

***Title of Lecture: Class 1 cavity preparation***

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***Refer to slide no. :***

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Since the doctor didn't give us the slides, I will try to write down each and every single word the doctor mentioned…

Class 1 : cavities which begin in structural defects (pits and fissures that occasionally occur on the occlusal surfaces of molar and premolars and other teeth).

Cavities and restorations of class 1 cavity preparation are of 3 types:

1. Occlusal surfaces of molars and premolars (the most obvious).

2.Occlusal two thirds of the buccal and lingual surfaces of molars and premolars.

3.Lingual surfaces of maxillary incisors.

So basically, any pit or fissure caries is a class 1.

A typical class 1 has 5 surfaces :

1.facial surface.

2.lingual surface.

3.mesial surface.

4.distal surface.

5.pulpal walls.

- Pits and fissures caries have the highest prevalence of all dental caries. Why ?

because the debris and bacteria are protected in that area.

\*if you look at this picture below, you can, from the size of the bristle of the toothbrush in comparison with the fissure, understand why tooth brushing doesn't remove debris from this protected or sheltered area.



So basically brushing will not protect our teeth against dental caries.

So,what is the best approach to protect the teeth against the dental caries ?

SEALING pits and fissures **just after the eruption** of the tooth.

\*dental caries is the disease of the young, it varies in individuals from dental caries to periodontal problems, in the early after-eruption the pits and fissures are open and very prone to dental caries, that's why we see many patients with extracted sixes not sevens and that's because the sixes erupt before the sevens and are more prone to dental caries.

\* The Cavity Preparation For dental Amalgam:

-What other restorative material can we use to restore a class 1 cavity ?

The obvious choice is composite. Also, we can use indirect materials (as an intermediate phase, manufactured in the lab then brought to you to cement it in the patient's mouth ) like the onlays, gold and ceramics. Composites can also be used as an indirect restoration.

\*The using of aesthetic materials is becoming more and more.why ?

Because people are demanding aesthetic restorations.

For direct restorations (materials that will be placed directly in the patient's mouth) other than amalgam and composite in small pits and fissures, we have GOLD. How ?

In spite of its high melting point , it is a ductile material , it has ductility and malleability, so, if you prepare it in a very thin sheets, you can pack these thin sheets inside the prepared cavity and form a solid mass and its going to be hard at the end due to the condensation forces we used.

\*we will take other materials later on, some of them are experimental or were experimental or marketed but they were discontinued like the gallium alloys which we mentioned earlier, also , there is a new technique named silver consolidation \*the metals like the gold and silver has something we call cold welding in which if we take two pieces of metals (silver) and you press them against each other they will bond (form a one mass) and the one thing that stops them from sticking to each other is the oxidation layers formed at the surface (as a barrier)\* so, theoretically if you bring the silver particles and treat them with a substance that will remove the oxidation and then put them in a cavity and pack them ,theoretically, they should form a solid mass, like the amalgam without the need for an intermediate material like the mercury. This material was actually available and marketed and was used (restoration of pure silver) but the problem with this kind of material is the cost, time and the forces you need to pack the restoration in position.

\* INDICATIONS and CONTRAINDICATIONS for class 1 amalgam restoration :

\*Classical indications :

1. Moderate -to- large cavities.

2. Restorations that are not in highly esthetic areas of the mouth.

3. Restorations that have heavy occlusal contacts.

4. Restorations that cannot be well isolated.

5. Restorations that extend on to the root surface.

- Those indications change through time because of the development in other fields eg : composites of today can be used in heavy occlusion because the work resistance of it is much larger (better) than the composites of before.

\*The modern dentine bonding agents overcome the problem of the extension of the cavity (to the root surface) that prevented us from using composites instead of amalgams because of the bonding.

6. abutment teeth for a removable partial denture in the disease control stage in the treatment plan.

\* Any treatment plan is two sections :

Disease control and rehabilitation phase.

\* disease control is the elimination of the oral diseases : dental caries and periodontal diseseases.

\* restorative phase : restore aesthetic and function .

So, in the disease control we can use amalgam restorations as part of this treatment.

\*Contraindications:

1. When aesthetics are of a prime importance.

2. Small cavities that could be very well isolated. Why ?

Because it's not conservative, if we have a small cavity, we serve the patient better by using a material like composite where the cavity preparation is minimal.

3. if the patient has a problem (allergy) with any component of amalgam material. (which is very rare by the way –to have an allergy to a metal-)

\* The most allergic metal is NICKEL which was used in dental alloys then it was limited.

4. Debatable issues according to the politics of the country due to the mercury toxicity :

- children under12.

- lactating women.

-pregnant women.

\* For the advantages and the disadvantages of the material : Go back to the dental materials lecture about the amalgam ☺

\*\* Clinical procedure :

The first step in any preparation is to establish ANASTHESIA. Why ?

To eliminate the pain , make the patient more cooperative , more comfortable patient; that way you can work more easily and comfortably , it also reduces the salivation.. So, you establish local anesthesia.

The second step is the conservative cavity preparation –it is recommended for several reasons- :

1.if you are more conservative with the cutting, the pulp will be protected.

\* THE BEST INSULATOR TO THE PULP IS THE DENTINE.

2. preserve the strength and the structure of the tooth.

\* the more cutting you do the weaker the tooth will become !

And that's an advantage of the composite over the amalgam because in the amalgam we fill the cavity but they will not bond to the tooth structure ( they will not restore the strength or aesthetics) as for the composites it will bond to the tooth structure so it will restore the lost strength due to the carious process.

3. reduce the preparation of the amalgam, the larger the amalgam, the more prone it will be to surface deterioration or marginal degradation.

\* THE MORE CONSERVATIVE YOU ARE THE BETTER FOR YOUR PATIENT.

The third step is the isolation of the operative site.

\*operative procedures should be performed under rubber dam : a sheet of rubber that you place (punch at the site of the tooth we want to work on) so all of the other teeth will be under the rubber dam and only the tooth we want to work on is passing through the rubber dam (ISOLATED FROM THE ORAL CAVITY).

\*it’s a must in endo treatment and operative procedures for example ,to prevent contamination and also to protect the patient and his airway passages and also the tooth we want to work on is also protected since it is isolated from any saliva or blood or whatever.

 We place the rubber dam right after the anesthesia (while the anesthesia is working).

\*Initial cavity preparation :

It is establishing the outline form by extension of the extended walls to sound tooth structure maintaining a specific hight-limited depth (minimum require) and providing resistance and retention.

\*\*outline resistance and retention forms include all the pits and fissures (that are carious of course) in such a manner that sharp angles in the marginal outline are avoided. Why ?

Beacause sharp angles are areas of stress concentration. And it's difficult to finish your restoration with a sharp angel. So, we prefer a smooth outline.

\* the IDEAL outline consists of the two resistance form principles that are bases for all occlusal cavities:

1.placement of the margins in areas that are sound and subjected to minimal stresses. Which means : don't let the margin in the fissure area.

2. reservation of the tooth structure, don't extend your cavity too far. ( don't overdo it) which means : extend it to the areas that are smooth and resistant (minimal occlusal forces).

\*we can achieve these two objectives by going AROUND the cusp!( not THROUGH the cusps!). this is very destructive. To avoid approaching the pulp horns.

- the caries are in the pits and fissures so follow the pits and fissures morphology.

\*\*Not extending the facial and lingual margins more than half way between the central groove and the cusp tip (the widest area) which means : don't let the extension of the cavity too far.

Here, we are talking about minimal cavity preparation, we do modification if the caries extension was beyond that,in the later stage of preparation we have to adjust our cavity(minimal cavity we prepared) to include all the caries of the dentine and the supported enamel.

\*\*Extending the outline form to include the fissures thereby facing the margin at a relatively smooth areas and we mentioned this before.

\*\*minimally extending into the marginal ridge (this is also another case of mistakes).why ?

Because if you overextend into the marginal ridge, you will weaken it, undermine it, and your cavity will be transformed from an occlusal cavity to a proximal one because you destroyed the marginal ridge (we need to conserve it!).

Even if the fissure is extending closer to the marginal ridge, we sacrifice one principal of tooth preparation which is the RETENTION. And we tilt the bur in a direction that will give us a wall diverging occlusaly. Or straight sometimes to preserve the dentinal support to the marginal ridge. We lost the retention in that area, it's okay because actually I don't need EVERY bit of the cavity to be retentive. There are other sites of the cavity that provide retention and resistance form we need.

\*\*Eliminating a weak wall of enamel by joining outlines that come close together which means :

I can make separate cavities occlusaly (It's not a must to have a single cavity!) for example : if part of the fissure is carious, I don't have to cut all the fissure, I can cut part of it ( just the carious).

-What determines if I should joint the two cavities together or not ?

If they approximate each other to less than 0.5 mm then I have to join them, but, if they are separated by 1mm or more of the tooth structure then I keep them separated.

\*\*Establishing the optimal conservative depth of the pulpal wall.

-minimal depth for dental amalgam :1.5-2mm.

\* In certain situations, when the cavity is extending too far proximally, in order to protect the marginal ridge we will accept them to be divergent occlusaly (the buccal and lingual sides). Not all the time, just in cases of approximating the marginal ridge closely.But, If we were far from the marginal ridge, we have to make it converging occlusaly.

-What is the best instrument to use when we prepare class 1 cavity preparation?

245 bur ; diverging endwise which means that the end of the bur is wider than its start. And that characteristic would give us the CONVERGING occlusaly. Also, the bur has a slighty rounded corners and a flat end which give us rounded internal line angles, but if the corners were sharp then it would give us sharp internal line angles and that's definitely not required because as we mentioned earlier sharp angles are sites of stress concentration and that will jeopardize the resistance form. Another important feature is that the length of the bur is about 3 mm and the width of the bur endwise is exactly 0.8mm so we can use the bur as a measuring device ; if you cut to the half of the bur then the depth is 1.5 mm and if you cut two thirds of the bur then its 2 mm and so on. Also, the size of the bur makes it very conservative because it's not very wide.

- An another bur to use is the 330 bur ; a pear-shaped bur, it is used for even more conservative cavity preparation because it is smaller.

\*\*Where do we start ? assume you are faced with a class 1carious region involving all of the occlusal surface or all of the occlusal fissure of a mandibular first molar, where do you start ?

With the most carious pit. But, if both of them is equally carious we start DISTALLY to see where we are going (towards the line of vision). So, always start distally unless the mesial side is more carious.

Here's a very important note :

With any rotary instrument you are using, don't touch the tooth and then operate your instrument ! it should be operating before it touches the tooth and before it's removed outside the tooth ; you remove it from the tooth, then you stop it! Why ?

Because it might fracture, as simple as that. This is important in the small burs or pins and most importantly the long thin instruments for example the rotary ones used for the root canal treatment; if they get stuck in the root canal, then we'll have a big problem.

\*\* Always start with a PUNCH CUT.

We take the bur while it's rotating, place it parallel to the long access of the tooth or parallel to the occlusal surface because there are times when we don't place it parallel to the long access of the tooth but perpendicular to the occlusal surface. Like the mandibular first premolar (45◦) for example, if we place the bur parallel to the long access of the tooth, we will end up with a deep cavity buccally and a shallow one lingually, and in that we will endanger the pulp, so in this situation you place your bur perpendicular to the occlusal surface so the cavity will be inclined but it's perpendicular to the occlusal surface.

-So, we start by inserting the ROTATING bur into the distal pit (for example) to the required depth of the cavity (1.5-2mm(which is half to two thirds of the length of the 245 bur)) (punch cut.)

\* the width will be the diameter of the bur.

Then, you start moving your bur laterally to the side buccally and lingually to include the radiating fissures (the ones radiating from the pit).

- When you place your bur at the distal pit for example, where exactly do you place your bur?

You place the DISTAL part of the bur on the pit.why? to preserve the marginal ridge.

\*NOTE : the depth 1.5 is the same as 2 it differs from where you measure it. If you measure it from the central part then its 1.5 and from the margin approximately 2mm.

\* The desired pulpal depth should be 0.1-0.2mm into the dentine. Why do I have to reach the dentine ? because the caries spread laterally in the amelodentinal junction so we have to expose it (the junction) to see if there are any caries spread-in laterally.

\*Extension into the marginal ridge (MR): as we said, you keep the bur parallel to the long access of the tooth and you are approximating the MR, if you find yourself getting too close to the MR, you start tilting the bur (slightly) at an angle not to exceed 10◦ .why? to preserve the M.R and the dentine support of the MR and the rest of the cavity will provide retention for the restoration.

-For premolars, the distance from the margin of such an extension to the proximal surface must not be less than 1.6 mm (or the width of two burs), for molars it should be about 2 mm (not less than 2 mm).

NOTE: after we prepare the cavity, the mesial or distal walls (surfaces) of the cavity which are close to the mesial and distal marginal ridges, could be converging occlusally if the cavity is minimal, could be parallel to the long access of the tooth, or could be slightly divergent, depending on how far the cavity is extending. Just when we are getting too close to the marginal ridge, we make them slightly divergent.

\* The size and extension (dimensions) is always according to the case that we have.

After the punch cut at the distal pit we move bucally and lingually like we mentioned before (to include the radiating fissures) maintaining the bur's depth and orientation, parallel to the long access of the tooth (maintaining the alignment) and you start moving your bur towards the mesial. Pay attention that always the fissure must be at the center of the bur we are using which means that the lingual side must equal the buccal side.

\*the high-speed handpiece has a speed of 300,000 RPM (revolution per minute) or more. Also, the cutting bur is made of tungsten carbide or diamond (the most efficient cutting materials). So, because of that we should maintain the intermittent pressure (light pressure) throughout the cutting.

So, we move from distal to mesial maintaining the same depth and the same orientation except the large teeth like the molars because the occlusal morphology varies so you can follow the pattern of the occlusal morphology (go up and down) to maintain a uniform depth.

\*Minimal facio-lingual extension of the cavity (width), it is a very important feature.

\*The most common mistake is starting with a shallow cavity then going back and forth to try to make it deeper you end up making it deeper but at the same time wider. Try to go through the cavity preparation once and only once.

**\*An ideal enamel margin : our purpose is to reach an ideal enamel (cavity) margin; a margin that is formed of full-length enamel prisms with partial length enamel prisms supported by dentine. We don't want unsupported enamel margins; we don't mind how much are the partial-length enamel rods or how much the full-length are, provided that both are supported by dentine.**

**\***The conservative class 1 should have an outline formed with gently flowing curves (no sharp edges) and it should have a facio-lingual width of 1.5 mm and a length (depth) of 1.5-2 mm.

\*The pulpal floor -depending on the enamel thickness- is usually in DENTINE.

\*Although, we should keep the conservation of the tooth structure, this is the main principal, but we have another form that we have to consider, the convenience form, sometimes we have to cut extra part of the tooth to gain access to caries that are spreading laterally at the amelodentinal junction, so you have to extend the cavity to give you accessibility and visibility to this caries.

To sum it up,

-We talked about the initial cavity preparation, we make sure that all caries are removed initially.

-The preparation is to the amelodentinal junction.

-**The pulpal floor should be remain at an ideal depth even if the restorative material or caries remain, which means in the initial cavity preparation, don't go deeper than the required depth even if there was caries, after you finish your initial cavity preparation then you modify your cavity to include any caries.**

-Resistance form is provided by sufficient areas of relatively flat pulpal floor in sound tooth structure.

-Minimal extension of the external walls not to weaken the tooth.

-Strong ideal enamel margins.

-Sufficient depth to resorb in a liquid thickness of the restoration.

-Retention form is provided by the occlusal convergence of all or part of the cavity walls.

-The final cavity preparation:

\*we remove the deep caries.

\*enlarge the cavity to expose the deep caries.

\*we do pulp protection (we will discuss it later).

\*you do procedure for the finishing of the external walls, for example: manual hand instruments to finish the external walls.

\*final procedure you clean and inspect.

-There are modifications for the class 1 preparation, for example:

 1. Class 1 with palatal extension.

 2. Class 1 with buccal extension

3.Class 1 on anterior teeth.

You can read these on your own.

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