A REVIEW ON TEMPORARY RESTORATIVE MATERIALS

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ABSTRACT:-The aim of this review is to analyse the various temporary restorative materials used in dentistry and its importance.A temporary restoration usually can be placed to seal a tooth until a permanent restoration can be placed.A temporary restoration seals the tooth, protecting the pulp from bacteria and reducing sensitivity.Temporary restorations are generally done when a tooth needs to be evaluated or time is not available for a final restoration.The reason of this review is to know about temporary restorative materials, their properties and usability in dentistry.

Keywords :- Temporary Restoration,Dentistry.

INTRODUCTION :-

Temporary restorative materials are used for restoring the tooth temporarily until permanent restoration can be given.It covers the prepared part of the tooth, in order to maintain the occlusal space as well as the contact points[1]. It also provide insulation of the pulpal tissues and maintains the periodontal relationship. Sometimes in order to prepare indirect restorations such as inlays and onlays,permanent restoration cannot be preferred after tooth preparation.Temporary restorations are also used for caries stabilization methods where many restorations are needed, and the problem may become worse before it can be fully treated . Hence temporary restorations are placed in order to stop caries progression[2]. Temporary restoration can last approximately for one month.

Bacterial infection has been declared as the most common cause of the pulpal and periradicular diseases [3-4]].Therefore; the major goals of root canal treatment are the chemo mechanical debridement and sealing of the root canal system to eliminate the irritants.Temporary restorations are commonly used to seal endodontic access cavities between patient visits and after completion of endodontic therapy to prevent coronal microleakage [5].

FUNCTIONS OF TEMPORARY RESTORATIVE MATERIALS :-

1-Provide an adequate seal against ingress of bacteria, fluids and organic materials from the oral cavity to the root-canal system.

2- Prevent seepage of intracanal medicaments

3- Adhere to tooth structure

4-It reproduces the tooth contours to allow ease of cleaning and also to maintain space.

5- Insulates the pulpal tissue and maintains the peridontal relationship

IDEAL REQUIREMENTS OF TEMPORARY RESTORATIVE MATERIAL :-

The ideal requirements of a temporary filling materials are as follows :-

1. Should be easily removed from the cavity
2. Should have sedative effect to the tooth and promote pulp healing
3. Reasonable strength and abrasive resistance
4. Radiopaque
5. Reasonable setting time and has low flow after setting
6. Anti bacterial property
7. Marginal integrity
8. Low Water sorption and solubility

CLASSIFICATION OF TEMPORARY RESTORATIVE MATERIALS :-

Based on composition :-

1) zinc oxide eugenol based materials
2) calcium sulfate- based materials
3) glass ionomer materials
4) composite resin based materials

Throughout the dental history, a wide variety of materials have been used for temporary fillings. Although many materials are available, no material has been found that fulfils all or most of the properties for ideal temporary filling material. Given below is the brief description of materials that have been or are currently being used as temporary restorative material.

ZINC OXIDE EUGENOL BASED MATERIALS:-

Eugenol-containing dental materials are frequently used in clinical dentistry. When zinc oxide-eugenol (ZOE) is applied to a dentinal cavity, small quantities of eugenol diffuse through the dentin to the pulp. Low concentrations of eugenol exert anti-inflammatory and local anesthetic effects on the dental pulp. Thus use of ZOE temporary filling may facilitate pulpal healing; on the other hand, high eugenol concentrations are cytotoxic[6].Direct application of eugenol to pulp tissue may result in extensive tissue damage. The ability of ZOE-based endodontic sealers to influence periapical tissue healing is considered in view of eugenol's anti-inflammatory and toxic properties[7].One of the most important property of this material is its sedative and the obtundent effect.Eugenol liquid provides an obtundent effect which help the pulp to relax after trauma from tooth preparation.

COMPOSITION :-

The chemical composition of ZOE is typically

POWDER:-

Zinc oxide:-69.0wt%

White rosin:-29.3wt%

Zinc acetate:-1.0wt%(improves strength)

Zinc stearate:-0.7wt% (acts as accelerator)

LIQUID :-

eugenol-85wt%

olive oil:-15wt%

Modifications of zinc oxide eugenol based materials are IRM and EBA.

INTERMEDIATE RESTORATIVE MATERIAL :-

IRM is a ZOE cement reinforced with polymethyl methacrylate. This reinforcement provides the restoration with improved compressive strength, abrasion,resistance and hardness[8].The manufacturers recommend the use of IRM as a temporary restoration for cavities for up to 1 year using a powder to liquid ratio of 6:1.Following these recommendations usually results in a less than ideal seal but provides more optimum physical properties. The use of less powder provides a better seal at the expense of minimally compromising the physical properties[9].In addition, a softer mix exhibits greater antibacterial activity due to hydrolysis and the subsequent increase in the release of eugenol, an antibacterial agent which may prevent bacterial colonization if leakage takes place.But the leakage of IRM is increased when subjected to thermal stress, which was attributed to its dimensional instability[10].

EBA :-

These are modifications of zinc oxide eugenol based material whose main component is ethoxy benzoic acid, designed to produce a mechanical interlocking effect upon hardening inside the mouth. These cements usually consist of a basic powder (zinc oxide, aluminum oxide) and an acidic liquid (ethoxy benzoic acid) that are mixed together in a viscous paste immediately before use, setting to a hard mass. Ethoxy benzoic acid cements have proper thermal and chemical resistance in the oral environment[11].This material is resistant to dissolution, in oral fluids and non-irritating to pulp and gingiva. These cements are used in dentists offices as sedative bases and for temporary restoration.

CALCIUM SULPHATE BASED MATERIALS :-

Cavit and cavidentin are the main calcium sulphate based temporary filling material. Cavit is soft when placed in the tooth and subsequently undergoes a hygroscopic set after permeation with water, giving a high linear expansion (18%). This rationalizes its use as a root-end filling material. Cavit has been shown to exhibit minor leakage[12].It is found to be soluble and quickly disintegrates in tissue fluids. Biocompatibility studies with Cavit are in conflict, showing it to be both toxic and nontoxic[13-14].

“Cavidentin” (Laszlo Laboratories, Netania, Israel)[15], a ready-to-use CaSO4-based temporary filling material, was used to seal access cavities and packed in the same way as IRM. The material was allowed to set for 24 hours while being immersed in water at room temperature before application of occlusal loads. It has a similar composition as that to Cavit but there is an addition of potassium aluminium sulphide as catalysts and thymol as an antiseptic. In an in vitro study by Tamse et al.[16]reported that a 5 mm thickness of Cavidentin provided superior sealing ability compared with that of IRM. Cavidentin and Cavit were almost equally effective.

GLASS IONOMER CEMENTS :-

Glass ionomers are formed by the reaction of calcium–aluminosilicate glass particles with aqueous solutions of polyacrylic acid. It bonds physico-chemically to dentin.Biocompatibility studies have shown evidence of initial cytotoxicity with freshly prepared samples, with decreasing toxicity as setting occurs. It is easy to handle and does not cause any adverse histological reaction in the periapical tissue[17-18].Glass ionomer cements have a variety of applications in endodontics. Use of these materials as a temporary restoration during endodontic therapy has been investigated in a number of studies with favorable results. In one study using the fluid filtration method by Bobotis et al 1958,glass ionomer cement microleakage values did not differ significantly from the intact crown values after 8 weeks[19].

In another in vitro study using an electrochemical technique, glass ionomer cement placed in unconditioned cavities was almost equally effective compared and superior to Cavit after a 1 month experiment period Lim et al[20].In a more recent study by Barthel et al1966 glass ionomer cement alone, or on top of an IRM base provided a significantly superior seal against penetration of Streptococcus mutans when compared to Cavit, IRM and glass ionomer cement on a Cavit base, over a one-month period[21].

The adhesion mechanisms of glass ionomer cements explains their acceptable sealing ability in addition, they possess antibacterial properties against many bacterial strains[18].The antibacterial activity of the material is attributed to the release of fluoride, low pH and/or the presence of certain cations, such as strontium and zinc in some cements. For these reasons, glass ionomer cements can be considered as a satisfactory temporary restorative material and may also be used in cases requiring longer term temporization.

BIODENTINE AS A DENTINE SUBSTITUTE :-

Biodentine is a calcium-silicate based material that has drawn attention in various clinical applications, such as root perforations, apexification,restorations,retrograde fillings, pulp capping procedures, and dentine replacement.It is also known as "biocompatible and bioactive dentine substitute‟ which overcomes the draw backs of Calcium hydroxide and Mineral trioxide[22]. Appreciable properties of biodentine includes good physical properties and its ability to stimulate tissue regeneration as well as good pulp response.

COMPOSITION :-

Powder -Tri-calcium silicate- This is the main core material.

Di-calcium silicate- this is the second core material

Calcium carbonate & oxide- it acts as a filler.

Iron oxide-it acts as a colouring agent.

Zirconium oxide- it acts as a radioopacifier.

Liquid -

Calcium chloride- it acts as an accelerator

Hydrosoluble polymer- it is a water reducing agent.

Biodentine is used for Temporary dentin-enamel restoration and also for restoration of deep or large coronal carious lesions (sandwich technique).

PROPERTIES OF TEMPORARY RESTORATIVE MATERIALS :-

ANTIBACTERIAL PROPERTY :-

Antibacterial properties of temporary fillings may serve as a selective barrier that eventually determines the bacteria that consequently penetrate the root canal system.

Recent studies shows that, using Tempit and IRM as temporary fillings may result in an advantage for the inhibition in growth of E. faecalis over S. mutans. These materials kept their bacteriocidic effect on S. mutans for 14 days, whereas Tempit was bacteriocidic on E. faecalis only as a fresh material, and IRM remained bacteriostatic for at least 24 days.Recently published data showed no difference in marginal leakage between IRM and Cavit, also a calcium phosphate based material [23]. Microleakage of the temporary filling materials after a short period of time has been demonstrated in previous studies.Some studies showed that IRM started to leak after 10 days, whereas Cavit, leaked after 14 days[24]. Although the most important function of temporary filling materials during and after endodontic treatment is their sealing ability and prevention of microleakage the findings shown may suggest the importance of the antibacterial properties of temporary fillings as the interim material. Furthermore, despite intracanal dressing between appointments of endodontic therapy, dressing of the root canals with calcium hydroxide was challenged by some studies that reported a residual flora after its use therefore, a temporary filling material possessing good sealability and bacteriocidic properties may be advantageous in preventing bacterial invasion. The difference in temporary filling materials may have some effect on the invasion of different microorganisms into the root canal system,

thus suggesting that these antibacterial property of the temporary materials may decrease the risk of caries development and failure of endodontic therapy.

MARGINAL INTEGRITY:-

The marginal integrity of restorations is an important parameter as marginal gap formation is associated with recurrent caries and pulpal disease. Testing of marginal integrity in vitro is viewed with uncertainty due to interactions and interpretation problems. The clinical evaluation of marginal behaviour is also questionable due to the lack of reliable diagnostic skills of the clinician. The scientific community must recognize that in vitro and in vivo testing have severe limitations and accept that materials will be misjudged during evaluation processes[25].

WATER SORPTION AND SOLUBILITY:-

Water sorption and solubility of temporary restorative material water sorption should be minimal. Usually, the absorption of water precedes events such as volumetric changes, swelling and softening of the materials (Ferracane 2006), which may compromise their microstructure and, as a consequence, the seal produced by the restoration[26].Water uptake is a key factor in the setting mechanism of Cavit, a calcium based temporary material.The expansion caused by the water diffusion is responsible for the sealing of the tooth-restoration interface, but also allows the swelling of components from the spaces occupied by water (Ferracane 2006), explaining the high solubility observed for this material. The intermediate sorption results observed with IRM reflect the cement nature of the material, which characteristically absorb water. IRM had greater solubility confirming the previously reported disintegration this cement undergoes in contact with moisture. This process was explained by Wilson & Batchelor (1970) as eugenol loss of the cement matrix by aqueous leaching, resulting in microstructural degradation and reduction of mechanical strength[27].Resin-based materials have different patterns of water uptake, depending upon the chemical structure of the resin (Sideridou et al. 2007), which involves the hydrophilic nature of the monomers and differences between the solubility parameter of the monomers and the solvent (Ferracane 2006)[28].

STRENGTH :-

Temporary fillings are expected to provide good marginal dimensional stability, minimal porosity, and resistance to abrasion and compression.All the above are essential for their main function in endodontic therapy that is to seal the access cavity adequately.Temporary fillings made of IRM and the CaSO4-based materials Cavidentin or Cavit have previously been compared for microleakage.IRM represents a group of reinforced zinc oxide-eugenol preparations in which enhanced mechanical properties were achieved by including materials such as polymethyl-methacrylate in the preparation[29].Compressive strength of 6,000 psi made IRM a material that can better resist masticatory forces as compared with only 2,000 psi in the CaSO4-based Cavit. Furthermore the addition of polymethyl-methacrylate made the material relatively hydrophobic, thus maintaining its integrity for prolonged periods when immersed in aqueous solutions. All modified forms of the ZOE cement had a film thickness less than 25 microns and a compressive strength below 35 MPa[30].With a wide range of retentive strength, modified forms of zinc oxide-eugenol cement may be found to have diverse clinical applications.Coming to glass ionomer cements,one of the main disadvantage of GIC is lack of adequate strength and toughness.GICs are usually weak after setting and are not stable in water; however, they become stronger with the progression of reactions and become more resistant to moisture[31].In an attempt to improve the mechanical properties of the conventional GIC,resin-modified ionomers were introduced which has high strength compared to conventional GIC.

CONCLUSION :-

The dentists should consider using materials, which have been biologically and clinically evaluated and which give evidence of long term success. The temporary filling materials should provide an adequate seal, should be non-toxic, non-carcinogenic, biocompatible and dimensionally stable. Hence, the role of temporary restorations should not be undervalued and more emphasis should be placed upon their importance within endodontic and other treatment protocols.Based on this review it has revealed that most of the temporary filling used in dentistry have got all these ideal properties.Hence these materials decrease the failure of treatment and increases the successful rate.

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