**fissure sealant**: It is a material placed in the pits and fissures of the tooth in order to prevent or arrest the development of caries.

So the fissure sealant will be placed in the fissure and it will block its anatomy; because as you know fissures are prone to the caries due to the fact that they act as shelters for the microflora and the bacteria that is found in the oral cavity, so these organisms will get trapped away from the OH and self cleansing measures in the saliva, and will start accumulating, starting the development of caries in the presence of sugars and fermentation process.

🡪 **So the idea if fissure sealant** is to change the anatomy to prevent the accumulation of the bacteria that cause caries.

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**History of fissure sealant**:

-It started in **1955** with M.G. Buonocore describing the method of enamel etching and bonding, then the dentists started thinking of sealant application.

-In 1956 Bowen developed resin sealant.

-And from the 1990s till now, there are ongoing discoveries for more types of sealants included the GI.

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**Types of sealants**:

1. Resin based sealant "conventional sealant" 🡪 appeared at the same time the itching-bonding process was introduced.

 2- Glass Ionomer sealant 🡪 More recent.

\*Note: in general, mentioning the fissure sealant means the conventional type.

**Resin Based sealant:**

-They are composed of Bis-GMA " bis phenol A" and Bis -Methacrylate.

Resin composed of cross-linked MMA, more or less it is an unfilled composite.

 -Mainly; it prevents the caries by the **mechanical means,** while other types "GI" do that by other means "chemical ones".

-The polymerization could be initiated either: chemically "Autocure" or by light "Light cured".

-This sealant could be either :
1) ***Clear*** :

 this type has multiple advantages; you can see the recurrent caries and can spread it more easily due to its decreased viscosity when compared to other types".

2) ***Opaque*** : "the one used in our clinics";

 it has some advantages; mainly you can see it so you can know if you sealed the whole fissure or not, while its main disadvantage is the inability to see the recurrent caries.

\* Both types have the same applications.

-Properties of Resin-Based sealants:

Physical ones:
1/ Inert, non toxic.
2/ Low viscosity.
3/ ----- Strength.

Clinical ones:
1/ Long shelf life.
2/ easy to handle and apply.
3/ long working time.
4/ Short setting time; as long as its the long cured one.

**GI sealant:**

-It is recommended for erupting at high-decay-risk teeth, those teeth are hard to be isolated so the use of the GI is easier.

E.g: distal aspect of 6 covered partially with operculum.

-GI since its easier to be applied; it is indicated also for high-decay-risk **fully erupted** teeth , when the cooperation of the child is compromised.

**-Advantages:**

1) Binds to enamel without acid etching, so it is less moisture sensitive, but you have to know that isolation is a must, do not apply it in a moist area.

2) Provides acceptable caries prevention; the ability of fluoride releasing has a major role in this process by remineralizing the tooth structure.

3) This sealant is rechargeable, which means that when the child brushes his teeth using a fluoridated toothpaste the sealant will absorb th fluoride and release later on.

-**Disadvantages:**

🡪 less retention than resin based sealant; when they compared them together they found that resin based sealants retains more in the oral cavity and this due to the fact that GI binds chemically to enamel, while the resin based one binds through micro-mechanical means.

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**Why do we seal ?**

The indications:
it is important to seal due to the fact that the pits and fissures form 12.5% of the total tooth surface area, and as you know 80-90% of caries occur there "in pits and fissures".

So the idea is to seal these small areas that have high the highest percentage of caries, protecting the whole large surface area of the tooth.

 \*\*Extra Notes:

In permanent teeth; pits and fissures account for 80-90% of the caries while in the primary ones they account for only 44% of caries and the rest 56% occur in the interproximal surfaces; due to the facts that they are wide and broad, and the pits and fissures are shallow in the primary teeth.

Pits and fissures benefit less from the fluoride applications than that of being sealed, due to the fact that the enamel thickness is very low there.

-You have to know that sealants should be part of the whole preventive measures including :
1) Patient education
2) Effective Oral hygiene practices.
3) Regular load of fluoride.
4) Regular dental visits.

You should never consider Sealants without these factors, especially if you want to guarantee the best for your patient.

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**Who do we seal?**The decision to apply fissure sealant should depend in base of:
1- clinical examination.

2- Supported by Rx.

1. Account the risk factors.

**Risk factors**: the key factor and the most important factor of determining the caries risk of the pt.:

1. The caries experience of the pt :
if the pt. already have caries in his mouth, our consider this pt ah high risk patient
2. Fluoride: 13:04
* Dose the pt live in fluoridated area
* Does the pt. use fluoridated tooth paste
so when the pt. is not exposed to supplement amount of tooth paste, so I have to consider this pt high risk for developing decay.
1. Fissure anatomy: if the fissure is too deep then this pt is at high risk of developing caries in comparison to pt with shallower fissure.
2. Oral hygiene: if the patient has plaque index of 2 or 3 then this patient is at high risk of developing caries.

So when you assess these factors and take them into consideration, you can determine the risk of this patient to develop caries and if the patient is at risk you have to seal.

Patient selection: which patient we have to apply fissure sealant:

1. Patient with dental decay; either history of dental decay-for example the pt has multiple fillings - or active decay.

Extra notes: in partially erupted teeth we can't isolate the tooth and apply fissures sealant, instead, we put G.I fissure sealant and when it’s fully erupted we change it to resin bases sealant.

1. Patient that don’t have dental decay; but they are at high risk of developing decay.

Ex: such as patient has all factors that might develop caries; their habit, high sugar intake, signs of erosion due to high intake of lemon juice, so he is at high risk of developing caries.

1. Medically compromised patents; such as patient with special needs, cardiac problem or diabetic patient.
* Sealant used must be paste of permanent tooth and surfaces of risk.
* Caries risk may changed at any time of life of the patient, in the past, they used to said that sealant should be placed only within 3 years of eruption; due to the e fact that in 1st 3 years of eruption the tooth is at high risk because enamel is not mature enough. But this doesn’t mean that sealent mustn’t be applied later in patient life.

Example: 7 years old child attend to your clinic and his oral hygiene is perfect, diet is perfect and there is no risk of decay, so you decided not to seal. Few years later when he is 14 years old, he return to your clinic because he is a regular dental attender, and he is know having juvenile idiopathic arthritis, so know he is taking NSAIDs and other medications, and as you know most of these medications are sugar based; so the patient caries risk has been changed. So in this case you have to seal the 6s.

* So in conclusion; sealant placement can be used within years of eruptions but it's not only in the first 3 years of eruption and this depends on the risk of the patient and how the medical condition at this patient changed.

**Do you have to seal primary teeth?**

* Many primary teeth may be judged at risk.
* In the past they said that primary tooth enamel doesn't etched well; so it doesn't bond properly so we shouldn't use it on primary teeth.
* After a time, clinical studies reporting that success of fissure sealant on primary molars are rare, some of them gives us success rate but some are not.
* But in these case we have to look to the study itself, does the clinician who applies a sealant are skilled enough to deal with children? Also the cooperation and isolation is critical as well. Because the failure of fissure sealant might not due to the fact that the primary molars don’t etched well, it may be due to poor isolation or the patient cooperation is no ideal.
* So this idea is wrong because in vitro experiments approved that enamel is etched well and the failure of fissure sealant due other cause not that one.
* Also you have to look far primary tooth anatomy; if the E doesn't have grooves on its occlusal surface then we don’t have to put the fissure sealant.

So we have to seal the primary teeth in the patients who have a high risk of developing caries.

-To decide whether to seal the primary tooth or not, there’s many factors that you have to consider:

1. Age of the patient, in 9 years old patient the surface of the E will be eroded so why to put a seal!
2. Caries risk
3. Fissure anatomy

**Are fissure sealant effective or not?**

-Sealant placed on occlusal surface of permanent teeth in adolescence reduce caries up to 48 months when compared to none sealed teeth of this according to koklers review in 2013.

So they are definitely effective of reduce caries risk.

* Other studies incorporate recall of maintenance have reported sealant success level of 80-90 s after 10 yr.

**How can we improved fissure sealant? Or what are the factors that generate the success of fissure sealant?**

1. Proper isolation, using either rubber dam or cotton rolls , or 4 handed dentistry
2. Tooth cleaning ; because cleaning removes all plaque remnant from fissures
3. In the past the said that we have to do enamel plasty by using very small fissure bur of prepare all fissures of then to apply fissure sealant. but later on the decided that this doesn't increase the retention , but it’s increase the determinantal effect if the fissure sealant goes away ; because we will have cavitated tooth structure of by that we will the risk of developing decay ; so this is No more recommended .

**Methods of increase the retention of sealant of ease its applications:**

1. The want to create florid releasing sealant ; creating dual effect for prevention
2. physical ; by blocking the fissure
3. by fluoride release

till know there is NO evidence approved that the resin based sealant that release fluoride will prevents caries ,so the presence of fluoride doesn't alter the prevention rate of sealant.

1. Incorporation of a layer of bonding agent between the itched enamel and resin sealant, because they believe that by doing this we will increase the retention. You know that the bonding agent is hydrophilic and when we place it between the hydrophilic enamel and hydrophobic sealant the retention will be much better. disadvantage of this, is that it will increase the working time, so you have to weigh the increase of retention over increase the working time.
2. Self-itching adhesive: 3 in 1 system; this will decrease the working time, but until now; no clinical evidence approved that this method is better

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**Enamel Caries:**sometimes it’s very difficult to determine if there is a discoloration or caries. So you have to look in general, which means you have to look at the tooth as a part of the pt. and as a part of the whole dentition.

So if the other teeth were not stained for example and the oral hygiene is good, so most probably it’s not caries, and to improve that you might take a BW radiograph because this will show any caries in dentine.

**Note**:

**any caries extended to the dentine should not be seated, but enamel caries might be sealed and its better even to seal enamel caries.** That’s due to the fact that enamel is not a vital tissue so as long as the bacteria present in the enamel and it can’t gain nutrient from the environment and you seal it tightly then then you will get rid of these bacteria.

But if I sealed the dentinal caries, although I block the outward comes of nutrient, the pulp and dentine contain nutrients and the bacteria can survive and extend so the decay will grow under the sealant.

So any fissure sealant just to be limited to enamel if it was therapeutic? 29:7

* Low specificity and sensitivity of diagnosis of caries: **sensitivity** to correctly diagnose caries lesion as caries and **specificity** to correctly diagnose caries lesion as Non-carious lesion. So diagnostic method of caries is low, and this lead to over or under diagnosis.
* Judgment should be based on caries risk level of population; sometimes the under diagnosis is better than over diagnosis, but sometimes the opposite is better.

For example: population with poor oral hygiene, non-fluoridated area and non-educated, so in this case; it’s better to over diagnose them. On the other hand if the population have good oral hygiene, high awareness, fluoridated water and good dental attender then it’s better to under diagnose them.

The end

Sorry for any mistake ☺ good luck