS	-	-	+	+	9	A	A	S	IS	-	-	+	+
10	A	S	IS	CH	-	+	+	+	10	A	A	NR	NR	-	-	NR	NR

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. Normal (CH)

Reduction in Size

- No change in size
- + Reduction in Size

V. Discussion

Periapical surgery is a well established and accepted endodontic procedure for the preservation of teeth with periapical pathology or following failed nonsurgical root canal treatment. Periapical surgery is done to remove pathologic tissue from the periapical region and simultaneously eliminate any source of irritation that could not be removed by orthograde root canal treatment.¹⁰ Its outcome has been assessed in numerous studies with a reported success rate ranging from 41-94%. The wide variation might be related to the differences in sample size, tooth types, indications for the operation, observation period, treatment procedures and materials used as well as criteria for success and recall rate. Factors that influence surgical intervention include quality of root canal filling, root canal anatomy and the presence of prosthetic restorations.¹⁰

The ultimate goal of periapical surgery is the predictable regeneration of periapical tissues including a complete repair of the osseous defects.

The most commonly used root end filling material is amalgam. One of the reasons for its popularity is that it has been used for more than a century and has proven itself well tolerated by oral tissues. Its potential disadvantages are initial marginal leakage, corrosion, tin and mercury contamination of periapical tissues, moisture sensitivity of some alloys, need for a retentive undercut preparation, staining of hard and soft tissues and technique sensitivity. The quest for a substitute for amalgam has induced clinicians to use a great variety of materials.

Of the other retrograde filling materials tried, Glass ionomer are sensitive to moisture at the start of the set and avoiding moisture contamination in the periradicular region is not achieved easily. The application of glass ionomer cements demands precise handling and placement procedures. Zinc oxide eugenol based cements like IRM and super EBA were recommended as root end filling material by Dorn and Gartner. In this study, IRM was used instead of amalgam because of its clear disadvantages. The test material was MTA White (Angelus)

After getting approval from the Human Ethical Committee Dental College, Kozhikode, this study was designed to evaluate and compare the healing after periapical surgery, when MTA and IRM were used as retrograde filling materials, both clinically and radiographically.

In our study age and sex had no influence on healing as only age groups between 15 -35 years were selected and in each group there were 7 male and 3 females. This finding is in accordance with the study done by **Mikkonen M et al and Lehtinen et al**. The relationship between patient age and healing as explored in previous studies are **Hirsch et** and **Norderam et al** found better healing in younger patients, while **Blum et al** and **Harty et al** found better healing with older patients.²

Among the 20 patients selected eighteen cases had history of trauma in childhood, 7 with history of failed and attempted apexification with calcium hydroxide, one had calcified canal with a periapical lesion and one had a history of failed nonsurgical treatment with a ceramic restoration. Case selection was in accordance with Swiah and Walker's criteria.⁵

In all cases, of open apex obturation was done during surgery. In the failed nonsurgical case, it was retreated before surgery. **Tschamer Harnish et al**¹¹ stated better prognosis when the root filling was made before

surgery. But **Norderon et al** in their study found better results with simultaneous root filling and surgery. However, the removal of all necrotic remnants from the root canal was very important.

In this study, the size of the lesions were all greater than 10mm at the maximum extent, which support the indication for surgery on the basis of the size of the lesion as suggested by **Grossman et al** whose guide lines suggest a lesion roughly 5 to 6 mm in diameter with an area of about 25 to 30mm².

After surgery all cases were followed up for a period of 3 months, 6months and 9 months respectively. During this period all the findings were entered in the proforma. Healing was assessed both clinically and radiographically.

Clinically pain on palpation, pain on percussion, mobility, presence of draining sinus tract, vitality of adjacent teeth was evaluated. These evaluations were done at the time intervals of 3mnths 6mnths and 9mnths.

On clinical evaluation it was found that the placement of MTA and IRM had no significant influence with regard to pain, mobility, healing of sinus tract and other soft tissue response. All the local signs and symptoms of inflammation were mild to moderate and subsided in due course .

Preoperative symptoms may have significant influence on pain experience after surgery, this findings correlates with the observations found in the study conducted by **Seymour RA et al** and **Tsisis I**, and **Fuss Z et al**

For adequate healing to occur there should be a fluid tight seal of the apical part of the root canal that is biologically compatible. **Torabinejad M, Pittford TR et al** in a bacterial leakage study with Staphylococcus epidermidis found that MTA prevented apical leakage of coronally introduced test bacterium.

Torabenejad, Higga RK et al in a dye leakage study with four root end filling material found that MTA leaked significantly less than amalgam, Super EBA, and IRM.

Necrotic and infected pulp may cause a gradually increasing, inflammatory lesion of the periapical tissue, accompanied by structural changes in the periapical bone, which appear with characteristic feature in periapical radiographs. Radiographic examination of the periapical area is important for the evaluation of the periapical condition and for the success and failure of endodontic treatment. The most consistent radiographic feature aiding diagnosis of the periapical condition of the teeth is the density of trabeculae bone.

In our study, in group A at 3 months, there was absence of trabeculae formation in two cases, specks of trabeculae formation in six cases and two cases showed intermediate stage of healing. In group B, there was absence of trabeculations in four cases, and six cases showed specks of trabeculations.

At 6mnths in group A, two cases showed complete healing and the rest of the eight cases were in the intermediate stage of healing, whereas in group B, two cases showed specks of trabeculations, seven cases showed intermediate stage of healing .and one case failed to report .

At 9 mnths , in group A, six cases showed complete healing and four cases were in intermediate stage of healing , where as in group B only two cases showed complete healing and the rest of the seven cases were in intermediate stage of healing. Based on these observations, the material used in group A (MTA) was found to cause faster rate of healing than IRM. This finding is in correlation with the study by **Mahmoud Torabinejad et al** who found that the tissue response to IRM caused marked rounding of the cells and depletion in number indicating its toxicity due to leaching of eugenol, thereby slowing its healing potential.⁶ He also found that MTA induces hard tissue formation and the regeneration of new cementum over MTA is a unique phenomenon that has not been reported to occur with any other root end filling material.³ The other studies that are in support of our observations are:

Apaydin et al in a study in dogs used MTA as root end filling material and found that there was higher incidence of cementum formation and there was no significant difference in quantity of cementum or osseous healing and bone density between freshly placed and set MTA.

Other studies that are in favour of our study are ; **Fischer EJ et al** , **Torabinejad M et al**, found that MTA is superior root end filling material than amalgam, IRM, Super EBA, and composite resins with respect to dye and bacterial leakage, cytotoxicity, and marginal adaptation. They also found that there is minimal inflammation and good healing around MTA root end fillings.

In our study according to the criteria by Zetterqvist, success rate of healing in group A is 60% and in group B is 22.2%. There are studies available in dental literature which reports a higher success rate for periradicular healing (ranging from 82% to 96.8%). This variance in success rates may be due to different techniques employed, differences in the angle of bevel, the different materials used as retrofillings and the difference in criteria used to access healing.⁹ In our study the low rate of success might be due to small sample size, traditional method of surgery used, and the short period of time used to evaluate healing. So the result obtained in our study, has to be considered as strictly pertinent to the observed sample and cannot be generalized .In most of the studies of periapical surgery, the treatment outcome should be assessed radiographically for atleast one year.⁷

Since surgical re-entry and histological examination were not done in this study, actual extent of bone formation could not be determined. So in our study, Rud et al, s criteria to assess healing was not used because in this radiographic finding was integrated with histologic findings.

However long term study with varieties of clinical cases and large sample size using this material is essential to conclude on its efficacy.

VI. Summary And Conclusion:

In this study MTA WHITE (Angelus) and IRM are used as retrofilling materials to compare and evaluate periapical healing after apicoectomy done on 20 patients who were randomly selected. These patients were clinically and radiographically reviewed for 3months, 6 months and 9 months. As per the results of our study, it was found that at 9 months, complete healing was observed in group A (MTA) in 6 cases and complete healing occurred in only 2 cases in which IRM was used.

In view of these findings, it can be concluded that on the basis of a limited number of patients and a relatively short observation period, the results of the present study show a tendency towards a higher success rate when MTA was used as a retrofilling material than IRM. However, clinical and histological evaluation for a longer period is necessary to evaluate the overall success rate in healing, so that MTA might emerge as the root end filling material of choice.

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