

## PROVISIONAL RESTORATIONS

**Definition** : they are Interim crowns used in the period between tooth preparation & the insertion of the final restoration.

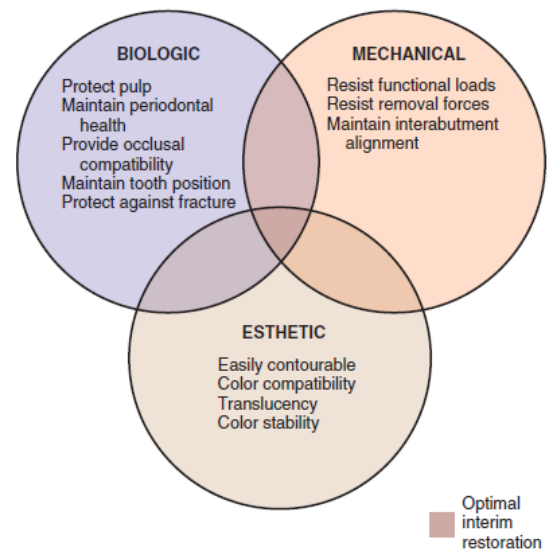
the period may extend from weeks to months, or even up to one year, because the tissue surrounding the prepared teeth might be traumatized or have other periodontal problems, so the period of the provisional restoration must extend until the tissue to become healthy.

### Why do we call it Provisional not Temporary?

because it could last for a long time affecting the prepared teeth and the surrounding tissue, & so will affect all the following steps later on (like the impression & cementation ..etc.), which mean that it should be as good as the final restoration, never with low quality like the word “Temporary” may indicate.

### Requirements of Provisional Restoration :

1. Biological:
  - a. Pulp protection.
  - b. Periodontal protection.
  - c. Occlusal stability.
  - d. Prevention of Enamel fracture.
2. Mechanical
  - a. Strong , to withstand function.
  - b. Withstands displacement.
  - c. Removal for reuse.
3. Esthetic



**Fig. 15-1**

Factors to be considered in making an interim restoration. The central area represents the optimum, in which biologic, mechanical, and esthetic requirements are adequately met.

### 1. Biological:

#### **a. Pulp protection:**

to seal and insulate the tooth from the oral environment; to prevent any sensitivity or irritation to the pulp:

preparation of the teeth for fixed prosthesis requires removal (loss) of a large amount of tooth structure, which usually causes trauma to the pulp, that's way whenever we prepare teeth we use water along with the tooth cutting procedure. So to keep this trauma reversible, the preparation & the exposed

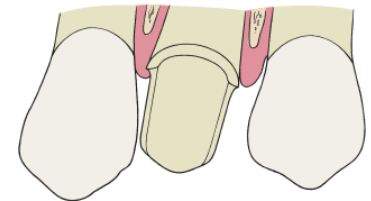
dentinal tubules must be insulated. Otherwise leaving a vital tooth exposed to the oral cavity for even two days might cause some serious problems like; leakage through the dentinal tubule, irritation of the pulp & irreversible pulpitis.

#### **b. Periodontal protection:**

To keep the margins, sulcus & the biological width healthy I have to use a provisional restoration with a good contour, good margins and a smooth surface ,Especially if the prepared tooth's margins were Sub-gingival. Otherwise, Leaving sub-gingival margins covered only with a poor provisional restoration, will cause several problems to the periodontium, like irritation to the gingiva with movement & mastication , and sometimes may lead to recession or even inflammation; due to the accumulation of debris in that area. Inflammation of the gingiva makes the impression and the cementation impossible, because they need an Isolated area to be done. Even worse than this, Ischemia & necrosis could happen to the gingival tissue.

#### **c. Occlusal stability:**

After the preparation of the tooth, it loses its contact with the adjacent & apposing teeth leading to occlusal instability, and this will allow the movement of that tooth by over-eruption or mesiodistal tipping.



**Fig. 15-5**

A missing proximal contact allows tooth migration. The resulting root proximity may necessitate surgical or orthodontic correction to allow impression making.

\*How over-eruption will affect the final restoration?  
will cause high contact.

\*How mesiodistal tipping will affect the final restoration?

will lead to an open contact on one side, and a very tight contact on the other one.

So, the provisional restoration will provide occlusal stability by preventing vertical & horizontal movements of the prepared tooth.

#### **d. Prevents enamel fracture:**

In prepared teeth with *Enamel Margins*, like  $\frac{3}{4}$  restorations, Inlays & Onlays, (usually even all other restorations have Enamel margin which is; The Finish Line). Otherwise leaving enamel structures without a provisional restoration will cause fractures in enamel due to mastication, which lead to gaps and open margins between the final restoration and the prepared tooth.

## 2. Mechanical:

### a. Strong, to withstand function:

The provisional restoration usually have 1/20 the strength of the final restoration because the materials used to make it are weaker (like polymethymethacrylate or composite).

Most fractures happen at the **connector area**, for this reason, the connectors in the provisional restoration are usually a bit larger than the connectors in the final restoration, but up to certain limit were it doesn't affect the interdental papillae or esthetics. (note: the final restoration's connectors are made of metal, so they are thinner & stronger).

Sometimes if the provisional restoration is long span, that will stay for a long time in the patient's mouth or the patient has heavy occlusal forces or para-functional habits like bruxism, Other more-reinforced materials called "*high strength acrylic materials*" can be used, which are heat cured in the lab, or reinforced with fibers.

### b. Withstands displacement

*\*why would a Provisional fail to withstand displacement (for example it fell the next day!)?*

*-Problems in the preparation.*

*-Problems in the cementation and moisture control.*

*-The occlusion is high for the patient.*

*-The fitting surface of the provisional is loose.*

So, *displacement can be prevented by:*

*1- proper tooth preparation.*

*2- closely adapted internal surface.*

*3- proper occlusal preparation.*

### c. Removal for reuse.

Provisional restorations often need to be removed to remove the cement inside and reused again, so it should with stand the removal & reuse,& shouldn't be damaged upon removal from the teeth.

### 3. Esthetic

Almost the same esthetic requirements for the final restoration, like smooth surface, good shape, good shade & good contour. So you need time to make a good provisional, sometimes it might need a full session! Although all provisionals will discolor with time, unlike the porcelain of the final restoration.

## MATERIALS

### Requirements of the provisional restoration's Materials:

- 1- Good working time.
- 2- Rapid setting time.
- 3- Biocompatible; non-toxic, non-allergic, not exothermic.
- 4- Has dimensional stability.
- 5- Ease of contouring & polishing.
- 6- Adequate strength and abrasion resistance.
- 7- Esthetic, translucent & color stability.
- 8- Good patient acceptance.
- 9- Non-irritating.
- 10- Odorless.
- 11- Ease of repairing (so no need for making a new one all over again if a small damage happened). *→important*
- 12- Clinical compatibility with luting materials.

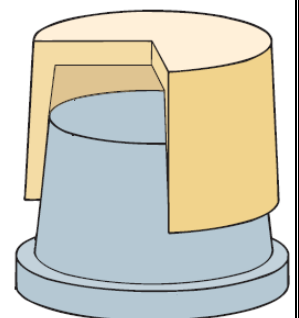
### Problems of the provisional restoration:

The main problems of the provisional restorations come from the properties of the materials that they are made of, for example, Acrylic have two main disadvantages when it sets inside the patients mouth which are:

1. exothermic setting reaction, which can lead to pulp sensitivity & irreversible pulpitis, So the provisional restoration can't be left to set completely in the patient's mouth, rather it is removed after a while & we let the final setting reaction to happen outside the patient's mouth.

2. shrinkage upon setting, leading to open margins and engage the undercuts .

A small amount of resin shrinkage will result in a significantly open margin.



### Materials used in provisional restorations:

1. Poly methyl-methacrylate.
2. Poly R-methacrylate,
3. Epimens,
4. Bis-acryl composite resin,
5. Light cure composite.

#### 1.Poly methyl-methacrylate.

supplied in (powder/ liquid)form, available in several shades.

##### Advantages:

- a. good strength.
- b. good polishability.
- c. repairable.
- d. good marginal fit

##### Disadvantages:

- a. Shrinkage is **8%** ,(more than all the other materials)
- b. High Exothermic reaction
- c. Low abrasion resistance ; i.e. wear with time from occlusal and proximal surfaces, this wear is also followed by other problems like roughness & porosities in the surfaces which cause color change ( staining) .
- d. Free monomers that cause sensitivity to the pulp & irritation to the gingiva.
- e. Very bad Odor.

##### The difference (in the properties) between self-cured & heat-cured PMM:

1. Heat-cured is Stronger.
2. Heat-cured has less porosities.
3. Heat-cured is more stain resistance.

#### 2. Poly R-methacrylate

*\*the R represents an alkyl group larger than methyl (e.g., ethyl or isobutyl).*

There is an exothermic reaction, But, because the R group is larger, it is less irritating to the tissue & the dentinal tubules. Also its shrinkage is less than PMM.

##### Advantages:

- a. minimal exothermic reaction.
- b. low polarization shrinkage.
- c. better stain resistance.
- d. good polishability.

Disadvantages:

- a. low surface hardness & strength.
- b. low durability.
- c. low fracture toughness.
- d. bad smell.

So, Mechanically it is a bit weaker than PMM.

**3. Epimines:**

They are acrylics as well, supplied in **two pastes**, but are not used anymore.

Disadvantages:

- a. Low hardness & strength.
- b. Causes sensitivity to the dentist, (the most important one).
- c. Patient tissue irritation.
- d. difficult to repair

The last two drawbacks are the reason why these materials are not used anymore.

**4. Bis-acryl composite resin**

A resin material with properties in between acrylic and composite, available in an auto-mixing syringe, & as Auto-cured or dual-cured.

Advantages:

- a. Very low exothermic reaction.
- b. Minimal polymerization shrinkage.
- c. High strength. (compressive strength)
- d. High abrasion resistance.
- e. Very good marginal fit.
- f. Good color stability.
- g. Odorless.

So, it has all the good qualities of the composite 😊

Disadvantages:

- a. limited shades, just two or three. (unlike the composite which has all the shades we want).
- b. limited polishability. (the most annoying disadvantage).
- c. brittle; i.e. low tensile strength (Just like porcelain). This disadvantage is especially detectable at the connector area of long span provisionals made of it. (it will break )
- d. expensive

### **5. Light cure composite**

Light cure, Microfilled or UDMA (Urethane Dimethacrylate,-the resin itself-).

#### Advantages:

- a. low curing temperature(it has the lowest exothermic reaction).
- b. very low polymerization shrinkage.
- c. good strength and abrasion resistance.
- d. doesn't need mixing.
- e. odorless.
- f. long working time.
- h. color stability & stain resistance.
- i. more shades.
- j. repairable.

#### Disadvantages:

- a. low marginal fit.
- b. limited shades (but it has the largest number of shades).
- c. brittle.
- d. limited polishability because it's a hard material.
- e. expensive

## **PROCEDURES**

The Provisional restoration usually has two surfaces :

1. The Fitting surface  
we can obtain the it from the prepared tooth, either inside the patient's mouth or from a model cast.
2. The outer surface  
We can obtain it from a wax up or from the tooth itself before the preparation, if it was completely existed .

*All procedures have in common the formation of a mold cavity empty space into which a plastic material is injected.*

And this mold cavity is formed of two parts :

1. An Internal/tissue surface form, ISF :  
forms the internal/fitting surface of the provisional crown.
2. An External surface form, ESF.  
forms the external contour of the provisional crown.

then after we obtain these two parts we can put the provisional restoration material in between to get the provisional crown. 😊 .

Provisional restoration techniques can be classified according to the **External Surface Form** to:

A. **Costume made**(Index) :

A negative reproduction/impression of the patient's teeth before the preparation or a waxed up of the teeth on a diagnostic cast. And it can be made by:

-Silicon.

-Alginate.

-Transparent vacuum sheet; a circular sheet that you adapt to the teeth under vacuum & pressure. it's transparent, So it's very useful especially when provisional is to be made of "light cure composite" .

B. **Preformed crowns:**

ready-made crowns for different teeth and in different shapes.

they always need relining with resin to satisfy the requirements for proper provisional and provide internal surface form.

For example, if there wasn't neither impression before the preparation, nor time for wax up & you just need a single crown, here a preformed single crown can be used. but because they are preformed, they won't fit exactly to the prepared tooth, So they'll need to be adjusted, relined & their occlusion should be checked, i.e. they need a lot of modification to fit the patient's teeth.

**\*to Reline:** means to add more material to the fitting surface.

\*Note: Provisional Bridges can't be made of these preformed crowns, why?

Provisional bridge replaces a missing tooth by a *Pontic* , so it must be costumed for the specific patient.



**Examples of Preformed crowns:****1\*Polycarbonate crowns :**

Empty crowns (just a shell), with different shades which can be modified by the color of the material you use inside it, and they are also labeled with size numbers. Note that they can't be used alone because they lack an inner surface, so they have to be relined with one of the four main materials used to make a provisional, which will fuse with this shell to form one unit crown.

**2\*Cellulose crowns:**

Same as the polycarbonate, but it's transparent & this shell is removed after you finish the provisional. It's usually used in class 4 composite restorations.

**3\*Metal crowns:**

for posterior teeth, just a shell, relined internally.

**4\*calendars:**

the cheapest ever crowns, should never be used !

**Provisional restoration techniques can be classified according to the *Internal Tissue Surface Form* to:****1. DIRECT:**

- a. The provisional is constructed with the matrix (the ESF) lined with the material and placed directly on the prepared tooth inside the patient's mouth (after applying a lubricant on the prepared tooth)
- b. We remove the excess that we can reach before the setting of the material inside the patient's mouth.
- c. Remove the provisional from the tooth.
- d. Mark the finish line and remove all the remaining of the excess with cutting and finishing burs.  
*for example* : an alginate index, or a vacuum sheet is filled with the material and then it is pressed on the prepared tooth, and finished with burs after the removal.
- e. put it in the patient mouth and check the occlusion.

Disadvantages:

- a. potential tissue trauma from the monomer itself.
- b. poorer marginal fit because the provisional has to be removed after 2 minutes, before its final setting, from the patient's mouth to a warm water bath, So, also shrinkage will happen outside the patient's mouth, which mean it might not fit again to the tooth, & will need to be adjusted from the inner side.
- a. exothermic reaction on the tooth itself.
- b. might engage to the tooth because of the shrinkage.
- c. difficult to be done.
- d. need more time.

**2. INDIRECT:**

obtained from a model cast for the prepared tooth.(after applying the lubricant).

Advantages:

- a. no contact between the free monomer and the tissue.
- b. no exothermic heat on the teeth.
- c. the marginal fit is better, because the setting is finished completely on the model of the prepared tooth.

**3. INDIRECT-DIRECT:**

One part of the procedure is done in the lab, & the second is in the patient's mouth:

A minimal preparation is done for the tooth on a model cast, then I make a provisional from it, and you will get a provisional with a wide ISF, So you then need to reline it inside the patient's mouth.

So with this technique half of the provisional is done outside the patient's mouth reducing some of the disadvantages of the direct technique (like the high exothermic reaction heat) by reducing the bulk of the material that sets on the tooth itself.

**\*\*\* The next part is from last year's sheet ,the dr. didn't talk about it but she said you should study it \*\*\***

### ◆ **Provisional Cementation**

The type of cement to be used here is temporary cement like Zinc oxide eugenol "ZnO-Eu" or zinc oxide non-eugenol "ZnO-non-Eu". The permanent cements (Glass ionomer / resin cements / polycarboxylate cements / zinc phosphate / RMGI) should not be used here because it would be very difficult to take the provisional out if you cemented it with a permanent cement, you might have to break it to take it out. The temporary cement is good because it will seal but it is weak so you can take it out easily. Note: if you used ZnO-Eu provisional cement and then you decided to cement with resin cementation, the Eu would prevent the polymerization and setting of the resin in addition of allergy to Eu. Not only prevent the setting of resin cement but also it prevents the polymerization of the PMMA. When I do relining, I should remove the cement from internal surface very good so it does not interfere with polymerization.

#### Why would we use a provisional for a long period of time (one year)?

*\_\_Patients may suffer from periodontitis and pocketing from the old restorations overhanging ones they have, so we have to remove these restorations to allow the periodontium to restore its health and that may take months, or if there are implants we have to wait until healing occurs before putting the final restoration, so we put a provisional restoration till that time.*

*So the provisional can be used from 2 weeks up to 2 years. We don't call it temporary cause temporary means something fast but the provisional restoration will give us functions, esthetics and last until you decide it is the proper time to make the final restoration and take the final impression.##*

Tip: if you put your provisional for one year, we don't use ZnO-Eu because it is weak cement. We mix polycarboxylate cement with Vaseline. So, it becomes long term provisional cement.

\*Sometimes when more strength is needed, you can use a reinforced ZnO-Eu

#### **Procedure of provisional cementation:**

- 1- Lubricate the internal surface
- 2- Mix the temporary cement (it is the same for provisional and final cement)
- 3- Apply small amount inside your crown

- 4- Seat the crown, the excess will escape out from the margins
- 5- Ask the patient to bite, make sure that the crown is not high.
- 6- The excess is removed once it sets and tell the patient not to eat for an hour.

#Ideal properties of the cement:

- 1- Ability to seal against leakage and pulp irritation.
- 2- Adequate strength
- 3- Low solubility
- 4- Chemical compatibility
- 5- Ease of use
- 6- Adequate working time
- 7- Compatibility with the final luting cement.

### **EVALUATION:**

The provisional must be just like the final restoration, if there was any open contacts you can add more material & repair it, & finally you have to check the occlusion

→ Refer to chapter #15 [Contemporary fixed prosthodontics]

When it rains all birds occupy shelters, But **EAGLE** avoids the rain by flying above the clouds...

Problems are common to all, but **ATTITUDE** makes **DIFFERENCE** ..

*Best of Luck...☺*