DENTAL CARIES

DEFINITION

- Irreversible microbial disease of calcified tissue of teeth, characterised by demineralization of the inorganic portion and destruction of the organic substance of the tooth, which often leads to cavitations.

-Shafer’s Text Book of Oral Pathology

CLASSIFICATION

(1) Depending on nature of attack

(2) Depending on progression of caries

(3) Depending on surfaces involved

(4) Based on direction of attack

(5) Based on number of surfaces involved

(6) GV Black Classification based on treatment and restoration design

1. NATURE OF ATTACK

- **Primary Caries**

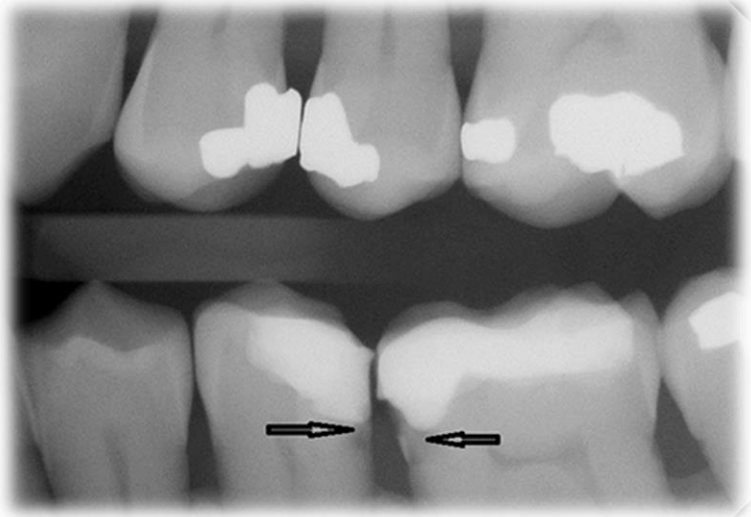
  ➢ Incipient

  - first attack on tooth surface

- **Secondary Caries**

  ➢ Recurrent

  - occurs on margins or walls of existing restorations



2. PROGRESSION OF CARIES

- **Acute**

  - rapidly invading process
  - involves several teeth
  - lesions are soft + light colored
  - usually pulp is involved at early stage

    -Rampant caries

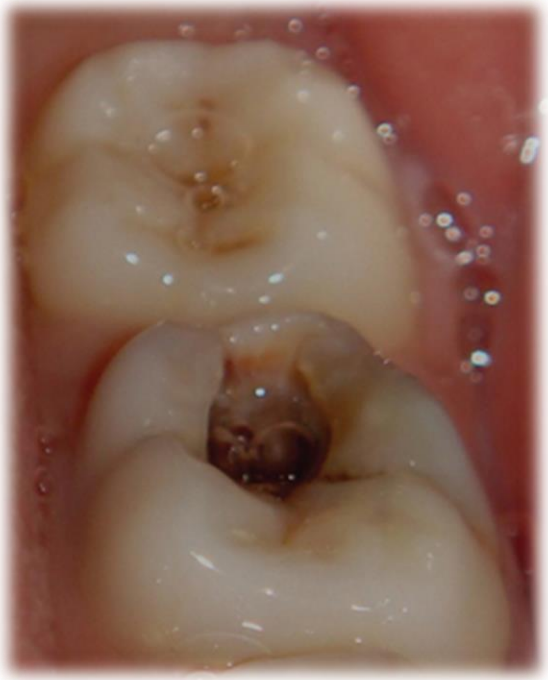
    -Nursing bottle caries

    -Radiation caries

2. PROGRESSION OF CARIES

- **Chronic**

  - lesions are long standing
  - fewer in number



3. SURFACES INVOLVED

- **Pit and Fissure caries**
  - Occlusal
  - Buccal or lingual pit
- **Smooth surface caries**
  - Proximal
  - Buccal or Lingual surface
- **Root caries**

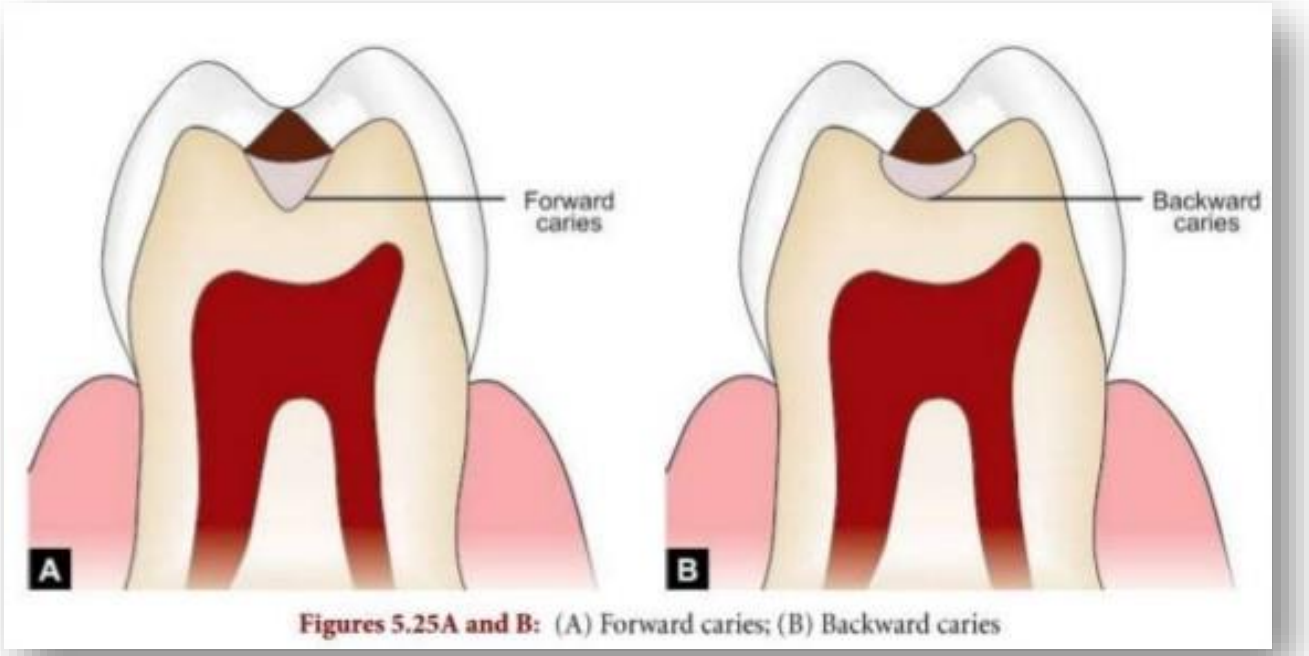
4. DIRECTION OF CARIES ATTACK

- **Forward Caries**

  - proceeds from enamel to dentin
  - lesion is triangle in shaped with base of triangle at enamel surface + apex towards dentin
  - in pits + fissures

- **Backward Caries**

  - proceeds from DEJ towards enamel surface
  - also triangle shaped with base at DEJ + apex towards enamel surface



Figures 5.25A and B: (A) Forward caries; (B) Backward caries

5. NUMBER OF SURFACES INVOLVED

- **Simple**
  - ➢ only one surface is involved by caries

- **Compound**
  - ➢ 2 surfaces are involved

- **Complex**
  - ➢ more than 2 surfaces involved

6. GV BLACK CLASSIFICATION

- **Class I**

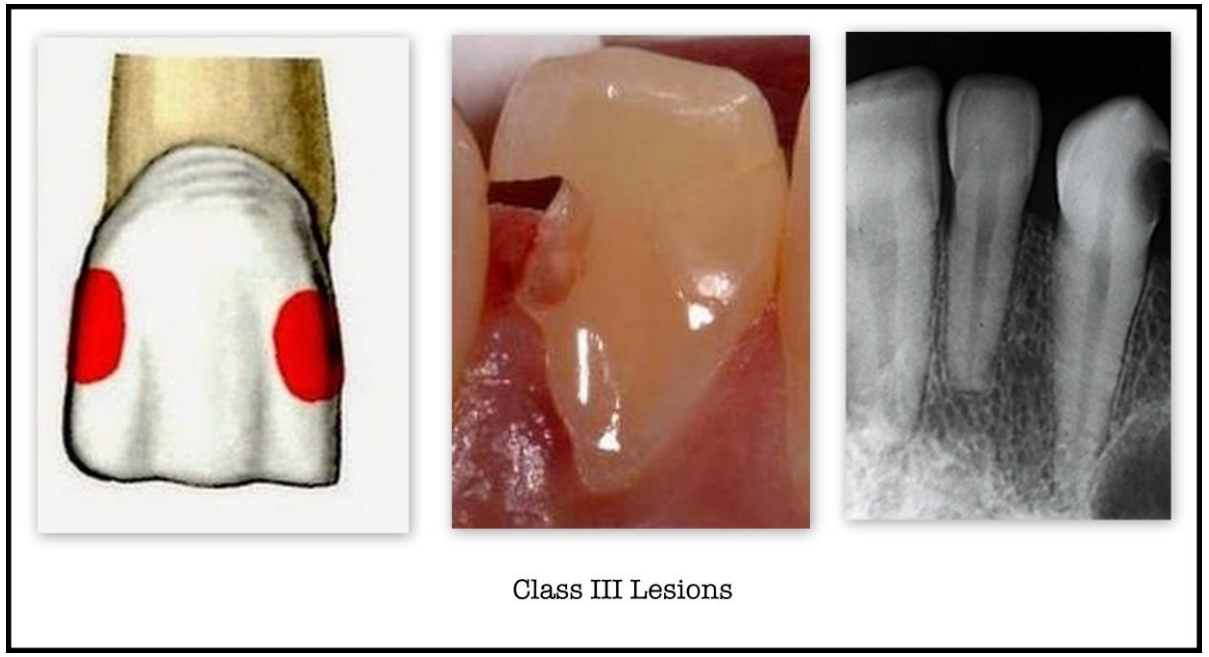
  - begin in pits, fissures + defective grooves
  - seen in occlusal surface
  - occlusal two-thirds of molars
  - lingual pits of incisors

- **Class II**

  - lesions seen on proximal aspects of molars + premolars

- **Class III**

  - lesions involving proximal aspects of incisors
  - do not involve or necessitate removal of incisal edge



- **Class IV**

  - lesions involving proximal aspects of incisors
  - involve or require removal of incisal edge

Class IV Lesions

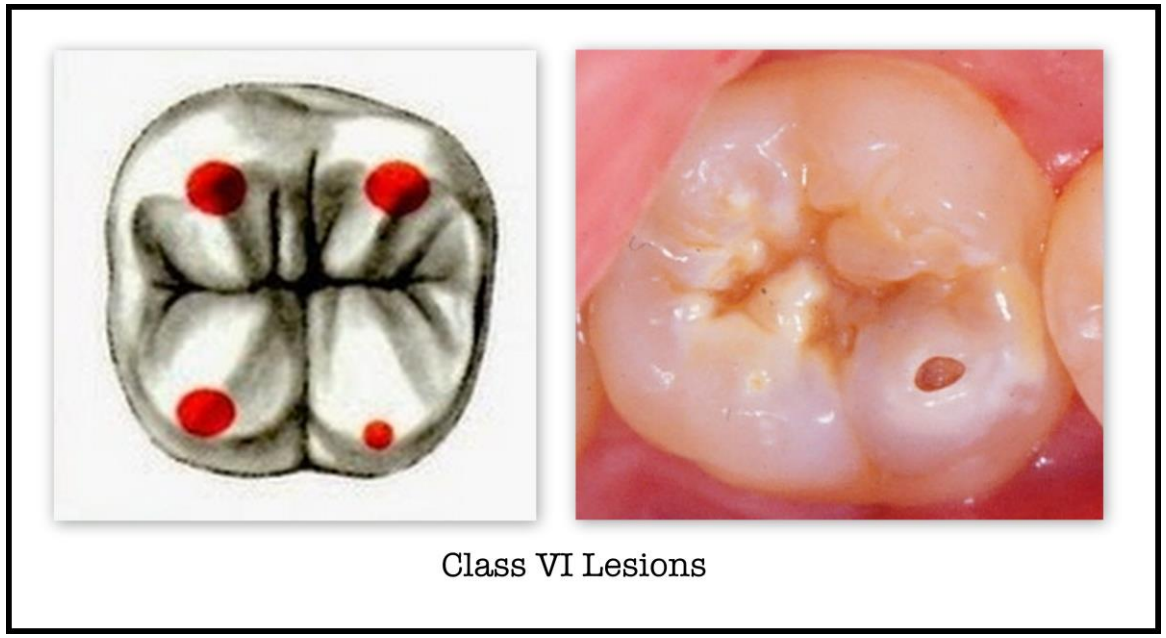
- **Class V**

  - lesions present on gingival third of all teeth

Class V Lesions

- **Class VI**

  - lesions found on incisal edges + cusp tips



ETIOLOGY OF DENTAL CARIES

- **Old Theories**

  - Exogenous Theories

    (1) Legend of worm
    (2) Chemical Theory
    (3) Parasitic or Septic Theory

- Endogenous Theories

  (1) Humoral Theory

  (2) Vital Theory

ETIOLOGY OF DENTAL CARIES

- **New Theories**

  (1) Acidogenic Theory

  (2) Proteolytic Theory

  (3) Proteolysis-chelation Theory

1. Acidogenic/Chemoparasitic Theory

- In 1890

  ➢ By WD Miller

  - dental decay is a chemoparasitic process consisting of 2 stages:

    - decalcification of enamel followed by gradual destruction of tooth structure.

- Following factors cause decay:

  (1) Role of carbohydrates

  (2) Role of microorganisms

  (3) Role of acids

  (4) Role of dental plaque

(1) Role of carbohydrates

- food substances act as substrate for microorganisms of dental plaque
- frequency of ingestion
  - taken repeatedly in between two major meals provides constant supply of carbohydrate to plaque bacteria for fermentation + production of acids

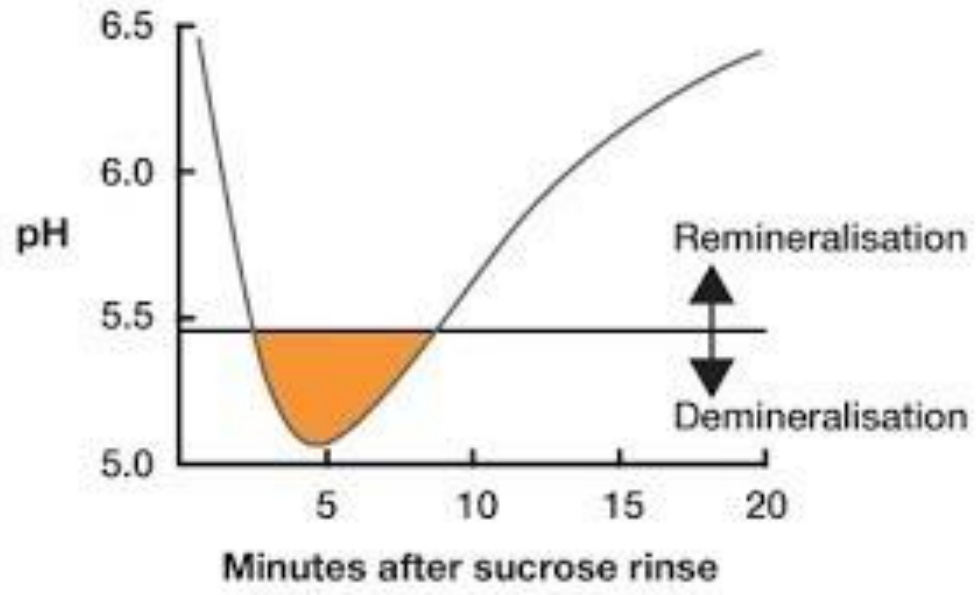
(2) Role of microorganisms

- caused by acid resulting from action of microorganisms on carbohydrates
- S. mutans has been proved for the initiation of caries

(3) Role of acids

- play most important role in pathogenesis of dental caries
- pH 5.5 is called critical pH
- below this pH demineralization of tooth substance begins

STEPHAN'S CURVE



2. Proteolytic Theory

- Proteolysis of the organic components of tooth as an initial process
- Proposed that enamel lamellae or rod sheath (proteins) may be lysed
- which means proteolysis as first event in further progression of bacterial invasion

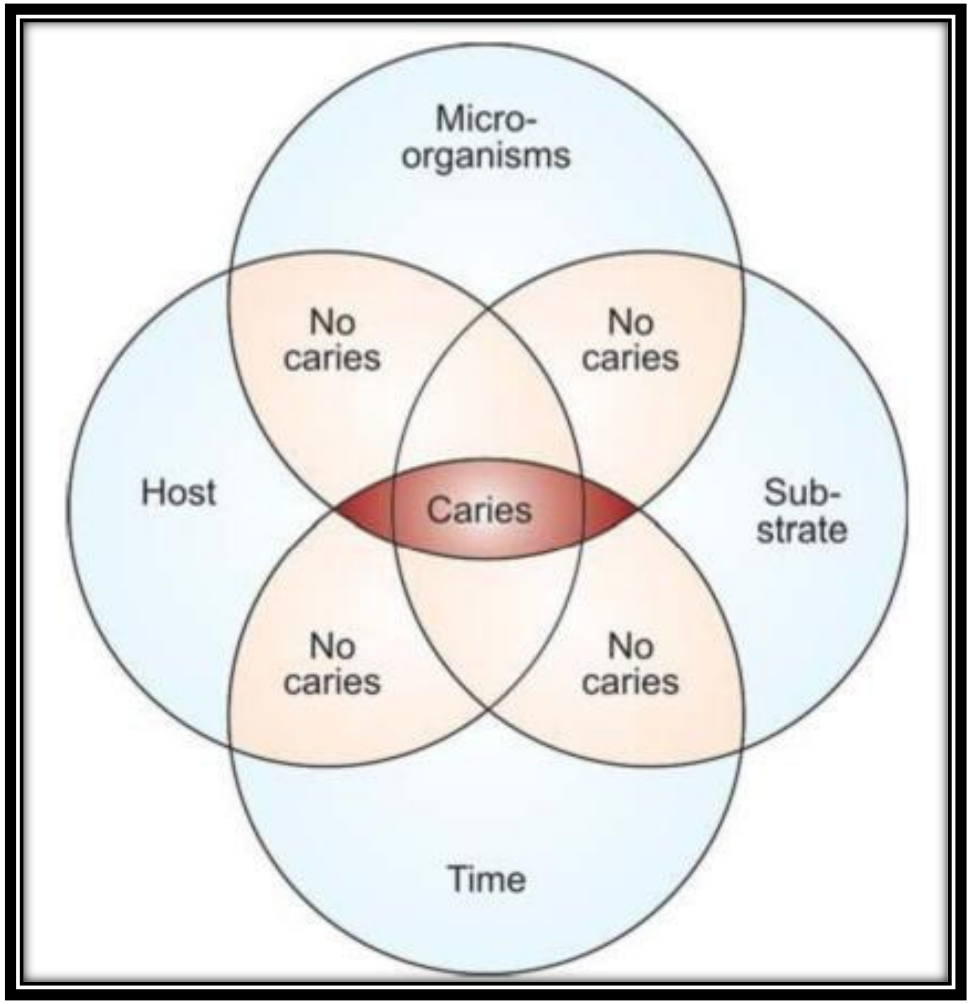
3. Proteolysis Chelation Theory

- suggests that caries is caused by simultaneous events of proteolysis + chelation

- proteolysis
  - destruction of organic portion of tooth by proteolytic microorganisms

- chelation
  - removal of calcium by forming soluble chelates

CARIES TETRALOGY (NEWBURN)



CARIOGRAM

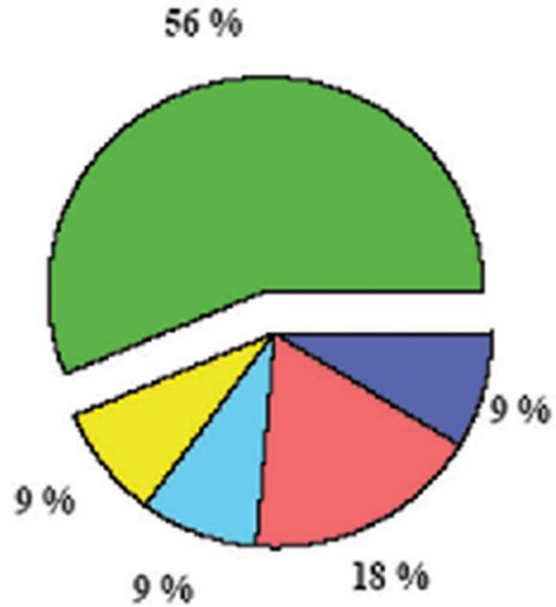
- **Douglas Bratthall** (1997) and workers at the dental school in Malmo have attempted to make the practical application of risk assessment more accessible by developing a computer-based caries risk assessment model called Cariogram.

- It identifies the caries risk factors for the individual and provides examples of preventive and treatment strategies to the clinician.

Cariogram

Name:
Ident.No.:
Date:
Examiner:

Country/area: Standard set
Group: Standard set



Actual chance to avoid new cavities	56 %
Diet	9 %
Bacteria	18 %
Susceptibility	9 %
Circumstances	9 %

Caries experience	3
Related diseases	0
Diet, contents	1
Diet, frequency	1
Plaque amount	2
Mutans streptococci	2
Fluoride program	2
Saliva secretion	0
Buffer capacity	0
Clin. judgement	1

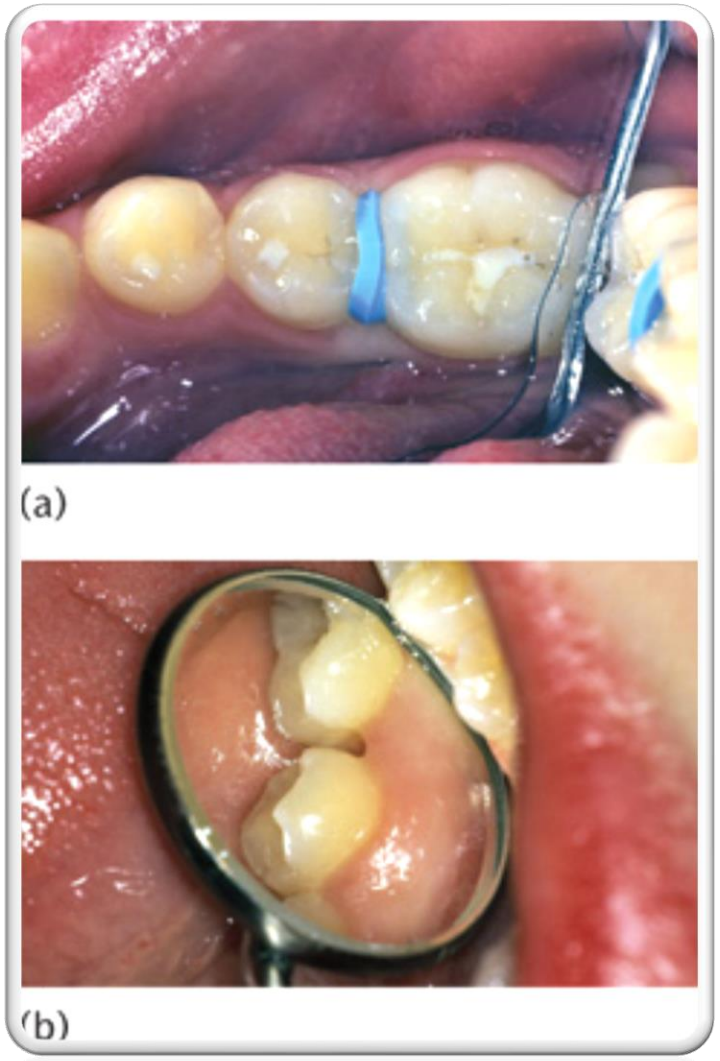
DIAGNOSIS OF CARIES

- Visual examination
- Tactile examination
- Radiographic examination
  - ➢Bitewing
  - ➢IOPA
  - ➢OPG
- Ultrasonics
- Dyes

❖VISUAL EXAMINATION

Aids in Visual diagnosis of Caries:

- ➢Magnification loupe
- ➢Temporary tooth separators

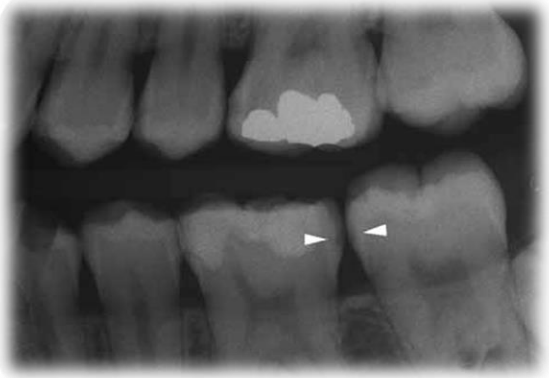


❖TACTILE EXAMINATION

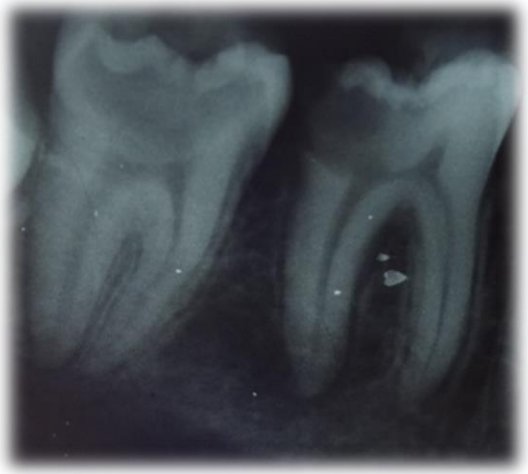
- Explorer and the Floss

❖RADIOGRAPHIC EXAMINATION

➢**Bitewing**



➢**IOPA**



➢ **OPG**

❖ULTRASONICS

- Use of sound waves for detection.

❖DYES

- Enamel caries (Calcein, Zyglo ZL-22)
- Dentin caries (Fuschin, Acid red system, 9-Aminoacridine)

RECENT ADVANCES IN CARIES DETECTION

❖FOTI (Fibre Optic Trans Illumination)

- PRINCIPLE: Different index of light transmission for decayed and sound teeth.

❖DIFOTI (Digitally Imaged FOTI)

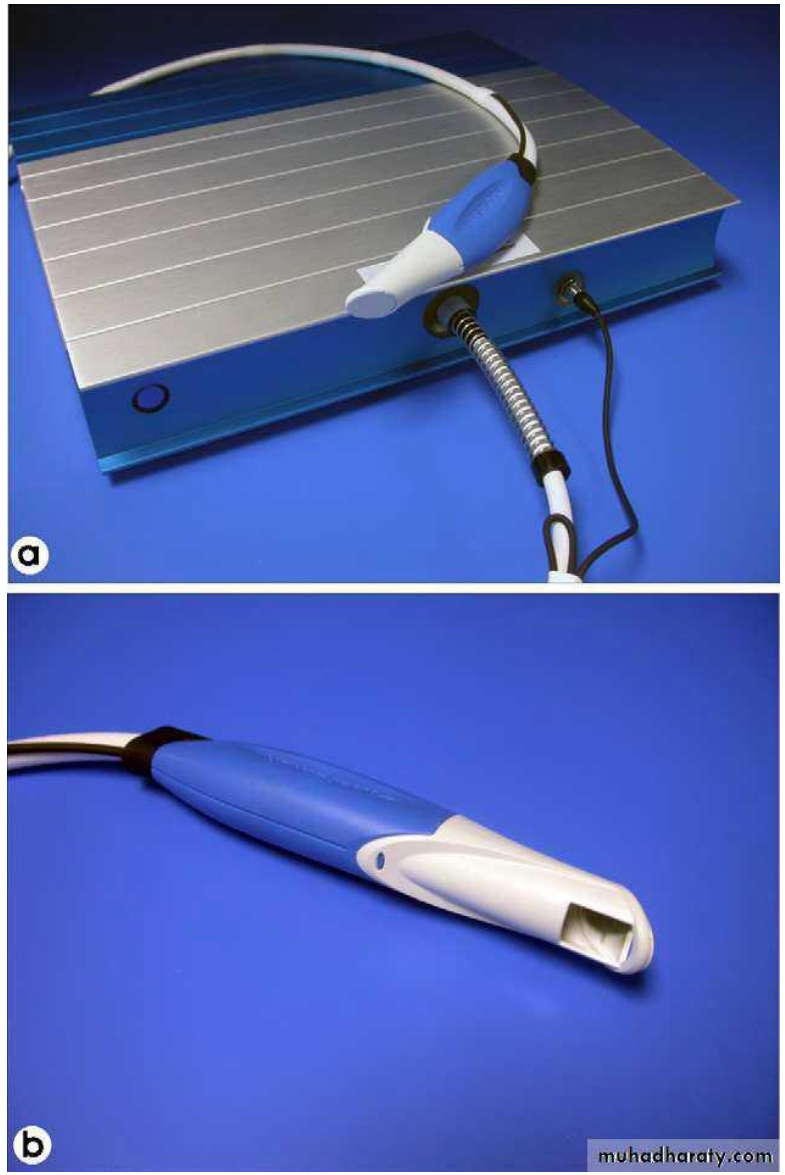
- digitized and computed version of the FOTI.

❖ Quantitative light-induced fluorescence

- Based on auto-fluorescence of teeth.
- When the teeth are illuminated with high intensity blue light, the resultant autofluorescence of enamel is detected by an intraoral camera which produces a fluorescent image.

Disadvantages

- it cannot differentiate between decay and hypoplasia
- has inability to detect or monitor interproximal lesions



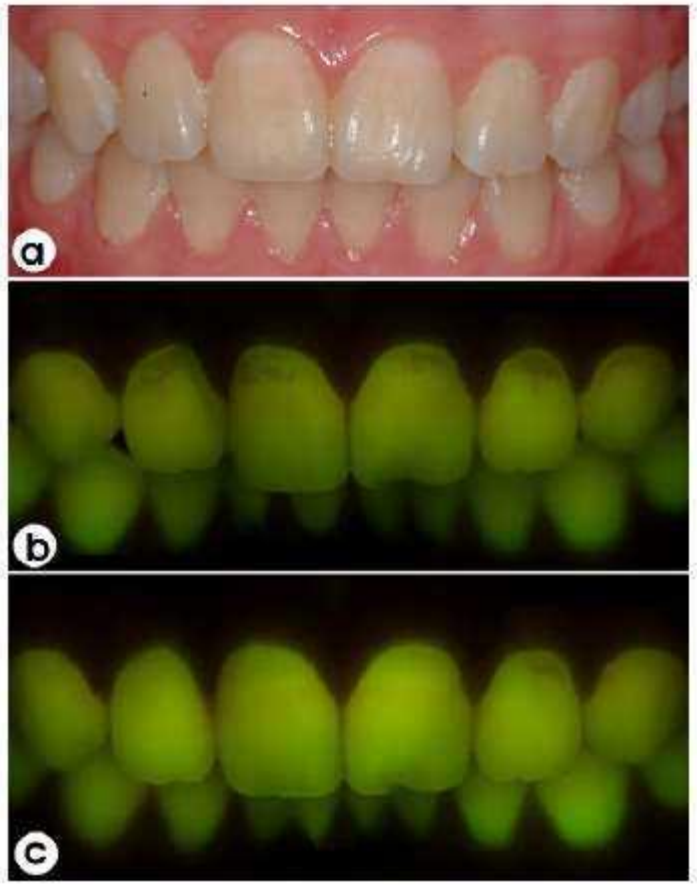


Fig. 14 – Example of QLF images. (a) White light image of early buccal caries effecting the maxillary teeth, (b) QLF image taken at the same time as (a), note the improved detection of lesions as a result of the increased contrast between sound and demineralised enamel, (c) 6 months after the institution of an oral hygiene programme, the lesions have resolved.

❖Laser fluorescence – DIAGNODent

- Unlike the QLF system, the DD does not produce an image of the tooth; instead it displays a numerical value on two LED displays.
- Could be used as an adjunct to visual inspection, and could be an alternative for radiography.

Signal reading	Inference
0-4	No caries, or histological caries limited to outer half of enamel
4.01-10	Histological caries extending beyond the outer half but confined to enamel
10.01-18	Histological dentinal caries limited to outer half of dentin
>18.01	Histological dentinal caries extending into inner half of dentin

❖DIAGNODent pen

- permits the assessment of both occlusal and proximal surfaces.

CARIES ACTIVITY TESTS

1. Lactobacillus colony count test

- Saliva is collected by chewing paraffin before breakfast
- The specimen is vigorously shaken and after that 0.1 cc of sample is withdrawn
- Dilute and undiluted samples are then spread evenly over agar plate
- The plate is incubated for 4 days & no. of lactobacillus colonies that developed are counted.

No of organisms	Symbolic designation	Degree of caries Activity suggested
1-1000	+	Little or none
Less than 10,000	+	Slight
Less than 1,00,000	++	Moderate
More than 1,000,000	+++/++++	Marked

2. Snyder test

- This test measures the ability of salivary microorganisms to form organic acid from a carbohydrate medium.

TIME	24hrs	48hrs	72hrs
Color	Yellow	Yellow	Yellow
Caries activity	Marked	Definite	Limited
Color	Green	Green	Green
Caries activity	Continue test	Continue test	Caries inactive

3. Alban’s test

- Alban modified the Snyder test to make it easier and for use in regular dental office.
- In this method lesser amount of agar is used.
- The agar is taken from the refrigerator but is not heated. To this saliva is added and incubated for 4days.
- Color observations are same as that of Snyder test

4. Swab test

- Advantage is no collection of saliva is necessary
- Valuable in evaluating caries activity in very young children
- Principle is same as Snyder test
- The oral flora is sampled by swabbing the buccal surface of tooth with cotton.

Interpretation :

- pH 4.1 and <4.1 – Marked caries activity
- pH 4.2-4.6 – Active
- pH 4.5-4.6- Slightly active
- pH >4.6 – Caries active

5. Reductase test

- This test measures the activity of reductase enzyme present in salivary bacteria
- The sample is mixed with fixed amount of diazo-resorcinol
- The change in color after 15 min is taken as a measure of caries activity

INTERPRETATION

color	Time	score	Caries activity
Blue	15min	1	Non conductive
Orchid	15 min	2	Slightly conductive
Red	15 min	3	Moderately conductive
Red	Immediately	4	Highly conductive
pink	Immediately	5	Extremely conductive

6. Saliva flow test

- Flow rate is determined by collecting paraffin stimulated saliva in a test tube over 5 min
- Severely decreased flow is related to caries susceptibility
- As salivary flow rate decreases viscosity increases

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THANK YOU