



REVIEW ARTICLE

SELECTION OF RESTORATIVE MATERIALS IN CONSERVATIVE DENTISTRY

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ABSTRACT

Restoration of carious teeth presents the dentist with the dilemma of selecting a suitable restorative material. Dentist must make this selection with great care because, in future years, those restorations needing replacement will result in the loss of increasing amount of tooth structure. This sets up a cycle where the increasing cavity size limits the choice of the materials that may be used effectively.

INTRODUCTION

Restorative dentistry constitutes the majority of the work load in daily clinical practice (Braga *et al.*, 2007). Many factors are associated with selection of a direct restorative material which includes dentist factor, patient choice and carious lesion characteristics (Vidnes-Kopperud *et al.*, 2009). There are many direct restorative materials available but amalgam and resin composite are the most commonly used materials (Burke *et al.*, 2003). Amalgams have less post-operative sensitivity, higher survival time for complex restorations compared to resin composites and are not technique sensitive (Shenoy, 2008). There are numerous factors to be considered when restoring a tooth, eg. the extent of lesion, the strength of the remaining tooth structure, the preference of the dentist in using the material, and the financial cost of the procedure and tooth related factors.

Factors regulating Selection

Teeth need restorative intervention most commonly due to carious destruction. This must be accomplished with restoration of proper form, function, esthetics, and occlusal stability. To achieve these objectives, selection of suitable restorative material is very important and varies with individual case.

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Material-related Factors

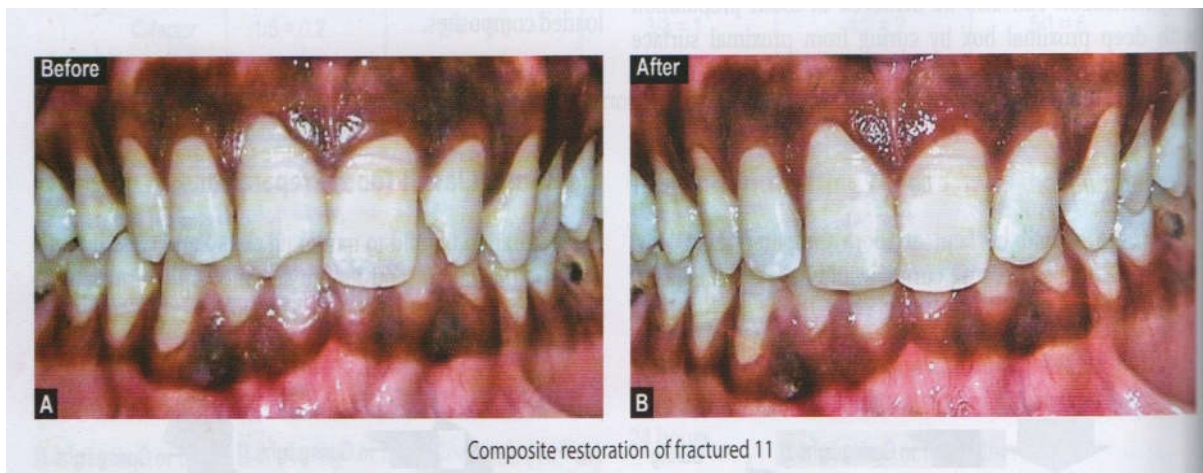
The ideal restorative material should

- Resist occlusal forces
- resistst the wear
- be indestructible in oral fluids
- be adequately adapted to the cavity walls
- Co-efficient of thermal expansion should be comparable to tooth structure
- exhibit low thermal conductivity
- be biocompatible
- be accomplished with minimal tooth preparation
- strengthen the remaining tooth structure
- be antibacterial
- be esthetically pleasing
- be compatible with the pulpal and periodontal health
- be easily manipulated
- be economical.

Tooth – related Factors

Characteristics of the Carious Lesion

The choice of restorative material depends upon the tooth type, its location in the arch, forces acting on the tooth, the surface(s) to be restored, and lesion depth. If anterior tooth is involved then choice is made among esthetic materials, in case posterior tooth is involved, then material with high strength is used.



Composite restoration of fractured 11



Composite restoration of class III caries in 11

Status of the Pulp

If there is no threat to the health of the pulp by carious lesion, caries is removed avoiding pulpal exposure and then restore the tooth with permanent restoration. Pulp capping is performed in the teeth with questionable condition. If pulp is irreversibly involved, then endodontic treatment is done.

Size of the Periodontium

The operative procedure must be performed only after evaluating the health status of the periodontium.

Size, Form and Structure of Teeth

When open proximal contacts are to be restored, re-establishment of the space or slight alteration in the usual size of the tooth is to be decided. Recontouring of interproximal surfaces is usually done with cast gold or metal ceramic restorations, as they have greater convenience and accuracy, as these are made by indirect method. Amalgam often fails to close the contact and produce an ideal interproximal contour due to its physical properties, technique of placement and condensation.

Patient- related Factors

- Age of the patient
- Physical condition of the patient
- Hygienic condition of the mouth
- Strength and character of the bite
- Expense of the operation
- Bruxism/habits

Site Specific Selection

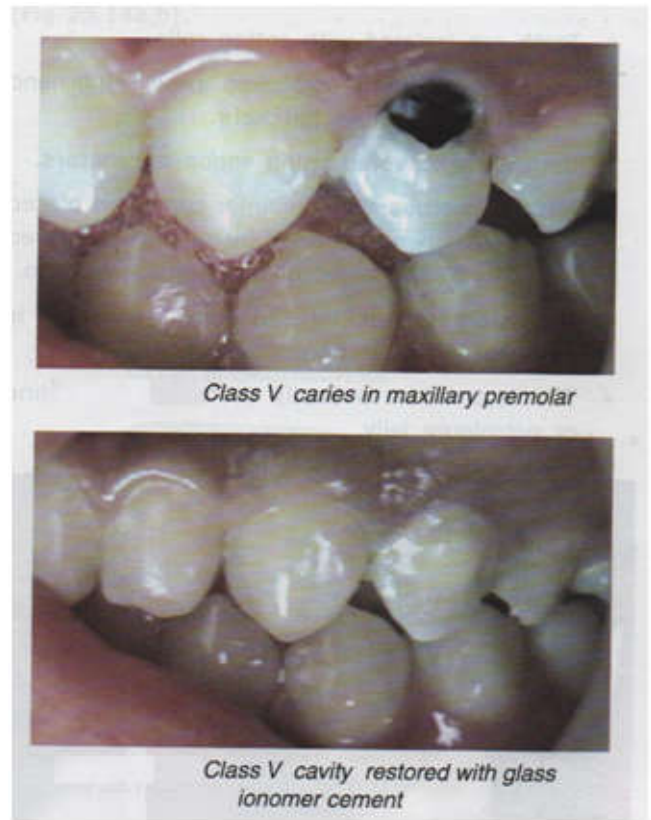
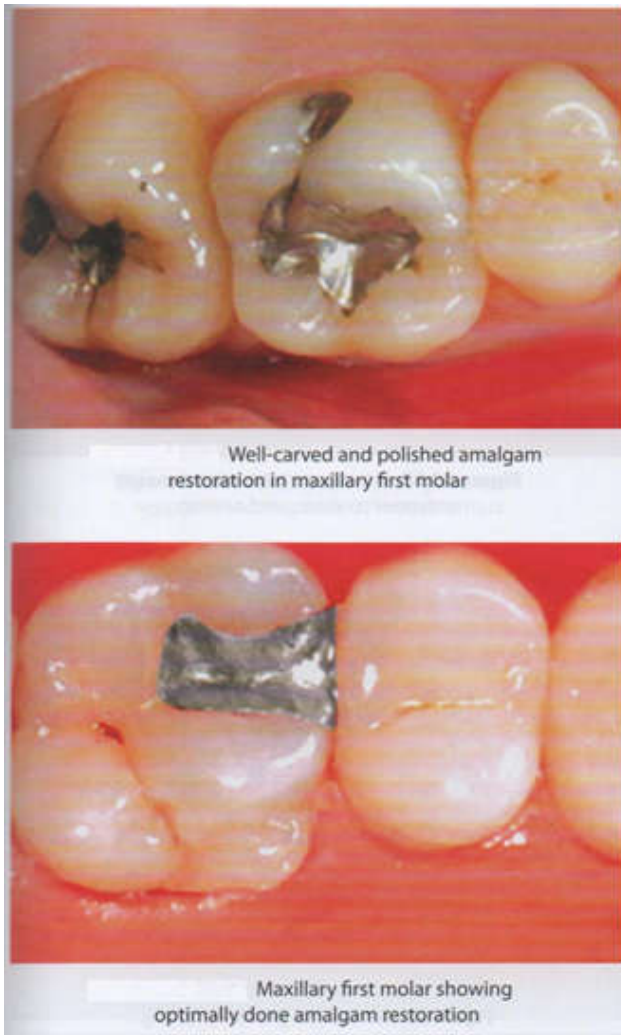
For Anterior teeth

For restoration of anterior teeth, preoperative occlusal assessment is very important along with esthetic considerations. Metallic restorations are usually not indicated for anterior teeth, but the distal surface of canine due to its location exhibits the unique stress pattern and may be satisfactorily restored with amalgam or gold foil. For class III cavities demanding more esthetics microfilled composites can be used. In class IV cavities where esthetics is essential, but the restoration is subjected to stress, the use of a microfilled composite as a veneer over a hybrid composite core is suggested. Tooth colored dental composite materials are either used as a direct filling or as construction material of an indirect inlay. It is usually cured by light (Composite resin fillings and inlays, 2003). Fillings have a life span of an average of 12.8 years for amalgam and 7.8 years for composite resin. The life span of a restoration also depends upon how the patient takes care of the affected tooth which was restored and do not exert too much pressure by eating hard food substances (Van Nieuwenhuysen *et al.*, 2003).

For Posterior teeth

Amalgam is a metallic filling material composed from a mixture of mercury (from 43% to 54%) and powdered alloy made mostly of silver, tin, Zinc and copper, commonly called the amalgam alloy. (WHO) Due to known toxicity of the dental mercury, there is some controversy about the use of amalgams. The Swedish govt banned the use of mercury amalgam in June 2009 (Sweden will ban the use of mercury on

1 June 2009). Some particular individuals may experience adverse effects caused by amalgam restoration. These include myriad neural defects, mainly caused by impaired neurotransmitter processing (Woods *et al.*, 2014). Cast metal is preferred in situations demanding alterations of occlusal contact or to build open contact. In patients with heavy occlusal forces or bruxism, metallic restorations (amalgam, cast metal) are suitable. Use of composite is preferred for sealing of pit and fissures, preventive resin restorations, restoration of moderate sized class I and class II lesions. In resin composite restorations, greater retention may be achieved with a smaller cavity preparation which leads to conservation of tooth structure. (NHS Centre for Reviews and Dissemination, 1999) The extremely low levels of bis-GMA released by composite restorations do not cause a significant increase in markers of renal injury, when compared to amalgam restorations. That is, there is no added risk of renal or endocrine injury in choosing composite restorations over amalgam (Woods, 2014). Glass Ionomers are useful for high caries risk patient, as they release fluoride and recharged with fluoride but their poor wear resistance and low fracture toughness limits their use for posterior restorations in permanent teeth. One of the advantages of G.I compared to other restorative materials is that they can be placed in cavities without any need for bonding agent (Burke *et al.*, 2003). However they can be used under composite restorations in cases of deep cavity or with subgingival margin. Resin modified GIC and compomers with better esthetics, improved mechanical properties and caries protecting are suitable for restoring deciduous teeth.



For Class V Cavities

If the restorations are in nonesthetic areas, resin-modified glass ionomer is the preferred restorative material. If the lesion are in esthetic areas, with all enamel margins, composite is the material of choice. If composite is used when the lesion extends on root surface, polymerization shrinkage can cause a V-shaped gap. In these situations Sandwich technique can be used, in which resin modified glass ionomer restorative material may be placed on the internal aspect of tooth preparation, followed by a layer of resin-composite on the surface of the restoration. Among composites, microfilled composites are suitable for restoration of class V cavities, as these restorations can flex rather than debond, when tooth undergoes cervical flexure.

Conclusion

The durability of any dental restoration is influenced not only by the material it is made from but also by the dentists technique when placing the restoration. Other factors include the supporting materials used in the procedure and the patients co-operation during the procedure. The length of time a restoration will last is dependant upon your dental hygiene, home care and diet and chewing habits. (The facts about fillings, 2005) The major cause for replacement of restoration was secondary caries which may reflect a short life span of the restoration. (Mjör and Toffenetti, 2000) The Restoration failure have been attributed to the material used, the technical quality of the restoration, and the patients compliance (Burke *et al.*, 2001). The relatively high use of amalgam in the previous studies may show dentist confidence in amalgam restorations (Burke *et al.*, 1999; Effect and side effects of dental restorative materials, 1991). It is considered to be the most effective restorative material for situation in which aesthetics is of secondary importance (Mahler, 1997). In class II restorations, still amalgam was predominated and 5 times more than resin,

compomers and G.I.C/ Cermet collectively (Smales, 1991). It is interesting to note, although there is an increasing trend to use esthetic materials, amalgam still constitute 75% of all the restorative materials used by the dentists (Bharati *et al.*, 2010).

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