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Constriction with Conviction

Dyes for caries detection

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Introduction

The main goal of treating dental caries is complete removal of carious tissues with maximum preservation of sound tooth structure and maintenance of pulp vitality [4]. Clinical assessment of dental caries is often based on color and dentin hardness which is considered to be completely subjective with low reproducibility [5, 6]. Application of caries detector dyes to facilitate diagnosis of carious dentin was initially introduced by Fusayama in 1979[7]. Dyes may be beneficial in detecting caries and when not used during cavity preparation, carious tissues may go undiagnosed by the clinician [8, 9].

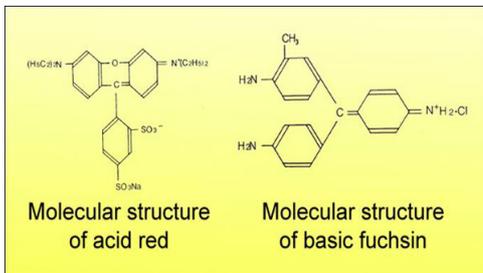


Fig. 1.1: Molecular structure of Acid Red and Fig. 1.2: Unstained Basic Fuschin

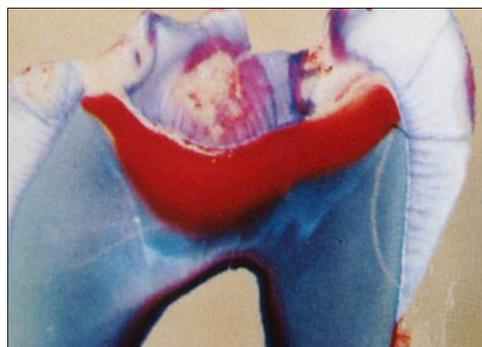


Fig. 1.3: Basic fushin stained

Fig. 1.4: Mallory -Azan stained

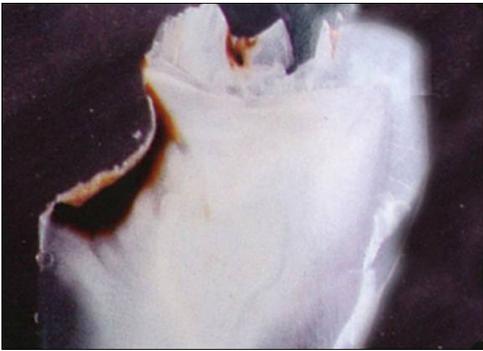


Fig. 1.5: Unstained

Fig. 1.6: Unstained



Fig. 1.7: Acid Red stained

Conclusions

The carious dentin is invaded by bacteria. The infected dentin must be removed, but the dentin that is not infected must be saved. When caries penetrates dentin, softening is always deepest, discoloration is next and bacterial invasion is last. In chronic decay, discoloration is heavy and reaches the comparatively harder and deeper layer, and so does bacterial invasion. In acute decay discoloration is light and does not reach the harder layer. Bacterial invasion remains at the very soft and superficial layer. In the year 1979, Takao Fusayama suggested 0.5% solution of basic fuchsin in propylene glycol can be used as a dye for caries detection but later was found to be carcinogenic. After researches 1% acid red was found to be a suitable dye (Figure 1). The natural carious dentin of human teeth consists of two layers with definite boundary. The collagen fiber is deteriorated in the outer carious dentin but keeps its sound proper histo-chemical character in the inner carious dentin and normal dentin (Figure 2). 1% Acid Red stains the outer carious dentin clearly red but not the inner carious dentin and normal dentin (Figure 3). Because re-mineralization of dentin occurs on the basis of collagen fibers on the periodic joints on which apatite crystals attach in fringes, it cannot occur in the outer carious dentin in which collagen fibers are broken, losing intermolecular crosslink. But it can occur in the inner carious dentin in which collagen fibers keep their characteristic cross band structure with intermolecular cross links only partly and reversibly shifting to precursors.

Hardness cannot be used as a guide for caries removal, because the hardness of the bacterial front is very inconsistent. In chronic decay complete removal of remarkably discolored dentin can assure complete removal of infected dentin without excessive over reduction. The softened but not infected dentin of acute decay should be saved if it is re-mineralizable. Dyes are the correct way of determination, discrimination and estimation of caries extent and their use guides us to our path of "Constriction with Conviction". (Figure 4).

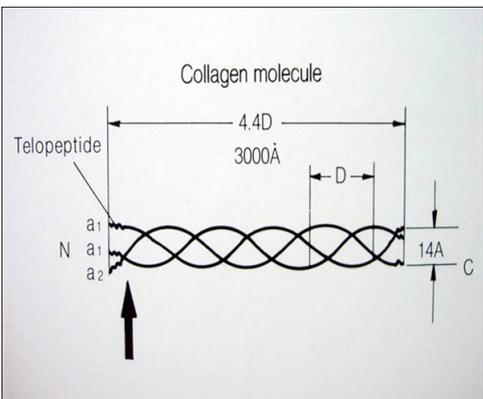


Fig. 2: Collagen Molecule



Fig. 3: 1% Acid Red

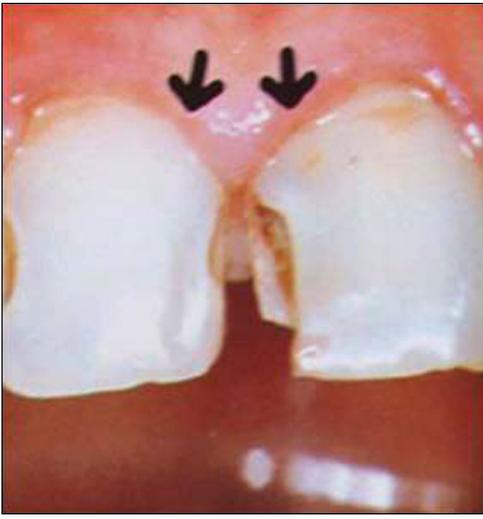


Fig. 4.1: Clinical case of proximal decay

Fig. 4.2: Application of caries detector



Fig. 4.3: Outer carious dentin stained red

Fig. 4.4: Opening the cavity



Fig. 4.5: Outer carious dentin stained red

Fig. 4.6: Removing red-stained tissue



Fig. 4.7: Reapplication of caries detector

Fig. 4.8: Spray washing of caries detector



Fig. 4.9: Cavity preparation is completed when no more tissue can be stained red

Fig. 4.10: Restoration completed

Literature

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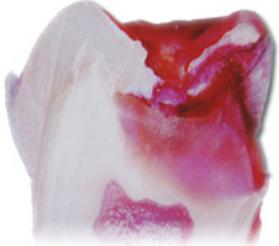
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Poster Faksimile:

Constriction with Conviction



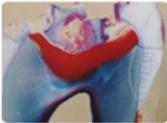
Dyes for Caries Detection



Unstained



Fuchsin stained



Mallory/Azan stained



Cariou Tooth
before Staining



Cariou Tooth
after Staining

CC1=CC=C(C=C1)C(=O)C2=CC=C(C=C2)S(=O)(=O)(O)O

Molecular structure
of acid red

ClC1=CC=C(C=C1)C(=O)C2=CC=C(C=C2)N

Molecular structure
of basic fuchsin



1% Acid Red in Propylene Glycol

Cavity preparation guided by Caries Detector



Clinical case of
proximal decay



Application of
caries detector



Spray washing of
caries detector



Opening the
cavity



Outer carious
dentin stained red



Removing red
stained tissue



Red stained tissue
has been removed



Second application
of carious detector



Spray washing of
caries detector



Cavity washing is complete when no
more tissue can be stained



Restoration
completed

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