

Management of Enamel Caries

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Abstract

Conservative dentistry in its true sense is the preservation of the natural tooth structure rather than filling it with the best restorative materials. Tooth structure once removed will not come back, particularly enamel. Caries confined to the enamel must be approached in the most conservative way so that the enamel will be preserved rather than cutting it with a bur and filling it with a restorative material. This article describes the mechanism of remineralisation of enamel caries.

Keywords: Caries; Pathology; Remineralisation.

Introduction

The caries in enamel must be distinguished from caries involving both enamel and dentin. The enamel caries can be treated in a different way. The remineralisation techniques can be used to manage enamel caries. Almost all the teeth surfaces are subjected to acid attack due to various foods consumed to different extent. The enamel caries can be remineralised with resins or minerals so that the tooth is conserved [1].

Disease Mechanism [1,2]

Caries is a multifactorial disease with interaction among three factors: (1) the tooth, (2) the microflora, and (3) the diet. If not disturbed, bacteria accumulate at specific tooth sites to form what is known as bacterial plaque or biofilm. The development of caries requires both the presence of bacteria and a diet containing fermentable carbohydrates. Caries is an infectious disease; because it is the lactic acid produced by bacteria from the fermentation of carbohydrates that causes the dissolution, or demineralization, of the dental hard tissues.

The *Streptococcus mutans* group plays a central role in demineralization. In the initial stages of the disease, bacteria are located on the tooth surface. It is only after severe demineralization or cavity formation has occurred that bacteria penetrate into the hard tissues. The demineralized area in the tooth surface, called the carious lesion, is not the disease but a reflection of continuing or past microbial activity in the biofilm.

Pathology of Enamel Caries [3]

The earliest evidence of this demineralization on the smooth enamel surface of a crown is a "white spot lesion." Enamel is an acellular tissue comprised 80-90% by volume of crystals of carbonated calcium hydroxyapatite (Angmar et al., 1963; Robinson et al., 1971, 1983; Elliott, 1997). The remaining 10-20% consists of fluid and organic, usually proteinaceous, material. The distribution of these components is not homogeneous (Angmar et al., 1963; Robinson et al., 1971, 1983), being for the most part related to specific tooth morphology.

Smooth Enamel Surfaces [2,4]

The proximal enamel surfaces immediately gingival to the contact area are the second most susceptible areas to caries, the first most susceptible being pit and fissures.

The smooth enamel surfaces of teeth present a less favourable site for cariogenic biofilm attachment. Cariogenic biofilm usually develops only on the smooth surfaces that are near the gingiva or are under proximal contacts. The proximal surfaces are

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particularly susceptible to caries because of the extra shelter provided to resident cariogenic biofilm owing to the proximal contact area immediately occlusal to it.

(Light-Induced Fluorescence Evaluator for Diagnosis and Treatment)

Autofluorescence Masking Effect

Green fluorescence in the diagnostic mode of the camera indicates healthy tooth and loss of green fluorescence (black green fluorescence) means infected dentin.

Excavate till Acid Green Fluorescence is Achieved

The second principle indicates that acid green fluorescence is to be attained at the end of the excavation process, as this is considered as an indicator of sound dentin.

Bright Red Fluorescence Indicates Infected/Affected Dentin

This principle can be applied only when images are taken in the treatment mode. Terrer E. *et al.* explained that in treatment mode images, sometimes red fluorescence may be seen at the end of excavation instead of acid green fluorescence, and this can be used as an indicator to differentiate between infected and affected dentin.

	Hydrated	Desiccated	Surface texture	Surface hardness
Normal enamel	Translucent	Translucent	Smooth	Hard
Hypocalcified enamel	Opaque	Opaque	Smooth	Hard
Incipient caries	Translucent	Opaque	Smooth	Softened
Active caries	Opaque	Opaque	cavitated	Very soft
Arrested caries	Opaque, dark	Opaque, dark	Roughened	Hard

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Possible Treatment Alternatives for Dental Demineralization

The minimally invasive treatment options for dental demineralization or early caries include the following:

- Application of topical fluoride and/or other remineralizing agents like CPP-ACP with several repeated applications;
- Removal of demineralized enamel with a bur and restoring the cavity with resin bonded restorative material;
- Use of microinvasive resin infiltration technique
- No treatment which may lead to possible progression.

Enamel remineralization [7, 8, 9]

Remineralization of enamel and dentine is studied from two perspectives. First of all, it is the process of mineral deposition from saliva or plaque fluid filling up small enamel or dentine defects formed during the demineralization episodes resulting from acid attack on the tooth.

Remineralization can take place by two methods: the minerals present in the saliva get deposited on the demineralized tooth surface, which has occurred due to acid attack from the food.

Alternatively, remineralization is studied and described as the repair of established lesions. Such

lesions have developed over a long period but may be filled in with calcium phosphates when external conditions favour mineral deposition. This type of remineralization may either be complete and partial; when the mineral precipitating in the lesion is less soluble than the original tissue, this remineralization will help in preventing or limiting future tissue loss.

At physiological conditions, the oral fluids (saliva, biofilm fluid) have calcium (Ca) and phosphate (Pi) in supersaturated concentrations with respect to the mineral composition of enamel and, as a result, these ions are continually deposited on the enamel surface or are redeposited in enamel areas where they were lost.

Enhancing remineralization of deep lesions [4, 6, 10, 11]

Resin Infiltration Technique

"Remineralization can be done at any stage, and the basic question is not how deep the demineralization takes place, but whether the lesion is cavitated or not," "In case the lesion is not cavitated, then bacteria are physically too large to gain access into the dentin, hence, remineralization can (and in fact should) be the first option." Resin infiltration is meant for use on noncavitated lesions only.

The science behind masking enamel lesions by resin infiltration is based on variation in light

scattering within the lesions. The novel technique used involves the infiltration of the carious lesions with resin (RI 1.46) that, in contrast to the watery medium, cannot evaporate. This makes the difference in refractive indices between porosities and enamel to be negligible and lesions appear similar to the surrounding sound enamel. It has a chameleon effect requires no shade matching. Lesions lose their whitish opaque color and blend reasonably well with surrounding natural tooth structure. Hence an immediate improvement in the esthetic appearance was observed.

Flourides

Low levels of flourides increases the saturation of hydroxyapatite with fluoride resulting in flourapatite that is more resistant to caries. They can be applied as varnishes, dentifrices or fluoride releasing restorative materials [7,8].

Caesinphosphopeptide can also be used as remineralizing agents. CPP-ACP amorphous calcium phosphate has the potential to reduce demineralization and enhance remineralization [6,7].

Conclusion

With the advances in diagnostic techniques and instruments, advances in restorative materials, the restorative dentist must use modern approach to treat enamel caries in the most conservative way. The enamel is the most mineralized part of the body. The remineralisation of enamel is a reliable approach to treat it a minimally destructive way.

Conflict of Interest

None

Source of Funding

Nil

Acknowledgements

Nil

Ethical Clearance

Not needed as it is a review article

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