Toothwear: The ABC of the Worn Dentition

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In dentistry, toothwear needs constant attention because more juices and acidic drinks are consumed now than in the past. In addition to other factors, this increased consumption has led to an increase in the loss of dental hard tissues, which is a growing concern in the dental field. Globally, the prevalence of toothwear is increasing and ranges in the primary dentition from 6% (China) to 78% (Australia). This book describes the important aspects of toothwear, from childhood to adulthood in 12 chapters. The diagnosis and prevention of toothwear are also discussed as are methods of restoration.

The book contains an index, and at the end of each chapter, up-to-date references are provided; however, no websites are mentioned.

The 1st chapter, 'The multifactorial nature of toothwear', written by Farid Khan and William G.Young, demonstrates why toothwear is a multifactorial process involving overall health, medication, lifestyle, diet and other habits. The role of saliva protection, intrinsic and extrinsic acids, the examination of facial; extraoral and intraoral soft tissues are discussed.

Chapter 2 talks about the diagnosis and management of toothwear in children. The authors (W. Kim Seow and Sue Taji) show that toothwear in children generally results from a combination of attrition, abrasion and erosion.

Of these, dental erosion is often the dominant factor, and it is caused by extrinsic acids from dietary intake or intrinsic gastric acids. The contributing variables are the exposure time, patterns of consumption and clearance of acidic food and drinks, because they will influence the site specificity. The differences in the predominant sites of toothwear and dental caries in children are listed by age groups and teeth. The management of toothwear that requires the education of parents and caregivers, intervention, monitoring of toothwear and restorative management are all discussed in this chapter.

Louise Brearley Messer and William G. Young discuss childhood diet and dental erosion in chapter 3. The dietary factors involved in erosion and dental carries are similar, and dietary counselling can be an effective approach for managing both conditions in children, adolescents and teenagers. The frequency and timing of consumption of acidic drinks should be included when discussing dental risk factors. High titratable acid (TA) is deemed more important than pH in determining the erosive potential of a drink. Foods can have similar pH values but because of different TA values, they can vary in erosive potential. The TA in orange juice is greater than that in a cola drink and thus indicates a bigger potential for erosion. During dietary counselling, patients should be told that it is better to drink an acidic drink chilled because the erosivity of an acidic drink is higher at higher temperatures. Adding low concentration of CPP-ACP (casein phosphopeptide-amorphous calcium phosphate) to drinks decreases the erosion potential in vitro, but this has been implemented only in preliminary studies.

The oral presentation of toothwear in adults which is described by Farid Khan and William G. Young in chapter 4 shows how important the diagnostic modalities are for toothwear and caries as well as their site specificity. For instance, the mandibular molar teeth are far more commonly affected than the opposing maxillary molar teeth and are an important indicator of early-onset dental erosion in children. The stages of wear and the patient's risk status are discussed and beautifully illustrated with photographs and odontograms.

Colin Dawes wrote the chapter 'Salivary protection against toothwear and dental caries'. He explains why teeth dissolve in acid and discusses the sources and components of saliva that are relevant to tooth wear and caries as well as salivary buffering. Saliva consists mostly of water (99%); however, 309 different proteins and glycoproteins have been identified in whole saliva, and more than 1000 proteins have been detected in secretions obtained from the ducts of the parotid and submandibular glands. Amylase may play a role in dental caries, antibacterial and antifungal factors may influence the composition of the oral flora, and many proteins contribute to the formation of acquired enamel pellicle, which, in addition to salivary clearance, is discussed in this chapter. Saliva is a thin film that may vary in thickness on individual surfaces, and a sense of dryness will be experienced when the film becomes very thin on the hard palate. The sensation of xerostomia may not be due to generalized oral dryness, but due to localized areas of dryness especially in the hard palate area. Bicarbonate is the main buffer in saliva, but it is not secreted by the minor mucous glands. Therefore in areas where secretions of the minor gland predominate, such as the buccal area of the upper incisors, saliva will be poorly buffered. In these areas, the salivary film velocity is very low and the viscosity of the mucous secretion is high, which may explain the site specificity of acid erosion. Enamel eroded by acid cannot remineralize, which makes early diagnosis important for the prevention of further erosion.

In chapter 6, 'Dental diagnosis and the oral medicine of toothwear', William G. Young and Colin Dawes write that dentist and patients have to solve the following five questions: Why the toothwear may be mild, moderate or severe; whether bruxism or abrasion are involved; what the sources of extrinsic or intrinsic acids are; and why saliva protection has been lost. These questions are discussed under the topics of complaint/ discovery, development, abrasion, tooth brushing, oral hygiene and diet erosion. Using four patient cases, the authors illustrate the steps that have to be taken in order to obtain an accurate diagnosis and determine the management for these patients. A discussion is added after every case report.

The preventive and management strategies are further developed in chapter 7, which is written by Farid Khan and William G. Young. Toothwear prevention involves the 'WATCH strategy', counselling on risk factors, diet diary and review, preventive adjuncts, population-based measures and future directions. The 'WATCH strategy' (Water, Acid& alcohols, Taste, Calcium, caffeine& chewing gum and Health) uses answers to several questions to develop advice on preventive measures that not only can be offered to every patient with toothwear, but also can be tailored to fit a specific patient. Providing dietary advice after the patient has kept a diet diary is advisable. Preventive adjuncts that are available can be recommended; these include sugar-free chewing gum, topical fluoride, artificial saliva solutions, CPP-ACP products and toothpastes, for example. The diagnostic assessment and preventive management process should ideally include a longterm follow-up to assess and monitor the patients' compliance and improvement.

Chapter 8 covers the measurement of the severity and progression of toothwear and was written by William H. Douglas and William G. Young. The gold standard used to measure the progression of dental erosion over time is profilometry. The parametric measurement of toothwear can be performed with the contact stylus and the optical technique. To include the interproximal and undercut areas, the microcomputed tomography scanning methods are needed. To report toothwear as a volume loss, which is the most complete description of the process, a digital method is necessary. Toothwear can also be reported as a depth loss and as an increase in area of occlusal contact. Diagnostic study casts are essential. The baseline model can be used to show the severity of the lesions, plan the treatment and be compared to later models to confirm the success of the treatment or the progression of toothwear. New diagnostic casts should ideally be taken every 2 years. Two well-illustrated case studies are discussed at the end of the chapter.

Chapter 9 is titled 'Biomaterials' and is written by Stephen C. Bayne. It explains how wear is classified, in material science, based on microscopic mechanisms occurring at the surface of interest and how definitions differ in dentistry and engineering. This section is followed by discussions on properties versus structure and the principles and concepts for biomaterials wear. However, one first has to consider the overall principles and concepts such as operators (which are more important than the materials used), environmental factors, tooth location and wear mechanisms. This chapter includes an overview of biomaterial wear, wear assemblies, wear potential, wear rates and accumulated wear. In 50% of the cases, the clinical outcome depends on the operators. Naturally, the material, intraoral location and the patient influence the clinical outcome factor as well.

Chapter 10 considers the role of toothwear in occlusion (Anders Johansson and Gunnar E. Carlsson). The various aspects of occlusion in relation to toothwear, based on the literature, are mentioned as is some relevant historical perspective. Toothwear experienced a linear progression until the modern Western lifestyle emerged. Dental erosion is now considered to be the major cause of toothwear even if the morphological features of the wear are similar to those of our ancestors. Toothwear has an effect on occlusion and vice versa. The interdependence is clear but also very complex, and this is discussed in this chapter.

To restore or not to restore is a central question in chapter 11, which is written by Ian Meyers and Farick Khan. The clinical judgment must be based on clear principles, and the risks and benefits should be weighed as described in this chapter. The well-illustrated cases in this chapter show the need for prevention starting from a young age. If the decision is made to rehabilitate a worn dentition, the success rate depends not only on the skills of the dentist and the quality of the restorative materials, but also on the compliance of the patient to change to a more tooth-friendly lifestyle and adhere to it. Patients with little toothwear may not need any restorative procedures. Only in cases of severe toothwear will the techniques for reconstruction and repair be more complex and time-consuming.

The last chapter in this book was written by Ridwaan Omar, and Ann-Katrin Johansson outlines the principles and strategies for the rehabilitation of worn dentition. Conventional rehabilitation techniques, methods for fixed prosthodontics, removable prostheses, materials, adhesive rehabilitation techniques, the concept of staged reconstruction and the maintenance phase are highlighted in this chapter. Implants, in the absence of good evidence, should be recommended with caution, especially if excessive loading is present. The cases are nicely illustrated.

The book is useful for dentists, dental hygienists, dental therapists and students in the dental field. The main theme that runs through the book is early diagnosis and prevention. The chapters can each be read separately, but there is some overlap when they are read consecutively. The odontograms are very informative and the illustrations are good. Inclusion of a large number of case reports greatly enhanced the book. This book should be read and used in dental hygiene schools.

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