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Introductory Chapter: Diagnosis of Dental Caries

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Introduction

Dental caries is a frequently observed pathology affecting both the primary and the permanent teeth. This disease is usually detected with visual-tactile method. Visual-tactile method is suitable for the detection of cavitated caries localized on the occlusal and smooth surfaces of the teeth. It also gives diagnostic information about the presence of deep cavitated caries localized on the approximal surfaces. However, it is not useful for the detection of initial non-cavitated approximal caries. It is not useful for the detection of initial non-cavitated approximal caries.

After the discovery of X-rays, radiography has become a routine method for the detection of dental caries. Caries causes loss of hard tissue of the teeth, therefore appears as a radiolucent area on radiographic images. The radiographic appearance of enamel caries is generally a radiolucent triangle. This changes when it progresses into the dentine. It is frequently seen as two triangles, one on the enamel, and the other on the dentin, with a base on the dento-enamel junction [1].

Compared to visual-tactile method radiographic imaging is superior for the detection of caries confined to enamel and dentine, and minimal cavitated lesions on approximal surfaces [2]. It has a higher sensitivity for detecting lesions extending into dentine and lesions forming cavitations on the approximal surfaces of the tooth. On the other hand, compared to visual-tactile method, the sensitivity of radiography for detecting initial caries is lower, but its specificity is higher. Detection of initial caries is important as they can be treated with non-invasive or micro-invasive methods, such as remineralization, sealing, or infiltration [3].

Periapical, bite-wing and panoramic radiography are routinely used two-dimensional radiographic techniques for the detection of caries. With the introduction of three-dimensional imaging in dentistry, it became possible to detect caries from cone beam computed tomography images. However, compared to intraoral and panoramic radiography, the radiation dose of this technique is very high; thus, it is not routinely used [4].

The crown, the root and the surrounding structures of the tooth in the area of interest could be assessed with periapical radiography. In general, periapical radiography should be performed in cases having deep dentinal caries and when the periapical region is going to be investigated. The crowns of the teeth and part of the roots (excluding the periapical region) in the area of interest could be evaluated with bitewing radiography. This technique allows the visualization of both the maxillary and mandibular teeth crowns in one radiographic image. In addition, due to the projection geometry, initial caries could be more visible compared to the periapical and panoramic technique. Bite-wing radiography is the most useful technique for the detection of caries [1].

Bite-wing radiographs could be obtained with intraoral X-ray equipment or with panoramic machines having a extra-oral bitewing option. These panoramic machines have a special digital sensor and a robotic motion of the panoramic X-ray tube. The advantage of this imaging modality is that it reduces the number of overlapping areas of the teeth compared to conventional panoramic radiography. However, the cost of the equipment is very high, and the number of false positive findings is higher [5].

According to the literature, compared to visual inspection bite-wing, radiography has a higher sensitivity for the detection of dentinal caries localized on the approximal surfaces [6]. However, it does not provide adequate information in all patients having caries located on the inner surface of the enamel and cavitated or non-cavitated lesions located on the outer surface of the dentine [7]. In general, the use of both visual-tactile method and bite-wing radiography increases the possibility of the detection of caries as compared to those using either method alone [8].

Although two-dimensional intraoral imaging is useful and has several advantages for caries detection, superimposition of unwanted structures is the main disadvantage of this method. In addition, the cervical burn-out effect and parallax phenomena seen on the approximal surfaces of the teeth are factors leading to false positive results [9]. Correct detection of caries is important as this is the key for proper treatment. Thus, the dentists should consider the advantages and disadvantages of these methods in dental practice.

The chapters in this book provide rich information to the readers starting with the history of oral hygiene manners, and modern oral hygiene practices. It continues with the prevalence and etiology of dental caries and remedy through natural sources. Etiology of secondary caries in prosthetic restorations and the relationship between orthodontic treatment and caries is addressed. Early childhood caries is presented according to updated research. The use of visual-tactile method, radiography and fluorescence in caries diagnosis is presented. The book ends with prevention methods and management of caries and white spot lesions.

Overview of the chapters of this book.

Second chapter: 'Vista of Oral Hygiene' written by Goryawala S. This chapter gives information about evolution and teeth. The author provides interesting history of oral hygiene manners of various ancient civilizations. The importance of oral hygiene habits for the prevention of caries is stressed. The relationship between pregnancy, radiotherapy to the oro-facial region, and caries is presented. The chapter ends with information about modern oral hygiene practices.

Third chapter: 'Dental Caries, Etiology and Remedy through Natural Resources' written by Tahir Lubna and Nazir Rabia. This chapter starts with the prevalence and etiology of caries. The role of dental plaque and microbiol flora in the development of caries is described. The authors give informative details about the usage of synthetic and herbal products for the treatment of caries. The readers could also find the answer for the question 'Why the dentists should go for natural resources in medicine?' according to the literature.

Fourth chapter: 'Etiology of Secondary Caries in Prosthodontic Restorations' written by Yıldırım Biçer A. Zeynep and Unver Senem. This chapter starts with the etiology and diagnosis of secondary caries. Detailed information about the factors affecting microleakage, marginal and internal fitting of the prosthetic restorations are presented. The authors' description of contemporary fabrication methods including Computer Aided Design and Computer Aided Manufacturing (CAD/CAM) systems and cementation agents based on recently published data is particularly informative.

Fifth chapter: 'The Relationship between Orthodontic Treatment and Dental Caries' written by Metin Gürsoy Gamze and Uzuner Deniz. This chapter starts with general information about removable and fixed orthodontic appliances and their effect on accumulation of dental plaque. The authors emphasize the importance of proper oral hygiene habits required for struggle against microbial agents leading to caries during removable and fixed orthodontic treatment. They underline the importance of daily removal of the dental plaque on the teeth and describe useful mechanical, chemical and biological methods for this purpose.

Sixth chapter: 'Early Childhood Caries Update' written by Pınar Erdem Arzu. This chapter starts with the diagnosis and classification of early childhood caries according to contemporary literature. Detailed information about the epidemiology and etiology of this pathology is provided. Prevention strategies from early childhood caries are given. The chapter carries on with the management methods used in dental clinics for cavitated early childhood caries.

Seventh chapter: 'Caries Diagnosis Aided by Fluorescence' written by Walsh Laurence. This chapter focuses on the role of fluorescence in the diagnosis of caries. The author gives information about fluorescence in detail. Clinical recommendations for using fluorescence as an aid to caries diagnosis are particularly helpful to the readers. The author emphasizes that fluorescence may be used to improve caries diagnosis according to a rich literature review.

Eighth chapter: 'Can Dental Caries Be Treated?' written by Elembaby Abeer. This chapter describes several recent approaches used for the non-invasive management of non-cavitated teeth. Beneficial information about the remineralization agents including, laser active fluoride, low-level laser therapy, bioactive materials and natural substances are given. The readers can find an answer for the question 'Can dental caries be treated?' and benefit from practical strategies.

Ninth chapter: 'Management of White Spot Lesions' written by Deveci Ceren, Çınar Çağdaş, and Tirali R. Ebru. This chapter starts with the prevalence and etiology of white spot lesions and continues with detailed information about the diagnosis and differential diagnosis of these lesions. Preventive measures and management of white spot lesions based

on recently published data in the literature are presented as well. The authors provide photographs showing step-by-step management of white spot lesions, which are useful for the readers in clinical settings.

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