

In the name of God

Shiraz university of medical sciences  
School of Dental medicine

Thesis :

For Folfilment D.M.D Degree

# CLASS V CAVITY

## PREPARATION & RESTORATION

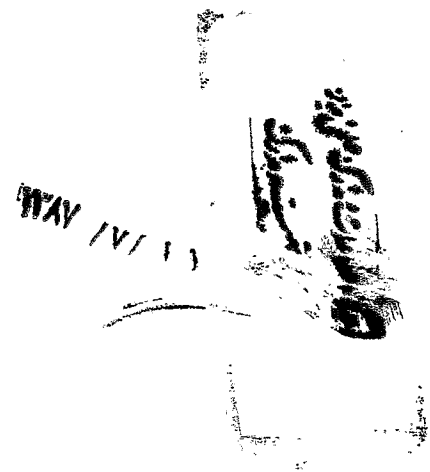
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1993- BAHMAN 1371



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*Cavity preparation &  
Restoration*

99 No 5

بسمه تعالی

ارزیابی پایان نامه

پایان نامه شماره ..... تحت عنوان *Cl. V. preparation of ...*

تهیه شده توسط ... خانم ... در کمیته بررسی پایان نامه مطرح و بنا  
درجه ..... نمره ..... به تصویب رسید .

استاد راهنما: دکتر ... سمت: ...

امضاء

امضاء کمیته بررسی

- ۱- دکتر ...
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To my parents  
for continual love, understanding , and support .

&

My sisters and brother

with

love

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## INTRODUCTION

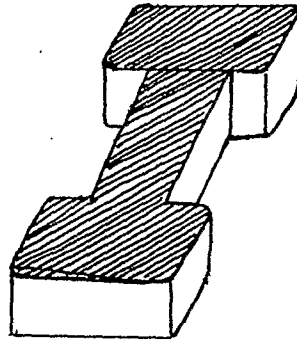
Effective preventive programmes and enhanced dental care have changed the disease pattern of caries. More and more patients are now living longer and retaining more of their natural teeth. However, degenerative processes and gingival recession, induced by chronic periodontal inflammation and aggressive periodontal therapy, result in more root dentin being exposed in older population groups. Food acids and inappropriate oral hygiene procedures produced saucer-or-V shape cervical defects.

Cervical caries and erosion lesions must be restored or reinstate esthetic appearance, overcome sensitivity, or prevent further loss of tooth structure.

The purpose of this thesis is to discuss about etiology of caries, abrasion and erosion, and methods of repair with different material. (including amalgam, composite resin, glass ionomer, and gold.)

Another purpose is comparing these materials and evaluation of microleakage in them.

# CHAPTER



*Etiology of*

*Cervical Damage*



## CARIES

The soft, translucent, and tenaciously adherent material accumulating on the surface of teeth is commonly called plaque. It is more accurately described as bacterial plaque, since it is almost completely composed of bacteria and their by-products. Plaque is not adherent food debris as is widely and erroneously thought. Another misconception is that plaque results from the haphazard collection of opportunistic microorganisms in the oral environment depends on either their ability to adhere to a surface or on initiation of plaque by pioneering organisms capable of surface adherence. Free-floating organisms are rapidly cleared from the mouth by salivary flow and frequent swallowing.

Only a few specialized organisms, primarily streptococci, are able to adhere to oral surface such as freshly cleaned tooth surface. These streptococci have special receptors and elaborate a sticky matrix that allows them to adhere successfully to an otherwise clean tooth surface.

Once they are attached these pioneering organisms proliferate to form a matlike covering over the tooth surface. This mixed streptococcal mat allows the adherence of other organisms that are unable to adhere directly to the tooth surface. Thus the formation of a mature plaque community involves a succession of changes, each change depending on some preparation or changes made by the preceding stage.

The root surface in the gingival crevice may harbor a very complex community dominated by filamentous bacteria. Whereas on

proximal surface may be carious having a plaque with large populations of *S. mutans* and *Lactobacilli*. Therefore generalization about plaque communities is difficult. Nevertheless, the general plan of plaque growth and maturation is predictable and sufficiently well known to be of therapeutic importance in the prevention of caries.<sup>25</sup>

## DIAGNOSIS OF THE CARIES.

1- The hardness of the softened cannot be reliably diagnosed by hand instrument and thus can not be used as a reliable guide for caries removal.

2- Hardness cannot be used as a guide for caries removal, because the hardness of the bacterial front is very inconsistent.

3- In chronic decay complete removal of remarkably discolored dentin can assure complete removal of infected dentin without excessive overreduction..

4- In acute or moderate decay the natural discoloration front is not only unclear but also far distant from bacterial front consequently discoloration can not be an adequate guide for caries removal.

5- The softened but not infected dentin of acute decay should be saved if it is remineralizable.

## TWO LAYER OF CARIOUS DENTIN.

When the tooth was extracted and the surface of the section was examined under an optical microscope. Two definite layers were unexpectedly observed in the demineralized layer of the floor dentin.

First (outer) layer was highly demineralized and that the second (inner) layer was intermediately demineralized, continuously shifting from the bottom of the outer layer to the top of the normal dentin.

The collagen Fiber is deteriorated in the outer carious

dentin but keeps its sound proper histochemical character in the inner carious dentin and normal dentin.

Conclusions of Biochemically and microscopic examination about these layers are:

1) The inner carious dentin, although demineralized to some extent, has essentially similar structure as the normal dentin, that is shape and arrangement of organic substance represented by collagen fibers, inorganic substance consisting of needle like or small plate apatite crystals and odontoblastic process.

2) The outer carious dentin, however, has definitely deteriorated structure showing broken collagen fibers almost nonexistent, many of tubules were filled.

With numerous bacteria often taking the place of even. The intertubular dentine were lacking leaving smaller number of collagen like fibers without the cross band. Structure characteristic of sound collagen the inorganic structure was also completely different. Granular looking small crystals were found irregular scattered without any relation to the collagen fibers the tubul spaces were not filled. With bacteria were empty or filled with small granular crystals sometimes mixed with large needle like crystals.

3) Because remineralization of dentin occurs on the basis of collagen fibers on the periodic joints on which apatite crystals attach in fringes, it can not occur in the outer carious dentin in which collagen fibers are broken, losing inter

molecular crosslinks, but it can occur in the inner carious dentin in which collagen fibers keep their characteristic cross band structure with inter molecular crosslinks only partly and reversibly shifting to precursors.

4) In the natural decay of human teeth the inner carious dentin can be physiologically remineralized, recovering the normal hardness or ca content from inside with time.

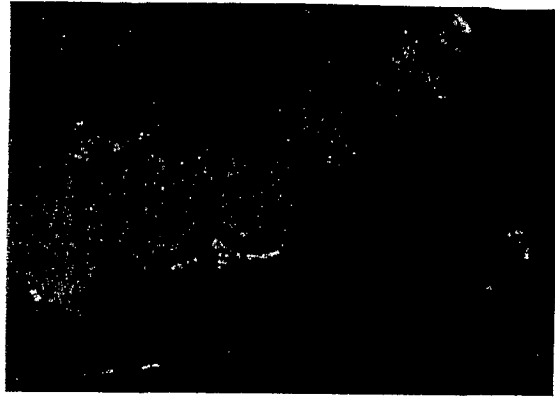
#### DETECTION OF CARIES WITH DYE:

(Finding a dye to differentiate the two layers and removed caries by this method.)

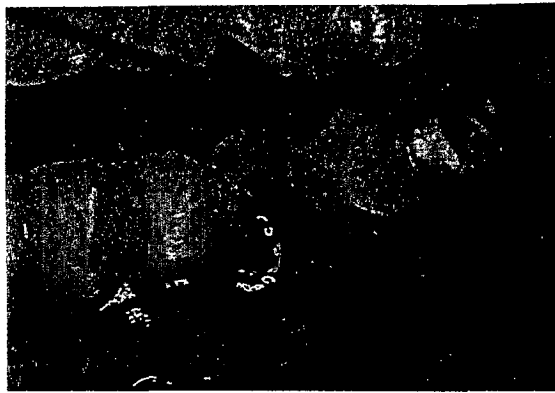
After trying a variety of dyes and solvents presently available or ever used in research laboratories, a successful result was finally obtained with a 0.5% solution of Basic Fuchsin in Propylen Glycol.\* When a drop of this solution was applied on the section surface of a decayed tooth and spray washed after 30 seconds, it stained the outer carious dentin and normal dentin. Fig(1-1), (1-2), (1-3)

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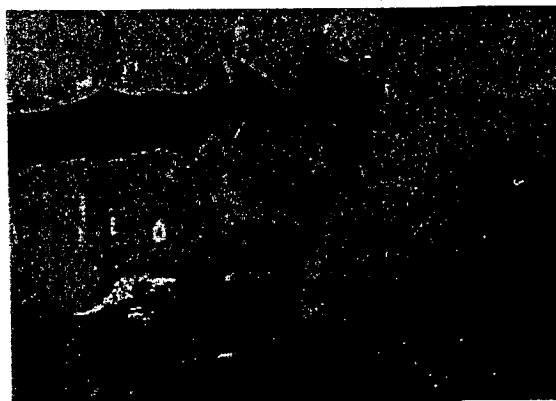
\* BF in PG



Fig(1-1) Decaied tooth



Fig(1-2) Applied of BF in PG on the surface of the decaied tooth



Fig(1-3) After spray washed it stained the outer carious dentin scalet red.

Complete Removal of fuchsin-stainable layer assures complete removal of infected dentin. A 0.5% solution of BF in PG was dropped in carious cavities of extracted and also living teeth. In half of the cavity floor the fuchsin outer carious dentin was completely removed, carefully the unstainable inner carious dentin. In the other half of the cavity floor the stainable through both area, and demineralized histologic sections were made for observing bacterial invasion. The sections showed numerous bacteria invading the stained outer carious dentin left in half of the area but not at all in the floor dentin after removal of the stained dentin in the other half of the area.

A 0.5% solution of BF in PG was dropped in carious cavities of teeth. In acute or moderately acute decay the Fuchsin stainable layer must be entirely removed for complete removal of infected dentin.

In chronic decay with heavy natural discoloration removal of heavy discolored dentin can assure removal of infected dentin without much overreduction.

Black discolored dentin under amalgam restoration need not be removed.

The metallic ions released from amalgam restoration usually pass through the outer carious dentin and mainly precipitate in the inner carious dentin. Consequently the heavily discolored dentin under amalgam restoration is usually the uninfected inner carious dentin and need not be removed.

## COMPOSITION OF CARIES DETECTOR AND ITS ADVANTAGES

It is acid red  $C_{27}H_{29}O_7N_2S_2Na$  (mol.wt 580,67) and chemically called 9-(2-Sulfonium-4'-Sulfophenyl) -6-diethylamine 3-(N,N- diethylimino)-3-isoxanthene -sodium salt this leads to the following advantages:

1- complete removal of the outer carious dentin is confirmed.

2- Maximum dentin layer for pulp protection is secured.

3- Pain less carious removal is possible.

4- Presence of free enamel is clarified.

5- Exposure of pulp horn can be avoided.

\* Caries detector stains the enamel tissue demineralized by caries. Stained enamel must be completely removed incipient subsurface enamel caries or an enamel. Caries covered by a dense superficial layer remineralized by the solving source sometimes fails to stain.

\* Caries detector is an excellent plaque discloser it stains the plaque not only on the tooth surface but also in the fissure and so can guide extension of the cavity for prevention along occlusal Fissures.<sup>21</sup>



### CERVICAL CARIES:

Cervical caries usually starts because the affected tooth surface is unclean and the patient has a caries inducing diet. Incipient smooth surface enamel caries appears as a milky white line just occlusal or incisal of crest of the marginal gingiva usually on the facial surface. These areas are often overlooked in the oral examination unless the teeth are isolated with cotton rolls and dried with air syringe. When this form of caries has not decalcified the enamel sufficiently to allow the explorer to detect a break or roughness in surface (non cavitate). The lesion may be reversed by remineralization resulting from altered diet, improved oral hygiene and fluoride treatment. An affected enamel surface that has a small break or roughness (cavitate) sometimes can be successfully treated by smoothing with sandpaper discs, polishing and treated with fluoride preparation.

Thereby preventing further caries that would require preparation and restoration. Obviously this prophylactic preventive treatment can not be instituted if caries has progressed to decalcify and soften the enamel to an appreciable depth and certainly must be abandoned if caries has penetrated to the dentinoenamel junction. When a large number of cervical lesions are present, particularly lingual, a relatively high caries index is obvious and the patient should be encouraged to improve oral hygiene and diet.<sup>25</sup>

### CEMENTAL CARIES:

Caries of cementum and dentin constitute a somewhat different problem from both a pathologic and a restorative standpoint. Class V caries on the buccal or, less frequently, the lingual cemental surfaces are treated clinically by applying a design.

Cariou lesions at the CEJ are not uncommon in persons with periodontal disease. Exposure of this anatomically irregular surface to the oral environment often results in dental caries at that site when previously the pt may have been caries-free. Gingival health is usually further jeopardized by the presence of the cemental lesion. Periodontal and operative treatment are carried on conjointly. Scaling, Root planing, instruction in oral hygiene, and the restoration of these carious lesions may be ideal sequencing, but at time illogical.

Caries removal and restoration, perhaps temporarily, may be more appropriate at an earlier time during initial periodontal treatment. A patient who previously had been either caries-free or relatively so, or who had adequate distal CEJ caries on bicusps and molars. Restorative treatment of such cemental lesions should be accompanied by rigorous preventive measures, including routine topical fluoride use. (see chapter 2).

### CHEMICAL FACTOR.

Erosion results from a chemical process and the defects are usually limited to the labial and buccal surface of the

teeth. These defects vary in shape from saucer like depressions to deep wedge like grooves. The base presents a hard, polished surface. The lesions are seen most often on the labio cervical portions of the maxillary incisors. They differ from those caused by calcification in that their base is hard, smooth and polished and their cause can not be determined.<sup>22</sup>



Fig 1-4-Abrasion. The orange appearance of the exposed dentin is due to tobacco staining and leukoedema of mucosae.

## MECHANICAL FACTOR

Abrasion is the term used to describe wear resulting from contact with some foreign body such as improper tooth brushing techniques, pipe smoking tobacco chewing, and chewing on pens or pencils.

Tooth brush abrasion is the most common example and is usually seen as a shape V shaped notch in the gingival portion of the facial aspects of the tooth .

Abrasion may affect any hard dental structures, whereas erosion is generally limited to the enamel surface. Abrasion of the cementum and dentin in the cervical area is frequently encountered in the presence of gingival recession.

The location and character of the lesions produced by abrasion are related to the type of mechanical agent that produces the defect. Exposure of the CEJ and the cementum by recession of the gingiva may rise to softening and brown discoloration of the cementum or exposed dentin.

The softening is associated with decalcification or maceration of the cementum or dentin by the fluoride of the mouth. Changes in color are associated with exogenous pigments exposure of the cementum and dentin of the cervical area by erosion frequently leads to cervical decay and hypersensitive cervical area.

(Fig 1-4).<sup>22</sup>