بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سامية زكى يوسف

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

Color Stability and Surface Roughness of Additive Manufactured versus Milled Interim Restorative Materials Using Two Surface Finish Protocols

(An In Vitro Study)

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Dedication

This work is dedicated **To My Father** and **Mother** *for all their love, prayers, and sacrifices for educating and preparing me for my future.*

To my family and friends.....

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Introduction

Provisional or interim restorations are commonly used in dentistry during the time between tooth preparation and placement of the definitive restoration.[1] Fabrication of an ideal provisional restoration is crucial for gum health and to protect the pulp, for prosthetically-guided tissue healing to achieve an acceptable emergence profile, for minimizing the migration of dental abutments, and for assessing the prospective form and function of the definitive prosthesis. [2] Moreover, it can be used for providing diagnostic information, changing the vertical dimension, correcting the occlusal plane and altering the gingival contours especially for implant-supported fixed restorations. It also provides an important tool for the psychological management of patient aesthetic, where the patient should feel as the temporary simulate the final restoration, until the final restorations are cemented. [1]

The surface smoothness and color stability are two of the most important requirements of the ideal provisional resin restorations.[3] It is important to select a temporary material with greater color stability and resistance to different pigmenting liquids to which they are subjected, with the purpose of optimizing the esthetics of the restorations made.[4]

Among many factors, discoloration of interim restoration is considered one leading factor for patient dissatisfaction, especially in the anterior region and esthetic zones.[5] When these interim restorations are used in complex interdisciplinary treatment, prolonged intraoral service will be required. Then, the fabrication technique and the material selection become an integral part of maintaining interim restoration's intraoral longevity.[6] Interim restoration materials include auto-polymerizing polymethyl methacrylate (PMMA), polyethylene methacrylate (PEMA), urethane methacrylate, bis-acryl, and

micro-filled resin.[7] The main drawbacks of these materials are warping due to polymerization shrinkage, free monomers that cause pulpal and gingival damage, brittleness and color stability.[8] The computer-aided design and computer-aided manufacturing (CAD/CAM) of interim restorations involves either subtractive or additive manufacturing. Additive manufacturing (3D printing) is a rapidly developing technology in dentistry.[9] In 3D printing, there is an ability to produce more complicated designs with minimal material waste.[10] In addition to that, the accessibility and the availability in the market at a low cost are considered the main advantages. There are some limitation that are reported in the literature including the color instability and how the printing parameters and build orientations can interfere with printing accuracy.[11]

Review of literature

Temporary restorations are an essential part of fixed prosthodontic treatment. A temporary prosthesis is defined as ‘‘a fixed or removable prosthesis, designed to enhance esthetics, stabilization or function for a limited period of time, after which it is to be replaced by a definitive prosthesis. The requirements of a temporary restoration are essentially the same as for the definitive restoration, with the exception of longevity. The provisional crown protects the pulp from thermal and chemical insults after tooth preparation and enamel removal. It serves to maintain gingival health and contour while providing for an esthetic and/or functional interim restoration .Most importantly, it maintains interocclusal and intra-arch tooth relationships[12]. Finally, provisional restorations should exhibit a good shade match and have a highly polished surface so that they are esthetically pleasing to the patient. [13]

❖ Types of provisional restorations

Provisional restorations can be classified as prefabricated or custom-made ones. Prefabricated crowns or matrices usually consist of tooth-shaped shells of plastic, cellulose acetate, or metal. They are commercially available in various tooth sizes and are usually selected for a particular tooth anatomy, limited in use for single crowns.[14] More complex restorations need customized provisional restorations. Custom made provisional restorations can be made by multiple techniques with different materials. They can be accomplished with direct clinical, indirect laboratory, or direct/indirect.[15] There are several types of resins that can be used for making temporary restorations. The most commonly used provisional restorative materials are polymeric resins. Polymeric resins can be divided into two subclasses: acrylic resin and composite resin. [16]

Polymethyl methacrylate (PMMA); a synthetic polymer of methyl methacrylate, was formerly the most popular acrylic resin material because of its high strength, color stability, and ease of repair[17]. When provisional restorations are made using the indirect technique, polymethyl methacrylate is the most preferred material owing to its superior physical properties[18] . Furthermore, Polyethyl methacrylate (PEMA) was introduced in the 1960s as a powder liquid formulation that polymerizes through self-curing. Due to its lower exothermic reaction, polymerization shrinkage, as well as less pungent odor, ethyl methacrylate may be better selection for direct fabrication of temporary prosthesis. The wear resistance and color stability are inferior to the newer materials, thus making it a poor choice for long-termprovisionals[18]

Recently, composite resins were introduced with an aim to overcome the negatives of the methacrylates. Bis-acryl resins has very low exothermic setting reactions, unlike the methacrylates, and is kind to the underlying pulpal tissue. Additionally, it has low shrinkage, providing good marginal fit with good transverse strength and abrasion resistance[7]. While Bis-GMA composite is a further extension of an attempt to eliminate the problems associated with both methacrylates and Bis-acryl material. They provide a good marginal fit, a lower shrinkage, and low exothermicity. A very thin oxygen inhibited layer is present on setting, and the polishabilty and esthetics of bis GMA resins is good.

Moreover, Urethane Dimethacrylate resin have been introduced to improve the mechanical properties of interim restorations in the area of toughness and flexibility[19] . Previous studies have shown that urethane composite resins are tougher because of the flexibility of the urethane linkages within the polymer matrix. [20]

❖ Fabrication techniques of temporary restorations:

Could be fabricated by either conventional technique (direct, indirect, indirect direct), CAD/CAM technique (subtractive or additive).

Conventional technique

It has been reported that disadvantages associated with the direct fabrication of acrylic temporary crowns include polymerization shrinkage, marginal discrepancies, and the exothermic reaction. [21] While, indirect technique produces restoration with a superior marginal fit and as an auxiliary is involved in fabricating the restoration in the lab, it frees the patient and dentist for considerable amount of time Therefore, the routine use of directly formed temporary restoration is not recommended when indirect techniques are feasible.[22] Although the chair-side fabrication of interim restorations is very common, it has its own drawbacks, for example, the mixing procedures may incorporate voids that could adversely affect the mechanical strength, surface texture, and precise fit of the restoration.[23]

CAD/CAM technology

The emergence of computer-aided design computer-aided manufacture (CAD/CAM) technology in dentistry has allowed the successful use of different materials. In addition, this technology permits shaping of materials with high precision that cannot be easily carried out via a traditional method to make a dental restoration, and this technology now includes the fabrication of provisional restorations.[24]