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Effects Of Dental Implants On Patients With Bruxism - A Review Article

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Abstract

A successful Dental implant treatment is determined by the level of osseointegration and peri-implantitis. Various risk factors like increased concentration of occlusal stress over an implant area can lead to failure even on the successfully executed Implants. Some authors state that, parafunctional habits like bruxism is one of the major risk factors in such patients. The correlation between dental implants and bruxism is an everlasting controversy. Implant failures are higher in bruxers. So certain treatment considerations, modifications must be taken, to achieve success in Bruxers. There is no gold standard method to diagnose bruxism. The clinician should be aware and have adequate knowledge to take proper history through series of questions, clinical examination of occlusal surfaces of tooth to assess the severity of bruxism to arrive at the suitable diagnosis. If the above-mentioned criteria are emulated properly, we can widen the success rate of dental implants in people with bruxism.

Keywords: Bruxism, Implants, occlusal overload, failure, occlusal splints.

Introduction

Restoring the edentulous missing tooth by an endosseous dental implant is successfully becoming more evident form of treatment. Because of the ceaseless advanced developments in its long-term effectiveness, the future prospective and scope of dental implants in the field of oral rehabilitation has been improved and amplified to a wider extent, thereby having the constructive effect on the quality of the life of the patients.[7] Success of the dental implant treatment is measured by the presence of osseointegration and the absence of peri-implantitis. According to Branemarket all osseointegration was defined as the formation of a direct functional and structural connection between the ordered, living bone and the surface of load carrying implant at a microscopic level. Following osseointegration, the bony structures adapt to the load by forming mature viable lamellar bone, a stage that is called bone remodeling.[3] However, various elements including the surplus load on the successfully executed implants can end up in failure.[2] Thus, abundant knowledge, understanding the concept and awareness about the complications plays a key role in implant treatment care.[4]

Failure of dental implants is divided into 3 factors which includes biological, biomechanical, and iatrogenic factors. Biological problems include early and late implant failure.[2] Early failures are noticed within first three to six months of treatment and is concerned with initial poor healing of the bone resulting in compromised osseointegration. Tissue damage and lack of osseointegration are the consequences of the copious amount of load on the implant.[3] In case of biomechanical complications, more than one component of an implant system fails implant fracture, abutment fracture, and abutment screw fracture.[2] The correlation between the dental implants and bruxism is an existing everlasting controversy. Hence this paper aims in discussing the relationship between bruxism and implants, evaluation of patient, the clinical management of implant prosthesis using alternative occlusal material and other treatment modalities to overcome the failures of implant in bruxers.

Reasons for implant failure

Success and failure of the dental implants are commonly classified into patient-related factors (e.g., patient's general health status, quantity and quality of bone, oral hygiene maintenance, smoking habits, etc.), implant characteristics (e.g., coating, loading, dimensions, etc.), implant location, and clinician experience.[25] Primary causes for Implant failure are chronic periodontitis, defective bone quality, systemic diseases, smoking, advanced age, location of the implant, loss of implant integration, inappropriate prosthesis and Para functional behaviors.[26] Increased prevalence of periodontitis and loss of tooth is seen in Diabetic patients because of which, it is grouped as a risk factor for implant placement. They are associated with delayed wound healing, occurrence of micro vascular disease and compromised response to infection.[28] Implant failure can also be accurately classified into Early and late implant failure, thus the Osseointegration plays a key role in Success and failure of the Implants. [26] The conspicuous crestal bone loss is seen after the placement of dental implant due to surgical trauma, occlusal overload, peri-implantitis, the influence of the micro-gap, biologic width, reverse torque testing, and the implant crest module. Also, the etiology of implant failure includes biological and mechanical causes. Biological etiology includes infection, peri-implantitis, overheating of bone, implant fracture, macrostructure (e.g., short implant length), microstructure (e.g., machined surface) and immediate or functional overloading resulting in bone loss. Compression of alveolar bone beyond its physiological tolerance results in ischemia followed by formation of necrosis/sequestrum resulting in implant failure.[27] The parafunctional habits are the crucial trap that prevents the success of the implant treatment even when the other mentioned risk factors are absent. According to some authors, parafunctional habits like Bruxism is a risk factor in such patients, since abundant occlusal stress is concentrated over the implant area, resulting in failure. Thus, in such patients receiving dental Implants, bruxism could be focused as a possible risk factor. [8]

Patient evaluation and occlusal considerations for implant restorations

Mastication is side to side action that delivers occlusal forces to the long axis of tooth/implant while Bruxism produces the lateral friction between the occlusal surfaces and subsequently results in destruction of it.[2] Therefore, it is considered chewing as an acceptable load and bruxism as an overload to the implant.[5] The natural teeth and the alveolar bone are mediated by the periodontal ligament, whereas the osseo-integrated implants directly contact the alveolar bone leading to restoration of existing occlusal relationship challenging.[2] The proprioception is limited in dental implants due to the absence of periodontal ligament

thus lowering the tactile sensitivity. Also, the proprioceptive feedback of the oral musculature is reduced. Thus, the Bruxers have higher possibility of implant failure because of the excessive load on it. [5] So certain considerations on occlusion should be designed to receive an implant in order to reduce the failure rate such as Cuspal interferences, channel the forces along the long axis, minimize the lateral forces. [2] The evaluation is based on questionnaires, information provided by the bed partner, or relatives.[36] Wearing of teeth has always been considered the clinical hallmark of bruxism. [19] It is the first sign to be evaluated on the patient examination.

The patients are asked to use the Bite Strip device (SLP, Pulheim - Stommein, Germany), to register the electro myographical activity of the masseter muscle during sleep to evaluate and estimate the presence, intensity and frequency of sleep bruxism.[35]

Hence the most important factor that must be considered and evaluated carefully before the implant treatment is occlusion particularly in bruxism patients because of the overload. The occlusal principles for restoring the implants are same as for the natural teeth, yet the mechanical effects on the occlusal principles of implants are not clearly explained in the literature. Since group function produce excess stress on the implant components. It is recommended to give canine guided occlusion especially in bruxers. In case of compromised canine or single implant on canine, it requires additional posterior support. It is necessary to check the occlusion in regular recalls to assess the attrition. Stress locations are usually found in the neck of the implants, abutments, and abutment screws.[1] Occlusal forces are substantial in the posterior molar region leading to increased stress on the implant components and the surrounding bone which then becomes susceptible to loosening and implant failure. In such cases placement of two implants are indicated to reduce the stress. [9]

What is bruxism? A risk factor

'Bruxism' is originated from the Greek word Brychein, meaning 'gnash the teeth'. The very early and common definition of bruxism was "gnashing and grinding of the teeth for non-functional purposes. [16]

Bruxism is defined as an oral habit consisting of involuntary rhythmic or spasmodic non- functional grinding, gnashing, or clenching of teeth, in other than chewing movements of mandible, which may lead to occlusal trauma (GPT9). Bruxism is a repetitive jaw-muscle activity specified by clenching, teeth grinding during sleep as well as wakefulness (Lobbezoo*et al*. 2013, AASM 2014).[10] When the teeth grinding takes place during wakefulness, it is called as Bruxomania, since clenching clearly differs from grinding. Clenching is the static process. In centric bruxism opposing teeth meets at an eccentric position when grinding is in dynamic process, in eccentric bruxism mandibular arch slides at different position over each other. Diurnal and nocturnal bruxism are different entities with different etiopathogenesis and clinical management plans.[15] The prevalence of awake bruxism is seen in adults range from 22.1% to 31%, most common in females and the prevalence of Sleep bruxism in children varied from 3.5% to 40.6% and has no gender differences.[11]

This can be identified on the first visit to the dentist as one can notice the predominant wearing of tooth.[10] Bruxism has been suggested to have an occlusal excessive overload on implants and its supra structure resulting in bone loss and failure of the implant.[2] According to Chrcanovic*et al* high failure rate of dental implants was observed in patients with bruxism.[7]

Etiology of bruxism

The etiology of bruxism remains controversial and is difficult to interpret because of the existing conflict between the definition and diagnosis of the disorder.[12] However, it is hypothesized as it has a multi-factorial nature. It is distinguished as central (pathophysiological and psychosocial) factors and peripheral (morphological) factors.[23] Previously morphological factors, like occlusal discrepancies and deviations in the anatomy of the bony structures of the orofacial region, have been considered the main causative factors for bruxism.[12]. Recent focus is more on the pathophysiological (central) factors.[23] Studies revealed that the bruxers had higher rate of depression and anxiety than the non-Bruxers.[12] Psychosocial factors include the inability to express emotions such as anxiety, rage, hate, aggression etc. which can also be a cause for bruxism.[24] Taken all evidence together, bruxism seems to be mainly influenced centrally, not peripherally.[12] It is also stated that etiology of bruxism is associated with local, systemic and neurological factors. The local factors include traumatic occlusion, excessive restorations, dental cysts, malocclusions, periodontal calculus, mobility, gingival hyperplasia, lip deformity. The systemic factors include nutritional deficiencies, mental retardation (syndromes like down syndrome), adverse drug effects (antidepressants), dementia, Parkinson's disease and gastro esophageal reflux disorder. Nutritional factors include consumption of beverages, hot and soft drinks and habits like smoking stimulate the central nervous system leads to increased levels of the anxiety and stress. They all can potentially trigger the emergence of bruxism.[10] Other factors like anatomical abnormalities, sleep disorders, trauma, genetics, alcohol consumption, hyperactive or competitive type of Personality and behavior can predispose to bruxism.[24]

Impact of bruxism on implants

The Common relationship between bruxism and implants remains unclear.[14] Bruxism has been suggested to cause excessive occlusal overload to the implant and their superstructures, resulting in bone loss and finally implant fracture and failure.{12] It can potentially cause the imbalance between the bone remodeling and absorption, leading to biological complications namely peri-implantitis. The proprioceptive feedback of oral musculature around the dental implants are minimized because of the absence of periodontal ligament causing the technical complications like chipping of the porcelain, losing the retention, screw/implant loosening and screw/implant fracture.[14] Despite the controversies, two conclusions have been put forth. The fast-occurring bone loss from overloading and complete loss of osseointegration takes place during overload.[21] Tagger Green *et al* specified that fair clinic examinations and proper treatment plans (factors to count on like location and size of the implants) can reduce the risk of failure. To protect the final treatment result of implant in bruxers by using the hard stabilization splint for night-time (night guard), as to reduce or even neglect the lateral destructive forces was recommended by Lobbezoo*et al*.[12] Before fulfilling the patient's wish to be re-implanted, it is necessary to first manage the sleep bruxism, therefore optimistically preventing another failure.[20] These impact can also produce other complications including bleeding on probing, peri-mucositis, peri-implantitis, loosening/fracture of abutment screw, crown loosening, porcelain chipping, fracture of the superstructure and abutment, thereby increasing the micro-gap and micro-motion between the implant-abutment interface, and hastens the micro- leakage at the interface and resulting in failure of the implant.[22]

Diagnosis

The diagnosis and clinical evaluation of bruxism is crucial because both the normal individuals and bruxers shows parafunctional nocturnal activities.[10] The appropriate amount of diagnostic approaches to bruxism in the implant literature is very poor and better ways of estimation for the diagnosis of bruxism is essential to improve the soundness of the findings.[13] Clinical researchers should utilize different evaluation methods to justify bruxism instead of an incomplete diagnosis, since there is no gold standard method available to diagnose bruxism then. To begin with, the clinician should have a proper diagnosis of bruxism and should figure out the type of bruxism (awake or nocturnal), simultaneously the severity of bruxism is assessed. Following this, the clinician should make a complete pre-operative planning including the proper positioning of implant to reduce the overload. A precise questionnaire, clinical examination, electromyographic and polysomnographic techniques are available in the diagnosis of bruxism. However, the common method for diagnosing bruxism is patient reporting the teeth wear.[14] A diagnostic system for grading of 'possible', 'probable', and 'definite' awake or sleep bruxism is recommended for clinical and research purposes. Self-report and the clinical examination are required for 'probable' sleep or awake Bruxism while 'definite' sleep bruxism is established with self-report, clinical examination, and polysomnographic recording ideally with audio/video recordings.[18]Kapusevska in trials of patients at the Clinic for Dental Prosthetics for diagnosis of bruxism used bruxonalizor to determine the horizontal type of bruxism and used bruxoquantifier to determine the vertical type of bruxism.[10] Currently, the polysomnographic recording (PSG) is contemplated as the gold-standard for the diagnosis of sleep bruxism but is limited because of high cost and the insufficiently equipped sleep laboratories. For this reason, a new number of diagnostic devices based on electromyography is been getting advanced, but they need to be validated as suitable for recording all the main four masticatory muscles, viz. Bilateral temporalis and masseter.[19] The quantification of oral muscles electromyographic activity is a more reliable data to find the effects of bruxism on implant-supported rehabilitations.[13]

Treatment planning

According to the literature, interventions for bruxers are divided into following groups, (1) Intraoral- occlusal adjustment, occlusal splints, NTI (nociceptive trigeminal inhibitory) splints, Mandibular advancement appliances; (2) Physiotherapy of masticatory muscles with electric stimuli, contingent electrical stimulation; (3) Intramuscular injection- Botulinum toxin A; (4) Drug therapy- antidepressants, L-dopa inhibitors, antiepileptic, sympatholytic, antihistamines or dopaminergic drugs; (5) Biofeedback- aversive taste, audible noise (6) Behavioral- sleep relaxation techniques, cognitive treatment physiological advice; (7) kinesiotherapy- facial exercise and masticatory muscles massage and (8) supportive therapies.[29] Initially To treat bruxism, Occlusal splints can be given, provided to close in centric relation, to immobilize the mandible, to relax the mandibular muscles. Permanent soft clear acrylic mandibular splint with positive indentations for the seating of opposing cusps in centric relation has been effective. In case of repositioning the mandible is indicated, hard acrylic resin for both maxillary and mandibular tooth is designed to achieve the centric relation primarily, then the soft splint is indicated secondarily.[30] The significance of home oral hygiene protocols should be properly explained to the patients.[31]Koriothet *al* reported that the parafunctional nocturnal dental activity on the occlusal splints resulted in wear which was asymmetric and uneven in nature.[17] Placing the dental implants in increased bone density areas

could reduce the stress on them and improve the prognosis in patients with bruxism. Higher the bone density, lesser will be the chance of developing peri-implantitis.[19] Prosthetic planning and biomechanical design should be adjusted carefully, as vertical forces produce less stress on the implant.[32] This is justified by studies that has proved the mechanical union of two or more implants can distribute and reduce the stress overload in bone around implants. The correct positioning and alignment of implants is also desirable to minimize the non-axial loads and the flexion of Implant components. The use of Implants with larger diameter and longest length as much as possible should be considered to reduce the stress in the cortical bone. The dental implants are to be installed perpendicularly to the curves of Spee and Wilson to indulge the direct contacts to the long axis of the implants.[33] Pharmacological treatment with drugs viz., Dopamine agonists, non-benzodiazepine hypnotics, anticonvulsants, anxiolytics, botulinum toxin A are appropriate when bruxism is very much pronounced.[10] When a patient does not respond to the conservative management, surgical treatment with Botulinum toxin A has been effectively carried out for masseteric hypertrophy and bruxism.[34]

Conclusion

Implants in the rehabilitation of bruxism patients are an achievable alternative when the implants possess adequate length, diameter and proper positioning, to reduce the failure of the treatment. However, in such case, the control of bruxism is very essential. It is done by using occlusal stabilization splints relieving in the implant region during sleep is suggested. Additionally, the patient must be educated about the need for regular maintenance, the possibility of technical complications that might arise and produce additional cost for the management of Implant.[23]

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