



Full Length Research Article

CLINICAL EVALUATION OF THREE DIFFERENT RETROGRADE FILLING MATERIAL (MTA, BIOCERAMIC, BIODENTINE) AFTER APICOECTOMY UTILIZING CONE BEAM COMPUTED TOMOGRAPHY

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ABSTRACT

Aim: The purpose of this In Vivo study is to compare the three different retrograde filling materials following endodontic surgery by using CBCT.

Materials and Methods: In our study, patients with periapical lesion were selected irrespective of site, age and sex. After incision, flap elevation was done. Osteotomy was performed using no. 4 carbide bur, to gain access to the apical region. Apicoectomy was performed followed by retrograde filling with three different materials. Nova bone putty was used as a bone graft material at the lesion site. The flaps were then sutured. Preoperative and postoperative CBCT was done to determine the size of radiolucent area or the periapical lesion.

Results: Bioceramic showed maximum decrease in size of the lesion, followed by Biodentine and MTA.

Conclusion: Within the limitations of this study, Bioceramic surpassed the rest as a retrograde filling material.

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INTRODUCTION

Three-dimensional obturation of the root canal is essential for the long term success of endodontic treatment, so the root canal system should be sealed apically, coronally and laterally. Periapical surgery is an option to avoid tooth extractions when conventional endodontic therapy has failed. (Abdul et al., 2014) Evolution of surgical endodontics and the refinement of its principles have a long and tumultuous history, biologically based and clinically updated directives have emerged. Furthermore, the endodontic literature have coupled the surgical aspects with magnification through the use of the surgical operating microscope, use of ultrasonics, refined principles of soft and hard tissue management, use of tissue regenerative root-end filling materials, and enhanced principles of wound closure and postoperative management (Priyalakshmi and Manish, 2014). Among the techniques indicated, retrograde obturation is one of the mostly performed procedure in surgical endodontics (James, 2014). Retrograde obturation comprises of apicoectomy and the retrograde cavity

preparation followed by the insertion of the retrofilling material. To perform the retrograde cavity, the introduction of the ultrasonic tips enables the preparation of a cleaner and deeper cavity more centered at the root canal. The retrofilling materials are inserted into the retrograde cavity aiming to provide apical sealing and to prevent microorganism penetration, decreasing the leakage of irritating agents in the canal's wall interface and contributing to periapical repair. (James, 2014) In addition, to being bactericidal or bacteriostatic, an ideal endodontic repair material should provide an impervious seal, be dimensionally stable, radio-opaque, nonresorbable, nontoxic and well tolerated by the periradicular tissues. Literature suggests various retrograde filling materials have been used for root repair including amalgam, zinc oxide-eugenol, intermediate restorative material (IRM), composite resins, carboxylate cements, zinc phosphate cements and glass ionomers.

However, the recent advancements include MTA, Biodentine and Bio-ceramic. (Roberta, 2012) The aim of our study was to clinically evaluate the sealing ability of three recent retrograde filling materials utilizing Cone beam computed tomography.

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MATERIALS AND METHODS

Thirty patients attended the department of Conservative Dentistry and Endodontics, with a large periapical lesion, in upper and lower anterior teeth, were selected for present study. The study period of three years (2013-2016) was carried out. Informed consent was taken. The clinical criteria for the consideration of these cases for surgical methods were: 1) Swelling 2) Sinus and pus discharge 3) Tenderness to percussion. 4) Radiographic (radiolucency surrounding the root apex of the offending tooth). The study sample was 30 and it was divided into 3 Groups, 10 patients allocated to each group. Group A treated with Bioceramic, Group B is Biodentine and Group C -MTA as a retrograde filling material respectively after apicoectomy. All operations were carried out by under local anaesthesia (Xylocain 2%) with adrenalin 1:80 000. Incision was marked on the involved tooth with one tooth mesial and one tooth distal to the offending tooth. Mucoperiosteal flaps were raised. Bone was removed by using no. 4 carbide round bur with copious external irrigation. The apical one third of the root was resected. The cavity for retrograde filling was prepared with small carbide round bur. The cavity was isolated before placement of material. Group A, B and C filling material were mixed according to

manufacturer’s instructions and placed into the root end cavity respectively. The excess material from the root end was cleaned with a slightly moistened cotton swab. Periapical radiographs were taken to confirm the proper placement of retrograde filling materials before suturing of the mucoperiosteal flap. In case of large lesion and severe bone loss, bone graft (NOVA BONE PUTTY) was used for faster healing. Evaluation of healing for success was done every 6 and 12 months following the endodontic surgery. In the follow up visits, radiographs were taken at an interval of six and twelve month for the assessment of healing. The assessment was done by clinical and radiographic examination. The data were collected on a well-structured Performa and analyzed using SPSS version 16 by determining the frequency. Chi square test and Wilcoxon signed rank test was used to determine the statistical significance .Results with $p < 0.05$ were considered significant.

RESULTS

Group treated with Bioceramic as a root end material better healing results of periapical lesion, followed by Biodentine and MTA in order of appearance.



Figure 1. Surgical armamentarium



Figure 2. Preoperative radiograph



Figure 3. Preoperative photograph

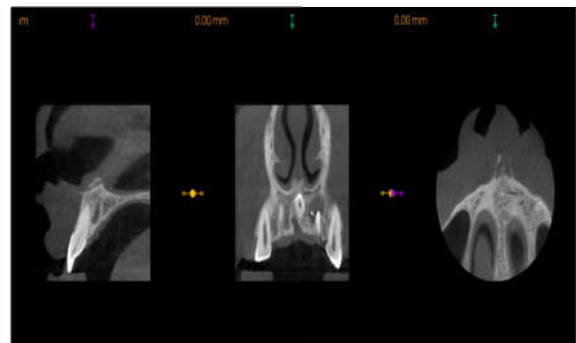


Figure 4. Preoperative CBCT image



Figure 5. Full thickness flap raised



Figure 6. Bone loss and presence of granulation tissue

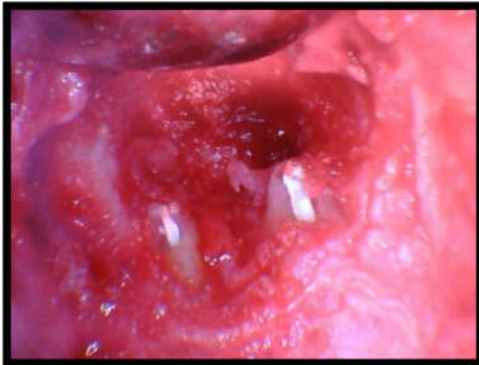


Figure 7. Following Apicoectomy, retrograde filling done with Bioceramic



Figure 8. NOVABONE PUTTY used as the bone graft



Figure 9. Sutures in place



Figure 10. Immediate Postoperative radiograph



Figure 11. 6 months follow up



Figure 12. Postoperative CBCT image

DISCUSSION

The goal of a peri-radicular surgery is to gain access to the periapical lesion, evaluate the root circumference, and place a biocompatible retrograde filling material that stimulates the regeneration of periapical tissues (Ahmed *et al.*, 2014). In this study three different retrograde filling materials are used. MTA (Torabinejad) has been investigated and used as a root end filling material since its introduction (Payal *et al.*, 2013). Despite its good physical and biological properties and hydrophilic nature; Its use has always remained a challenge because of its technique sensitivity, prolonged setting time, and high cost (Saravanapriyan *et al.*, 2014) Biodentine, which is similar to MTA in its basic composition, but has setting time that is greatly reduced by a combination of different effects: a) particle size greatly influences the setting time, since higher the specific surface, shorter the setting time (Ivan *et al.*, 2015). b) Adding calcium chloride to the liquid component accelerates the system. c) Finally, the decrease of the liquid content in the system decreases the setting time to harden within 9-12 days (Harpreet *et al.*, 2014). Kolkata and Pawar *et al.* in 2013, conducted a study that compared the microleakage of Glass ionomer cement, MTA, and Biodentine when used as a retrograde filling material. They concluded that Biodentine exhibited the least microleakage when compared to other materials used (Ambica *et al.*, 2014). Sulthan *et al.* in 2014 carried out a study to evaluate the pH and calcium ion release of MTA and Biodentine when used as root end fillings. He concluded that Biodentine presented alkaline pH and ability to release calcium ions similar to that of MTA (Han and Okiji, 2011). Bioceramic, (the latest invention) –the high pH and released calcium ions are required for a material to stimulate mineralization in the process of hard tissue healing. Bioceramic have a potent antimicrobial action, it kills the bacteria within two minutes of contact. This is due to its high pH, calcium hydroxide diffusion (Gregory *et al.*, 2014).

Conclusion

In our study we have concluded that routine endodontic therapy followed by surgical intervention with a placement of biocompatible retrograde filling material like Bioceramic for management of endodontic periapical lesions of chronicity would positively affect the treatment outcome and prognosis.

ANNEXURE 1

Ref. No. :

Name & Address of the Principal Investigator (s):

Dr. Panna Mangat.

Divya Jyoti College of Dental Sciences & Research

To

Chair Person/Member Secretary

Divya Jyoti Dental Ethics Committee

Divya Jyoti College of Dental Sciences & Research

Modinagar

Sub: Ethical Clearance for Research Project entitled-

Clinical evaluation of three different retrograde filling material (MTA, Bioceramic, Biodentine) after apicoectomy utilizing Cone beam computed tomography.(In Vivo study).

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UNDERTAKING

With respect to the above said thesis protocol involving human extracted teeth (invitro study) for which the Ethical Clearance is being sought, we state that we have gone through the Divya Jyoti Dental Ethical Guidelines for Biomedical Research involving human subjects and I am aware of the rules governing the studies involving human subjects. We are aware that the guidelines are to be strictly followed while carrying out the research project.

I affirm that I will be responsible to keep the IEC informed of-

- 1) Any serious and unexpected adverse events and remedial steps taken for that
- 2) Any new information which may influence the project.
- 3) Any changes made in the consent form
- 4) In the event of need to amend the original protocol approved by the EC, the proposed amendment shall be brought to the notice of the EC for approval. Under No circumstances I/we shall deviate from the original approved protocol without prior notice to that effect.

Date:
25/ 07/2015

Name & Signature of Principal Investigator Panna

Dr. PANNA MANGAT.

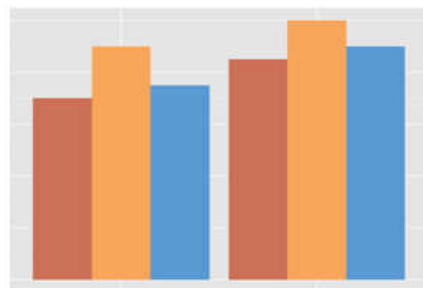
Professor

Divya Jyoti College of Dental Sciences & Research, Modinagar

Table 1. Volumetric analysis of the periapical lesion

	Preoperative evaluation	Postoperative evaluation
MTA	15.3mm ³	8.6mm ³
BIOCERAMIC	15.1mm ³	5.1mm ³
BIODENTINE	14.9mm ³	6.7mm ³

Table 2. Statistical analysis



- MTA
- BIOCERAMIC
- BIODENTINE
