



Damage in Dentistry

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Abstract

Dentistry is one of the clinical disciplines that is closely related to medicine, but also to the technology of making various devices and placing artificial materials that compensate and/or upgrade lost teeth and surrounding structures. Dentistry is also medically responsible for the treatment of patients with diseases of the oral cavity. The main task of dentistry is healthy teeth and oral cavity, ie their preservation and treatment of damaged teeth. Caries is the most common dental disease, and is caused by the multiplication of bacteria inside the oral cavity due to lack of oral hygiene. If not treated in time, caries penetrates deeper tooth structures and destroys them which leading to tooth decay. The most common symptoms of caries are tooth sensitivity and toothache. If these symptoms occur, it is necessary to perform an examination at the dentist in order to prevent the disease immediately at the beginning and to avoid significant consequences for dental health. If caries is not treated in time, there is a high chance that irreparable damage will occur to the teeth and tooth tissue, which can ultimately result in the loss of one or more teeth.

Keywords

Teeth, Damage, Pain, Oral Care, Dentistry

Introduction

Your teeth develop beneath your gum line, but the minute your teeth break through the surface, they are subject to all kinds of potentially damaging influences [1]. The enamel that coats your teeth protects them from many of these dangers, but the sugars in the foods you eat, the hard textures of some foods, and the ever-present bacteria in your mouth, all work together to weaken this enamel and threaten the strength of your teeth. To maintain strong teeth, you must remain ever vigilant in your oral hygiene efforts.

Most tooth problems begin with damage to your tooth enamel. Any weakness in your teeth's enamel is a place where decay can take hold. Plaque is the number one cause of decay you must protect your enamel

against. Bacteria are the cause of plaque. Your mouth is always dark and wet, making it the perfect place for bacteria to live. Every moment of every day, bacteria are breeding and multiplying in your mouth and on your teeth. In just a number of hours, there are enough bacteria to form a sticky, clear film on your teeth called plaque. The more hours that go by without brushing, the thicker this film gets.

The two types of bacteria that can cause caries or cavities in your teeth are streptococci and lactobacilli. These bacteria feed on the sugars in your food. When the bacteria eat these sugars, they give off an acid that can dissolve the enamel on your teeth in a process called demineralization. Just a few minutes after you eat something containing sugar, the bacteria begin this

acid production. Luckily, your saliva neutralizes and washes away most of the acid. Most acid attacks last for about twenty minutes before your saliva can neutralize them. A serious problem occurs, however, when you have a plaque build-up. The plaque holds the acid next to your teeth, and it is more difficult for your saliva to penetrate sticky plaque. The older and thicker the plaque is, the more difficult it is for your saliva to penetrate and the longer the acid has to attack and dissolve your enamel. After just a few attacks, a weak area can form where even more bacteria, plaque, and sugar can collect to dissolve away more of your tooth. In just a few months, a very serious cavity can result.

Dental Care

The methods in which dental care is provided on a global basis differ widely [2]. Variations between industrialized nations and developing nations exist. Specifically, delivery systems are affected by political, cultural, and socioeconomic factors and can change frequently. Some countries have no set oral health policy, and in others more structured policies are practiced.

Dental hygienists place oral health as a priority issue, but for the majority of countries oral health is low on the list. Government health policies too often exclude oral health or it is hidden in the text among nutrition or general health policies. Even in these enlightened times, oral health promotion is often not prioritized within health care.

Over the past decades, in many industrialized regions effective preventive strategies have contributed to a decreased incidence of dental disease. These strategies included the addition of fluoride to toothpastes, community water systems, milk products, and table salt; community efforts to educate the public about oral health risk factors; the application of dental sealants; the use of noncariogenic sweeteners; and the introduction of the dental hygiene profession as a discipline of prevention. Life expectancy is increasing, and teeth are more likely to be retained.

Thus, to plan for the provision of oral health care for a given society, it is important to gather reliable evidencebased information on treatment needs, oral

health care systems, costs, workforce numbers, and education for the dental team. In some regions of the world, dental hygienists, due to their primary preventive orientation, play an important role in providing access to oral health care. The majority of the world's dental hygienists practice in societies that have a high demand for prevention, esthetics, and wellness, as well as the recognition that oral health is an integral part of general health and quality of life. Because of this, most dental hygienists provide care on an individual basis in dental or dental hygiene offices and serve the increasing number of persons who have maintained a functional dentition as a consequence of preventive or restorative dental work, and implants.

Biomaterials

There are different considerations for the function of biomedical materials which can be divided into three main classifications [3]. First, the biomaterials can be considered from the point of view of the problem area which is to be solved. Some areas of problems are replacement of diseased or damaged parts (e.g. the artificial hip joint, kidney dialysis machine), assist in healing (e.g. sutures, bone plates, and screws), improve function (e.g. cardiac pacemaker, intraocular lens), correct functional abnormality (e.g. cardiac pacemaker), correct cosmetic problem (e.g. augmentation mammoplasty, chin augmentation), etc. The second classification is the body consideration on a tissue level (i.e. organ or system levels). These are the heart (e.g. cardiac pacemaker, artificial heart valve, total artificial heart), lung (e.g. oxygenator machine), eye (e.g. contact lens, intraocular lens), bone (e.g. bone plate, intramedullary rod), etc. The third is for the classification of the type of materials like polymers, metals, ceramics, and composites.

The comparison between natural and engineering materials shows higher values of strength and toughness. Many natural materials have a self-healing capability against damage, on the other hand, man-made materials are still dramatically limited. Many natural composite materials, as exemplified by bone, have got toughness values that far exceed those for their constituents and also their homogeneous mixture which by employing extensive extrinsic toughening mechanisms, can resist incipient crack growth.

Oral Hygiene

Toothbrushing is the most important oral hygiene measure [4]. A simple, short backward and forward scrubbing action is the simplest and most effective technique for most people, especially children. The more complex a technique is, the more difficult it is for the patient to learn and to maintain over weeks, months or years. Toothpaste has a detergent effect and some toothpastes also contain an anti - bacterial agent such as triclosan. A fluoride toothpaste should be recommended for its caries prevention properties.

A variety of other oral hygiene aids are available. For a patient with poor oral hygiene the first advice should be to develop a methodical, thorough brushing technique that causes no damage. This should then be established as a daily routine. When this has been achieved it can be supplemented with a variety of aids such as floss, tape and interdental brushes. It is good practice to concentrate on achieving oral health by helping patients learn one skill at a time.

Not all patients have good manual dexterity. Some will need a toothbrush adapting so they can grip it properly. Flossing is not suitable for young children. Wood sticks can cause damage if misused. While most people need encouragement to clean their teeth effectively, some patients will do so excessively. A heavy - handed enthusiast may cause tooth abrasion and gingival damage. Such a patient could be encouraged to use only small backward and forward actions. Holding the brush in a pen grip reduces the pressure with which the brush is applied.

Bone

When studying bone specimens prepared for anatomical examination, they are hard, dry, and very obviously dead [5]. Many people think that this is what bone is like inside the body too. Nothing could be further from the truth. We have all experienced a bone fracture or know someone who has. The orthopaedic surgeon will bring the parts of the broken bone together and support them with a plaster cast. After a few weeks, the bone will have repaired itself and is able to function normally to support the person's weight, for example, so the cast will be removed. This shows that bone is very much alive and very adaptable.

A bone fracture is an extreme example of change in bone, but even intact bones are changing all the time to meet the functional demands placed upon them. This is a process known as remodelling and preserves the mechanical efficiency of bones.

Bone is potentially heavy, but is beautifully designed so that maximum strength can be achieved for minimum weight. Unnecessary bone is removed and additional bone is added as required. In a paralysed limb, the bone becomes thinner and weaker; in an athlete or an overweight person, it may become stronger and heavier. Look at the bones available to you for study and you will quickly find a damaged bone. The outside of the bone is thick and dense and is called compact bone. Look inside and you will see a meshwork of bone with spaces in between; this is cancellous or spongy bone made up of a meshwork of individual trabeculae.

If you look very closely at a damaged bone, it may be possible to see that the trabeculae making up the cancellous bone are not arranged at random, but are aligned very accurately along the lines of stress that the bone is subject to. The cancellous bone trabeculae in the shaft are arranged at right angles to each other along the lines of stress arising from the weight bearing function of the bones. In the areas of bone forming the joint, stresses will be applied in different directions according to the movement of your body; the trabeculae are arranged radially so that some are always aligned along lines of stress.

Bone fractures related to trauma, neoplasia or metabolic disorders such as osteoporosis, are among the most common human injuries [6]. Unfavorable conditions, such as extended bone fractures (accompanied with soft tissue damage and poor blood supply) or inappropriate fracture stabilization, may lead to delayed union, nonunions or permanent bone loss. These unfavorable outcomes are estimated at a rate of 5-10 %, but the number is expected to increase along with the increase of the aging population. Successful bone repair is thus of immense clinical importance. Notably, bone repair ends up with an osseous part identical to the intact bone. This is a unique feature of the skeleton, compared to soft

tissues' repair that results in fibrous scar formation.

Bone defects in the oral and maxillofacial region are caused mainly by trauma, various pathology and their surgical treatment, and congenital situations that have functional, esthetic, and psychological effects on patients [7]. These defects remain a major health problem that commonly challenges oral and maxillofacial surgeons, scientists, and healthcare systems. Clinician scientists have been studying and applying various materials and methods to retrieve function and esthetic appearance. In this regard, the size of bony defects and possible radiotherapy in that specific region are the main restricting factors in order to achieve a successful bone reconstruction.

Damage to ceramic restorations can occur during milling, during laboratory fabrication, during the delivery phase, and during function [8]. Flaws introduced into ceramics are particularly deleterious to the strength and clinical survival of a dental restoration. Milling using rotary instruments shapes a restoration by removal of small particles from the surface. The resulting surface often has defects caused by chipping of the material during milling. These small flaws can act as stress concentrators that initiate a crack in the material, eventually leading to fracture of the restoration.

During fabrication, dental laboratories must fabricate restorations to fulfill a wide range of clinical situations. In adjusting restorations, the laboratory may air-abrade the surface to clean it prior to ceramic application of glazing. Damage from particle abrasion, not necessarily immediately apparent, has been shown to compromise the fatigue strength of zirconia and alumina ceramics in crown-like structures. In fatigue, small flaws introduced by particle abrasion can lead to fracture.

Pain

Pain is a highly subjective experience and has been defined as occurring when and where the patient says it does [9]. Pain is defined by the International Association for the Study of Pain as 'an unpleasant sensory and emotional experience associated with

actual or potential tissue damage, or described in terms of such damage'. It is difficult to determine a cut-off point for when acute becomes chronic pain but estimates vary from 3 to 12 months.

Chronic pain conditions affecting the oro-facial region can originate from any of the multitude of tissue types present in the head and neck: vascular, nervous, muscular, bony and cartilage, amongst others. Chronic pain conditions must start at a chronological point. They can start either insidiously, or suddenly with an acute limitation of everyday function due to the severity and urgency of the pain experienced. In the latter case, patients may present 'acutely' to the dental practitioner. The presentation of their complaint may be complicated by the rich sensory oro-facial peripheral innervations. Messages from the peripheral nociceptors can diverge or converge, and therefore, pain may be reported, felt and perceived, to be related to teeth or other oral structures, but may originate from another anatomical site.

Reconstruction

The aim of regenerative medicine is to achieve structural and functional rehabilitation of the damaged tissues and organs affected by trauma, age-related, congenital, or disease incurred injuries [10]. In view of the recent findings, the field of nanotechnology has evolved as a promising candidate for providing advanced nano-functional biomaterials with customizable morphologies, properties, and functions that can recapitulate the exact in vivo microenvironment down to the extracellular matrix level that can promote cellular adhesion, proliferation, differentiation, and morphogenesis in a controlled spatiotemporal manner.

The foremost principle of tissue reconstruction is to replace "like with like." The "gold standard" graft material for lost tissue has been autogenous tissue: skin grafts for burns, muscle grafts for bulk loss, bone for skeletal reconstruction, etc. Autogenous grafting provides the best results but has disadvantages of donor site morbidity, limited availability, additional surgical time, and post-operative temporary mobility impairment. Allogeneic grafting overcomes the

shortcomings associated with autogenous grafts. Allografts are considered to be biocompatible, exhibit good post-operative response, without donor site morbidity. These have the advantage of shorter surgery time, abundant bone supply, and elimination of donor site morbidity but there are risks of infection transmission, immune reaction, and insufficient literature support. Alloplastic grafts and xenografts are limited in use and their clinical success is not adequately supported by literature. These drawbacks have led to the search for better alternatives. Alternatives to autologous graft should satisfy three criteria assured by autogenous grafting: cell laden grafts, production of biological moieties stimulating tissue formation, and stimulation of endogenous tissue-forming cells to migrate into the defect. Unfortunately, none of the currently available grafting alternatives intrinsically satisfy all the above criteria. One of the most promising techniques currently being developed for tissue regeneration is tissue engineering using autogenous cell transplantation. Tissue engineering aims to regenerate damaged and/or lost tissues by integrated use of biomaterials, optimal source of cells along with biological factors, providing new tools for regenerative therapy.

Law and Ethics

Law and ethics are now fundamental to the practice of dentistry and underpin relationship with the profession and with patients [11]. Probity lies at the heart of your professionalism and requires strict adherence to a code of ethics and the law.

The law informs dentistry at every stage and it is essential that dental professionals understand and are able to critically reflect on the legal issues relevant to practice. This is particularly true in emergency situations when an appropriate and timely response is required.

When dental professionals treat patients they undertake a duty of care towards those persons not to harm them in accordance with the law of negligence. Where dental professionals provide treatment to a patient for a fee then that treatment will be regulated under the laws of contract with the patient able to sue

if the contract is not fulfilled. Dental professionals' right to touch a patient will be based on the law of consent and the informed and freely given permission of the patient will be a prerequisite to any lawful treatment. The legal principles of confidentiality and negligence regulate the relationship between the dental professional and the patient while they are in the professional's care.

A registered dental professional is legally and professionally accountable for his or her actions, irrespective of whether they are following the instruction of another or using their own initiative. Healthcare litigation is increasing and patients are increasingly prepared to assert their legal rights.

U.S. law is outlined under principles of criminal and civil law; the latter is divided into contract and tort law [12]. Most legal issues related to dental practice involve civil wrongs or torts— that is, wrongful acts or injuries, not involving breach of contract, for which an individual can bring a civil action for damages.

Malpractice is part of the law of negligence, which constitutes one type of tort. A malpractice suit based on the law of negligence alleges that the dentist failed to employ the care and skill of the average qualified practitioner. It further alleges that the failure to employ the required care and skill was the "proximate cause" of the patient's injury. Malpractice is considered an unintentional tort. It is normally covered by dental malpractice insurance.

Informed consent cases used to be based on the theory of assault and battery, but today they are considered no differently from other malpractice cases.

Invasion of privacy, an intentional tort, results when a patient's image or name is used by a dentist for personal gain, such as in advertising. Discussing a patient by name without permission, with persons other than the clinical staff, also may be construed as a violation of the privacy implied by the doctor-patient relationship.

Conclusion

Good oral hygiene is the foundation of oral health. If you do not rinse your mouth with plain water after consuming a sweet or sour drink, the pH value in the oral cavity will drop which will create the conditions for the tooth enamel to begin to dissolve. The tooth enamel is made of hydroxyapatite crystals which are sensitive to the action of acids. Due to its action on the tooth enamel surface, its crystal lattice collapses and holes are created into which bacteria that are normal inhabitants of the oral cavity will be drawn. If this condition persists, advanced caries can develop from the initial caries, which can be recognized as a small white spot on the enamel surface. The human body has mechanisms to fight the drop in pH in the mouth, but it is always desirable to reduce the frequency and time of exposure of teeth to acids.

Conflict of Interest

The author has read and approved the final version of the manuscript. The author has no conflicts of interest to declare.

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