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- Tooth decay is one of the most common diseases and it accounts for 50% of extraction causes. It is usually treated by simple restorations and this costs many countries a huge amount of money because many things need to be provided for different cases including the dental team, the equipment, the materials..etc
- Primary caries is the most common causative agent for the need of simple restorations, other causes include fractures, aesthetics, hypoplastic lesions and non-carious lesions.
- Secondary caries is the most common causative agent for the replacement of simple restorations.
- Dental restorations do not last forever as many studies concluded that 60% of the restorative work is actually a replacement of old restorations.
- Until recently, amalgam was the direct restorative material of choice unless aesthetics is important. It is easy to place, lasts for the longest time compared to other restorative materials and it is the cheapest.
- Nowadays, the shift is towards newer and more aesthetically pleasing restorative materials including composite, as many factors play a role in shifting the direction away from amalgam and referring to the literature, the most important factor is the mercury content in amalgam which is an environmental factor. On the other hand, many factors play a role in shifting the direction towards composite including the aesthetics and the mechanical properties of composite.
- Problems with old composite restorations have been recently reduced significantly with the evolving of newer composite restorations and many physical and mechanical properties have been engineered up making them comparable to the properties and behavior of dental amalgam. In addition to that, the developing of dentine bonding agents has increased the popularity of this material.
- With the developing of resin-based composite whether it is intended to be used as a restorative material or as a luting cement, new techniques have been developed that are in common use today, for example, looking at the aesthetic restorations like veneers, onlays, full ceramic crowns..etc, it is impossible to use these restorations without a mechanically superior luting agent.



- Factors related to the success of dental restorations can be divided into three main categories: **factors related to the patient, factors related to the dentist and factors related to the material.**
- The factors that are related to the patient include **the personal oral hygiene**, where the better the oral hygiene the higher the chance of success. Also, **the size of the restoration** plays a role in the oral hygiene and preventive practices.
- **The cooperation and the general health and well being of the patient** are important factors where uncooperative or medically compromised patients who are unable to practice a good oral hygiene method tend to have inferior restorations in terms of quality.
- The factors that are related to the dentist include: **the clinical skills that need to be developed by practice, knowledge of the material properties and knowledge of the cavity design as overcutting of the tooth structure will compromise the longevity and quality of the restoration**
- The factors that are related to the materials include: **The strength, durability, wear resistance and technique sensitivity.** For example, in terms of strength amalgam is a brittle material and brittle materials tend to behave strongly under compression and weakly under tension, so when preparing a cavity for amalgam, we have to make sure that the forces acting on this cavity are compressive in nature because if they were tensile, fracture may result. Another example regarding durability is the inability of glass ionomer to withstand the forces acting on it when it is placed in a posterior occlusal cavity. Regarding technique sensitivity, isolation is a very important factor, for example, placing a composite restoration without contamination prevention will significantly affect the longevity of the restoration.

Done by: Amer Mismar

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### Second Part...

An example of a study that was done on the handling characteristics of amalgam restorations:

40 teeth were prepared with class II cavity design and were restored by 10 operators using 2 different materials

Each operator's task was to fill 4 cavities with 2 different materials without knowing which type of the material they were using...After restoring each tooth, a form was given to the operators to evaluate the handling characteristics of the materials used.



The study ended up with 40 class II cavities restored with amalgam restorations. When these restorations were looked under the microscopes, lots of defects were observed on the margins.

What do you think the reason that made these specialized operators make a lot of defects on the margins of the teeth they restored?



The operators thought this study was made to examine the handling characteristics of the different materials used to restore teeth; they had no idea their fillings were going to be examined afterwards.

And this is what generally happens in clinical practice (substandard restorations), no one is there to follow you after you do a restoration and check what you have done!!



**Keep in mind:**

The longevity of the restoration carried out in dental quality research studies suggest substandard clinical situation.

Published clinical studies are of two types:

### **PROSPECTIVE** and **RETROSPECTIVE**,

The more scientifically approved is the prospective because it is a **standardized** procedure, meaning you prepare for it before you perform it. For example, the clinician who is doing the restoration knows his work is going to be followed for years.

Retrospective studies are based on taking a group of patients and look at the restorations in their mouths placed by one or more operatives, without preparing for the study. *You prepare for the study after the restoration has been provided.*

**Success rate** is higher in prospective studies because they are standardized (operators know the aim of the study)

However; retrospective studies are not standardized, have higher failure rates, variations and produce substandard restorations, but they **more representative** of the clinical situations. Remember that the most important factor in that regard is the operator.

**FAILURE** of restorations is generally presented in these reasons,

1-Mechanical failure



2-Biological failure

3-Failure due to esthetics, concerning tooth-colored restorations

### Mechanical;

#### ✚ incorrect use of the material

Examples of incorrect use of the material leading to substandard restoration: over trituration of amalgam and under-mixing, these would result in a granular mass that will not be readily condensable inside the cavity

#### ✚ lack of understanding by the dentist of the cavity design

#### ✚ mechanical deficiencies of the restorative material itself

As amalgam is weak in retention and not adhesive to tooth structure

### Biological;

Presented by micro leakage.

Micro leakage is the biggest enemy to any restoration placed in the mouth, leading to secondary caries, destruction of sclerotic dentin and immediate damage to the pulp may take place under soft tissues produced..

Biological factor is *more significant* than mechanical (it is more likely that amalgam restorations fail due to micro leakage and secondary caries than due to fractured amalgam)

Secondary caries in class 2 restorations (all types of restorations) is mostly found in gingival floor, indicating the difficulty in obtaining access and doing a proper restoration at that part of the cavity.

The clinical judgement about secondary caries is remarkably inaccurate. And that is scientifically approvable.

Several studies have shown that dentists frequently want to replace restorations even when they don't detect secondary caries around. They simply criticize work done by other dentists and think they can do better restorations

(But usually the restorations that have been removed and replaced are better than the previous ones).



So in deciding whether to replace an amalgam restoration that is incorrect you have to rely on some *scientific criteria* and it would seem that to institute the preventive measures and to leave the restoration on tooth rather than to be restored is usually



the appropriate method of management unless there is one or more reasons of the following:

- ⬇ active secondary caries that can be demonstrated either clinically or radiographically
- ⬇ Tooth is symptomatic
- ⬇ There is impairment of function, fracture amalgam restoration when the patient bites wedged amalgam impinge in the soft tissue
- ⬇ Esthetic reason demand

You should not encourage the patient to replace amalgam for esthetic reasons but if the patient has the request with conviction and he wants to replace amalgam for esthetic reasons then it is a good enough reason for replacement. Your job is to advise the pt and to help them look at the success of the alternative material.

If a patient comes to the clinic and wants to replace a subgingival class two amalgam restoration with composite, you should tell him that composite is not indicated in gingival areas and advise him to use inlay restoration or indirect restoration instead.



**IF YOU DON'T FIND ONE OF THESE FOUR POINTS DON'T REPLACE THE RESTORATION**

\*\*marginal deterioration is not an indicative for replacement of amalgam restorations because all amalgam restorations will have deteriorated margins over time, if margins are defective and are sound and cleansable, they should only be kept them under observation without replacing them.

Other features of the material that can also attribute to failure: **Creep and corrosion**

**Creep** is clinically associated with *marginal deterioration* of the material and can cause a marginal fracture; all amalgam restorations tend to creep over time leading to thin margins that will fracture.



**High-Cu amalgam has less creep value**

**Corrosion** of dental amalgam is *initially useful* in sealing of the restoration but if exaggerated over a period of time it will affect the strength and the physical properties of the material, leading to inferior restoration in terms of strength, it might



also cause discoloration of tooth and surrounding tissues related to the corrosion products that are being released.

**Post-operative sensitivity** related to dental amalgam is usually related to defective margins due to inadequate condensation and lack of proper dentin sealing.

**Marginal voids** is also related inadequate condensation material pulling away or breaking from the marginal area

(Potential solution for that is a proper condensation technique)

You need to use a force that is enough to condense the material in order to get a good amalgam restoration.

The force must be reasonable and enough to condense the material. *Don't apply a force that is enough to fracture the cusp.*



**Recall:**

Spherical amalgam requires less condensational force than lathe-cut or mixed.

The key for good condensation is to *mix the material quickly* and *use the material early after mixing* and to *use proper size of instrument*.

\*Using of small condensers for large cavities: causes penetration not condensation.

\*Using large condensers for small cavities: the condenser will not go inside the cavity so not condensing the material.

A *common* failure of dental amalgam:

Fracture of the marginal ridge

Reasons:

- ✚ **Marginal ridge left too high during carving**, leads to marginal fracture immediately when the patient bites
- ✚ **Incorrect occlusal embrasure due to improper removal of the matrix**; when you are removing the matrix you are subjecting the amalgam to tensile stresses so it fracture easily.
- ✚ **Overcarving** to produce a perfect pattern of occlusal morphology; leads to marginal weakening of the restoration.





**Dr's tip to remove the matrix:** When pulling the matrix out of proximal surface, apply a small amount of pressure using a burnisher or a condenser on the marginal ridge to counteract the tensile forces that are developed from removing the matrix.

Ex, mesial box fractured in mod cavity, you can remove part of the restoration (don't remove it all) and place a new one to correct it. *we want it to retain we are not expecting it to bond because amalgam does not bond.* It will be sealed with time and mercury on the fresh amalgam will attack the surface of the old restoration.



**Another tip:**  
You have to remove the wedge first then the band  
Remove them both early so you can start carving the restoration

## AVOIDANCE OF FAILURE OF AMALGAM RESTORATIONS

- ✚ Prepare small cavities (smallest possible that is suitable for the dental amalgam)
- ✚ Finish all cavities to a butt joint 90; degrees
- ✚ Avoid shallow isthmus and wide embrasures, in order to strengthen isthmus prepare them wide but not deep and not shallow (مو متأكدة من هاي المعلومة، ما فهمت شرحها من الدكتور)



**Strength is not an intrinsic property of the material** it is a function of the geometry of the test specimen that you are studying, depends on the shape of the object

**Intrinsic properties of the material; hardness**

- ✚ Use high copper alloy to minimize corrosion; in a three years time low cu alloys will be out of the market
- ✚ Avoid contamination



⬇ Amalgamate the material properly

⬇ Wedge the matrix band firmly

END OF SECOND PART

DONE BY: REHAM ISSA

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Third part....

- Use high copper alloy to minimize corrosion( all the alloys available nowa daysin the market are high copper alloys ) within 3 years you will not find amalgam low copper
- avoid contaminationand fill the material properly
- wedge the matrix band early
- bonded amalgam restorations are superior and the capsulated amalgamincorporate the consistency .

**what is the difference between amalgam bond and composite bond ?**

1-amlgam bond must be**more viscous**

while dentine bond is very fluid and most of the bond is actually primersolvent

2- Amalgam bond must be **chemically cured** which means that amalgam bond is secured after placing it that's why it has to be chemically cured

**Why should it be cured after ?**

To provide micromechanical interlockingbetween the amalgam and the resin and between the resin and the tooth structure becausethere is no chemical bonding between restorative material and the resin

#### ❖ COMPOSITE RESTORATIONS

Most common problems with composite restorations :

1. Most of our problems with composite restorations arise from**poor isolation**of the working area (not using a rubber dam , poor technique , preparation is too deep subgingivally )
2. **white line around therestoration** , the idea that composite restoration should blend with the tooth structure ,you should not be able to see it , in lots of studentswork you can detect the whole margin of the composite restoration **why is that ?**
1. Traumatic contouring or finishingtechnique using heavy forces and producing heat that will affect this newly developing bond between the composite and the tooth structure



- II. Inadequate etching or bonding which means inferior bond with the composite and the tooth structure
- III. High intensity light curing ( there is types of light cure units that are with high intensity can cure the composite in a very short time but this high intensity curing results in a sudden shrinkage of the material and that will produce enough stresses to affect the margins of the composite restoration )

✓ **Solutions**

- Sometimes we can re etch prime and bond that area
- Conservatively remove the fault if it is in a part of the restoration and restore
- Use atraumatic finishing technique (finishing discs must not be used with molars )
- Light intermittent pressure
- use water
- Use slow start polymerization technique or sometimes if its not visible and is not causing micro leakage you can leave it as it is.

3. **Voids** in the composite restoration is another problem u will find it more with chemically cured materials and specially during the mixing procedure

And that's why u should not mix light cure composite material together

(as to mix A1 and A3 to get A2 ) you will end up with a similar shade that u require but the problem that u will introduce voids or air bubbles in to the restorative material and that mechanically will weaken ur restoration because the voids itself is a source of a stress concentration and crack propagation and because voids contain oxygen and that will inhibit the polymerization of the material around it

4. **Spaces left between increments** and this is another common mistake

we always think of the outer surface ,as when we are doing a class 5 we think of the outer contour before thinking of the inner aspect of the cavity as the most important factor in the bonding is **intimate contact** if u don't have it, it dosent matter whether u do isolation or whether u use the best material in the world because the composite is not contacting the walls of the cavity it wont bond to it

When u are placing ur material make sure that u are filling the cavity not just contouring the outer surface

That's why with lots of students the clinician come and just flex the composite restoration with the probe and it fly to the other side because there is no contact between the composite and the underlining tooth structure so intimate contact is the key for bonding

5. **Tacky Composite** pulling away from preparation During insertion and this is a very important point because composite is a tacky material it sticks to the instruments



and if u are not using the proper technique whenever u are pushing against composite once u remove the instrument the composite will come out again, it will not come out completely, it will be distorted or slightly move away from the tooth structure

6. **Weak or Missing proximal contact** and this is one of the most common problems with proximal cavities which appears because of inadequate contour of the matrix band
- Lots of the Matrix band we use are straight and when u roll it around the tooth u are producing the buccolingual contour but the occlusogingival contour is straight so u need to burnish it before u apply it or u need to use the sectional matrix that already anatomical in nature
  - Inadequate wedging
  - Matrix band movement during composite placement
  - Using a circumferential matrix when restoring only one contact, if u have class 2 mesioclusal don't use a universal matrix band, **why ?** because with the universal matrix band the band will pass adjacent to both contacts mesial and distal and you know one of the most important function of a wedge is to compensate for the thickness of the matrix band no matter how thin the matrix band is its still occupying a space so if u use circumferential it will occupy double the space because it is in both sides of the cavity

So if you have one proximal cavity always use sectional matrix or use type of a matrix band that will only go around one proximal surface as

Sectional , mylar strip , ivory

7. **Incorrect shade of the material**, composite is an esthetic material and shade is one of the most important attribute to the restoration so what will u do if u have incorrect shade or **what is the cause of incorrect shade of the material ?**

Selecting the shade after the tooth is dry whenever the tooth is dry it will become lighter , inappropriate operating light on the field that u are working in that will affect the selection of the shade sometimes u just select a wrong shade because u don't have an alternative one

### **Potential solutions include**

1-Use natural light if possible

2-Select the shade before isolating the tooth

3-Preoperatively select the shade and take part of that composite and place it in the cavity and cure it and then compare why yo do that ?

- ❖ Shade guide itself in not accurate cuz sometimes its not made of composite but of plastic and it might vary from the shade box u have, the shade guidance is standard and the composite is not so there is variation



- ❖ Composite shade changes slightly after curing , it becomes lighter because of the **consumption of the photo initiators** that are dark in color ,once u subject it to light the photoinitiators will be consumed in the setting reaction and that will reduce the shade of the composite

4-When doing a restoration that is extending from the gingival margin to the incisal edge u have different zones of shades u cant use one shade you have touse two shades or more I might put A3 gingival A2 middle and incisal and always overlap the layers don't put them as a joint

8. **Poor retention**, what is the cause?

- Inadequate preparation
- Contamination
- Poor bonding technique , most of us do poor bonding technique because we are not concerning about the instructions for the bonding system, you have to follow the instructions another point all of us dry the cavity before insertion of the bond if u dry the cavity then u don't have any bond u have to have wet dentine, most of us apply one layer of bonding agent, if the primer is 90% alcohol or solvent it will evaporate then what is left !! so you have to apply several coats of primer . lots of you bring the bonding agent before they start the cavity preparation □ so when u dispense the bonding agent dispense it when your cavity is isolated and u have the brush in your hand ready to dip it in the bonding agent
- mixing different bonding systems together, a primer of one system and a bond from another system ,this is not appropriate
- poor Contouring and finishing
- Injuries to the adjacent teeth
- Overcontoured restoration , under contoured restoration
- Ditching of cementum this is a common problem when using needle burs to finish gingival margins of class 5 u tend to increase the angle slightly so u are finishing the margins but u are cutting the subgingival root ,The same thing when u carve amalgam u carve the buccal part of the occlusal cavity but the tip of ur carver is removing amalgam on the other side cuz u r concentrating on the buccal wall and not looking at the lingual wall so always be careful
- Inadequate anatomic form of a tooth and dealing with a difficult tooth to see margins

**Potential solutions :**

Be careful

Select proper matrix

Create embrasures to match adjacent teeth



Use appropriate water instrument

Don't use a disc on a molar or occlusal surface

Don't use a convex bur when u want a convex surface use a straight bur and move it

Look at your restoration from different angle

### REPAIRING COMPOSITE RESTORATIONS

If a pt present with a composite restoration that has a localized defect ,

If u find a defect before the restoration is contaminated then repair it immediately just add a layer of composite, the composite will bind to the old composite because the defect will create air bubble that will prevent full Polymerization

If ur defect is contaminated just roughen it with it and apply it if there is exposed dentine apply a primer depending on ur bonding system of course but don't tend to remove all the restoration when there is a defect

And the most more important than that don't create defects on your restoration from the start

#### ❖ PROBLEMS FROM REPLACEMENT OF RESTORATION

##### 1-*Repetition of the errors*

Inability to identify the cause of failure this is a very important point lots of dentists they redo the restoration because its failed but they don't know why is that so they do another restoration that is going to fail because they didn't recognize the cause of failure and they didn't treat it

2-*Cavities increased in size* ( whenever u replace a restoration especially when it is a tooth colored you tend to cut part of tooth structure even if it is not tooth colored like amalgam we have natural tendency to freshen up the margins of the cavity we don't like the discolored margin we prefer the white looking enamel or dentine so we tend to cut more so our cavity will increase in size, teeth becoming weaker, restoration becoming more complex and becoming more costly

#### ✓ Conclusion

Greater attention should be carried when doing restoration rather than replacement

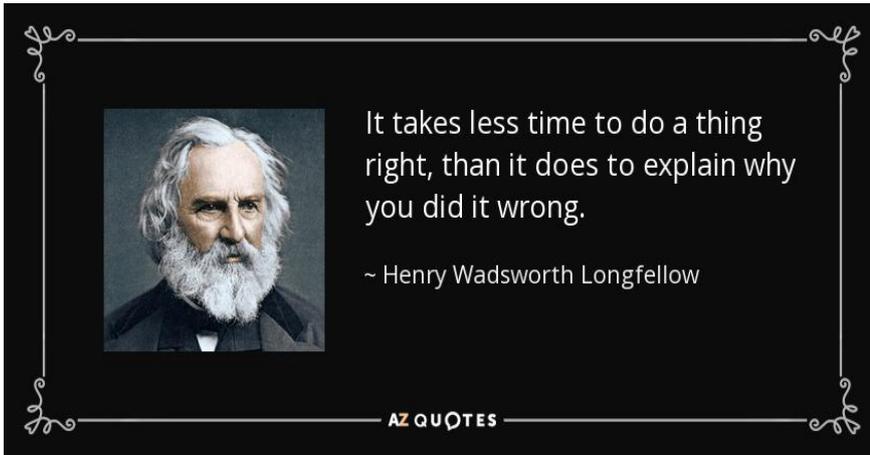
Always thinks of repair when possible

Researches indicate that dentists are more likely to replace restoration placed by other dentist, this is the nature of humans I don't like ur work and u don't like my work so u think u can do something better most likely u wont be able to de a better job so if the restoration doesn't have one of the problems that we mentioned leave it alone because most likely u will do inferior restoration.



The removal of any restoration should be based on a scientific criteria the clinical diagnosis of secondary caries is the most common diagnosis for replacement of the restorations there is general agreement that marginal degradation of an amalgam restoration is poor indication for replacement and the clinical diagnosis of secondary caries invariably needs replacement, most of the reported caries is in the cervical area

***Finally and from the doctor:***



***Done by: Majd Khawaja***

ختامها مسك .. موفقين جميعا

