ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 11, pp.41752-41754, November, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

COMPARATIVE EVALUATION OF SEALING ABILITY OF THREE DIFFERENT RETROGRADE FILLING MATERIALS-AN IN VITRO STUDY

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ARTICLE INFO

Article History:
Received 14th August, 2016
Received in revised form
29th September, 2016
Accepted 17th October, 2016
Published online 30th November, 2016

Key words:

Root end reatoration, Microleakage, Biodentine.

ABSTRACT

The success of the endodontic treatment depends upon the fluid tight seal between the intraradicular space and the periradicular tissues, both apically and coronally which should prevent microleakage. In some cases according to periapical conditions indicated for periapical surgery where in this procedure includes exposure of involved apex by flap reflection, removal of necrotic tissue, resection of the apical end of the root, root end preparation and placement of retrograde filling restorative material. Ideally retrograde filling materials should be biocompatible, easy to manipulate, radiopaque, dimensionally stable and non resorbable. It should not be affected by presence of moisture and should be adhesive to dentin, nontoxic, well tolerated by the periradicular tissues as well as promote healing.

Citation: Shailja Singh, Ramesh Chandra, Jyoti Jain, Supratim Tripathi, Manjusha Mohan and Faisal Naseem, 2016. "Comparative evaluation of sealing ability of three different retrograde filling materials-An in vitro study", *International Journal of Current Research*, 8, (11), 41752-41754.

INTRODUCTION

Now days in dentistry, cleaning and shaping of the root canal system can be proficiently performed. Due to recent developments on instruments and improved techniques, the success rate of root canal treatment is increased upto 90% with conventional root canal therapy. (Guttman and Harrison, 1991) However, several other factors, such as perforations, instrument breakage, calcifications and anatomic anomalies can lead to treatment failure. The preferred treatment of endodontic failure cases is non-surgical .Butin some cases, conventional endodontic retreatment is not satisfactory to solve the problem and a surgical endodontic intervention is required. (Bernabé, 1981; Bernabé, 1994) Periapical surgery procedure comprise of flap reflection of involved apex, removal of necrotic or inflamed tissue, resection of the apical end of the root, root end preparation and placement of retrograde filling material. The ideal root-end filling material must be nontoxic, non-mutagenic, biocompatible, insoluble, easy to manipulate, radiopaque, dimensionally stable, promote periapical healing and should stable in moist environment. (Gartner and Dorn, 1992) Several root-end filling materials have been used like gutta-percha, amalgam, Cavit, intermediate restorative material (IRM), Super EBA, glass ionomers, composite resins, Nanocomposites carboxylate cements, zinc phosphate cements, zinc-oxide eugenol cements, and Mineral trioxide aggregate (MTA) & Biodentine. The main objective of a root-end filling material is to provide an apical seal that prevents the movement of bacteria and the bacterial products between the root canal system and the periapical tissues. (Bernabé, 1994; Gartner and Dorn, 1992; Chong *et al*., 1995) MTA due to its higher biocompatibility and sealing ability promotes better healing of the tissues when placed in contact with the dental pulp or periradicular tissues over the available root-end filling materials. (Ozata *et al*., 1993; Sousa *et al*., 2004) A newly researched material with largely improved physical properties BioDentine has been introduced which can be used as a root end filling material. BioDentine is acalcium silicate based cement. In addition to the chemical composition based on the Ca3SiO5 and water chemistry which brings the high biocompatibility of already known endodontic repair cements like MTA, it has increased physico-chemical properties like short setting time, high mechanical strength which make it clinically easy to handle and compatible. (Goldberg *et al*., 2009) Nanocomposites are a new class of composites that have shown great potential. A PNC is a generalized term for polymeric materials that are loaded with minimal amounts of nanoparticles such as clays, carbon nanotubes, etc dispersed at a nanoscale. (Hamouda *et al*., 2011) Cytotoxicity study

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evaluating these two forms PNC resins found no significant difference between MTA, Geristore and PNC resin C-18 Amine MMT on 24 hours, 1, 2 and 3 weeks samples. (Modareszadeh *et al*., 2011) The purpose of this study was to evaluate the sealing ability of three different retrograde filling materials i.e.MTA, Biodentine and Nanocomposite.

MATERIALS AND METHODS

The present in vitro study was conducted in single rooted anterior teeth in the Department of Conservative Dentistry and Endodontics, Career Post Graduated Institute of Dental Sciences and Hospitals, Lucknow, U.P., India. The single rooted anterior teeth that were taken for this study were:-non carious and non-restored and had a length of 10 mm or greater from the cementoenamel junction to the apex. Presence of a single canal and continuous hydration was essential. The teeth were endodontically treated using conventional step-back technique for cleaning and shaping and lateral condensation technique for obturation. The coronal access was sealed with Cavit. The samples were divided into three groups, in which each group having 10 teeth. A diamond point of 3 mm in length and 1.5 mm in width (ISO size 012) was used in this study to standardize the root-end preprations.in group I root end restoration was done by MTA where as in group II and in group III root end restoration was done by Biodentine and Nano composite respectively. After retrograde root filling procedures were completed, teeth were coated with three layers of nail varnish except for the apical portion. Then teeth were allowed to dry for 30 minutes. After the drying period, teeth were placed into four tubes containing 1% methylene blue solution for 72 hours. The teeth were sectioned longitudinally with the help of chisel and mallet and dye penetration was examined under stereomicroscope and microleakeage was evaluated.

For evaluation of microleakage scoring was done as follows –

Scoring criteria

Score 0: No leakage
Score 1: leakage upto 1mm. (on either or both sections)
Score 2: leakage upto 2mm. (on either or both sections)
Score 3: leakage upto 3mm. (entire cavity depth and even on floor)

RESULTS

Theresult of our study showed that all materials exhibited microleakage but there was significantly less leakage in Biodentine (0.70 mm) when compared to MTA (1.10 mm) and Nanocomposite (2.0 mm). Fig.1 Data were summarised as Mean ± SD (standard deviation). The obtained microleakage of three groups is summarised in Table 1 and also shown in Fig. 1.

Table 1. Microleakage (mm) of three groups

Groups	n	Min	Max	Mean	SD
Mta	10	0	2	1.10	0.74
Biodentine	10	0	2	0.70	0.67
Nano composite	10	1	3	2.00	0.82

Groups were compared by one way analysis of variance (ANOVA) and the significance of mean difference between the groups was done by Tukey's post hoc test. Analyses were performed on STATISTCA 7.1 software (StatSoft Inc., USA).

Fig 1. Mean microleakage of three groups

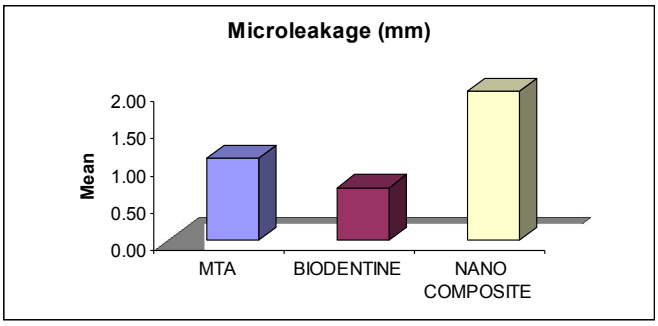

Table 2. Comparison of mean microleakage between groups using Tukey test

Comparison	Mean Diff.	q	P value	95% CI of diff
Mta vs. Biodentine	0.40	1.70	P > 0.05	-0.4271 to 1.227
Mta vs. Nano composite	-0.90	3.82	P < 0.05	-1.727 to -0.07292
Biodentine vs. Nano composite	-1.30	5.52	P < 0.01	-2.127 to -0.4729

Comparing the mean microleakage of three groups, ANOVA showed significantly different microleakage among the groups (F=7.98, P=0.002). Further, Tukey test showed that the mean microleakage of NANO COMPOSITE was significantly (P<0.05 or P<0.01) different and higher as compared to both MTA and BIODENTINE while not differed (P>0.05) between MTA and BIODENTINE i.e. found to be statistically the same (Table 2).

DISCUSSION

The goal of a periradicular surgery is to gain access to the affected area, evaluate the root circumference and root canal anatomy and place a biocompatible seal in the form of root end filling that stimulates the regeneration ofperiodontium. Several substances have been used as root end filling materials. The choice of a root-end filling material could be governed by manipulating properties, biocompatibility, apical seal as well as its long term clinical success. Most *in vitro* studies evaluate leakage of the apical seals, but the correlation between dye leakage around root-end filling materials and their clinical performance is uncertain.The clinical significance of microleakage in apical surgery has not been elucidated. However it seems logical that the lesser leakage would prevent migration of bacteria and toxins into the periradicular tissue. (Ahlberg *et al*., 1995) The marginal seal is compromised because of its dissolution in tissue fluids and it being technique sensitivity. (Wu and Wesselink, 1993) MTA has been investigated and used as a root end filling material since its introduction. Despite its good physical, biological properties and it being hydrophilic in nature, MTA has some disadvantages such as long setting time and high cost. (Torabinejad *et al*., 1995) The search for alternative materials is aimed to reduce costs and to increase the feasibility to both professional and patient. BioDentine is similar to MTA in basic composition. The manufacturers claim that it's modified powder composition i.e. the addition of setting accelerators and softeners, a new pre dosed capsule formulation for use in a mixing device largely improve the physical properties of the

material making it more user-friendly. Biodentine is a relatively new material introduced as a dentine substitute. Biodentine powder is mainly composed of highly pure tricalcium silicate, which regulates the setting reaction. Other components are calcium carbonate (filler) and zirconium dioxide (radiopacifier). The liquid contains calcium chloride (setting accelerator), water reducing agent (super-plasticizer) and water. The super-plasticizer reduces the viscosity of the cement and improves handling. (Goldberg *et al*., 2009) The manufacturer claims that this material can be used for pulp capping, pulpotomy, apexification, root perforation, internal and external resorption and also as a root end filling material in periapical surgery. In the previous studies, Biodentine showed biocompatibility and the ability to induce odontoblast differentiation and mineralization in cultured pulp cells (Zanini *et al*., 2012).The main benefits of Biodentine over other calcium silicate based materials are the reduced setting time, better handling and mechanical properties. (Santos *et al*., 2005) The importance of marginal adaptation is that it may have an indirect correlation with the sealing ability of retro-filling materials. In nanocomposites polymerization shrinkage that leads to microleakage can be resisted by high bond strength between the restoration and the dentin surface thus, reducing subsequent micro gap formation at the tooth restoration interface. Although many composites are in the market, it is difficult to select a composite with minimal microleakage. One study stated that it is not only the degree of conversion that acts upon the polymerization shrinkage, but also the composition and structure of the material. (Goldberg *et al*., 2009)

Conclusion

Within the limitation of study, Biodentine as a retrograde filling material is more efficient as compare toMTA & Nanocomposite.

REFERENCES

Ahlberg KM, Assavanop P and Tay WM. 1995. A comparison of the apical dye penetration patterns shown by methylene blue and india ink in root-filled teeth. *Int Endod J*., 28(1): 30-34

Bernabé PFE. 1981. Healing process after apicotomy and retrofilling. Influence of the material and and root canal conditions: dogs' teeth study. [Doctoral Thesis]. São Paulo, Brazil: Faculty of Dentistry of Bauru, University of São Paulo; 124 p.

Bernabé PFE. 1994. Pulp less dogs' teeth study after apicotomy and retrograde treatment: influence of filling level and retrofillingmaterial [Master's Degree Thesis]. Araçatuba, Brazil: Faculty of Dentistry of Araçatuba, Sao Paulo State University; 352 p.

Chong BS, Pitt Ford TR Watson TF, and Wilson RF. 1995. Sealing ability of potential retrograde root filling materials. *Endod Dent Traumatol*, 11(6): 264-269.

Gartner AH, Dorn SO. 1992. Advances in endodontic surgery. *Dent Clin North Am*., 38:357-378.

Goldberg M, Pradelle-Plasse N, Tran XV, Colon P, Laurent P, Aubut V. *et al*. 2009. Emerging trends in (bio) material re-search.- Physico – chemical properties of Bio-dentine. In: Goldberg M, editor. Biocompati-bility or cytotoxic effects of dental composites. 1st ed. Oxford: Coxmoor publishing co, p.181-203.

Guttman JL, Harrison JW. 1991. Surgical Endodontics. 1st ed. Boston: Blackwell Scientific Publications.

Hamouda IM, Elkader HA, Badawi MF. 2011. Microleakage of nanofilled composite resin restorative material. *J Biomater Nanobiotechnol*., 2:329-34

Modareszadeh MR, Chogle SA, Mickel AK, Jin G, KowsarH, Salamat N, Shaikh S, Qutbudin S. 2011. Cytotoxicity of set polymer nanocomposite resin root-end filling materials. *IntEndod J*., 44:154-161.

Ozata F, Erdilek N and Tezel H 1993. A comparative sealability study of different retrofilling materials. *IntEndod J*., 26(4): 241-245

Santos AD, Moraes JCS, Araujo EB, Yukimitu K, Valerio Filho WV. 2005. Physico-chemical properties of MTA and a novel ex-perimental cement. *Int Endod J*., Jul; 38(7): 443-7.

Sousa CJ, Loyola AM, Versiani MA, Biffi JC, Oliveira RP and Pascon EA 2004. A comparative histological evaluation of the biocompatibility of materials used in apical surgery. *IntEndod J*., 37(11): 738-748

Torabinejad M, Rastegar AF, Kettering JD, Pitt Ford TR 1995. Bacterial leakage of mineral trioxide aggregate as a rootend filling material. *J Endod*., 21, 109-112.

Wu MK, Wesselink PR 1993. Endodontic leakage studies reconsidered. Part I. Methodology, application and relevance. *IntEndod J*., 26, 37-43.

Zanini M, Sautier JM, Berdal A, Simon S. 2012. Biodentine Induces Immortalized Murine Pulp Cell Differentiation into Odontoblast - like Cells and Stimulates Biomineralization. *J Endod*., Sep;38(9):1220 - 6.

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