ESTHETIC TEMPORARY PROVISIONAL RESTORATION IN FIXED PARTIAL DENTURE PATIENTS - A CLINICAL REVIEW

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INTRODUCTION

Provisional restorations are important treatment procedures in fixed prosthodontic rehabilitation, especially if the restorations must last for an extended period of time or when additional treatment is necessary before the rehabilitation is complete. [1] It typically takes 3 to 7 days for the fabrication of permanent prosthesis, during which time the prepared tooth must be kept out of the oral environment and its link to the neighbouring and opposing teeth must be preserved. Therefore, temporary restorations are made and the technique is known as "temporization" in order to protect these prepared abutment teeth. [2]

The pulpal protection, positional stability, occlusal function, ability to be cleansed, margin accuracy, wear resistance, strength, and aesthetic requirements should all be met by provisional restorations. Once they have been examined intraorally, they provide the crucial function of serving as a template for the final restorations. [3] However, the dentist must create a restoration that is up to standard in order to avoid wasting expensive chair side time. Failure to do so eventually leads to the loss of more time than was initially believed to be saved. A well-made temporary fixed partial denture should improve the condition of the periodontium and abutments while giving a preview of the final prosthesis. [4].

CLINICAL SIGNIFICANCE

Provisional temporary restorations are important because they cover the exposed dentin to prevent bacteria from getting into the exposed tubules and onto the tooth surfaces. They hold space both horizontally and vertically to accommodate a definitive restoration. Also they are used to avoid or minimize any sensitivity between the preparation and the final restoration. During the provisional phase, maintain tissue so that it stays healthy with minimal to no inflammation. It also identifies aesthetic parameters that meet the patient's anticipated objectives (not including final shades and stains in the final porcelain).[2]

The provisional phase allows for the verification of shape, midlines, smile lines, embrasure shapes, and contact positions that are reasonable.It evaluates speech and airflow using phonetic verification (sibilance, no whistlers, articulation, lisp). Finally it also maintains cleanliness as this is crucial for bacterial management, but it's also crucial for training the patient for final restorations. [1,2]

REQUIREMENTS AND CONCEPT OF PROVISIONAL CROWNS

The biological, mechanical, and aesthetic principles that underlie the interim restorations as the provisional crown shields the pulp from thermal and chemical injuries. Other requirements of provisional crowns are that it maintains gingival health and contour while providing an interim restoration that may be aesthetically pleasing and/or functional. It should be simple to clean and avoid chafing on soft tissues, and it should keep the intra-arch and inter-occlusal tooth connections intact. To make the provisional crown aesthetically pleasant to the patient, they should also have a good shade match and a highly polished surface. [1,2]

MATERIALS USED IN FABRICATION OF PROVISIONAL CROWNS

For interim restorative treatment, a variety of acrylic resin materials are available, including polymethyl methacrylate resins, polyethyl methacrylate resins, and combinations of unfilled methacrylate resins.[2]

1. ACRYLIC RESINS

A. PMMA [POLYMETHYL METHACRYLATE]: It is a self-curing resin compound that is available in liquid and powder form for manual mixing. It is a resistant material with good mechanical and aesthetic properties, but it also has a low abrasion resistance, high polymerization shrinkage, a strong exothermic reaction, it releases toxic free monomer. PMMAs are better suited to indirect approaches due to their high exothermic reactivity and free monomer release.[4]

B. PEMA [POLY-R' METHACRYLATE]: PEMA is a self-curing acrylic resin that can be manually mixed in powder or liquid form.This material offers superior biocompatibility, less exothermic reaction during polymerization, and reduced polymerization shrinkage as compared to PMMA. However, compared to PMMA, its mechanical properties are comparitively inferior, and its colour stability is poor. [4]

C. EPIMINES: The first two-paste acrylics were epimines, which were commercially marketed as Scutan in 1968. Scutan was weak and could not be changed or mended, despite having low heat generation, low pulpal irritation, and comparatively low shrinkage. [4]

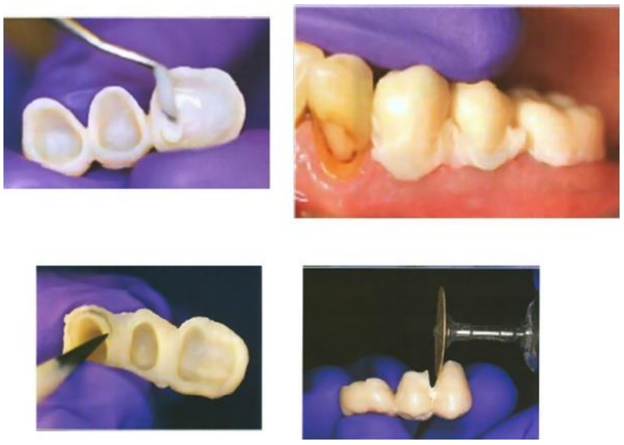

Fig 1- Acrylic Provisional restoration in FPD

2. COMPOSITE RESINS

Composite materials are described as rigid but fragile. Although their implicit rigidity provides outstanding mechanical qualities like hardness and flexural strength, it also serves as a limit when the stresses reach a specific threshold. There are three types of composites: auto-polymerized, dual-polymerized, and visible light polymerized.[5]

A. BIS-GMA (BIS-GLYCOL-DIMETHACRYLATE):

Bis-acryl provisional materials are resin composites that excel acrylics in terms of shrinkage, heat release during setting, aesthetics, odour, and ability to be polished at the chair-side.These products are offered in cartridges that fit an automix dispenser pistol. Young et al. examined the occlusion, contour, marginal fidelity, and finish of materials made of

bis-acryl and polymethyl methacrylate.Bis-acryl materials were found to be significantly superior to PMMA in all categories for both anterior and posterior teeth. [5]

B. UDMA (URETHANE DIMETHACRYLATE):

The inclusion of urethane dimethacrylate, a resin whose polymerizationis catalysed by visible light energy and a camphoroquinone/amine photo initiator, is necessary for the visible light polymerized (VLC) materials. In order to improve their physical characteristics, such as decreased polymerization shrinkage, these materials frequently contain filler, such as microfine silica. They display much lower tissue toxicity compared to methacrylate resins because they do not release residual free monomers following polymerization. [5]

3. PREFORMED CROWNS

Preformed provisional crowns or matrices often consist of metal, plastic, or cellulose acetate shells that are shaped like teeth. They are usually selected for a specific tooth anatomy and are commercially available in a range of tooth sizes. The selection process is crucial for clinical success because the range of sizes and shapes is limited. [5] These are relined with acrylic resin to provide a more custom fit before cementation, but the plastic and metal crown shells can also be cemented directly onto prepared teeth.Compared with custom fabricated restorations, this treatment can result in improper fit, contour, or occlusal contact for a provisional restoration. The crowns contain microglass fibers with a polycarbonate plastic material. These serve as matrix material around a prepared tooth that is relined with acrylic resin to customize the fit. High impact strength, abrasion resistance, hardness, and a strong bonding with methyl-methacrylate resin are all characteristics of this substance.[5]

4. PEEK:

Poly-Ether Ether Ketone (PEEK) is a synthetic, aromatic, semi-crystalline thermoplastic material.It is a biocompatible which is opaque material, which should be veneered with composites to achieve aesthetics.PEEK's grey colour can be changed by mixing in the right amount of pigment in the unfilled material. Multifunctional methacrylate-containing resin varnish or air-abraded PEEK surfaces generate a promising, long-lasting bond to PEEK. [6]

The greatest advantage of PEEK is its simplicity in binding with indirect composite polymerized with light. PEEK fixed prosthesis should have a satisfactory survival rate given its good abrasion resistance, mechanical qualities, and appropriate bonding to composites and teeth.The PEEK fixed partial prosthesis made by CAD CAM has the highest fracture resistance compared to zirconia, alumina, and lithium disilicate glass ceramics (950N, 851N, and 850N) Thus, A PEEK fixed partial denture is anticipated to have a long-term survival rate given the other characteristics that make it superior to other traditional materials. [7]

5. PROTEMP 3M

Protemp Crown Temporization is an excellent substitute for temporary crowns from 3M. This substance is a nanotechnology-based bis-acrylic material with a new generation of advanced fillers that provides easy handling and does not require any additional impressions, matrices, or mixing. [8]

Fig 2- Protemp Material (3M ESPE)

Using the provided sizing tool, the correct size is chosen, and after fitting the crown to the preparation, excess material is trimmed away to complete the fabrication. Then, the crown is cured, polished and cemented with any preferred cement of the dentist.The Protemp Crown combines the benefits of full coverage prefabricated crowns with the advantages of composite-based chemical-cured temporization for a personalised fit and aesthetics (fast, easy, no matrix and no mess) Protemp Crown can, in short, drastically minimise chair time and boost practise productivity as a whole. [8]

6. POLYPROPYLENE SHEET

As an esthetic, comfortable, and cost-effective alternative to traditional fixed and removable orthodontic retainers, Dr. John Sheridan created the clear retainer (also known as the Essix® retainer, thermoplastic retainer, or vacuum-formed retainer) in 1993. It is rapidly manufactured, practically invisible, and reasonably priced. Polypropylene or ethylene copolymer type "C+" Duraforce and copolyester type

"A" Endure are the two main kinds of material used to make thermoplastic retainers. This thermoforming procedure ensures the appliance's posterior stability, offers flexibility for simple insertion and removal, and does not obstruct speech.As a result, patients may easily use the appliance full-time and find it to be pleasant, aesthetically pleasing, and well accepted.[9]

Fig 3- Essix retainer with temporary prosthesis

The fabrication of a temporary bridge to replace missing anterior teeth is one practical usage for a clear retainer.When a replacement prosthesis is not available and a patient has undergone an emergency extraction, this clear retainer design can be used to restore edentulous areas. The benefits of a clear retainer with a prosthesis include its affordability, preservation of the abutment teeth, quick fabrication, and provision of good retention.[10]

TECHNIQUES OF FABRICATION

There are numerous techniques and a large range of materials that can be used to create effective interim restorations. The fabrication of temporary restorations can be done either directly on the prepared teeth using a matrix or indirectly using an impression of the prepared teeth. [11]

I. Indirect Provisional Fixed Partial Denture :

The approach entails creating the temporary restoration outside of the mouth. [Making temporary restorations via the indirect method offers the advantage of being partially transferred to support staff while also eliminating the drawbacks of the direct method. [12]

PROCEDURE:

Place a suitable acrylic tooth over the area of the missing tooth on the diagnostic cast, adjust the occlusion, and then seal the tooth with carding wax. The next step is to create a silicone putty index that includes at least one tooth on either side of the abutment teeth. Now, prepare the patient's teeth so the desired prosthesis can be placed on them. Using a sectional impression, create a check cast of the teeth and surrounding structures. Try the prefabricated restoration intra-orally initially to see how it fits on the cast. The restoration is completed, polished, and then cemented. If necessary, reline the temporary restoration to obtain the ideal inside fit. [12]

Advantages: The advantages of this technique are: On the articulator, any aesthetic and occlusal alterations can be done; It is easy to avoid any free monomer contact that could harm tissue or trigger an allergic reaction or sensitization on the cleaned teeth or gingival; It prevents exposing the prepared tooth to the heat produced by the resin-polymerizing process; It creates restorations that have better marginal fit; It limits the patient's intake of volatile hydrocarbons.

Disadvantages: Increased chair-side time; More intermediary steps in this procedure; If the lab equipment or assistance are inadequate, it becomes a laborious task to complete; This method entails the use of diagnostic casts, which could be damaged.

II. Direct Provisional Fixed Partial Denture

The direct approach uses the patient's prepared teeth and gingival tissues to directly provide the tissue surface. When assistant training and the office laboratory space are insufficient for effectively creating an indirect restoration, this is convenient.[12,1,2] The acrylic resin block technique is a beneficial, albeit little used, approach for creating temporary restorations. It offers a way to create the interim repair without spending money on laboratory processing and diagnostic casts.

PROCEDURE:

Make an alginate impression or a putty index before preparing the tooth by replacing the lost tooth with an acrylic one. The patient's teeth should be prepared as usual. Now, apply petroleum jelly to the prepared teeth and the surrounding gingival margins, and then reseat the alginate or index impression with temporary restorative material while it is still in the dough stage on the tissue surface of the impression. Up until it sets, remove and reinstall the restoration. Finish the restoration, polish it, and cement the restoration. [13]

Advantages: Economical, Easier to fabricate, Useful when laboratory is insufficient to efficiently produce an indirect restoration. Useful during lack of appropriate dental assistant training.

Disadvantages: Poor marginal adaptation caused by shrinkage during polymerization. Tissue inflammation is brought on by residual monomer. Pulpal damage and patient discomfort are brought on by the exothermic heat of polymerization. Potential tissue trauma from the polymerizing resin and inherently poor marginal fit.

III. Indirect-Direct Provisional Fixed Partial Denture

The technique produces a custom-made, prefabricated external surface form for the restoration, but the internal tissue surface form is created from underprepared diagnostic castings. [14]

PROCEDURE:

Using an impression of the natural teeth, create an accurate pre-treatment diagnostic cast. Wax a pontic into the edentulous region of the study cast for FPDs. On mounted diagnostic castings, remove the acrylic tooth and prepare the abutments. Mix the temporary restorative material, place it in the tissue surface of the index, and then reposition it on the prepared diagnostic casts. Lubricate the prepared diagnostic casts with petroleum jelly or any other suitable separating media. Finish the restoration after the acrylic resin has polymerized. Prepared the patient's teeth. Give the completed restoration a try. If necessary, reline the temporary restoration to achieve the ideal inside fit. Finish the restoration by polishing and cementing. [11-14]

Advantages: The provisional shell is made before the patient's appointment, which can reduce chair time. There will also be less heat generation, chemical exposure, allergic reactions, and polymerization shrinkage when less acrylic resin will polymerize in contact with the prepared abutment during relining. There is less possibility of allergic reactions due to limited interaction between resin monomer and soft tissues. The amount of time needed for chair side adjustments is reduced because to greater control over restoration contours.[12]

Disadvantages: Before preparing the tooth, a laboratory step may be required. Modifications may be required to fully seat the shell on the prepared tooth. This technique cannot be used when there is inadequate laboratory materials. Proper training of the assistants and lab technicians is needed.[12]

training of the assistants and lab technicians is needed.[12]

LUTING OF PROVISIONAL RESTORATIONS:

The main purpose of the temporary luting cement is to create a seal, protecting against pulp irritation and marginal leakage.When used for temporary cementing, the provisional cement should have the following qualities: Good retention (adhesion) of the indirect restoration, Ease of dispensing, mixing, and application, Adequate working and setting time, Optimal viscosity and handling properties for ease of application, Ease of removal of the indirect restoration from the preparation once cemented without harming the soft tissues, tooth preparation or pulp, Ease of removal of the provisional cement from the indirect restoration's external surfaces after cementation, Biocompatibility to soft tissues, pulp, and tooth structure; None or minimal reactivity to the restorative material; Should not interfere in the adhesion of a final cement; and long shelf life.

It is common for some alterations and adjustments to be done where the pontic is contacting the ridge after an FPD has been provisionally cemented, removed, and re-evaluated. In some situations, such as when a patient has a history of dentinal hypersensitivity, the temporary restoration is momentarily cemented after tooth preparation in order to evaluate the pulp's health.[15]

Provisional cements can be divided into two categories: Eugenol-containing and non-eugenol–containing. Zinc oxide and eugenol were used to make the first temporary cements. The advantage of these eugenol-containing cements was that they "set down" the prepared tooth because eugenol acts as an obtundent to the pulp. Numerous temporary cements contain the oily chemical eugenol, which has been found to influence bonding quality and can inhibit the setting reaction by free-radical polymerizing dental resins. A main factor to be taken into account is the risk of an early failure of a provisional since an acrylic provisional may soften over time due to the eugenol in the provisional cement. Because manufacturers now provide non-eugenol containing versions of their interim cements because of these issues, practitioners should make sure they are using the right one.[15]

Technique for luting the provisional restoration

To prevent desiccation, the prepared teeth are wrapped in cotton rolls and dried with a cotton pellet. To cleanse the tooth surface, the prepared teeth are wiped with a cotton pellet soaked in 2% chlorhexidine

gluconate, and then dried once more. The luting cement is mixed in accordance with the manufacturer's instructions using a cement spatula. A thin layer of cement is applied with a little brush inside the occlusal surface and along the internal surface of the provisional restoration's margins.[16]

The major problem with cementing a temporary restoration is that too much cement prevents the restoration from entirely seating. This effect is more frequently seen with posterior restorations. The simplest way to get out of this dilemma is to use very little provisional cement and to just apply it to the inside edges. Cement is moved toward the occlusal surface as the restoration is seated, the axial walls are coated, and surplus cement is not caught on the occlusal surface.

Fig 4- Pre operative

Fig 5- Tooth Preparation

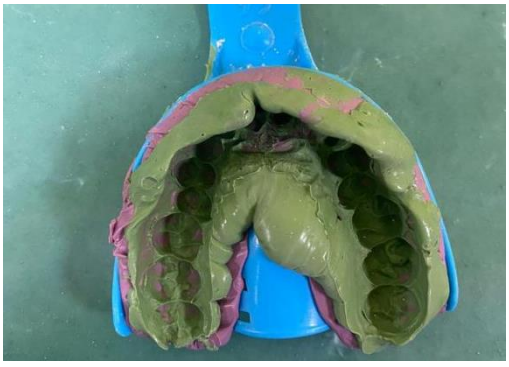

Fig 6- Final Impression

Fig 7- Temporization

DISCUSSION

The preparation of temporary provisional restorations can be done using a variety of materials, but none have, to date, shown to be the most precise and stable. Every material has advantages and disadvantages that might be attributed to a variety of causes. Any temporary restoration must meet the necessary biologic, mechanical, and esthetic standards. Provisional restorations must not only match the shade initially, but also preserve the aesthetics over time. The acceptability of these restorations is compromised by colour changes. When restorations must be worn for extended periods of time and affect aesthetic zones, colour stability becomes more important. Discoloration of temporary materials may result in patient dissatisfaction and even greater cost of repairs. Thus, choosing an interim restorative material should take into account colour stability in addition to mechanical qualities. While various fabrication techniques are discussed, none of them can be regarded as a universal standard. The indirect method is typically favoured over the direct method since it avoids any potential risks to the tooth during fabrication, but frequently, the situation determines the material and the technique of fabrication

CONCLUSION:

Providing a predictable outcome for any oral rehabilitation is one of the most crucial aspects of the dental profession, and using a provisional restoration is a crucial component of this process. With an emphasis on the benefits and drawbacks of temporization, various methods for the effective manufacturing of temporary or provisional restoration have been given. It can be quite beneficial for both the patient and the dentist to pay close attention to detail throughout these procedures.

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