Sheet #7

-Complex Restoration= 4-Surface Restoration = It is the type of Restoration we use when most of the tooth is destructed

The destruction could be due to :

1. Fracture.
2. Extensive caries.
3. Existing defected restorative material
* In case of leaky restoration .. you have to redo it and remove the associated caries which will leave a destructed tooth

**Problems with very large posterior restorations:**

* 1-no sound tooth structure opposing occlusal contact
1. 2-part of the cavity would be on the root’s surface which leads to more complications
* 3-The area will be probably difficult to isolate>> because the badly destructed tooth will not be easy to adapt the clamp on it

**Differences between ordinary class II and extensive cavities:**

1. Class II 🡪has sound tooth structure around the restoration

Whereas complex restoration as here with amalgam 🡪 all the tooth is made from amalgam

2-Some or all the cusps may need to be capped

1. Extensions in all directions need to be greater

More secondary retentive features will be needed

**Stages for restoring posterior large cavities:**

1. **Preoperative assessment** 🡪 to decide if complex restoration is the best choice

**Clinical examination**

1. 2-Extent of the caries or the existing restoration and its relation with the gingival margin**…**the cavity would be sub-gingival .. I can’t take an impression or even isolate the tooth .

3-violation of the “*Biologic Width*” ; the distance from the Alveolar bone to the margin of the cavity which should be at least 2mm,

here “*Perio-Surgery”* must be done to cut from the bone & restore that distance. Or else Non-existing Biologic width is an indication for EXTRACTION..

Assessment of the pulp (vitality testing)

Examination of occlusion in centric and lateral excurions.

**Radiographs (bitewing, periapical**)

1. **Caries removal**
2. **Designing the restoration**

Design is initially indicated by the previously existing restoration or the extent of carious lesion

The relation of the floor of the cavity to the gingival margin 🡪 the biological width

**Choosing the restorative material: depends on**

1. amount of the remaining tooth structure after I remove all the caries & old restorations

**Our options are :**

1. **Direct restorations**
* Amalgam (bonded, pin retained, core)
1. Bounded Amalgam…we have to use the self-cure type to bind dentin and amalgam
* Composite (restorative material or foundation under indirect restorations). 🡪 with some new addition it can withstand high occlusal load.
1. **Indirect restorations**

Where I prepare the cavity with convergent walls , take an impression, send to the lab .. and there they will make the restoration & just need to adapt it.

Such restorations need more work and more time

* Indirect composite
* Inlays
* Onlays
* ¾ crowns
* Crowns

**(1)**

**THE USE OF AMALGAM**

**Advantages**

* Easy to use
* Has high compressive strength.
* Excellent wear resistance.

Proven long term clinical performance

**Disadvantages**

* Unaesthetic. 🡪 in esthetic areas of posterior teeth like the lowe & upper premolars
* Requires a retentive tooth preparation.

Doesn’t seal or strengthen tooth structure

Amalgam may be used as:

-Control restorations in teeth that have questionable pulpal and or periodontal prognosis>>> as atemporary restoration.

Protection of the pulp from the oral cavity

Provide anatomic contour which provides gingival health

* Facilitate control of caries and plaque.
* Provide some resistance against tooth fracture.

2. Control restorations in teeth with acute and severe caries.

3. Definitive final restorations

Foundations.>> as a core under an indirect restoration 4-

Contraindications:

-If the tooth cannot be properly restored with a direct restoration because of anatomical or functional considerations

* -The patient has significant occlusal problems.

 - If the area to be restored is esthetically important for the patient

**Amalgam Treatment options**

1. Pin retained amalgam
2. Slot retained amalgam

 Amalgam foundations3-

4-Bonded Amalgam

1. **Pin retained Amalgam restoration**

one or more pins in dentin to provide adequate retention and / or resistance form.

A part of it will be retained in the restoration & the other in dentin

This way it will increase retention & some times resistance form as well.

**Types of pins**

1. **Cemented pins**
2. **Friction locked pins**
3. **Self-threading pins**
4. **Cemented pins**

.. it will be cemented inside the dentin

* Threaded or serrated SS pins cemented into pinholes prepared 0.001 (0.025mm) to 0.002 inch larger than the diameter of the pin. So the pin will enter the hole easily
* The depth of the pinhole is between (3-4mm) 🡪 inside the dentin

used Zn-Ph, poly carboxylate

* It does not cause stress or craze lines in dentin 🡪 because the hole is larger than the pin so it will enter without engaging with dentin
* Least retentive of the 3 types.
1. **Friction locked pins**
* Diameter of the pinholes prepared 0.001 inch (0.025mm) smaller than the diameter of the pin.
* The pins are tapped into place and retained by the resiliency of dentin. 🡪 tapping (by a special hammer) is a disadvantage
* They are 2-3 times more retentive than the cemented pins. 🡪because the hole is smaller than the pin
1. **Self-threading pins**
* Diameter of the pinholes prepared 0.0015 to 0.004 inch (0.038-0.1mm) smaller than the diameter of the pin.
* The depth of the pin-hole varies from 1.3 to 2.0mm.
* instead of tapping into place .. it will work just like real screws with threads you turn it clockwise to adapt into the hole , & because dentin is resilient it will engage easily

It is the most retentive of the three types.& no need for tapping

It is 5-6 times more retentive than the cemented pin

* Lateral and apical stresses can be generated in the dentin when the pin is inserted. 🡪 this is a disadvantage & can damage the pulp if the cavity is deep (close to the pulp) or it might perforate the tooth or penetrate the pulp
* The Thread Mate System (TMS) is the most widely used self-threading

**large sizes of pins are used with amalgam & small sizes with composite”**

**Problems associated with pin placement**

difficulty of placement in posterior teeth

* small amount of tooth structure is remained , so perforations or penetrations can happen easily making extraction as the only choice, also the posterior position of the tooth will make insertion in a certain tilt really difficult .
* patient apprehension during placement.
* Stresses are created in dentin causing lateral cracks perpendicular to the long axis of the pin and shearing forces apical to the leading edge of the pin.

**When determining the appropriateness of pin retained amalgam restorations the following should be considered:**

Resistance and retention forms-

* Status and prognosis of the tooth
* Role of the tooth in the overall treatment plan.
* Occlusion, esthetics and economics.
* Age of the patient.

**Retention and resistance form**

Mainly obtained from the pins

as a general rule 1 pin for each missing cusp is adequate. 🡪& is inserted in the previous cusp location

In selected cases pins placed before placement of amalgam can function to improve the resistance form

**The location of the pin hole from the external surface depends on:**

1. External morphology of the tooth**>>>** like mesial or distal depressions on the roots of some teeth so I should be very careful & always remember teeth anatomy

2The type of restoration to be placed (amount of reduction required).

3The type of margin to be prepared. 🡪amalgam or composite , direct or indirect restoration

**Preferred locations for pin placement:**

at the line angles in at the cusps place ,away from the external margins

areas to avoid because of concavities, furcations, or thin dentin

areas where pins may be placed with added caution 🡪by holding a probe parallel to the externalsurface inside the gingiva and holding the bur parallel to it to avoid perforations

 **Status and prognosis of the tooth**

* Teeth that are sensitive or symptomatic should be treated first before pin placement.
* The placement of non-cemented pins in RCT teeth should be avoided because they are already weak, RCT teeth could be better restored used the appropriated “posts” they are large pins inside the root canals which takes advantage of the endo access in retention instead of using ordinary pins
* Pins are contra indicated in teeth were the gingival margins are so deep that the application of a matrix band is difficult or impossible.

**The role of the tooth in the overall treatment plan**

* Pins are contraindicated in teeth that require elaborate occlusal alteration

When esthetics are of prime concern pin-retained amalgam could be contra-indicated

When cost is a major factor, the pin retained amalgam is appropriate provided that an acceptable restoration could be achieved

**Age of the patient**

* For some geriatric or debilitated patients, this could be the treatment of choice over the more expensive and time-consuming cast restorations also pulp is smaller in older patients so pins are can be inserted easily

**Advantages**

more conservative

amalgam usually is not conservative but in this situation in comparison with the other choices of indirect restoration & crowns it is more conservative

Gingival margins could be healthier than indirect restorations

* Less time consuming, could be finished in shorter duration and in one visit.
* Relatively economical compared with other materials and techniques.
* Retentive form is significantly improved by the use of pin or pins.

In selected cases, the resistance form is significantly improved by the use of pin or pins

**Disadvantages**

* Proper contours and occlusal contacts are sometimes difficult to achieve. 🡪 needs high skills to reproduce the occlusal table
* Drilling of pin-holes and placement of pins could create internal stresses in dentin.

Micro-leakage around all types of pins has been demonstrated, however it is no greater than micro-leakage occurring at the tooth restoration interface

Pins do not reinforce the amalgam therefore do not increase the strength of the restoration. No increase in compressive strength, significant decrease of tensile strength”

🡪They just increase resistance & retention

**Factors affecting the retention of the pin in dentin and amalgam**

1. Type of pin, self-threading > friction locked > cemented.

Surface characteristics of the pin>> self-threading > cemented> friction locked

No bonding between the amalgam and the pin, pure mechanical retention

1. Orientation of the pin(s): putting the pins not parallel to each other enhance retention of amalgam, severe bending of the pins should be avoided parallel pins will make the dislodgment of the restoration easier.
2. Number of pins: Within limits increasing the number of pins increase the retention in dentin and somewhat in amalgam (the benefits should be weighed against the risks of increasing the number of pins).
3. Diameter of the pin: within limits, as the diameter increase retention in amalgam and dentin increase. 🡪 but the risk of perforation will increase so be carful !

Length of pin into dentin and restorative material

**Failure of pin retained restorations**

1. Within the restoration (fracture).
2. At the interface between the pin and the restorative material (the material could pull off the pin).
3. Within the pin (the pin can fracture when stressed beyond its limit).
4. At the interface between the pin and the dentin (the pin can pull out of the dentin).

Within the dentin (the dentin can fracture

# ***failure is more likely to occur at the pin/dentin interface rather than pin/restorative material interface.***

**Potential problems of pin retained amalgam restorations**

**Broken drills and broken pins**

* Removal of the broken piece is difficult and should not be attempted.
* Prevention is the best solution.

Choose a safe location at least 1.5mm away from the broken piece

**Loose pins**

Pins could be loosened when attempts to shorten them with a bur.

The pin should be removed by:

* The pinhole is prepared with the next largest size drill.

The depth is increased to 3-4mm using the next largest drill and the same pin cemented in position

**Penetration or Perforation**

* Hemorrhage in the pinhole following removal of the drill.

Usually operators can tell through their tactile sensation (you feel a sudden drop!). Or if the pin continue to thread beyond the 2mm depth(this means that perforation has occurred ). Observation of the angulations of the drill should indicate whether a pulpal or external penetration has occurred

* Radiographs can verify if **pulpal penetration** has not occurred
* Any radiograph showing the pin projecting outside the tooth confirms **external penetration**
* However any radiograph showing the pin inside the projected outline of the tooth does not exclude the possibility of perforation.
* Perforations located occlusal to the gingival attachment:
* Cut the pin flush with the tooth surface.
* The pin removed and the pin hole restored.
* The pin cut and the tooth prepared beyond the perforation.

**Perforations located apical to the gingival attachment:**

* Reflect the gingival surgically, expose the pin hole, enlarge and restore.

Perform a crown lengthening and place the margins of the restoration gingival to the perforation