

Crown and bridge Prosthodontics

Lecture. 8

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Provisional (temporary) Restorations

Between the time that the tooth is prepared and the final crown restoration is delivered, it is important that the patient should be comfortable and the tooth should be protected and stabilized with an adequate temporary restoration so temporary crown can be **defined as**; Crown or bridge restorations that are used in fixed prosthodontics during the interim between tooth preparation and final placement of **definitive** (permanent) crown or bridge restorations.

Why provisional restoration needed???

Provisional restoration is given for a period of time until a permanent arrangement can be made.

- *To protect the prepared tooth and kept patient comfortable.*
- *By successful treatment with provisional restoration dentist can get the patient confidence which is an influencing factor for success in the final restoration.*

Requirement of provisional restoration

A. Biological requirement

- 1. Pulp Protection:** *A provisional restoration must seal and insulate the prepared tooth surface from the oral environment to prevent sensitivity and further irritation to the pulp.*
- 2. Occlusal Compatibility and Tooth Position:** *provisional restoration should establish or maintain proper contacts with adjacent and opposing teeth inadequate contacts allow over eruption and horizontal movement.*
- 3. Periodontal Health:** *To facilitate plaque removal, a provisional restoration must have good marginal fit, proper contour and smooth surface.*
- 4. Prevention of Enamel Fracture:** *provisional restoration should protect crown preparation margin. This is particularly true with partial-coverage designs in which the preparation margin is close to the occlusal surface of the tooth and could be damaged during chewing.*

B. Mechanical Requirements

- 1. Function:** *The greatest stresses in a provisional restoration are likely to occur during chewing. Internal stresses will be similar to these in the definitive restoration. Fracture is not problem with complete crown due to adequately tooth reduction.*
- 2. Removal for reuse:** *Provisional restorations often need to be reused and therefore should not be damaged when removed from teeth.*
- 3. Esthetic Requirements**

The appearance of a provisional restoration is particularly important for incisors, canines, and sometimes premolars.

□ IDEAL REQUIREMENTS OF PROVISIONAL RESTORATIVE MATERIAL:

- 1-** *Adequate strength and wear resistance.*
- 2-** *Biocompatible.*
- 3-** *Good dimensional stability.*
- 4-** *Easy to contour and polish.*
- 5-** *Odourless and non-irritating.*
- 6-** *Chemically compatible with luting cement.*
- 7-** *Aesthetically acceptable.*
- 8-** *Adequate working and setting time.*
- 9-** *Easy to repair.*

CLASSIFICATION

- ❖ According to method of fabrication:
 - Preformed
 - Custom made
- ❖ According to material used:
 - Resin :
 - ✓ Preformed (Polycarbonate, Cellulose acetate)
 - ✓ Custom made (Acrylics, Bis-acryl composites)
 - Metals:
 - ✓ Preformed (Aluminium, Tin silver, Nickel chromium)
 - ✓ Custom made (Cast metal alloy)
- ❖ According to duration of use:
 - Short term.
 - Long term.
- ❖ According to technique of fabrication:
 - Direct technique.
 - Indirect technique.

1. Preformed Temporary Crowns.

Generally they consist of a shell of plastic or metal and may be cemented directly on the prepared tooth following adjustments or after lining them with of a resin material. They are indicated for single or multiple preparations. These include:

A- Metal temporary crowns:

Metal crowns are mainly used for posterior teeth. They are made of stainless steel, nickel chromium or aluminum .The most commonly used metal temporary crown is **aluminum temporary crown**, which is of two types;

- 1-Non Anatomical or Flat topped cylindrical AL. temporary crown.
- 2- Morphological or Anatomical AL. temporary crown.

B- Plastic Temporary Crowns:

They are mostly used for anterior teeth, the clinical procedure for their use is nearly the same as that for the metal T.C.

Types of Plastic temporary crowns:

1-Polycarbonate Temporary Crowns: made from polycarbonate plastic combined with micro-glass fibers, they are available for anterior and posterior teeth.

2-Acrylic Temporary Crowns: made from acrylic resin (tooth colored) & they are available in different sizes and colors, they used for anterior teeth.

In case we need to improve the fitness of the temporary crown or if there is no size which approximately fit the prepared tooth, we can reline the temporary crown with resin material to improve its fitness after selection of the most suitable size and shade of the crown and cutting its margin according to the finishing line. The procedure of relining could be done either directly on the prepared tooth in a similar manner to that of celluloid temporary crown or could be done indirectly on study cast of prepared tooth.

3-Celluloid Crown forms:

They are mainly used for anterior teeth, but can be used for posterior teeth also. They are made from very thin translucent layer of cellulose acetate, they act as a mold for construction of temporary crown, they come in different size.



2. Customized temporary crown and bridge:

The fabrication of customized temporary crowns involves the construction of a mold or a matrix of the patient's teeth before they have been prepared, it may be obtained certain materials (elastic impression material) ,into which we place polymer resin material (**acrylic or composite**) which is held directly on the prepared tooth or teeth or indirectly against a model of prepared teeth.

❑ **MATERIALS USED:**

1-Acrylics

■ **Polymethyl Methacrylate's:**

Advantages:

low cost, good wear resistance, good esthetics, high polishability, good color stability.

Disadvantages:

significant amount of heat given off by exothermic reaction, high degree of shrinkage (about 8%), strong, objectionable odor, short working time, hard to repair, must be mixed, radiolucent.

2. Poly-R' Methacrylate's (R' = ethyl, vinyl, isobutyl):

Advantages:

Low cost, less heat given off during reaction than polymethyl methacrylates, less shrinkage than polymethylmethacrylates, extended working time.

Disadvantages:

Less esthetic than others, poor wear resistance, poor color stability, strong, objectionable odor, hard to repair, must be mixed, radiolucent.

3. **Bis-Acryl Composites:**

Advantages:

Less shrinkage than acrylics, minimal heat generated during setting reaction, relatively high strength, minimal odor, excellent esthetics, most products use automix delivery, can be repaired or characterized using resin composite, easy to trim, good color stability, radiopaque.

Disadvantages:

Greater cost than acrylics, some do not have a rubbery stage, viscosity cannot be altered, sticky surface layer present after polymerization, may be more brittle than acrylics.

4. **Epimines (resin material)**

Advantages

low exothermic heat reaction during polymerization, low residual monomer content and low volumetric shrinkage.

Disadvantages

- could not be altered or repaired.
- weak (low degree of hardness).

Provisional restoration might need some time to be reinforce, ethylene fiber or glass fiber or metal casting can be used to increase their strength. The indication for such reinforcement are the following :

- 1) Long poster span fixed partial denture long duration provisional restoration
- 2) Excessive occlusal force on the restoration
- 3) History of frequent breakage
- 4) masticatory muscles strength above average

Methods of construction of customized temporary crowns and bridge:

According to the type of material used for mold or matrix construction we have the following method:

- 1) Impression method.
- 2) Template method.
- 3) Polycarbonate matrix method.
- 4) Acrylic shell method.

TECHNIQUES FOR FABRICATION OF CUSTOMIZED PROVISIONAL RESTORATION

- 1) DIRECT TECHNIQUE
- 2) INDIRECT TECHNIQUE
- 3) DIRECT-INDIRECT TECHNIQUE

The most commonly used method is the **impression method**.

- ▶ **Alginate:** absorbs resin exotherm
- ▶ **Elastomers:** reusable

Advantages: simple, quick, inexpensive.

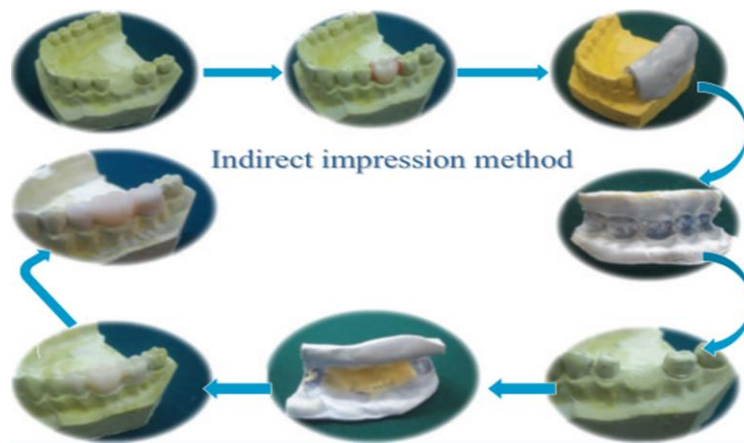
1) Clinical procedure for **DIRECT TECHNIQUE**

- 1- A preoperative over impression with alginate or silicon rubber base is made from the patient mouth or study model & carefully stored until complete teeth preparation(in case if you want to construct temporary bridge fill the missing tooth area with acrylic denture teeth and remove it after you complete preoperative over impression).
- 2- Complete the preparation of the teeth& Coat the prepared tooth with separation medium (saliva or Vaseline)
- 3- Mix tooth colored acrylic resin, the mixed acrylic were then place in the over impression at the area of the prepared tooth only. Seat over impression in it position over the dental arch
- 4- Remove over impression from patient mouth and separate acrylic restoration from the prepared teeth before acrylic completely polymerized , otherwise ,it cannot remove due to shrinkage of acrylic also to reduce the effect of heat of polymerization of acrylic on the prepared tooth (polymerization reaction of acrylic is exothermic reaction).leave the restoration a side until complete setting
- 5- Trim any excess material from the formed crown, the crown were then seat on the prepared tooth , check and adjust occlusal, the crown were then smoothen
- 6- Cement T.C. on the prepared tooth using temporary cement.



2) Clinical procedure for **INDIRECT TECHNIQUE**

- 1- A preoperative **over impression** with alginate or silicon rubber base is made from the patient mouth or study model & carefully stored until complete teeth preparation
- 2- Complete the preparation of the teeth. An alginate impression were then taken and pour with a fast setting plaster or stone , wait till stone is set, the cast were then separate from the impression
- 3- Coat the prepared tooth (on the cast) with separation medium (petroleum gully).
- 4- Mix tooth colored acrylic resin , mixed acrylic were then place in the **over impression** at the area of the prepared tooth only.
- 5- Seat the cast onto the over impression in upright position and maintain pressure(rubber band can used for this respect) until acrylic is set completely, be sure that the cast correctly seat into the over impression.
- 6- After complete polymerization, separate the cast from the over impression , the formed crown were then removed from the prepared tooth(from the cast).
- 7- Trim any excess material from the formed crown, the crown were then seat on the prepared tooth , check and adjust occlusal, the crown were then smoothen
- 8- Cement T.C. on the prepared tooth using ZOE cement.



3) Clinical procedure for DIRECT-INDIRECT TECHNIQUE:

1. A preoperative over impression with alginate or silicon rubber base is made for the study model (fill the missing tooth area with acrylic denture teeth prior to impression taken)
2. Remove the acrylic tooth from the cast and start Preparation of abutment on diagnostic cast (more conservative than an actual preparation)
3. Mix tooth colored acrylic resin , mixed acrylic were then place in the over impression at the area of the prepared tooth and denture tooth only.
4. Seat the cast onto the over impression in upright position and maintain pressure (rubber band can used for this respect) until acrylic is set completely, be sure that the cast correctly seat into the over impression.
5. After complete polymerization, finish restoration
6. After complete the preparation of teeth in patient mouth, try and relined the preformed restoration, finally Cement T.C. on the prepared tooth



Advantages of indirect over direct technique:

- 1) There is no direct contact of free monomers with the prepared teeth or gingival tissue which might cause tissue damage or allergic reactions.
- 2) The procedure avoids subjecting a prepared tooth to the heat of polymerization of resin (acrylic exothermic polymerization reaction).
- 3) The marginal fitness of temporary restoration is significantly better (stone restricts resin polymerization shrinkage).
- 4) Save the clinician chair time.

Vacuum formed thermoplastic (Template method) (Vacuum-Formed Template):

- Stone models of both arches are used prior to mouth prep.
- used only in presence of number of adjacent locating teeth
- Constructed with the aid of a thermal vacuum machine that adapts a plastic sheet (clear vinyl sheet) over the entire stone cast
- Plastic sheet is trimmed around the teeth to be prepared
- Could be used with light cured resins.

Clinical procedure:

Prior to tooth preparation make a study model from alginate impression. In this technique, in state of using over impression as a mold or matrix for construction temporary restoration, we construct plastic matrix (to be used later as a mold) from the study model using clear plastic vacuum made matrix (translucent coping material or transparent splint material that come as sheet 5 x 5 inch dimension & 0.025 inch thickness). By the aid of Thermal Vacuum forming machine , a sheet of clear plastic vacuum made template (matrix or mold) is adapt over the diagnostic cast covering the whole dental arch. In order that fits comfortably inside the patient mouth, After teeth preparation, cut any excess from plastic matrix that might interfere with accurate seating of template(matrix). If too much of matrix is removed it well makes the final placement of crown in the patient mouth more difficult. **Quadrant matrix is the most comfortable.** Then follow the same steps discus in impression method

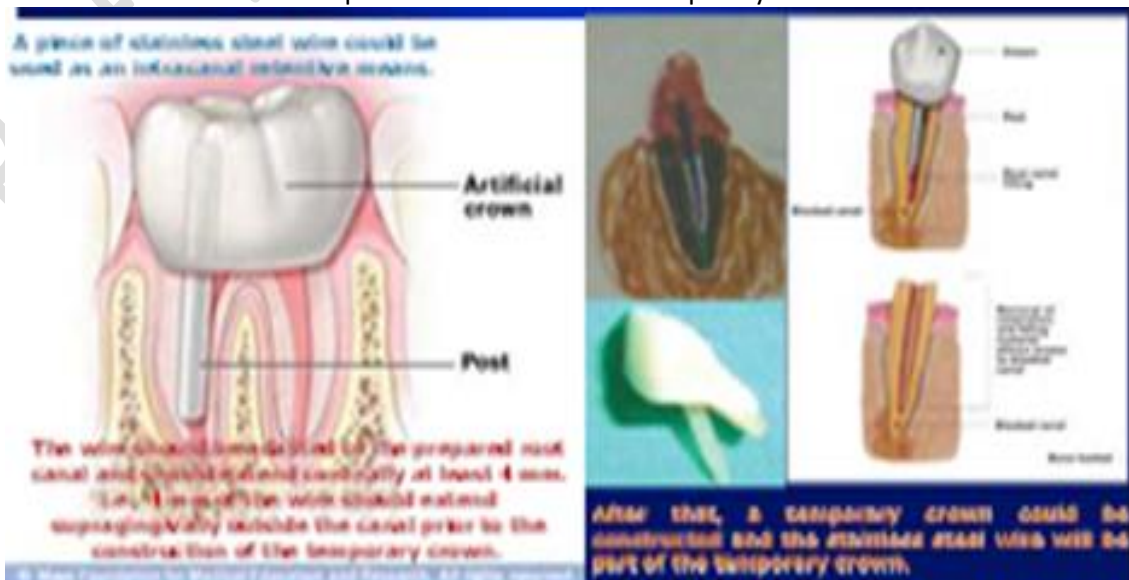


Direct versus Indirect

- Direct is faster for routine provisional restorations
- Indirect can save time with multiple units or complex fixed partial dentures
- Indirect provisionals can be fabricated in advance of the tooth preparation appointment

Temporary restoration for tooth prepared to receive post crown.

It is often difficult to fabricate T.C for a tooth that has been prepared for postcrown because there is so little of tooth structure left standing supragingivally that cannot give support to the T.C , so, in such a case we need intra canal retentive mean to give retention for the T.C. A piece of stainless steel wire can be used intra canal retentive mean, it should be place and adapted to the prepared canal (the wire should extend coronally so that we will have at least 4mm. of the wire extend supra gingivally outside the canal) prior to construction of the temporary crown. After that you can construct the T.C. in the normal way ,as result at the end the wire will be a part within the formed temporary crown.



CEMENTATION OF PROVISIONAL RESTORATION

❑ IDEAL PROPERTIES OF CEMENT:

- Ability to seal against leakage of oral fluid.
- Strength consist with intentional removal.
- Low solubility.
- Chemical compatibility with provisional polymer.
- Ease of eliminating excess.
- Adequate working time and short setting time.

❑ CEMENTS USED:

- 1) Zinc oxide eugenol.
 - 2) Reinforced zinc oxide eugenol , The liquid can be ethoxybenzoic acid, known as ZOEB, making it stronger.
 - 3) Non- eugenol cements, do not soften resin (as in provisional restorations), They use carboxylic acids in place of eugenol.
 - 4) TempBond Clear is a translucent cement with Triclosan (an antibacterial & antifungal agent)
- ❖ Zincoxide eugenol cement is the most commonly used cementing medium for T.C and bridge. This cement promote healing and allow easy removal of the temporary restoration *Zinc phosphate, Zinc polycarboxylate, and Glass ionomer cements are not used because their comparatively high strength makes intentional removal difficult.*

Digital interim fixed prosthesis

(CAD/CAM) production of restorations, definitive restorations can be fabricated the same day as tooth preparation, and interim crowns are not necessary. However, not all clinical situations are amenable to treatment with same-day CAD/CAM restorations, necessitating the use of interim restorations. Such situations include the need for large reconstructions, evaluating the effects of changes in occlusion in the presence of a temporomandibular -disorder, a planned change in occlusal vertical dimension, and the period of healing of pontic or implant site. In these situations, interim restoration can be extremely helpful. The patient can evaluate comfort, function, and appearance before the fabrication of the definitive restorations .

*interim restorations can be fabricated by means of a digital workflow. **The Tissue surface form (TSF) consists** of three-dimensional virtual image of the prepared tooth.*

***The External surface form (ESF) consists** of one of the following:*

- ***a three-dimensional virtual image of the intended tooth before preparation,***
- ***a scan of a preoperative diagnostic waxing,***
- ***a virtual shape proposal generated by computer***

The digital information is sent to a milling machine at the time of tooth preparation and the TSF and ESF are milled from solid blocks/disks of resin. Thus there is no need to have analog representations of the TSF and ESF or to then fill a mold cavity with material Resins available Materials use for milling interim restorations include PMMA and composite.

The CAD/CAM process reduces the patient's exposure to chemicals dramatically, inasmuch as the commercially produced blanks from which interim restorations are milled contain only approximately 1% residual-free monomer. Therefore, the digital method of fabricating an interim crown is an entirely indirect method. The CAD/CAM interim restorations have been shown to be stronger and more accurate than traditional bis-acryl composite prostheses.

Another advantage of the digital production of interim restorations is that the data file can be used to mill the definitive restoration, if the tooth preparations (and tissue contours) have not been altered.

Advantages:

1. *Efficient.*
2. *No laboratory work needed.*
3. *Easy on tissues.*
4. *Lowest residual monomer.*
5. *Generally more wear resistant.*
6. *No air-inhibited layer.*
7. *No polymerization shrinkage; some can be bonded to tooth structure.*
8. *Definitive restoration can be milled as an exact duplicate of interim.*

Disadvantages:

1. *Digital impression and in-office mill needed*
2. *Some blanks are monicolor.*

LIMITATIONS OF PROVISIONAL RESTORATION

1. *Lack of adequate strength—fracture of provisional is possible in long span FPDs, patient with bruxism and reduced interocclusal clearance.*
2. *Inadequate marginal adaptation.*
3. *Poor aesthetic in long term provisional restoration.*
4. *Plaque accumulation due to poor surface characteristic.*
5. *Compromised bonding characteristics.*
6. *Mild to moderate tissue irritation*