

Direct versus indirect restoration: A review

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Abstract

In the era of continuous research and development the clinician has a plethora of options to choose the restorative material. The choice of the type of restoration largely depends on factors including the amount of remaining tooth structure, the size of the defect, aesthetic requirements, longevity of restoration, need for retention, financial considerations. This article highlights the key factors to be considered while making a choice of the type of restoration and the restoration material.

Keywords: Direct restorations, Indirect restorations, Inlay, Onlay, Longevity of restoration

Introduction

The primary aim of any dental restoration is to best restore the form, function and aesthetics of the tooth. Advances in modern dental materials provide patients and the practitioner a number of choices from which one can create more pleasing and natural looking restorations. However, every clinical case requires separate attention and usually has more than one option to obtain the desired results. It is important for the clinician to make an informed decision which is most beneficial for the patient. Therefore, it is very important for the clinician to have a thorough knowledge regarding the factors influencing the type of restoration to be used.

A restoration may be defined as a material so placed in the prepared cavity of a tooth that its physiologic and mechanical functions, anatomic forms, occlusion, contact point and esthetic appearance are properly restored or preserved, and the tooth in the area of the restoration is protected as far as possible from recurrence of dental caries.¹

The restoration of a small portion of defective tooth structure can be accomplished easily by designing a tooth preparation with retentive features and restoring it with a pliable material. This material can be adapted to the tooth structure and shaped to re-create normal anatomic contours; and is capable of hardening in situ. This process is called Direct Restorative procedures because it is accomplished directly in the intra-oral environment. Direct restorative materials include nonesthetic materials and esthetic materials. Such restorations can be completed in a single appointment however they do not reinforce the remaining tooth structure.²

However, in case of extensive loss of tooth structure, the restorative materials must provide better stress distribution characteristics and be more carefully bonded to remaining tooth structure. Such cases may require the use of materials that cannot be made fluid for direct use. These

materials must be fabricated into a restoration outside of the mouth and cemented or bonded in place. This procedure is categorized as, Indirect Restorative procedures. Common indirect restorations include inlay, onlay, crown and bridges veneers. Placement of these materials generally requires two or more appointments. Indirect restorations on the basis of material can be metallic or non metallic. Metallic include gold restorations and cast metal whereas non metallic include indirect composites, porcelains.

Indirect restorations can also be classified as intracoronal or extracoronal. However there are certain clinical conditions in which restoration is partly intracoronal or partly extracoronal.

Direct restoration

Non-esthetic direct restoration materials include amalgam, Direct filling gold. Amalgam according to G.V Black, is an alloy, one of the constituents of which is mercury. According to Mc-Gehee, an amalgam is a mixture, or union of mercury with one or more other metals.³

Direct filling gold is described by Sturdevant as gold restorative materials that are manufactured for compaction directly into prepared cavities.⁴

Esthetic direct restoration materials include composite resin, glass ionomer cement, resin modified GIC, compomers. Composite resin according to Skinners is a "A highly cross linked polymeric material reinforced by a dispersion of amorphous silica, glass crystalline or organic resin filler particles and/or short fibers bonded to the matrix by a coupling agent. According to Baum & Phillips - they are defined as 3 dimensional combination of at least two chemically different materials with distinct interface.¹ According to McCobe - A composite material is product which consists of at least two distinct phases normally formed by blending together components having different structures and properties.

Glass ionomer cement discovered by WILSON and

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KENT in 1972 has been described as:

“A water based material that hardens by acid-base reaction between the basic fluoro-allumino silicate glass powder and acidic solution of poly acrylic acid.”⁵

Resin modified Glass ionomer cement is a combination of glass-ionomer and composite resin, these fillings are a mixture of glass, an organic acid, and resin polymer that harden when light cured. Compomers are a new class of dental materials that would provide the combined benefits of composites (the “comp” in their name) and glass ionomers (“omer”).⁶

Indirect restorations

Intracoronar restoration includes the inlay, which is described by Mc-Ghee as a restoration, which has been constructed out of the mouth from gold, porcelain, or other material and then cemented into the prepared cavity of a tooth.” According to Sturdevant, the class II gold inlay involves the occlusal and proximal surface(s) of posterior tooth and may cap one or more but not all the cusps.⁷ Onlay is a partly intracoronar and extracoronar restoration which by definition caps all of the cusps of a posterior tooth and can be designed to help strengthen a tooth that has been weakened by caries or previous restorative experiences.⁸

Direct vs indirect restorations

The choice of the type of restoration for a given clinical situation is a challenge to the clinician as so many types of restorative materials and techniques are available. The clinician should always take into consideration the advantage of both direct and indirect restoration and weigh

them against the disadvantages thereby enabling himself to select the type of restoration which is the best for the patients.

According to DR.Gordon J. Christensen⁹

The choice of the type restoration is influenced by certain factors such as:

1. Financial feasibility.
2. Time involvement.
3. Physical properties of the restorative material.
4. Difficulty of placement.
5. Longevity of restoration.

Financial considerations and time involvement

The clinical time involved to place a simple class I or minimal class II composite is only a few minutes in most restorative dental practices. However, placement of a large MOD composite can easily require 30 to 45 minutes and the procedure is relatively difficult.

When considering the time involvement and cost of indirect restorations, the financial picture and the time needed for the procedures are very different from direct restorations. The laboratory cost for the indirect restorations, or the overhead cost for inoffice milling devices, must be considered when comparing direct and indirect restorations. However, by considering both the time and cost together it can be said that the indirect restorations are more financially acceptable than the direct restorations, especially when multiple restorations are made at the same time.

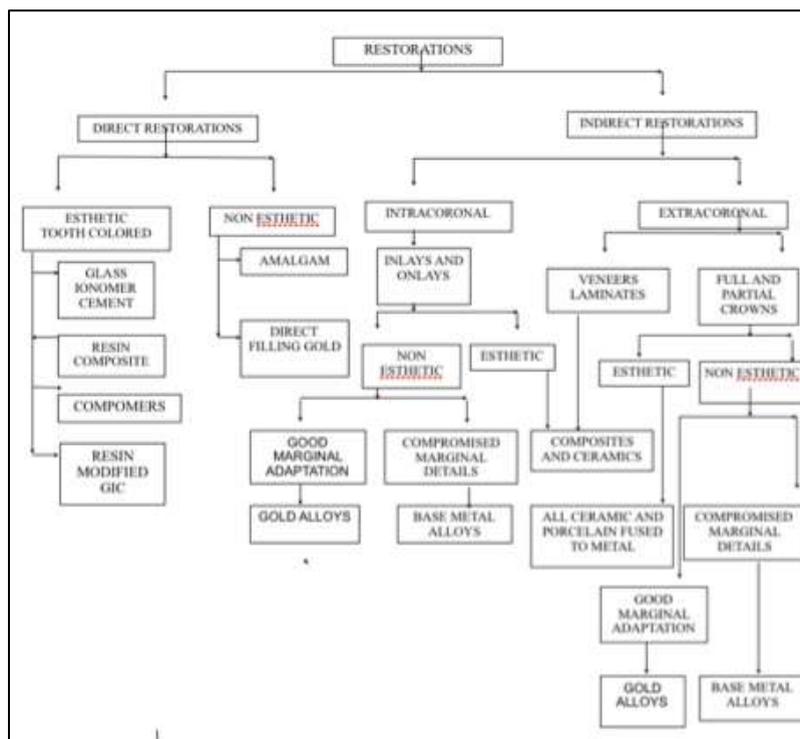


Fig. 1

Physical properties of restorative material

It has been well-accomplished that cast gold alloy restorations have long been the highest level of restorative service from a longevity standpoint, for inlays, onlays and crowns. However, the aesthetic restorative emphasis for the last 30 years has made these restorations less desirable to patients. As a result they are used by only a small percentage of practitioners.

Historically, fired, layered feldspathic ceramic inlays and onlays have had mixed reviews relative to clinical success. When placed well, they were acceptable, but many fractured in service. However, in recent years ceramic and polymer tooth-

Longevity of restoration

Today with the ever expanding range of restorative materials the dentist needs to be aware of how the restoration are likely to survive and possible reasons for failure.

The dentist must also have the knowledge of restorative materials advantages, disadvantages, indications, contraindication. All this information will allow the dentist to select the correct restorative material for specific clinical situations leading to long term clinical survival of restoration.

Long term survival of direct and indirect restorations is dependent on the restoration not failing "failure occurs when a restoration reaches a level of degradation that precludes proper clinical performance for either aesthetic or functional reasons of because of inability to prevent new disease".

Choice of direct restorative material in the posterior teeth

Amalgam is still considered the best plastic restorative material for class I and class II cavities and all multi surface restorations.¹⁰ Tooth colored materials are preferred by some dentists and patients, however these alternatives are more technique sensitive than amalgam. Composite resin currently is the most common direct placement alternative to amalgam, providing patients with relative low cost, tooth colored restorations. However, composite resins have limited indication, their placement is more time consuming than for amalgam, cost benefits considerations are a concern, difficulty in obtaining a marginal seal persists and there are a few long-term studies published in the peer reviewed scientific literature. The literature currently supports the use of composite resin for the restorations of a limited range of class I and class II cavities.¹¹ Composite resin restorations are not recommended for MOD or other multi surface restorations. In selected clinical situations, fissure sealants, preventive resin restorations and glass ionomer cement are also appropriate material to restore posterior teeth. Fissure sealants, when properly maintained, can play a significant role in the prevention and control of dental caries in pits and fissures in primary and permanent teeth. Preventive resin restorations should be placed to

coloured restorative materials used for laboratory made inlays and onlays have improved significantly. Some well-proven brands are IPS Empress, IPS e.max, and belleGlass.

Difficulty of placement

This is an important factor to be considered while planning a direct restoration. For example, placement of direct resin composite in a large class II MOD cavity is not only time consuming but also lots of problems are encountered during the procedure.

So, the clinician should determine when the restoration is difficult and when it is relatively simpler.

restore deep pits and fissures with incipient caries and/or developmental defects of primary and permanent teeth. Glass ionomer cement may be used for restoring class V cavities where appearance is not the primary concern, for conservative class III cavities, and as provisional restorative material.¹² It is not recommended for Class II or IV restorations.

Choice of indirect restoration material for posterior teeth

The practitioner today has a number of alternative restorative modalities from which to choose when faced with the necessity of restoring teeth with indirect restorations.

Cast metal offer excellent service and have a long clinical track record. High noble alloys are desirable for patients concerned with allergy or sensitivity to other restorative materials. These restorations can be designed to strengthen the tooth and to conserve more tooth structure than a full crown. Lower esthetic value is the probable disadvantage.¹³

Indirect composites are generally considered to be user-friendly. Their characteristics features include esthetics and tooth reinforcement along with conservation of tooth structure. However, they have short clinical track record.¹⁴

Ceramics offer excellent esthetics as compared to indirect composites but they cause abrasion of opposing tooth structure. They too have short clinical track record.¹⁵

In the current era, there has been continuous development of techniques and materials for indirect composites and ceramics. Material and technique choice should be based on knowledge of material properties and the limitations of the material and technique. To be satisfactory, the restorative procedure for indirect restorations requires meticulous care both in preparation and in proper manipulation of dental materials and the dentist and technician must be devoted to perfection. To conclude, the high degree of satisfaction and service derived from properly made indirect restoration is rewarded for the painstaking application it requires.

Conclusion

Advances in modern dental materials provide patients and the practitioner a number of choices from which one can

create more pleasing and natural looking restorations. However, every clinical case has its own requirements to be fulfilled by the restorative material and restorative techniques to obtain a restoration which is best restores the form, function and esthetics of the tooth. For every clinical case there will be more than one way to achieve such a result. Many decisions regarding treatment are straightforward, as the advantages of particular procedure outweigh its own disadvantages and relative advantage of other available options. There are, however, a variety of situations where choices is less clear-cut, in such a situation clinician should use his experience and knowledge about the use of material and technique and also take into consideration patient requirements.

There will never be a completely black and white guide to dental treatment, and grey areas will always exist. As long as treatment is performed with care, to a high standard and with a not to the underlying science, it will likely to be successful.

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Conflict of Interest

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