

## Preventive Dentistry

### Pit and fissure sealants

#### Lec.12

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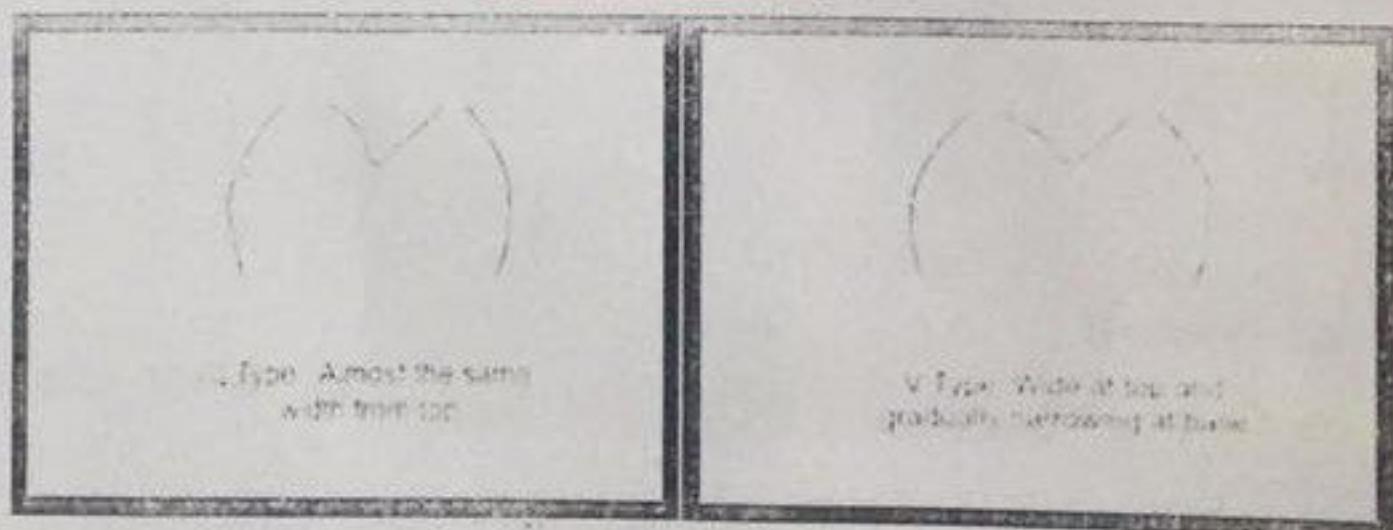
A pit and fissure sealant is an organic polymer (resin) that flows in to the pit and fissures and bonds to the enamel surface by mechanical or chemical retention.

The occlusal surfaces constitute only around 12% of all the surfaces in the mouth, and yet they often account for 80%–90% of all the decay in younger populations. Although reduction of occlusal caries has occurred over the last decades, the proportion of occlusal decay has increased, mainly due to increased use of fluoride. The pit and fissure system has been proportionally less affected by the caries preventive effect of fluoride than approximal or smooth surfaces. The pit and fissure system is usually the first site on the erupting tooth to be subject to caries, often because of lack of hygiene during the eruption period. Although the caries status of the erupting teeth can be affected, it takes a vigorous program of hygiene instruction, coupled with application of fluorides, to keep those teeth free of decay. Initial active lesions detected during the eruption period often revert to a status of inactivity once the teeth have reached full occlusion.

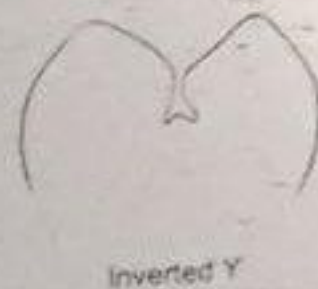
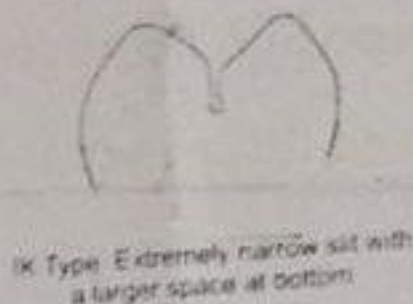
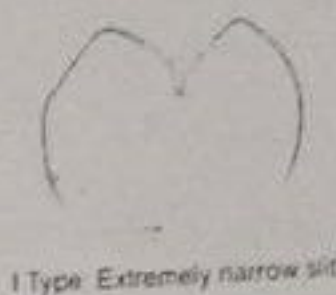
#### Classification

The fissures are developmental grooves, mainly in the occlusal surfaces of the teeth. They are considered to be faults which arose during development of the cuspal enamel, caused by the failure of the enamel lobes to coalesce perfectly during the formative stages, with their location based on the developmental lobes of the tooth formation. Although most common found in molar teeth, the premolars have such grooves too. Also for palatal surfaces of upper anterior teeth, pits and fissures might be found.

Nagano (1960) in study of crown sections classified occlusal fissure into five types on the basis of fissure morphology: V, U, Y, I, K types.







## Purpose of sealant

1. To provide physical barrier to seal off the pit or fissure.
2. To prevent the bacteria and their nutrients from collecting within the pits or fissures to create the acid environment necessary for the initiation of dental caries.

## Criteria for the ideal sealant

1. A viscosity allowing penetration into deep pits and fissures even in maxillary teeth.
2. Adequate working time.
3. Rapid cure.
4. Good and prolonged adhesion/bonding to enamel
5. Low sorption and solubility.
6. Resistance to wear.
7. Be compatible with the oral tissues (minimum to tissues).
8. Cariostatic action.

## Types of Sealants

### A. Based on generation

1. Generation 1 Sealant (photocured via UV light).
2. Generation 2 Sealant (auto or chemically-cured).
3. Generation 3 Sealant (photocured via visible light).

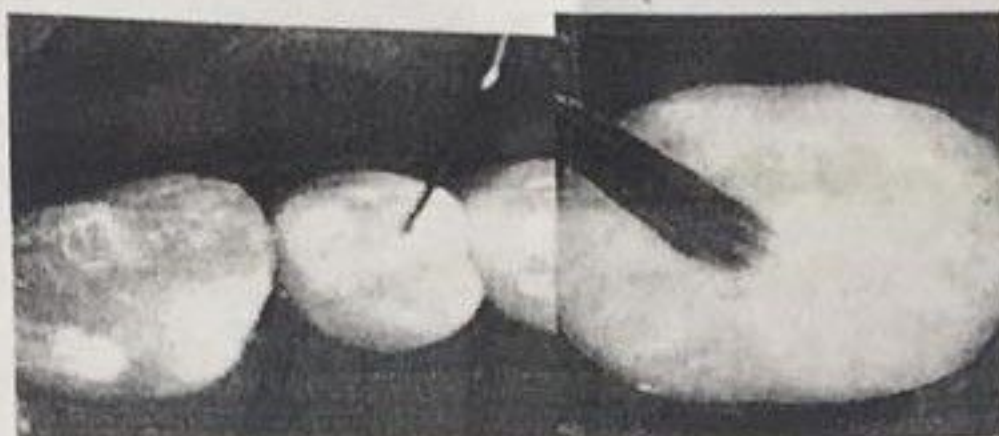
### B. Based on fillers

1. Unfilled.
2. Filled sealant.  
Fillers: glass and quartz particles.
3. Fluoride -Releasing.

### C. Based on Color Helps in quick identification for equation during maintenance assessment:

1. Clear: Esthetic but difficult to detect in follow up.
2. Tinted/opaque sealant: easy to detect.





### Factors affecting Development of Occlusal Caries:

It is strongly correlated to:

**1-Morphology:** Caries may not affect all fissures in same intensity but may be localized in occurrence.

Extreme risk fissure with irregularity may successfully maintained caries free without fissure sealant, by good oral hygiene and daily use of fluoridated toothpaste. Fewer than 10% of fissures are atypically flask shaped, with a narrow neck and a bulbous base: The carious lesion can start at the entrance as well as at the base of the fissure. These fissures should be regarded as at risk. Fortunately, from a diagnostic point of view, there is a strong correlation between steep cuspal inclination and such sticky risk fissures.

### 2- Eruption stage

This explains why almost all molar occlusal caries is initiated during the extremely long eruption period (12 to 18 months) and why occlusal caries is uncommon in premolars, with an eruption time of only 1 to 2 months. This was confirmed in a 2.5-year longitudinal study by Mansson (1977), who examined first molars every 3 months from the start of eruption and found that development of caries occurred, on average, within 11 months of the start of eruption, i.e, during eruption (most had decayed within 3 to 9 months). On the other hand, there was virtually no further initiation of occlusal caries beginning 15 months after the start of eruption.



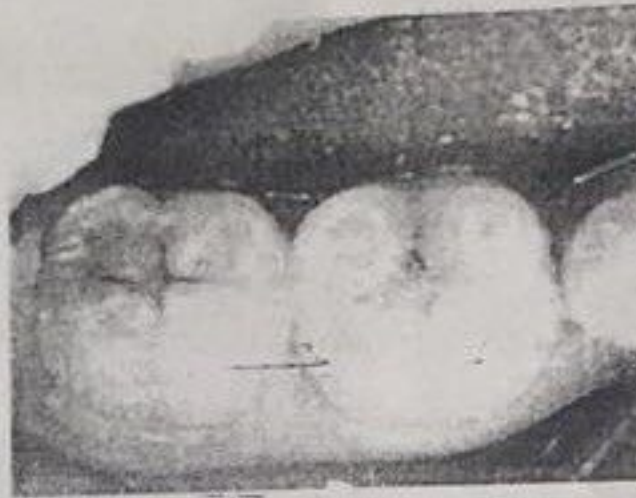
Monitoring for and measures to prevent the development of occlusal caries should be intensified during the eruption period (high-risk period). If the teeth have erupted into



natural chewing function without developing occlusal caries, then the risk is over; examinations can be more cursory and less frequent.

### 3- Functional wear of occlusal surfaces:

Bruxism is one of the most prevalent, complex, and destructive dental functional disorders.



### History

1-In 1895, Wilson reported the placement of cement in pits and fissures to prevent caries.

2-Bodecker in 1929 suggested that deep fissures could be broadened with a large round bur a procedure that is called enameloplasty.

3-In 1923 and again in 1936, Hyatt advocated the early insertion of small restoration in deep P. and F. before carious lesions had the opportunity to develop. He termed this procedure "prophylactic odontotomy". Again, this operation is more of a treatment procedure than a preventive approach because it requires the cutting of tooth structure.

4-In the late 1960s and early 1970, an other option become available – the use of pit and fissure sealants. With this option, a liquid plastic is flowed over the occlusal surface of the tooth where it penetrates the deep fissures to fill areas that cannot be cleaned with the toothbrush.

5-Several methods have unsuccessfully used in an attempt either to seal or to make the fissure have more resistant to caries. These attempts have included the use of topically applied e.g. zinc chloride, The use of ammoniacal silver nitrate, The use of copper amalgam packed into the fissures.

### Background on sealants

Three different kinds of plastics have been used as occlusal sealants:

- 1- Polyurethanes.
- 2- Cyanoacrylates.
- 3- Bisphenol A- glycidyl- methyl-acrylate (Bis -GMA).