EFFECT OF PARAFUNCTIONAL FORCE ON DENTAL IMPLANT TREATMENT IN BRUXISM: A CASE REPORT (TWO YEAR RESULTS)

Mustafa Zortuk[1], Erdem Kilic[2], Pinar Yildiz[3], Ikbal Leblebicioglu[3]*

1. Assistant Professor, Department of Prosthetic Dentistry, Faculty of Dentistry, Erciyes University, Kayseri- Turkey.
2. Assistant Professor, Department of Maxillofacial Surgery, Faculty of Dentistry, Erciyes University, Kayseri- Turkey.
3. Research Assistant, Department of Prosthetic Dentistry, Faculty of Dentistry, Erciyes University, Kayseri- Turkey.

Abstract

An implant fracture may be one of the major causes of implant failures. The probable cause of the implant fracture was due to biomechanical overload caused by bruxism. Bruxism (teeth grinding and clenching) is generally considered a contraindication for dental implants. So far, in the dental literature, the possible cause-and-effect relationship between bruxism and implant failure do not yield consistent and specific outcomes.

This is partly because of the large variation in the literature in terms of both the technical aspects and the biological aspects of the study material. Although there is still no proof for the suggestion that bruxism causes an overload of dental implants and of their suprastructures, a careful approach is recommended.

This case report illustrates the importance of an extensive clinical examination and accurately occlusal arrangements of oral implant patients for the presence of severe bruxism for two year results.

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Introduction

Bruxism is a movement disorder of the masticatory system that is characterized, among others, by teeth grinding and clenching, during sleep as well as during wakefulness.[1] Several recent review articles describe the definitions, epidemiology, (differential) diagnosis, aetiology, and treatment of this disorder.

Bruxism is frequently considered an aetiological factor for temporomandibular disorders (TMD), tooth wear (e.g. attrition), loss of periodontal support, and failure of dental restorations and dental implants, although conflicting evidence for many of these purported aetiological relationships can be found in the literature.[2]

Corresponding author:
Dr. Mustafa Zortuk
Department of Prosthetic Dentistry
Faculty of Dentistry
Erciyes University, Melikgazi-Kayseri 38039, Turkey.

E-mail: mzortuk@erciyes.edu.tr

These possible musculoskeletal and dental consequences of bruxism illustrate the clinical importance of this disorder. Importantly, it should be borne in mind that there is still a lack of agreement about, for example, the definition of bruxism, which makes it sometimes difficult to unequivocally interpret the available evidence. [3]

Since the beginning of implant dentistry, implant-supported prostheses have proven to be a highly predictable treatment for completely and partially edentulous patients. However, complications affecting osseointegrated dental implants can occur in specific situations and the clinician must be aware of the treatment limitations and avoid risky situations, which can lead to implant-supported prostheses failure due to biomechanical complications.[4,5] These complications can involve loosening or fracture of the prosthetic screw, loosening or fracture of the abutment screw, and also implant fracture.[6]

Bruxism has also been suggested to cause excessive (occlusal) load of dental implants and their suprastructures, ultimately resulting in bone loss around the implants or even in implant failure. Not surprisingly, bruxism is, therefore, often considered a cause of

concern or even a contraindication for implant treatment, as stated in many textbooks and conference proceedings on oral implantology and prosthetic dentistry.[2]

According to Misch, bruxism doesn't necessarily represent a contraindication to implants but it does dramatically influence treatment planning. In addition, many researchers use bruxism as an exclusion criterion for the selection of their participants in clinical studies concerning treatment modalities with dental implants. These authors argue that the overloading influence of bruxism on implants and their suprastructures yields a higher risk of biological and biomechanical complications than would be the case during physiological masticatory activities.[7]

In the presence of bruxism, most authors recommend to place more implants than would have been necessary in the absence of this movement disorder. More specifically, as to avoid free-ending situations, one implant should be placed for each missing element.[8,9] This recommendation is supported by the findings of in vivo studies that indicate a reduction of the forces that are being exerted on an individual implant when the number of implants increases.[10] In addition, mechanically connecting the implants leads to a better distribution of the forces and a reduction of the stresses in the bone around the implants.[11]

In these 2-year follow up this report, the efficacy of bruxism is described in a patient experiencing oral implant treatment and effect of bruxism on implant survival.

Case Report

In March 2008, a 64 year old woman consulted the clinic of the Department of Prosthetic Dentistry of Erciyes University Dentistry Faculty, with a wish for oral implants in the right lower jaw and retreat her old fixed prosthodontics to improve her aesthetics and oral function. There was not any systemic disease in her history. On her clinical examination there were improper fixed partial prostheses at her left mandible and maxilla. Also it was identified that the occlusal surface of her teeth was abraded severely. Consequently the occlusion type of the patient was bilateral balanced occlusion.

Additionally the patient confirmed her grinding and clenching habit on her anamnesis. Nevermore she hadn't any temporamandibularjoint (TMJ) problem like sensitive muscles, limited occlusal opening and deviation on lower jaw opening.

Following the routine oral implant treatment planning protocol of the clinic, 2 implants, with lengths of 12 mm and diameters of 3,3 and 4,1 mm, respectively, were finally placed at the former tooth sites of elements 45 to 47 *(Standard Plus Implant, Straumann® AG,Basel, Switzerland)* by submerged approach. The patient had not used any temporary removable denture during osseointegration. After a healing phase of almost 3 months, the implants appeared to be firmly anchored, as assessed clinically and radiographically. In July 2008, the secondary surgery was performed and healing caps were placed. After a ten day period the patient recalled in order to take the impression.

The impression of the implants and teeth was taken by a custom made tray by using polyvinyl siloxane material (*Express™ XT, 3M ESPE AG D-82229 Seefeld-Germany)*. The master model was casted with Type IV stone. Afterwards the abutments were chosen for each implants (*SynOcta 048.605 for 45 and SynOcta 048.602 for 47 , Straumann® AG,Basel, Switzerland*). The metal-ceramic restorations were produced for both quadrants.

Subsequent to the laboratory procedures abutments were placed on the implants and the trials were performed in order to examine the coherence. Before the screwing the premature contacts during the occlusal and lateral movements were removed and occlusal management was finished by bilateral balanced occlusion with tripod sentric contact. Bridges were made on the implants and teeth, to the full satisfaction of both the patient and the prosthodontist (figure1).

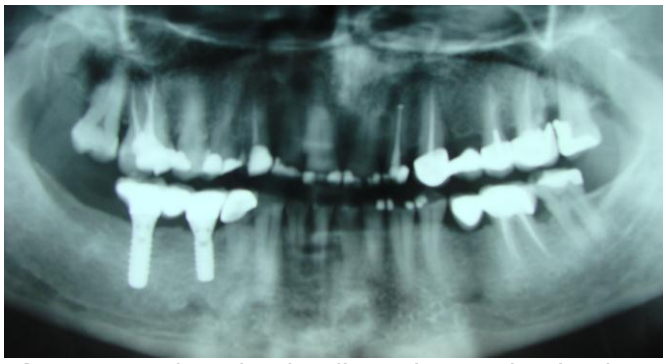

Figure 1. After the loading phase, the implants assessed radiographically.

Although the patient had bruxism, the occlusal splint was not performed because of not having any symptomatic complaints as TM disorder or muscle pain.

She was controlled with clinically and radiologically whether her bruxism influence the implant and its periimplant tissues at 6 month, 1 and 2 year. At 6 month control there was not anything wrong. However, in the first year control, we recognized that at the other quadrant of her mandibula, the porcelain of her bridge was fractured 1mm diameter on the occlusal surface of functional cusp (Figure 2).

Figure 2. The porcelain fracture and removed aesthetic composite on screw due to bruxism at the 1 year control.

A porcelain repair system was performed for repairing the fractured porcelain piece *(Ultradent Porcelain Repair Kit,Ultradent Inc, South Jordan, UT)* . After the measurement of the periapical radiographs, the bone loss around the implants was evaluated by the formula below:

$$\frac{\text{The bone loss that evaluated from periapical film } \mathbf{x} \text{ the real size of implant}}{\text{The size of implant in the periapical film}}$$

The bone level in the mesial and distal portion of the implants in 6 month, one year and 2 year follow up were shown in the table 1.

	45		47	
	mesial	**distal**	**mesial**	**distal**
Before loading	**1.81**	**2,57**	**1,90**	**1,97**
6 month	**1.95**	**3,01**	**1,98**	**2,13**
1 year	**2.24**	**3,41**	**2,11**	**2,92**
2 year	**2,28**	3,68	**2,67**	**3,07**

Table 1. The bone levels that outcome measures from radiographs.

The marginal bone level was examined at 2-year recall, and the initial bone level of actual implants placed according to the guidelines determined by the manufacturer was used as a baseline reference. Periapical radiographs were obtained by using a paralleling device (Dentsply RI˙NN, Rinn Cooperation, Elgin, IL, USA). Radiographs were digitized at 2,400 dpi by using a scanner (CanonScan Lide 200 Canon Inc Vietnam), and linear distance measurements were made (Figure 3).

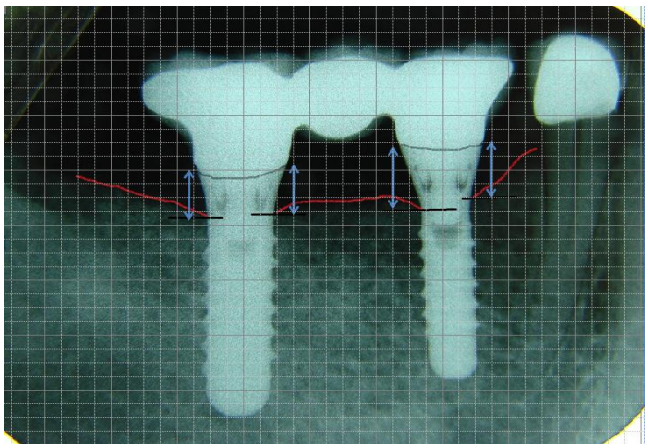

Figure 3. Periapical radiographs were obtained by using a paralleling device and linear distance measurements were made.

The maximum bone loss was 1,2mm at the distal side of implant, located at second molar tooth localization. The observed values are encountered the early term success criteria of the implant.

Discussion

Stress is a particular entity that directly related to force. As a result, any dental force factor magnifies the stress. Different patient conditions place different amounts of force magnitude, duration, type and direction. In addition, several factors may multiply or increase the effect of the other conditions once the dentist has determined the prosthesis type, the dentist should evaluate and account for in the overall treatment plan the potential force levels that will be exerted on the prosthesis.[7,12]

Several elements observed during the dental evaluation may be the source of additional forces on implant abutments. The initial implant survival, early loading survival, early crestal bone loss, incidence of abutment or prosthetic screw

loosening, and unretained restorations, porcelain fracture, and component fracture are influenced by the factors of the force.[13]

The most harmful forces of stomatognatic system are bruxism because of its repeated or sustained forces. Bruxism has also been cause excessive (occlusal) load of dental implants and their suprastructures, which may ultimately result in bone loss around the implants or even in implant failure.[3]

In dental literature, bruxism was used as an exclusion criterion, success rates of about 95% are found after 18–24 months[14-16] , while for studies that included bruxism patients in their study sample, lower success rates are reported, i.e. about 80% after 1–2 years.[17] On the other hand, some studies report high success rates despite the inclusion of bruxists in the study population.

For example, the cumulative success rate after 6 years varies between 92 and 95% in a study by Quirynen et al. [18], while Lidquist et al.[19] reported a success rate of almost 99% after 15 years. In other words, epidemiological data yield equivocal results with regard to the purported causal relationship between bruxism and implant failure.[2]

All guidelines aim to minimize the forces that are applied to the implants. A frequent advice is related to the number of implants. In the presence of bruxism, most authors recommend to place more implants than would have been necessary in the absence of this movement disorder. More specifically, as to avoid free-ending situations, one implant should be placed for each missing element.

A final recommendation regarding the implants themselves is related to their length and diameter: longer implants with a larger diameter help to keep the stresses in the bone as low as possible. Articulation should be characterized by flat incline planes of the cusps as to protect the implant system against the lateral components of the forces that are being exerted during, for example, teeth grinding. In addition, mechanically connecting the implants leads to a better distribution of the forces and a reduction of the stresses in the bone around the implants.[2]

Conspicuous finding from our case was that the porcelain fracture increase was disproportionate with bruxism habit. Comparably Kinsel and Lin were found that there was a disproportionate increase of porcelain fracture in patients with a bruxism habit, patients not wearing a protective occlusal device, and when the restoration opposed another implant-supported metal ceramic crown or FPD in their study. And they deduced that approximately 7 times higher odds of porcelain fracture that these patients.[20]

Additionally the masticatory function is not clear in current literature for bruxism with dental implant treatment. The chewing efficiency of unilateral implant supported fixed partial dentures in bruxism patients must be investigated for further informations.

At the end of our study we compared our data with the success criteria of implants that were approved by dental literature. [21,22] The individual unattached implant was immobile when tested clinically and also the radiograph did not demonstrate any evidence of periimplant radiolucency. In addition, the vertical bone loss was max 1,2mm following the two years. Due to absence of persistent or irreversible signs and symptoms such as pain and these reasons we mentioned above the implant success criteria were ensured.

Conclusions

In this study the patient who has bruxism and as two implants on one side edentulous ending dentition was followed up during 2 years. There were not any complication existed in the bruxism patient who we investigate and also the registered bone loss was between the normal limits. On the account of our study the implant therapy is applicable and sufficient therapy after making the required occlusal arrangements.

Declaration of Interest

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