Advanced methods in caries detection and diagnosis

By : Assist. Lec Shatha Abdullah

Assist prof Aseel Haideer

Content:

Aims

01

- There has been a developing paradigm shift in dentistry—one moving away from a surgical model of treatment to one based on the prevention of disease.

02

- As with many disease entities, prevention is at its most effective when detection is early within the natural history of the disease.

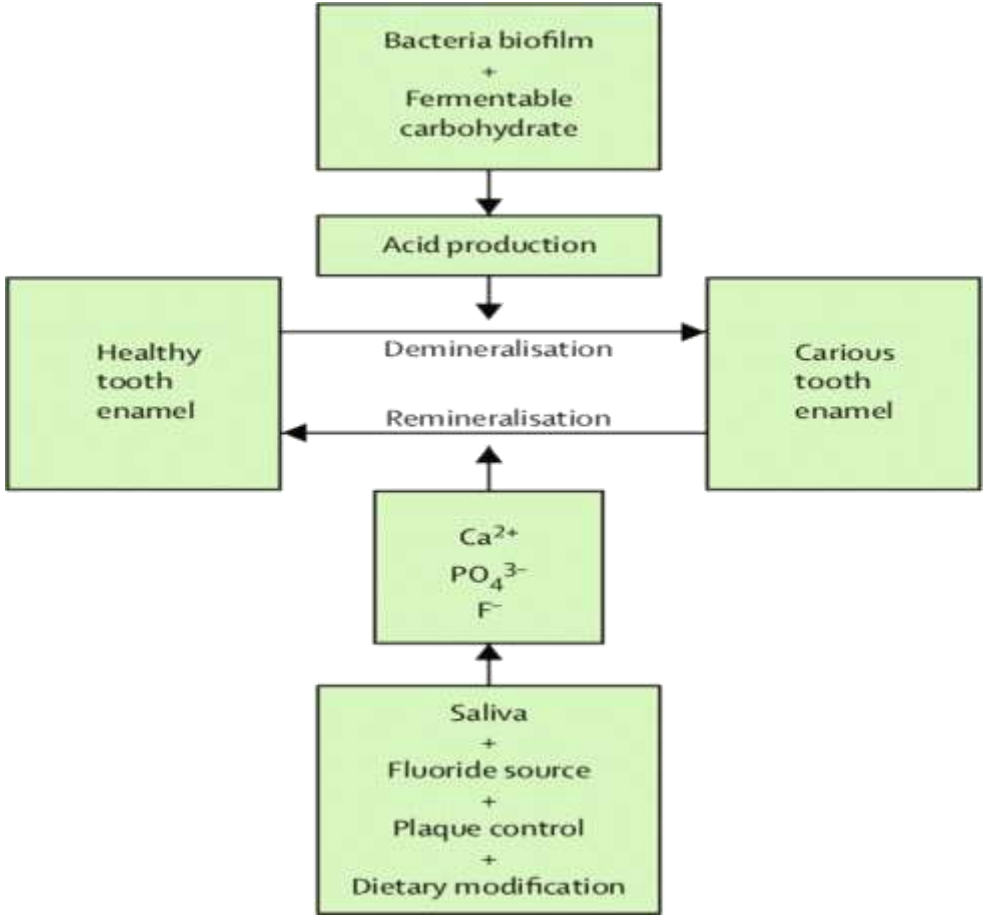
03

- The failure to detect early caries, leaving those detectable only at the deep enamel, or cavitated stage.

Introduction :

Dental caries is defined as an infectious disease of the teeth that leads to the destruction and dissolution of the calcified tissues of the tooth structure.

- that can be characterized by a progressive demineralization process that affects the mineralized dental tissues.
- It is considered to be the most prevalent oral disease worldwide and it is the main cause of tooth loss among the population .
- It multifactorial disease.


Bacteria biofilm
+
Fermentable carbohydrate
Acid production
Healthy tooth enamel
Demineralisation
Remineralisation
Carious tooth enamel
Ca^{2+}
PO_4^{3-}
F^-
Saliva
+
Fluoride source
+
Plaque control
+
Dietary modification

Introduction

Dental caries still a common infection influencing a huge number of individuals around the world ,There has been a creating interest in dentistry that is moving away from the treatment of the disease to one based on the prevention of it. Concerning some other diseases, prevention is best when the detection of the disease is early.

Visual detection and Visual-tactile strategies utilizing the dental explorers and air drying with amplification and radiographs are the regular methods generally utilized for detection of caries .

Caries Detection Methods

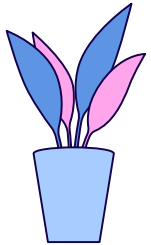
01
Visual methods

02
Radiological based methos

03
Light based methods

04
Electric based methods

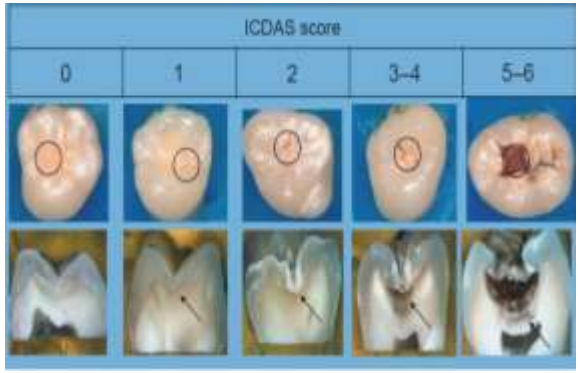
05
Methods on probation



1- Visual Caries Detection Methods

Conventional visual inspection

ICDAS



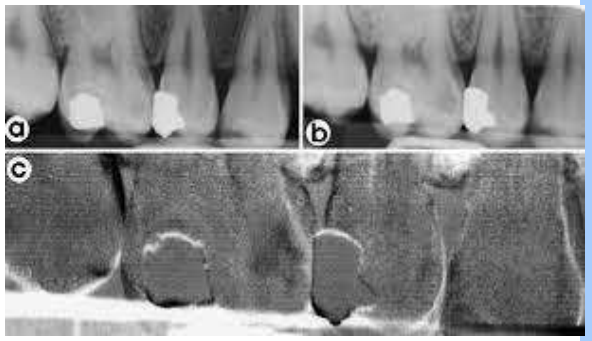
Caries detection dyes

2- Radiology Based Caries Detection Methods

Conventional radiographs

Digital radiographs

Digital subtraction radiographs



3- Light Based Caries Detection Methods

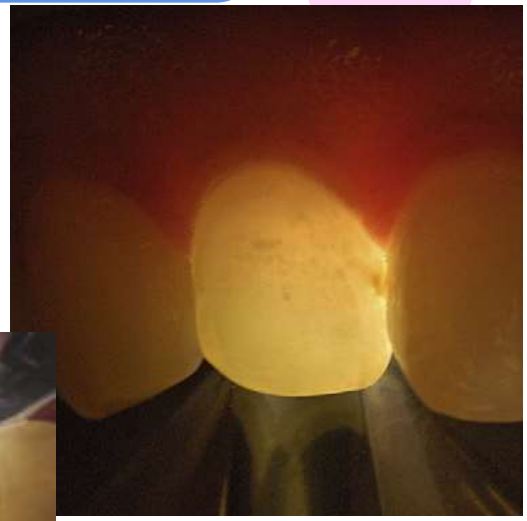
A- Fluorescence – Aided Caries Excavation (FACE)

- FACE works by exposing carious dentin to purple light of the wavelength of 405 nm and it presents as a red fluorenscence.
- Non-carious areas show a green fluorescence

3- Light Based Caries Detection Methods

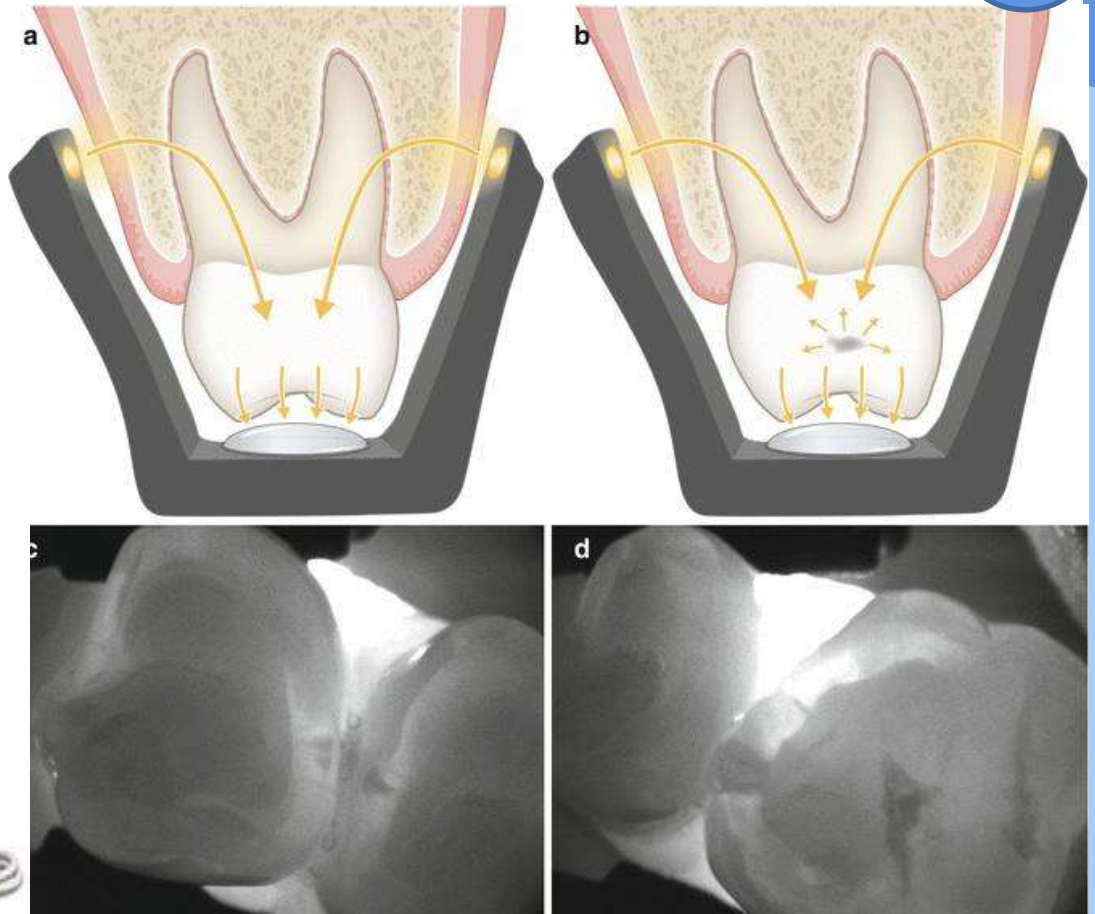
B- Fiber – Optic Transillumination (FOTI)

- The basis of using fiber optic transillumination to detect caries is based on the scattering of light phenomenon.
- using a white light with high intensity that is presented through a small aperture in the form of a dental handpiece.



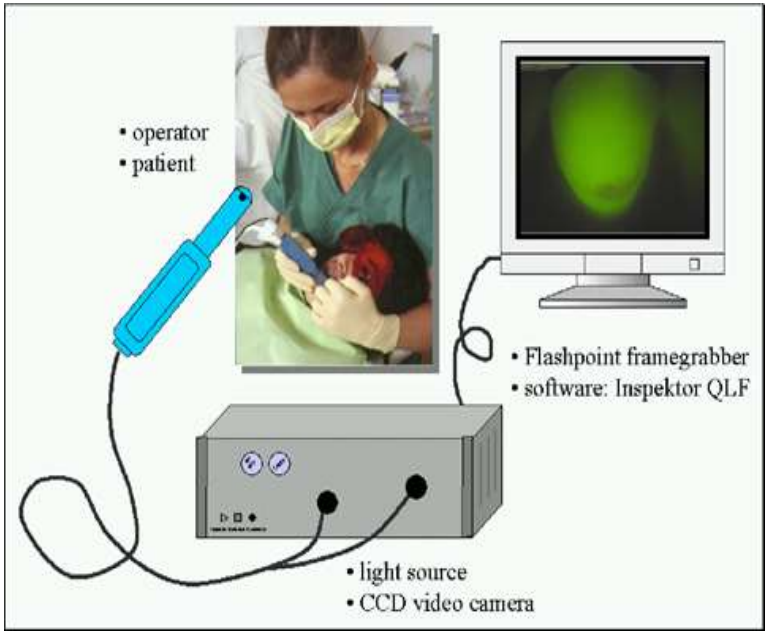
Digital imaging FOTI

DIFOTI™



3- Light based caries detection methods

C- Quantitative Light- induced Fluorescence (QLF)



3- Light Based Caries Detection Methods

D-Laser fluorescence (DIAGOdent)

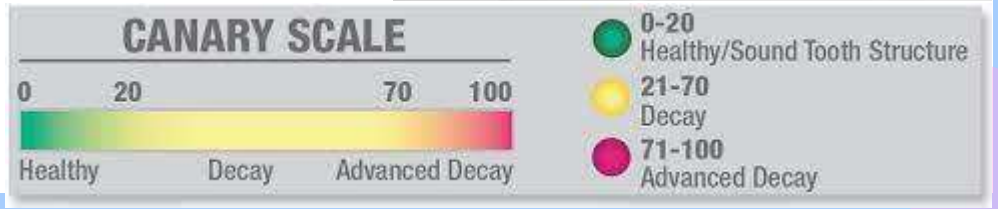
- The principle is that when Diode laser with 655nm wavelength is irradiated on dental surface
- it is absorbed by metabolites of caries lesion bacteria and these metabolites emit a red fluorescence.
- This fluorescence reflected by the dental surface is indicated as a number between 0 and 99 on the screen of the device.

3- Light Based Caries Detection Methods

E-Photothermal Radiometry and Modulated Luminescence (The Canary System):

- It basically pulses low- energy laser light on the tooth surface, and when it interact with the crystalline structure of tooth tissue, it converts to heat and light,

  that can be emitted from the tooth surface once the laser is modulated and thus, the existence and the severity of the dental caries can be identified.



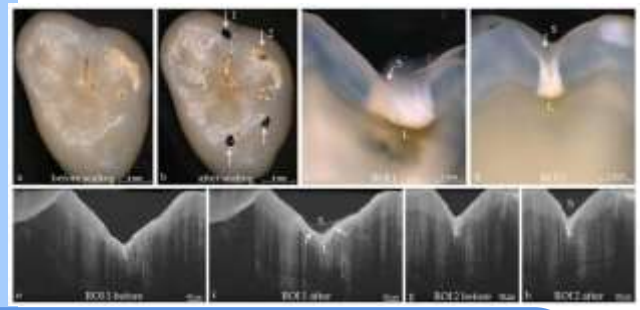
4- Electric Based Caries Detection Methods.

Cariescan pro device:

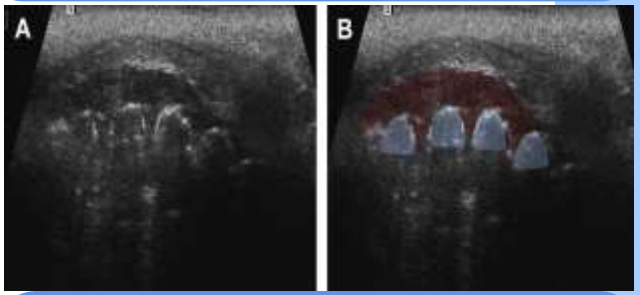
The sound tooth has a high electrical resistant and when demineralization occur, there will be a reduction in electrical resistivity due to the increased size of pores by demineralization, which are occupied with fluids that rise the electrical conductivity.

Caries Detection Methods On Probation

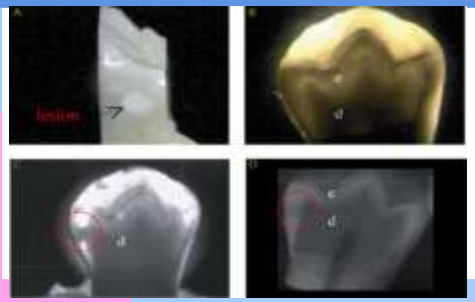
2- optical coherence tomography



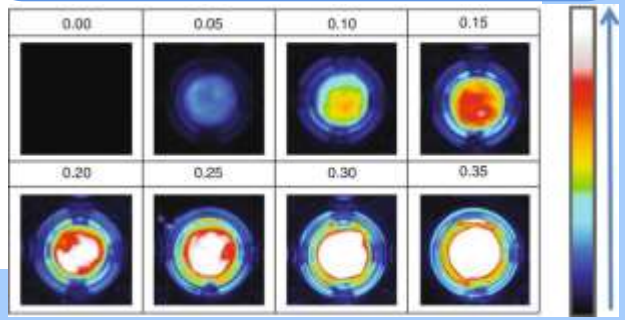
3-ultrasound techniques



1-Near infrared reflectance imaging



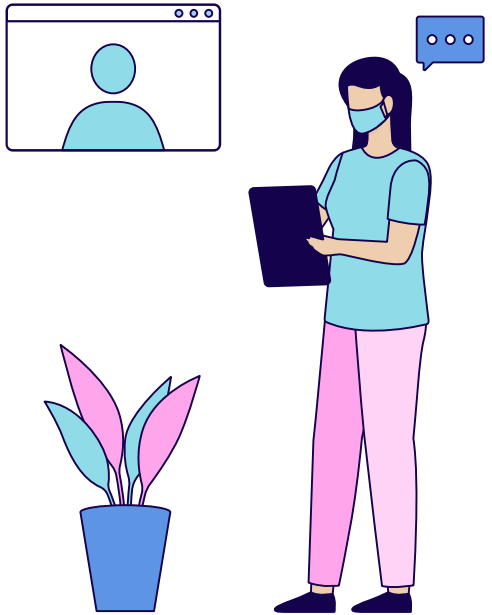
4- Bioluminescence technology



The conclusion:

- The purpose of caries detection tools is to detect dental caries at the early stage of caries and prevent its progression from demineralization to cavitation.

- Non of the mentioned techniques alone are sufficient for diagnosis of dental caries. In the future with the development of diagnostic tools, small changes in the tooth structure will be detected.



Thanks!

Do you have any questions?