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Secondary Caries: Clinical Characteristics, Etiology, Risk Assessment & Management

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Abstract

Caries is the most common lifestyle-influenced disease in children and adults worldwide. Although preventable, but if left untreated or not properly treated leads to initiation of the secondary caries. Secondary or recurrent caries has been defined as "lesions at the margins of existing restorations" or "caries associated with restorations or sealants" (CARS). Secondary caries is a complex process, combining well known causes of "conventional" caries with the specificities of the restorations and restorative materials. Restorative treatments are expensive for the individual and society. In the absence of treatment, the disease might spread again and cause severe pain, eating problems, social stigma, and reduced disability-adjusted life year. That's why it is essential to know certain features about secondary caries in detail.

Keywords: Secondary Caries, Microflora, Caries Scoring And Risk Assessment,Diagnodent,Silver Diamine Fluoride, Glass Ionomer Cement.

Introduction

Dental caries is the localized destruction of susceptible dental hard tissues by acidic byproducts from the bacterial fermentation of dietary carbohydrates. Primary caries is the term used to describe caries lesions developing on intact, natural tooth surfaces, as opposed to secondary or recurrent caries, which develops next to an existing restoration. Secondary or recurrent caries defined as the primary carious lesion found adjacent to the existing restorations, which occurs after a period of

time in which the restoration is in use or caries associated with restorations or sealants (CARS). Recurrent caries is a major concern in daily practice of dentistry and it is the most common cause of restoration replacement. Therefore, it is essential to know the clinical characteristics and etiology as well as the prevention and management of secondary caries.[1]

Clinical Characteristics of Secondary caries

The lesion usually consists of two carious regions: an outer lesion formed in the enamel or cementum of the tooth surface, similar in histology to a primary lesion, and the wall lesion, which is a narrower defect in the enamel and/or dentin along the cavity wall restoration interface.[2]

Prevalence and Incidence of secondary caries

Association between age and reasons for failure of restoration showed that age group between 18 to 35 years showed that most common failure is fracture which is 24%, secondary caries 4.6% and parafunctional habits 4%; age group between 36 to 55 years showed that secondary caries is the most common reason for failure of restoration which is 28% and 2.67% accounted for both fracture and para functional habits.[3]

Etiology of secondary caries:

Biofilm accumulation on dental structure can lead to caries occurrence and the mechanical action of tooth brushing produces biofilm disorganization, which can prevent or arrest caries development. Bacterial adhesion on the surface of restorations has been considered an important parameter in the etiology of caries formation around restorations.[4]

Role of Microleakage

The secondary caries lesion is related, for the most part, to the cariogenic challenge, and not to factors related to the material composition, microleakage or gap formation because demineralization started on the enamel surface and progressed until reaching the tooth-restoration interface, which is completely different than being caused by microleakage.[5]

Sarrett (2007)[6] proposed an association with a "microspace" between the tooth and the restoration. Also, such tooth-restoration "microspaces" exist where secondary caries can progress to frank cavitation, independent of any enamel caries, and that microleakage.

Microbiology of secondary caries

The cariogenic bacteria of secondary caries are similar to those of primary caries, and consist primarily of Streptococci, Actinomycesnaeslundii and Lactobacilli. Streptococcus mutans is important for the initiation and progression of caries, and Lactobacillus acidophilus is frequently found in high numbers in both superficial and deep carious lesions.[7]

Diagnosis of Secondary caries

These lesions are difficult to detect clinically, unless they are advanced or become cavitated. Currently, vision, tactile sensation with probes, and bitewing radiographs are used in various combinations by practitioners in the diagnoses of secondary caries. However, radiography is of limited value in the diagnosis of secondary caries because of the shading effect of the restorative material. Accurate detection of secondary caries is difficult with conventional techniques unless the lesion is relatively advanced and a significant amount of tissue has been lost. It is therefore necessary and important to look for and test new methods and thus aid clinicians in the detection of secondary caries. Diagnodent is a relatively new laser fluorescence-based instrument which may have the potential to detect secondary caries and could be a valuable adjunct to conventional methods.[8]

Caries scoring and risk assessment

The International Caries Detection and Assessment System (ICDAS) is an evidence-based, preventively oriented strategy that classifies the visual appearance of a lesion (i.e., detection, whether or not disease is present), characterization/ monitoring of the lesion once detected (i.e., assessment), and culminates in diagnosis **(Arino et al, 2016).**[9]

The scores are on a 7- point rating scale, as follows:[10]

0	Clinically sound
1 to 2	Clinically detected "intact" enamel lesions (initial stage decay)
3 to 4	Clinically detectable early, shallow, or microcavitations (moderate decay)
5 to 6	Clinically detectable late or deep cavitations (extensive decay)

Prevention of secondary caries

The fluoride has been incorporated in dental restorative materials, because it can exhibit an anticariogenic activity by increasing dentin and enamel resistance to acids present in the oral cavity, protecting the dental structure against caries attack. Sealing pit and fissures of occlusal surfaces with a thin layer of resin was introduced as a caries preventive method.[11]

SDF (Silver Diamine Fluoride) is a topical fluoride solution used for arresting caries, although it has been cleared by the US Food and Drug Administration as an anti-hypersensitivity agent. A review concluded that SDF is a safe, effective, efficient and equitable caries-preventive agent. Conditioning with 38% SDF could prevent secondary caries of glass ionomer cement and composite resin restorations.[12]

Management of secondary caries

The fluoride has been incorporated in dental restorative materials, because it can exhibit an anticariogenic activity by increasing dentin and enamel resistance to acids present in the oral cavity, protecting the dental structure against caries attack. The potential of glass-ionomer cements (GIC) to form a chemical bond to enamel thus reducing the importance of maintaining a dry operating field during application, and their ability to release fluoride to provide a possible cariostatic effect, were strong motivations for their use as pit and fissure sealing materials, especially in very young children and in partially-erupted posterior permanent teeth.[13,14]

However, available evidence does not allow a definitive conclusion as to whether glass-ionomer or resin-modified glass-ionomer sealants are equally effective or superior to resin-based dental sealants in preventing occlusal dental caries in permanent or primary teeth.[15]

Resin dental materials used for this purpose evolved from ultraviolet to visible-light cured sealants, with the newest materials having fluoride incorporated into the resin. There is evidence to suggest that resin-based fissure sealants are effective in preventing occlusal caries in permanent molars of children and adolescents when compared to no sealants, but it is still not known whether fluoride-releasing resin-based sealants provide any additional benefit **(Jeong et al, 2014).**[16]

Raucci et al (2014)[16] dental laser is the latest modern innovation of the 20th century. It offers an alternative to high speed drill, reducing patient's discomfort and fear. At present, Erbium lasers are the only hard tissue laser wavelengths available commercially. The use of laser irradiation in operative dentistry has several advantages such as a more conservative cavity design, a significant decrease of enamel solubility, which play a significant role in the prevention and treatment of recurrent caries.

Conclusion

Secondary caries is the most common reason for the replacement of restoration of teeth. This review

highlights the progress of initial secondary caries adjacent to restoration margins, with the objective of studying etiopathogenesis and/or to identifying potential prognostic factors which are likely to be associated with the patient, the operator and restorative material. Thus alternative strategies can be developed to discover innovative restorative materials which reduce the risk of secondary caries formation by minimizing adhesion of cariogenic biofilms, and elucidating the reasons for the deterioration of the restorative materials including the tooth-restoration interface.

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