Pit and fissure sealants
INTRODUCTION

• Occlusal surface -- 12.5% OF TOTAL tooth SURFACES

• NEARLY FOR 80% OF CARIES ATTACK.

• PF caries 8 times > smooth surface caries
1905- Miller – application of silver nitrate

1923- Hyatt “PROPHYLACTIC ODONTOTOMY”

1929- Bodecker – fissure eradication enameloplasty.

1955- Buonocore – use of concentrated phosphoric acid

1962- Bowen-BIS-GMA
Definitions

- **PIT**: A small pin point depression located at the junction of developmental grooves or at terminals of those grooves.

- **FISSURE**: Fissure is a deep, very narrow channel, cleft, ditch or crevice which may be sometimes deep. It is formed at the depth of developmental grooves during the development of the tooth (or) Deep clefts between adjoining cusps.
Pit and Fissure Sealant

A material that is introduced into the occlusal pit and fissure of caries susceptible teeth, thus forming a micromechanically–bonded, protective layer cutting access of caries producing bacteria from their source of nutrients.
• Classification
1. BASED ON GENERATION –

A. First generation sealants:
   - UV-light at a wavelength 356 nm.
   - Incomplete polymerization of sealant at its depth.
   - Damage to retina.

B. Second generation Sealants/Self-curing resins
   - Based on catalyst – accelerator system
   - Most are unfilled.
   - May be transparent, tinted or opaque

MITCHELL AND GORDON (1990)
C. Third generation sealants:

- Visible light at wavelength 430 nm-490nm.
- Filled or unfilled, and with or without tint or opaquer.
- Most of the unfilled resins are colored white.
- Filled resins are either clear, yellowish white or tan

D. Fourth generation sealants: fluorides

Helioseal-F, Delton plus, Ultra Xseal, Fluoro-shield
2. Based on filler content

A. Unfilled [ free of fillers ]
   - Flow is better
   - Retention is more
   - Abrade rapidly

B. Filled
   - Need for occlusal adjustments
   - More resistant to wear
3. Based on colour

A. CLEAR
   - Esthetic, but difficult to detect at recall examination.
   - More easily appreciated by the patient.

B. TINTED /
   - Can be easily identified
   - Easy to see during placement
   - Easy to see during recall check up

C. OPAQUE
   Can be easily identified

D. Pink
   - Better fluoride release
MATERIALS USED AS PIT AND FISSION SEALANT
1. CYANOACRYLATES:

- Disadvantages:
  - Bond to unetched enamel is poor
  - Material sticks to skin
  - Mechanical durability poor
  - Biodegradable
  - Hydrolysis of cyanoacrylates to toxic materials

- Recent cyanoacrylates – butyl and isobutyl esters

- Cyanoacrylates with fluoride – also available
2. POLYURETHANES:

- Adhesion to enamel is not satisfactory
- Disadvantages:
  - Poor mechanical properties
  - Low oral durability (2-3 months).

3. BOWEN 1972: BIS-GMA

- Addition of BIS-PHENOL A and GLYCIDYL METHACRYLATE (BIS-GMA)

- In 1972, Nuva-Seal
- Hydroxyl group in BIS-GMA is responsible for viscosity
- The fillers make the sealant more resistant to abrasion
4, GIC, RMGIC
5, FLOWABLE COMP
6, FLOW COMPOMERS
WHY PIT AND FISSURES ARE MORE PRONE TO DC?
why pit and fissures are more prone to DC?

• MORPHOLOGY

• Niche for microorganism

• Inaccessible (brush & saliva)

• Thickness of enamel

• Less effectiveness of fluoride

• Salivary pellicle (newly erupted teeth)

• More porous enamel (newly erupted teeth)
Two main types of pits and fissures are usually described

1) Shallow, wide V-shaped fissures - self-cleansing and **Caries Resistant**

2) Deep, narrow I-shaped fissures - constricted and resemble a bottle neck. May have different branches - **Caries Susceptible**
Types of fissures

NANGO, 1960: FIVE TYPES.

V – TYPE
34%

U – TYPE
14%
Types of fissures

K – TYPE
26%, hourglass

INVERTED Y – TYPE
7%

I – TYPE
16%
How do sealants work???

- Keep substrates out of pits, fissures and grooves.
- Create an anaerobic environment.
CLINICAL GUIDELINES FOR APPLICATION OF pIT AND FISSURE SEALANT
• REQUIREMENTS

- Non-toxic and non irritating.
- Adhere to the tooth.
- The consistency and viscosity.
- Mechanical, Compressive and Tensile properties.
- Resistance.
- Able to be seen.
- Low solubility in oral fluids.
- Cariostatic action.
3-4yrs : Primary molar sealant application.
6-7yrs : First permanent molar.
11-13yrs : Second permanent molars and the premolar.

Simonsen 1983.

Group 1 – Caries free patients judged at no risk to decay.
Group 2 – Patients judged to be at moderate risk to decay.
Group 3 – Patients with rampant caries at a high risk to decay.

Sealing of teeth in group 2 patients is done but not in group 1 and 3.
• ADVANTAGES

- Non invasive technique.

- Fluoridated sealants.

- Used at the community level.
Lack of universal usage.

Inadvertent placement.

Technique sensitive.

Economic unfeasibility.
•TECHNIQUE

• PROPHYLAXIS
• ISOLATION
• ETCHING
• WASHING AND DRYING
  • APPLICATION
  • EVALUATION
  • ADJUSTMENT
  • REEVALUATION
PROPHYLAXIS

- Pumice and water.

- By patient (dry brush).

- Use of explorer.

- H₂O₂

- Prophy-Jet: air polishing system.
  (sod-bicarbonate instead of aluminium oxide)

- *widening of the fissures with rotary instrumentation* (Garcia-Godoy, Simonsen & Tandon.s)
ISOLATION

Critical to sealant application

Cotton rolls

Rubber dam
ETCHING

- Small sponge, cotton pellet or brush.
- Etchant – liquid, gel or semi-gel form.
- “SKIPPING EFFECT” - USE OF GEL ETCHANT.
- Technique of application: continuous but gentle dabbing or agitation of sol on enamel surface.
WHAT IS THE ETCHING TIME ???

IADR sealant symposium in 1991
Primary – 30 sec.
Permanent – 20 sec.

WHY IS PROLONGED ETCHING TIME NECESSARY FOR PRIMARY TEETH ???

1) Less mineral and more organic material (silverstone 1976).
2) Larger internal pore volume.
3) More prismless enamel (Ripa et.al 1966).
4) The greater angle of prism rods at surface.
If contamination occurs . . . .

- If saliva contamination does occur – re-etching for 10 sec before washing once again

- If etched enamel is exposed to saliva for 1 to 60 sec – re-etching

- Minimal saliva exposure for less than 10 sec – immediate washing performed
WASHING AND DRYING

- Rinse ~ 10-20 sec and dried for ~ 10 sec.
- Water under pressure in air-water spray + high power evacuation.
- Evacuator tip placed above/adjacent the tooth and water directed to the tip.
APPLICATION

- Site of application.
- Etching time.
- Applied smoothly by slowly depressing the lever.
With an explorer - adequate bond strength is established.

The sealant should completely cover the occlusal surface.
ADJUSTMENT

- Unfilled sealants: No concern.

- Filled sealants: Adjusted with a green stone.

- Studies shown that sealant can be applied after Topical F1-, no change in bond strength.
REEEVALUATION ( RECALL )

- Every 6 months.
- Bitewing radiographs.
- If sealant is completely lost, the entire procedure is repeated.
Cost effectiveness of Sealants
• In terms of fees charged by dentists in a private practice, the average fee for a sealant has remained approximately 50% of the fee for a one-surface amalgam restoration.

• In public programs it has been shown that sealants can be very less expensive.
HENCE THE CONCEPT:
‘WHEN IN DOUBT SEAL RATHER THAN WHEN IN DOUBT FILL”
-BODECKER