RETROGRADE FILLING MATERIALS A REVIEW

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Introduction:

Root end filling materials In an endodontic surgery are generally used to seal off the root ends.(1) The root end filling materials should provide an apical seal and prevent the bacterial passage inside the root canal. They are used in consideration to prevent the exit of unobturated root canal or to improve the seal of existing root. Once the root end preparation is completed Suitable root end material should be placed. These material should provide adequate amount of radioopacity inorder to be distinguished among other anatomical structures such as bones and tooth. Zinc oxide Eugenol was used since the discovery of the root end fillings in 1936 by Grossman. IRM Is a polymethacrylate reinforced zinc oxide eugenol cement recently indicated as the root end filling material (2). Throughout the field of dentistry various materials has been used as the root end filling although all materials are not found to fulfill the physical properties for retrograde filling material.

The REF materials provided for this purpose should enable the best seal with preventing microleakage and also possess other properties like biocompatibility,bioactive, non resorbable, dimensonally stable, radio opaque, impervious to dissolution or breakdown by tissue fluids and be capable of adapting closely as possible to the dentinal walls of root end preparation.

CLASSIFICATION OF ROOTEND FILLINGS

1. Zinc oxide eugenol
2.IRM and Super EBA
3.Amalgam
4. Gutta percha
5. Cavit
6. Gold foil
7. Zinc phosphate cement
8. GIC
9. Composite resin
10.Mineral trioxide aggregate(MTA)
11.Endosequence BC RRM
12.Biodentin

ZINC OXIDE AND EUGENOL :

Zinc oxide and eugenol was first to be invented as the root end filling materials. These materials are widely used because they are better tolerated by the tissues when compared to other dental materials(3). As they alleviate the pain and provides better bacteriostatic and antiseptic they are tolerated by the patients. They have good sealing property than zinc phosphates cements. The ability of the ZOE based endodontic sealer to influence the peri apical tissues healing is considered in view of eugenol anti-inflammatory and toxic properties.(4) They proved the best property of plasticity and dimensional stability.

IRM AND SUPER EBA :

Super EBA is manufactured in 1960 at England . They contained powder components 60% zinc oxide, 34% silicone dioxide and 6% resins and the liquid components contains 62.5% ortho-ethoxy benzoic acid and 37% eugenol. Super EBA shows high compressive stress,high tensile stress and low solubility(6). A comparison

study shows that IRM and Super EBA shows no sign of solubilitywhen compared to re nforced zinc oxide-eugenol cement (Super EBA) has become an alternative to amalgam, and it is generally accepted as an effective root-end filling material. As suggested by Yaccino et al.22 (1999), a Centrix syringe can also used to fill the root-end cavities with Super EBA, since the consistency and the setting time of the material may cause difficulty in handling it clinically. Super EBA showed less leakage when compared to amalgam, but more leakage than the other two materials. Wu et al.21 (1998) obtained similar results in a long-term study of Super EBA ,amalgam and MTA.(7)

IRM Intermediate Restorative material is designed for intermediate restorations intended to remain in place for up to one year. (8)The eugenol content in zinc oxide-eugenol composition gives the material sedative like qualities on hypersensitive tooth pulp and is a good thermal insulator as well. IRM may be used as a base under cements and restorative materials that do not contain resin components, such as amalgams, and inlays and onlays. (9)Among the many other applications are: emergency placement prior to complete treatment, endo access openings, pedo teeth that will soon exfoliate, and caries management programs. Its strength properties approach those of zinc phosphate cement.

AMALGAM: An amalgam is an alloy composed of mercury. .Dental amalgam is produced by mixing liquid mercury with an alloy made of silver, tin, and copper solid particles. Compatibility silver amalgam Alloy significantly reduces the microleakage. Studies show that the unreacted mercury shows the cytotoxic decreasing the hardness for the material to set.(10)Dental amalgam is relatively safe to be used as a restorative material because it is used in low doses. Amalgam vapour can be released through chewing but this is minimal. However, there is an increased release of mercury following the exposure of electromagnetic fields generated by Wi-Fi routers and mobile phones(11). Some patients may develop allergic reactions to it. Resin composite, glass ionomer cements and ceramic or gold inlays can be used as alternatives to amalgam.

GUTTA PERCHA: When GP is used as a root-end filling material, it absorbs moisture from periapical tissues because of its absorbing capacity It expands first and then contracts.Pitt Ford et al. found that the tissue response to GP with zinc oxide root canal sealer was characterized by little or no inflammation and hence safe in usage .In a comparative *in vivo* study on bone defect regeneration, most histological sections using GP as retrograde material showed signs of non-healing with lack of cortical bone and high level of inflammatory (12)

CAVIT:

It is a Zinc oxide based transitory filling material. Cavit is delicate when put in the tooth and in this way experiences a hygroscopic set after saturation with water, giving a high straight extension (18%). This legitimizes its utilization as a root-end filling material[13]. Cavit has been appeared to display more prominent spillage than IRM16. It is observed to be dissolvable and rapidly breaks down in tissue liquids. Biocompatibility ponders with Cavit are in struggle, demonstrating it to be both toxic and nontoxic..Keepingthese contemplates at the top of the priority list, the utilization of Cavit as a root-end filling material can't be exhorted.[14]

GOLD FOIL:

There are sufficient evidence to support and use direct filling gold as restorative material? The concept of evidence based dentistry has surfaced the past decade and most of the evidence based studies regarding longevity and holistic analysis of restorative material is from 1990. the material science researches is at snail pace for the direct filling gold. Even then, it has recent improvement with EZ gold and various types of precipitated gold. Most of the research regarding gold foil was done from 1900 till 1985. Where the direct filling gold restoration has stood the test of time , as G.V.Black pointed out in 1908,there is no restorative material as good as gold foil to take the full advantage of the modulus of elasticity of the dentine. The research in the arena of gold foil and other metallic restoration are not very aggressive because most of present researches are supported and funded by the manufacturers.(15)) university based researches, other non profit funding agencies are very minimal and in the current scenario. Research based by manufacturers will definitely eclipse around the demand and the want of the patients. In the light of evidence based dentistry, the direct filling gold does not have any evidence to support; even then it has proclaimed itself to be one of the most durable materials from 1900 -1980!!(16)

ZINC PHOSPHATE:

Rhein(1897) used the zinc phosphate with gutta percha to seal the root canal. Herbert (1974) sealed with thymol as root end sealers. They are not generally used because of solubility,irritability to tissues and improper healing.(17). Because of these features it is not used as the root end fillings .

GLASS IONOMER CEMENT :

Formed by the action of polyacrylic acids and Aluminium silicate glass. They bond through chemical adhesion. Biocompatibility studies show that the cytotoxicity was found in the initial setting GIC it decreases after setting. They have tight sealing capacity and does not cause any irritation to periapical tissue[18,19]. Marginal adaptation and adhesion of GIC has shown the increased usage of varnishes and sealers.[20]. Resins and the composite varnishes test conducted by Chong et al showed the least microleakage due to sensitivity ,less curing shrinkage and deep penetration to the polymer to dentin surface[21,22]. The
similarity of glass ionomer concretes is essential since they should be in direct contact with polish and dentin if any compound bond is to . In an in vitro contemplate, naturally blended traditional glass ionomer bond was observed to be cytotoxic, however the set concrete had no impact on cell cultures(23). In another review, the pulpal reaction to glass ionomer bonds in sans caries human premolars got ready for extraction was examined(24). The outcome demonstrated that in spite of the fact that glass ionomer bond created a more noteworthy fiery reaction than zinc-oxide eugenol concrete, the aggravation settled suddenly with no expansion in reparative dentin arrangement(25)

COMPOSITE RESINS

Resin composite fillings are made of ceramic and plastic compounds. Because resins mimic the appearance of natural teeth, these fillings have been used in front teeth for years(26). When they first appeared, however, resin compounds weren't strong enough to be used in back teeth, where high-pressure grinding and chewing require greater durability.(27)
In the past 10 years, technology has improved enough to allow the use of resin material in posterior or back teeth. Still, many dental plans including Delta Dental don't cover resin fillings in teeth that aren't visible in a smile, and many dentists choose not to use resins for one or more of these reasons:

1.Durable over years together
2.Reliable filling that undergo various stress
3.Cost is much better(28)

The proper use of denting bonding agent when doing the. Composite restoration can help in lasting the retrograde material with further use and they serve with longer periods of time.

MINERAL TRIOXIDE AGGREGATES

Mineral trioxide total (MTA) was created at Loma Linda University, California by Torabinajed and associates in 1993.(29) MTA has indicated phenomenal seal and hard tissue repair contrasted and other root-end filling materials. The principle parts in MTA are tricalcium silicate, tricalcium aluminate, tricalcium oxide, silicate oxide. Bismuth oxide has been added to the powder to make it radio-obscure(30). The powder is made out of hydrophilic particles that set within the sight of dampness. Hydration of the powder shapes a colloidal gel that solidifies (31).As per a clinical review done by Chong and Pitt passage in 2003 looking at MTA and IRM, the utilization of MTA demonstrated a higher achievement rate. MTA has demonstrated promising outcomes because of its great fixing properties, bioactivity, and potential to animate cementogenesis(32). The fundamental favorable circumstances of MTA are its biocompatibility and its osteogenic and regenerative potential MTA has been shown to have better hostile to bacterial properties against E.faecalis(33), S.aureus and P.aeruginosa contrasted with different materials. What's more, MTA has better hostile to bacterial movement when utilized in the wake of blending with 0.12% chlorhexidine .In a review done to think about fixing capacities of white and dark MTA when blended with water and 0.12% chlorhexidine which demonstrated no distinctions in fixing abilities.this demonstrates that CHX does not bargain the fixing impact of MTA(34) .The utilization of MTA has been appeared to initiate cementum development and periodontal recovery with acceptance of slightest measure of aggravation.(35)

ENDOSEQUENCE BC RRM

EndoSequence Bioceramic Root Repair Material is a prepared to-utilize, premixed bioceramic material produced for changeless root channel repair and surgical applications(36). It is an insoluble, radiopaque and without aluminum material in light of a calcium silicate sythesis, which requires the nearness of water to set and solidify(37). EndoSequence Bioceramic Root Repair Material does not contract amid setting and shows magnificent physical properties.recent bioceramic detailing created by BrasselerUSA is a premixed syringe (EndoSequence Root Repair Material) with a going with putty material that is utilized for retrofilling ultrasonically arranged retropreparations. (38)This material gives the benefits of bioceramics without the clinical

taking care of restrictions of MTA. This instructional exercise shows the utilization of this root repair material in conjunction with the putty material.(39)

BIODENTIN

Biodentine is a calcium-silicate based material that has drawn attention in recent years and has been advocated to be used in various clinical applications, such as root perforations, apexification, resorptions, retrograde fillings, pulp capping procedures, and dentine replacement(40). There has been considerable research performed on this material since its launching; however, there is scarce number of review articles that collates information and data obtained from these studies.(41) Therefore, this review article was prepared to provide the reader with a general picture regarding the findings about various characteristics of the material. The results of a PubMed search were classified and presented along with some critical comments where necessary(42). The review initially focuses on various physical properties of the material with subheadings and continues with biocompatibility. Another section includes the review of studies on Biodentine as a vital pulp treatment material and the article is finalized with the summary of some case reports where the material has been used(43)

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