

A Brief Comparison Between Direct and Indirect Restorations

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ABSTRACT

Background: The importance of restoring the lost tooth structure due to one or other reasons is to provide physiologic and functional state to the particular tooth. From the history to recent years, there are so many researches and developments taking place in the field of Dentistry, including from Direct restorative procedures to Indirect Restorative Techniques. The choice of the type of restoration largely depends on factors including types of lesions affecting the tooth, the amount of remaining tooth structure, the size of the defect, aesthetic requirements, longevity of restoration, need for retention, financial considerations or even dentists' knowledge and skills. 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.

INTRODUCTION

A restoration may be defined as a material so placed in the prepared tooth that its physiologic and mechanical functions, anatomic forms, occlusion, contact point and esthetic appearance are properly restored or preserved.¹ Now-a-days multiple materials and techniques are available for better restorations. There are some restorative materials which can be used only for direct restoration like Silver Amalgam restorations and Direct Filling Gold. Some materials can be used directly or indirectly like Composite restorations. And some materials can only be used by indirect techniques like Ceramic Inlays/Onlays. The selection between direct and indirect technique is a challenging decision making process. Single visit direct posterior composite restorations facilitate for preservation of tooth structure, reduce multiple visits, eliminate the need of interim restoration. In direct restoration by Amalgam, after removing the carious tooth structure and preparing the tooth, the appropriate base is applied to protect the pulp from thermal changes and galvanism from Amalgam and the final restoration is completed with Amalgam giving

proper contour and cuspal anatomy to the restoration. While performing Direct Composite restorative procedure, following etching and application of bonding agent to the prepared tooth, composite restoration is built up in increments, curing one layer at a time allowing the practitioner to sculpt the restoration. Indirect technique refers to fabrication of the restoration outside the oral cavity in the laboratory following which it is luted to the tooth with luting cement or resin cement.² Historically, indirect restorations, especially crowns, were considered long-lasting restorations, and the aim was for the restoration to be permanent. However, almost no restoration is really permanent, except the last one in a patient's lifetime. Traditionally, in a tooth that will be restored with an indirect restoration, all direct restorative materials are removed or are covered by the indirect restoration in an attempt to promote the restoration's longevity. This is because of the traditional belief that an indirect restoration will have a better marginal fit and that indirect restorative materials are more resistant to deterioration like wear or fracture over the longer time duration. The traditional concepts may be less

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believed in recent days because of following: 1. The clinical longevity of modern adhesive restorative materials, whether placed directly or indirectly does not differ significantly. 2. Certain risk factors may be present which are not related to properties of direct and indirect restorations.

Direct restoration

Direct restoration materials include amalgam, Direct filling gold. According to Mc-Gehee, an amalgam is a mixture of mercury with one or more other metals, including Silver, Tin, Copper, Zinc.⁵ Esthetic direct restoration materials include composite resin, glass ionomer cement, resin modified GIC, compomers.⁶ 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. 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.⁶ Glass ionomer cement discovered by WILSON and KENT in 1972 has been described as: "A water based material that hardens by acid-base reaction between the basic fluoro-alumino silicate glass powder and acidic solution of poly acrylic acid."⁷ 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 and glass ionomers.⁸

Indirect restorations

Indirect technique refers to the procedure of preparing the tooth for restoration, making the negative replica of the prepared tooth and fabricating the of the restoration outside the oral cavity in the laboratory. This fabricated restorative part is then cemented onto the tooth with luting cement. There are two types of indirect composite restorations, first and second generation of indirect composite restorations.²

The first generation of indirect composite restorations was introduced in the 1980s. These restorations have shown failures showing low flexural strength (60–80 MPa) and elastic modulus (2–3.5 GPa) and higher wear levels.⁹

The fabrication process differs for direct composite inlays and indirect inlays. For direct composite inlays first a separating medium is applied to the prepared tooth. The resin pattern is then formed, light-cured and removed from the preparation. The rough inlay is then exposed to additional light for approximately 4–6 min or heat activated at 110°C for 7 min, after which the preparation is etched, the inlay is cemented into place with a dual-cure resin, and is then polished. This technique can be completed in a single sitting since it eliminates the need for an impression of the cavity.¹⁰ Indirect inlay technique requires fabrication of impression of the inlay in the laboratory. In addition to conventional light-curing and heat-curing for polymerization, laboratory processing may use heat (140°C), pressure (0.6 MPa for 10 min) and nitrogen atmosphere. These materials have shown greater physical properties, resistance to wear and attaining a higher degree of polymerization. The polymerization shrinkage does not occur in the prepared tooth, so induced stresses are reduced which ultimately reduces the potential for microleakage at the luting interface.

To overcome the disadvantages of first generation indirect composites, in the early 1990s, a second generation of indirect composites was introduced into the market. By composition, they were microhybrid composites having fillers 66% by volume. This change in composition improved mechanical properties with somewhat higher flexural strength in the range of 120–160 MPa and elastic modulus of 8.5–12 GPa.¹¹

Direct vs indirect restorations

The selection of types and techniques of restorations for particular types of the cases to be restored has been the utmost important step for a dental clinician for better results. To make a perfect choice for the material and technique to be used, a clinician must have the thorough knowledge about the clinical diagnosis and related treatment plans as well as the knowledge regarding the properties of materials and related techniques. The clinician

should always take into consideration the advantage of both direct and indirect restoration and put 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. Christensen

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.⁶

Majority of clinical decisions are usually dictated by a variety of factors including:

- Lesion size and aetiology
- Aesthetic, occlusal, endodontic and periodontal considerations
- Number of teeth affected
- Patient compliance, habits and preferences
- The dentist's own competence and underlying beliefs about restorative treatment.¹²

CONCLUSION

There are still some situations in which there are good reasons to choose an indirect over a direct technique, including the following: In large rehabilitations in which the dentition has to be restored extensively, indirect techniques allow for preoperative design with wax-up or digital wax-up and better management of occlusion and vertical dimension. In cases where optimal form and esthetics are required, indirect techniques have advantages, especially when ceramic materials are used. In cases in which a direct restoration is too difficult for the operator to make, sometimes an indirect restoration can be more successful. Alternatively, direct restorations are more preferred When minimally invasive techniques are required, especially in high-risk and young patients. When low-cost treatments are the only option. When the dentist is skilled in direct techniques; for such operators, direct techniques are indicated in more situations.¹³

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Anusavice ed. Phillip's Science of Dental Materials, Ed 11, Philadelphia, Saunders, 2003.
2. Azeem RA, Sureshababu NM. Clinical performance of direct versus indirect composite restorations in posterior teeth: A systematic review. *J Conserv Dent*. 2018;21(1):2-9.
3. Opdam NJ, Bronkhorst EM, Loomans BA, & Huysmans MC (2010) 12-year survival of composite vs. amalgam restorations Journal of Dental Research 89(10) 1063-1067.
4. Van de Sande FH, Opdam NJ, Rodolpho PA, Correa MB, Demarco FF, & Cenci MS (2013) Patient risk factors' influence on survival of posterior composites Journal of Dental Research 92(7 Supplement) 78S-83S.
5. McGehee, WHO: A Textbook of Operative Dentistry, Ed 4, M.C. Books, New York, 1989.
6. IP Indian Journal of Conservative and Endodontics, July-September, 2019;4(3):75-78
7. Craig, O' Brein Powers: Dental materials properties and manipulation. Ed 5, St Louis, Mosby.
8. Nagaraja Upadhya P, Kishore G, Glass Ionomer Cement- The Different Generations Trends Biomater. *Artif Organs* 2005;18(2).
9. Peutzfeldt A. Indirect resin and ceramic systems. *Oper Dent* 2001;200:1153-76
10. Garber DA, Goldstein RE. Porcelain and Composite Inlays and Onlays. Illinois: Quintessence Publishing Co. Inc.; 1994. p. 117-33
11. Miara P. Aesthetic guidelines for second-generation indirect inlay and onlay composite restorations. *Pract Periodontics Aesthet Dent* 1998;10:423-31.
12. Jason Smithson, Philip Newsome, David Reaney, Siobhan Owen. Direct or indirect restorations? International Dentistry – African Edition Vol. 1, No. 1

13. NJM Opdam R Frankenberger P Magne. From
'Direct Versus Indirect' Toward an Integrated

Restorative Concept in the Posterior Dentition.
Operative Dentistry, 2016, Supplement 7, S27-S34.