Republic of Iraq

Ministry of Higher Education and

Scientific Research

University of Baghdad

College of Dentistry

Bruxism and Prosthetic Treatment

A Project Submitted to

The College of Dentistry, University of Baghdad, Department of Prosthodontics in Partial Fulfillment for the Bachelor of Dental Surgery

By

Amena Rafid Moujed

Supervised by

Lect. Dr. Zainab A. Azeez

B.D.S, M.Sc. Prosthodontics

A.D 2022 **A.H 1443**

بسم الله الرحمن الرحيم

صدق الله العظيم

Certification of the Supervisor

This is to certify that this project entitled "**Bruxism and Prosthetic Treatment**" was prepared by the fifth-year student **Amena Rafid Moujed** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Lect. Dr. Zainab A. Azeez

B.D.S, M.Sc. Prosthodontics

Dedication

All my success as well as everything I do, I'm honored to dedicate it to my parents, the two people who gave me the values and paved the path for my journey in life.

My father, for always pushing me to shine and always trusting me, for being my backbone and my all times super hero.

My mother, my mentor and role model for the love she planted in me for this field and department and for her generosity in love, knowledge, wisdom and life lessons.

My young sister Malek with the biggest heart, for being my number one cheerleader and for embracing me with her genuine care.

My grandparents for believing in me since day one and granting me the gift of compassion and motivation.

To my big family, for their presence, warmth and endless support.

And of course my friends who shared the journey of learning with me, to our memories here and to the future we hold, may we grow and rise together.

Last but not least I dedicate this to all the young dreamers with hope for the future, this road may have obstacles but is worth each step.

Acknowledgment

Foremost my gratefulness and appreciation to my God **Allah** almighty for blessing me with passion for this career, preservation to walk this journey and for bestowing me with strength, good health and peace of mind to finish this project.

I would like to express my thanks to **Professor Dr. Raghad Al Hashimi** dean of College of Dentistry, University of Bagdad for his constant support and efforts to improve our educational system and college.

I wish to extend my sincere thanks to **Professor Dr. Abdel-bassit Fathallah** Head of Prosthetic Department for his continuous care and efforts to facilitate the work and completion of this project and requirements.

This project wouldn't have seen the light without the guidance, support and supervision of **Lecturer Dr. Zainab A. Azziz,** her scientific advices, insightful comments, immense care and time spent proofreading and following the work is deeply appreciated.

Last but not least I thank everyone who played a role in this work by their provided information, encouragement and enlightening.

Table of Content

List of Figures

List of abbreviations

TMD	Temporomandibular Disorder
CNS	Central Nervous System
RPD	Removable Partial Denture
FDP	Fixed Dental Prostheses
CD	Complete Denture

CHAPTER ONE

REVIEW OF LITERATURE

Introduction

Activities of the masticatory system can be divided into Functional, which includes chewing, speaking, and parafunctional, which includes clenching or bruxism of the teeth. Bruxism is defined as a parafunctional habit occurring during sleep or while awake, and is characterized by grinding of the teeth **(Basic and Mehulic, 2004; Lavigne *et al.*, 2008).**

Bruxism can be considered as the commonest of the many parafunctional activities of the masticatory system. Opinions on the cause of bruxism are numerous and widely varying. Studies indicate that the etiology is not fully known but that it has probably multifactorial causes which have to be identified and managed by various treatment modalities. As bruxism events bring about tooth and restoration damage, it is of major concern for the dentists **(Lobbezoo *et al.*, 2008; Kanathila *et al.*, 2017)**.

Sequelae of bruxism that have been proposed include tooth wear, signs and symptoms of temporomandibular disorders, headaches, toothache, mobile teeth, and various problems with dental restorations as well as with fixed and removable prostheses **(Grossi, 2014).**

Relationships may, directly or indirectly, exist between bruxism and prosthetic treatment. Although certain occlusal conditions and/or incorrectly prosthetically modified occlusions were historically believed to be potential causes of bruxism, this has largely ceased to be the case. Also, the assumption that ‘correction’ of such occlusal conditions could reverse bruxism has also been discredited. What is important is the possible effect of bruxism on prosthetic restorations **(Paesani, 2010).**

The recommended approach to managing bruxism includes three angles, the use of an occlusal splint - preferably the hard acrylic-resin devices - works more as a

protector of the teeth, preventing further damage. A behavioral approach to increase the patient's awareness of the disorder, relaxation, lifestyle, and sleep hygiene instruction, and the use of drugs, which should be limited to short periods and severe cases where occlusal devices and psychological methods were ineffective, hence, early diagnosis and treatment is considered to be of utmost importance **(Lobbezoo *et al.*, 2008).**

When prosthetic intervention is indicated in patient with bruxism, efforts should be made to reduce the effects of heavy occlusal loading on all the components that contribute to prosthetic structural integrity, failure to do so may indicate earlier failure than is in the normal **(Johansson, 2011).**

Aims of Review

The aims of this review are:

1. To clarify the different management and treatments for bruxism patients.
2. To predict the suitable prosthetic treatment planning and the effect of bruxism in
    - Natural dentition.
    - Removable partial denture.
    - Removable complete denture.
    - Fixed dental prosthesis (Bridge and Implant).

1.1 Mandibular Movement:

Mandibular movement is any movement of the lower jaw which allows for its participation in mastication and occlusion. The muscles of mastication contribute to the mandible's complex movements and include the temporalis, masseter, medial pterygoid, and lateral pterygoid **(GPT-9, 2017).**

There are primarily 6 types of mandibular movement, including

-opening

-closing

-rightward jaw translation

-leftward jaw translation

-protrusion

-retrusion **(Sivam and Chen, 2021).**

1.1.1Functional Movement

The functional movements of the mandible can be divided into two types:

a. Rotational movement according to **Dorland's** in **(2019)** is defined as "the process of turning around an axis: movement of a body about its axis." more specifically in the masticatory system rotation occurs when the mouth opens and closes around a fixed point or axis within the condyles.

Rotational movement of the mandible can occur in all three reference planes: horizontal, frontal (vertical), and sagittal; in each plane it occurs around a point called the axis **(Rahn *et al.*, 2009).**

The rotation movement is further divided into three axes as in (Fig. 1.1):

-Horizontal axis of rotation: pure rotational activity occurs in this type by opening and closing motion around the horizontal axis, which is also called 'hinge movement' **(George, 2019).**

-Vertical axis of rotation: it's the mandibular movement around the frontal axis occurs when one condyle moves anteriorly out of the terminal hinge position with the vertical axis of the opposite condyle remaining in the terminal hinge position, this is an isolated movement that doesn't occur naturally **(George, 2019)**.

-Sagittal axis of rotation: Mandibular movement around the sagittal axis occurs when one condyle moves inferiorly while the other remains in the terminal hinge position. This type of isolated movement does not occur naturally, it occurs in conjunction with other movements **(George, 2019)**.

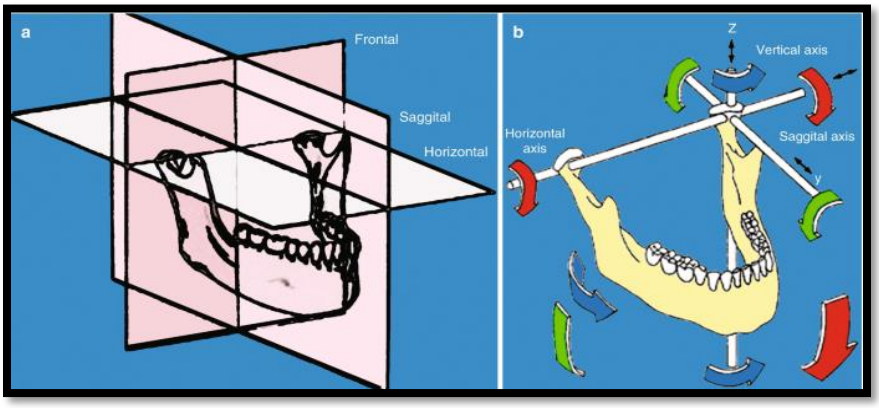

Figure 1.1 Axis of rotation in the mandibular movement **(Ozkan, 2018)**

b. Transitional movement: every point of the moving object simultaneously has the same direction and velocity. In the masticatory system, it occurs when the mandible moves forward, as in protrusion. The teeth, condyles, and rami all move in the same direction and to the same degree. It occurs within the superior cavity of the joint between the superior surface of the articular disc and the inferior surface of the articular fossa (i.e., between the disc-condyle complex and the articular fossa) **(Mapelli *et al*., 2009).**

1.1.2 Parafunctional Movement

Parafunction in dentistry refers to those activities of the stomatognathic system that would be considered to fall outside of functional activities, it includes bruxism, clenching, lip biting, thumb sucking, and any other oral habit not associated with mastication, deglutition, and speech in contrast to the movements mentioned above **(GPT-9, 2017)**.

Bruxism and clenching are the most common of the parafunctional activities given much focus with a prevalence of up to 90% in the general population which received special attention in the last three decades from dental researchers. It usually occurs in mild and intermittent form; however in progression of parafunction damage of oral structures, wear of the teeth, breakdown of the periodontium in the presence of inflammation, and internal derangement and muscular dysfunction can be noticed **(Metha, 2014)**.

1.2Bruxism

'Bruxism' originates from the Greek word *brychein*, meaning to 'gnash the teeth'. An early and common definition of bruxism was thus "gnashing and grinding of the teeth for non-functional purposes" followed by a more specific one "involuntary, non-functional, rhythmic or spasmodic gnashing, grinding, and clenching of teeth, usually during sleep", other causes of bruxism may be related to repressed aggression, emotional tension, anger, fear, and frustration **(Johnasson *et al*., 2008).**

According to **GPT-9** in **2017** Bruxism is defined as parafunctional grinding of teeth or an oral habit consisting of involuntary rhythmic or spasmodic nonfunctional gnashing, grinding or clenching of teeth in other than chewing movements of the mandible which may lead to occlusal trauma**.**

1.2.1 Types of bruxism:

There are two main types of bruxism:

a) **Awake Bruxism,** also known as diurnal bruxism and is related to the stress due to familial responsibility or work pressure, anxiety, anger or frustration which consists of clenching and grinding in addition to other oral habits. Awake bruxism is more commonly seen in females compared to males **(Shetty *et al.*, 2014)**.

A case presented despite its reported nightly compliance with a guard, the patient showed continued wear on his anterior teeth and on questioning, it was determined that the patient had an awake bruxism habit-grinding his anterior teeth in times of stress as shown in (Fig 1.2) **(Goldstein *et al*. 2017)**.

Figure 1.2 (A&B) Awake Bruxism **(Goldstein and Wendy, 2017)**

b) **Sleep Bruxism,** which occurs at day or night during sleeping, is considered as a sleep related oro mandibular movement disorder which consists of clenching and/or grinding as in (Fig 1.3) showing upper and lower teeth wear matching closely. Individuals who brux during sleep are more likely to

have other sleep disorders, snoring and pauses in breathing (sleep apnea) **(Yap and Chua, 2016)**.

Figure 1.3Sleep Bruxism **(Kumar and Duncan, 2012)**

Another simple method to determine bruxism in an individual patient, it allows the disorder to be classified as according to severity

a) Absent No anterior wear patterns in the teeth signify an absence of bruxism.

b) Mild bruxism has slight wearing of anterior teeth but is not a cosmetic compromise

c) Moderate, or severe Moderate bruxism has obvious anterior incisal wear facets but no posterior occlusal wear pattern. Severe bruxism has minimal to absent incisal guidance from excessive wear, and posterior wearing of the teeth is obvious **(Resnik, 2021)**.

1.3 Causes of bruxism:

Bruxism is what's known as a "*multifactorial*" health issue. That means it's often caused by a combination of factors, or that it can be hard to distinguish what actual causes are at play in a single person's case. There isn't a single cause of bruxism in every case **(Kanathila *et al*., 2017)**.

However, in general, there are three basic parts defined in the etiology of bruxism:

A. Central factors:

The physiology of sleep has been studied extensively, especially the 'arousal response', as bruxism usually occurs during sleep. Arousal response is a sudden change in the depth of the sleep during which the individual either arrives in the lighter sleep stage or actually wakes up **(Macaluso, *et al*. 1998)**.

B. Psychosocial factors

A multifactorial large scale population study of sleep bruxism concluded highly stressful life as a significant risk factor. Inability to express emotions such as anxiety, rage, hate, aggression etc.. can also be a cause for bruxism. Awake bruxism or diurnal bruxism can be associated with stress due to familial responsibility or work pressure **(Selms, *et al*. 2004)**.

C. Peripheral factors

Bruxism is commonly considered to be related to deviations in dental occlusion and articulation. It has been mentioned that for an effective management of bruxism, establishment of harmony between maximum intercuspation and centric relation is required **(Giffin, *et al*. 2003)**.

Literature studies on this aspect agrees that there is hardly any relationship between bruxism and occlusal factors **(Manfredini, *et al.* 2004)**.

1.4 Risk factors for bruxism initiation:

a. Age: Bruxism is more common in young children and noted to decrease by adulthood.

b. Stress: Increased stress and anxiety can cause bruxism.

c. Personality: Aggressive, competitive and hyperactive type of behavior and personality can increase the chance of teeth grinding.

d. Family history: Sleep bruxism tends to give a family history, other members also may have teeth grinding or a history of it.

e. Medications and habits: Certain antidepressants can result in bruxism as an uncommon side effect. Habits like smoking, tobacco chewing, drinking caffeinated beverages may increase the risk of bruxism.

f. Other factors: Bruxism can be associated with medical problems like epilepsy, sleep related disorders, dementia, Parkinson's disease and gastroesophageal reflux disorder **(Kuhn and Turp. 2018)**.

1.5 Clinical Manifestations

a. Pain in the teeth and sensitivity to heat and cold.

b. Chronic muscular facial pain with tension headaches, caused by intense muscle contraction.

c. The noise noticed by parents, friends or relatives, occurs as the teeth are ground together.

d. An abnormal alignment of the teeth, caused by uneven tooth wear.

e. Flattened and worn tooth surfaces, which may reveal the underlying yellow dentine layer.

f. Microfractures of the tooth enamel.

g. Broken or chipped teeth

h. Loose teeth with possible damage to the tooth sockets

i. Stiffness and pain in the jaw joint (temporomandibular joint or 'TMJ') that cause restricted opening and difficult chewing; sometimes the jaw joint may suffer damage that is slow to heal.

j. Earache.

k. Parotid-masseter syndrome

l. Tooth mobility.

m. Indentation of lateral border of tongue.

n. Ridging of buccal mucosa.

o. Hypertrophy and/or mycositis of muscles masseter and temporalis **(Manfredini *et al*., 2017; Kanathila *et al.*,2018).**

1.6 Management of Bruxism

Bruxism management relies on the recognition of the potential causative factors associated with the development of the condition. Diurnal bruxism can be managed by considering interventions such as habit modification, relaxation therapy, and biofeedback **(Keskinruzgar, *et al*. 2018)**.

A.Physiotherapy

Physiotherapy plays an important role in the treatment of bruxism. It is used primarily to reduce its negative effects (**Amorim, *et al*. 2014)**.

Physiotherapeutic methods include:

-Massage (massage of masticatory muscles serves to reduce pain and tension of the muscles, improve their blood circulation, and prevent the adherence of tissues).

-Manual therapy

-Therapeutic exercises (including relaxation exercises)

-Electrotherapy, including (transcutaneous electrical nerve stimulation) and (microcurrent electrical nerve stimulation).

-Muscular awareness therapy

-Moist heat

-Laser

-and microwaves **(Visscher *et al*., 2000).**

B.Psychotherapy

Another important element of multidirectional bruxism therapy is psychotherapy, like relaxation exercises. It is composed of many different elements, for example, relaxation, the ability to control behavior, and various exercises to consolidate new behavioral patterns **(Ohrbach, 2006; Fjellström, *et al*. 2010).**

C.Medication

The use of drugs in treating bruxism should be limited to short periods and severe cases where occlusal devices and psychological approaches were ineffective **(Lobbezoo, *et al*. 2008)**.

Pharmacological management includes the use of antianxiety agents, tranquilizers, sedatives, and muscle relaxants. Medications such as diazepam can be prescribed for a few days to alter the sleep disturbance and anxiety level **(Veiga, *et al*. 2015)**.

It should be noted that most authors point to the need for further research in order to achieve optimal treatment for patients with bruxism. An individual approach and therapy taking into account systemic diseases and earlier treatment should be never neglected **(Wilmont, *et al*. 2018).**

1.7 Dental Management of Bruxism

Treatment for bruxism is suggested to be multidisciplinary, for both children and adults. Dental treatment includes some intraoral devices, which aim to protect teeth and restorations from possible wear and tear that may be generated as a result of parafunctional activity **(Ladino *et al*. 2020)**.

1.7.1 For natural dentition

Bruxism was for long considered a major cause of tooth wear. In recent years, however, the multifactorial etiology and the importance of other factors related to tooth wear, such as erosion, have been emphasized **(Johansson, *et al*. 2008).**

1.7.1.1 Splint therapy

Occlusal splints have been considered as the first-line strategy for preventing dental grinding noise and tooth wear in primary sleep bruxism, in general, the design of the device is simple, covers the whole maxillary or mandibular dental arch, and is well tolerated by the patient. However, its efficacy reducing the number of masticatory episodes per hour of sleep seems to be transient, with a maximal effect observed during the first 2 weeks, and returning to baseline after longer periods of use **(Dube *et al*. 2004; Huynh *et al*.2006)**.

1.7.1.1.1Types of Occlusal Splints

A. Hard Splint: It is fabricated by 3 mm thickness of acrylic between the maxillary and mandibular posterior teeth as in (Fig 1.4) **(Yadav and Karani, 2011)**.

Figure 1.4 Hard Splint **(Amin *et al*. 2016)**

B. Soft Splint: It's fabricated from a 3 mm thick, soft polyvinyl sheet done in a vacuum former (Fig 1.5) **(Türp *et al,* 2004).**

Figure 1.5 Soft Splint **(Amin *et al*. 2016)**

C. Liquid Supported Splint: hydrostatic occlusal splints have a flexible fluid layer that equalizes all bite forces by preventing tooth to tooth contact (Fig 1.6) **(Amin *et al*. 2016)**.

Figure 1.6 Liquid Supporting Splint **(Amin *et al*. 2016)**

A comparative study was conducted by Amin about hard, soft and liquid occlusal splints, to evaluate their efficacy in treating patients with TMDs including bruxism, it showed significant reduction for all three groups reflecting patients' improvement in muscle pain with hard, soft, and liquid supported splints. The hard splints proved to be very effective in a shorter period of time. From baseline to 7-day interval the curve for the hard splints showed a steep change. Whereas the soft and liquid splints showed much more gradual change **(Amin *et al*. 2016)**.

D. The bilaminar (or dual-laminate) splint

It is an alternative occlusal appliance proposed for the management of attrition-based tooth wear, and protection of anterior composite restorations placed for tooth wear management. Tooth wear in these situations may result from sleep bruxism, awake clenching or a combination of both. Bilaminar guards which have been studied by Longridge are composed of two individual thermoplastic layers, or laminates, chemically bonded to produce a two-layered guard. The authors have found mandibular guards easier to construct, with higher patient satisfaction and compliance than maxillary appliances. A bilaminar occlusal guard will prevent

further tooth wear and/or protect any composite restorations. Guards should be worn during the period of bruxism or clenching as in (Fig 1.7). This may be over night (sleep bruxism) or during the day (awake bruxism/clenching), but prolonged wear is not advised **(Longridge and Milosevic. 2017)**.

Figure 1.7 Bilaminar Splint **(Longridge and Milosevic. 2017)**

E. Bite Raising Splint

Bite raising appliances are perhaps the most commonly prescribed splint for bruxism and TMD; they can be used for occlusal disengagement which prevents the posterior teeth from contact as in (Fig 1.8). This prevents trigger from occlusal discrepancies reaching the CNS which cause abnormal mandibular positioning. Various types of appliances such as bite planes and bite raising help in repositioning the condyle to its centric relation position **(George, 2019)**.

Figure 1.8 Bite raising splint **(Dylina, 2001)**

1.7.2 Removable Dental Prosthesis

1.7.2.1 For Partial Dentate Patients

Removable partial denture wearers with bruxism may complain from pain and uncomfortableness in the remaining teeth and periodontal structure upon waking up in the morning **(Wostmann *et al.* 2005).**

A study was made by **Baba** in **2008** with the principal strategy of providing the patients with an additional specially designed denture called the night denture as shown in (Fig 1.9) on the lower left and right pictures compared to the RPD in the upper pictures, which was to be worn exclusively during sleep in place of the currently used RPD. These dentures were fabricated following standard RPD fabrication procedures and designed according to the pattern of remaining teeth control. An alternative method to manage bruxism-related complications would be to allow the patients to use their dentures during sleep.

However, the use of night dentures is advantageous in comparison with this method based on Baba's study for the following reasons. First, night dentures made of acrylic resin allow the even distribution of the bruxism force across the complete dental arch, thereby avoiding force concentration on the remaining teeth with minimal expense. Second, as the occlusal surfaces of the remaining teeth are covered by acrylic resin, they are protected from further attrition. Third, as night dentures are free of food debris, the risk of a periodontal disease due to denture plaque would be minimal. Fourth, severe attrition on the occlusal surface of the night denture can be easily repaired. Even if a refabrication is required due to excessive wear or fracture, the construction cost of an acrylic resin-based night denture is minimal. Therefore, the delivery of an inexpensive acrylic night denture is a practical approach to minimize the unfavorable effects of sleep bruxism in these patients, which include progression of tooth attrition, uncomfortable feeling

or pain in the remaining teeth upon waking, and increased tooth mobility **(Wostmann *et al.* 2005; Baba *et al.* 2008)**.

In a study, results showed that, subjects with moderate shortened dental arches with or with-out mandibular distal extension removable partial dentures as reported awareness of bruxism, occlusal wear of lower anterior teeth while premolars had significantly more occlusal tooth wear with signs and symptoms related to temporomandibular dysfunction **(Creuges *et al,*2010).**

.

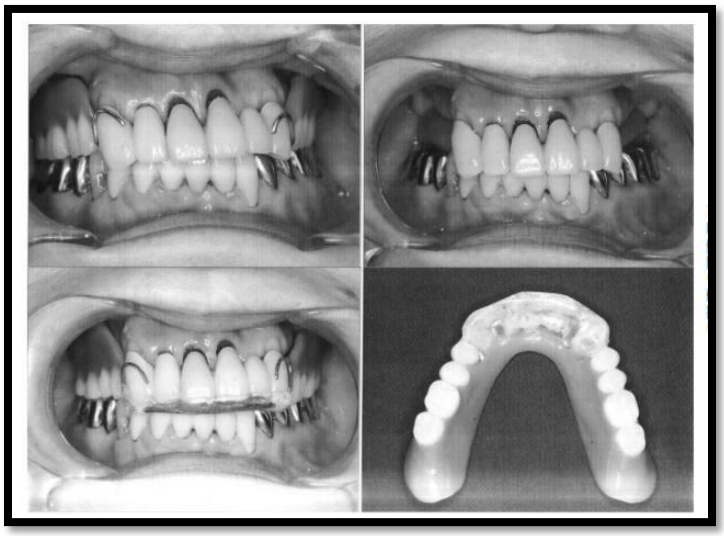

Figure 1.9 Night denture (**Baba *et al.,* 2008)**

1.7.2.1.1Material selection for artificial teeth in RPDs

Contemporary acrylic-resin teeth are generally preferred to porcelain teeth, because they are more readily modified and are thought to more nearly resemble enamel in their abrasion potential against opposing teeth **(Jagger, 2016)**.

Acrylic-resin teeth with gold occlusal surfaces are preferably used in opposition to natural teeth restored with gold occlusal surfaces, whereas porcelain teeth are generally used in opposition to other porcelain teeth. Acrylic-resin tooth surfaces,

however, may in time become impregnated with abrasive particles, thereby becoming an abrasive substance themselves. This may explain why acrylic-resin teeth are sometimes capable of wearing opposing gold surfaces. An evaluation of occlusal contact or lack of contact, however, should be meticulously accomplished at each 6-month recall appointment, regardless of the choice of material. Although some controversy may continue with regard to the use of porcelain or acrylic-resin artificial teeth, there is broad agreement that narrow (reduced bucco-lingual) occlusal surfaces are desirable. Those forms that have excessive bucco-lingual dimension should be avoided **McCrackens (2011)**.

If the opposing arch is a soft tissue–supported removable prosthesis, the effects of the nocturnal habit may be minimized if the patient removes the prosthesis at night. The use of an occlusal guard is helpful for a patient with a fixed prosthesis, to transfer the weakest link of the system to the removable acrylic device **(Misch, 2002)**.

1.7.2.2 Complete Edentulous Patients

Textbooks on complete denture fabrication often mention that clinical experience indicates that bruxism is a frequent cause of complaint of soreness of the denture-bearing mucosa. The relationship between oral parafunctions and residual ridge resorption has not been investigated, but it is tempting, even if anecdotally, to include parafunctions as a possible factor related to the magnitude of ridge reduction **(Johansson *et al.* 2011)**.

As for the effects of materials used in artificail teeth, If a patient is not wearing their full CDs at night then typically it doesn't form a serious threat on them and it's not necessary to wear a night guard at night, while if the patient wears their dentures then a soft night guard can protect the dentures from teeth grinding and clenching, although in regards to removable complete denture wear of acrylic teeth

of a maxillary CD with opposing metal crowns was noticed in (fig 1.10) the prosthetic treatment had been provided 3 years earlier because of a history of extensive wear of similar previous reconstructions **(Zarb *et al.* 2013)**.

Figure 1.10 Wear of porcelain teeth of complete after the patient had previously rapidly worn down the acrylic teeth on her dentures against metal crowns **(Johnasson *et al*., 2011)**

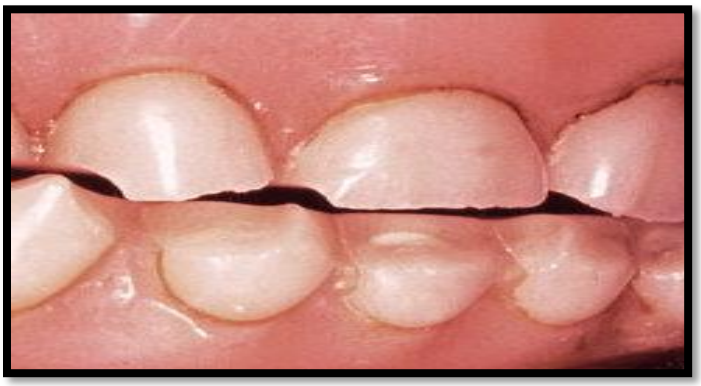

Figure 1.11 Wear of porcelain teeth of full set complete dentures following rapidly worn down acrylic teeth **(Johnasson *et al*., 2011)**

1.7.3 Fixed Dental Prosthesis

Fixed dental prostheses (FDP) are successful prosthetic restorations in partially dentate patients but can face technical failures due to loss of retention and fracture of material which is greatest in patients with bruxism **(Pjetursson and Lang, 2008)**.

1.7.3.1 Materials used for artificial teeth in FDP

With an opposing occlusion of tooth enamel, most clinicians and researchers agree that a metal occlusal surface, and preferably one of high noble content, is preferred in order to minimize wear of the natural dentition. Unpolished ceramics could be especially hazardous to opposing natural teeth, a similar condition can be seen in a patient with severe lower anterior tooth wear caused by a combination of different factors, including increased load produced by bruxism and/or heavy load due to loss of posterior support, opposing unglazed porcelain, and most likely dental erosion as another contributing factor shown in (Fig 1.12) **(Pjetursson *et al*., 2007).**

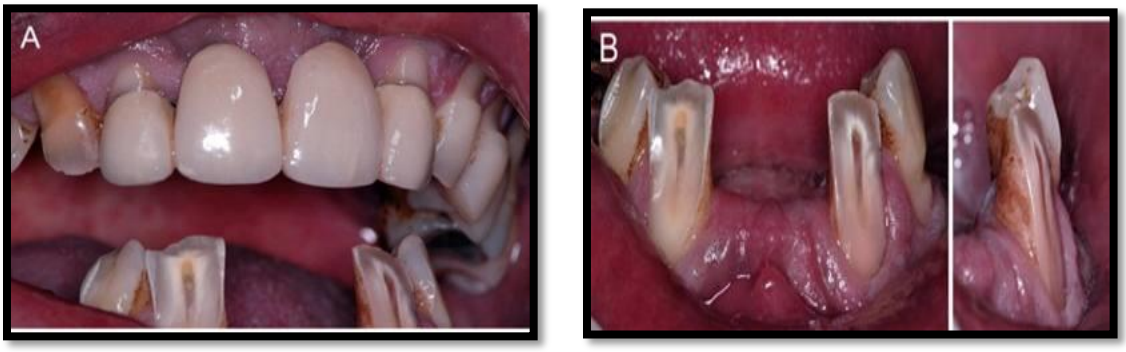

Figure 1.12 (A & B) Excessive wear of lower anterior teeth **(Yip *et al.* 2004)**

In cases of heavy occlusal load such as, in bruxers, the situation becomes very complex as we need to consider not only the risk for wear of the restorative material itself and the opposing dentition, but also the need for sufficient strength in all the components of the superstructure to be able to withstand the applied load as noticed by the case above, in addition, to a case of patient with maxillary metal–ceramic crowns and a deep bite. Heavy load due to bruxism and an absence of posterior support, opposing porcelain crowns, in combination with dental erosion have most likely contributed to the excessive wear seen on the mandibular incisors as shown in (Fig 1.13), also wear of metal crowns veneered with acrylic opposing natural teeth, unfavorable occlusal loading without molar support probably explains the extensive wear in (Fig 1.14) **(Yip *et al.*, 2004)**.

All things considered, metal or metal–ceramic restorations seem to be the safest choice in cases of high load conditions, although under extreme conditions, there is no material that will last for too long because of the risk of chipping of ceramic veneers in metal–ceramic restorations, many clinicians prefer gold– acrylic FDPs for heavy bruxers **(Eliasson *et al.*, 2007).**

Figure 1.13 Maxillary metal-ceramic crowns opposing excessively worn mandibular incisors **(Eliasson *et al.*, 2007)**

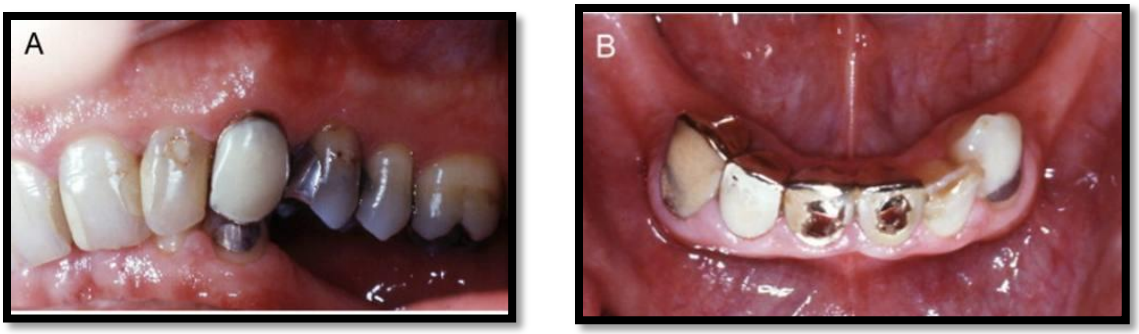

Figure 1.14 Wear of metal crowns veneered with acrylic opposing natural teeth **(Eliasson *et al.*, 2007)**

The few clinical studies published on wear of materials in bruxers indicate only small differences in wear resistance of gold and ceramic materials, whereas resin-based materials showed 3–4 times more substance loss than gold or ceramics.

New ceramics, for example zirconia, have demonstrated improved mechanical properties in laboratory studies and may be promising in the treatment of bruxism related tooth wear. However, a systematic review of zirconia FDPs has shown that there are complications when the material meets clinical reality. Improvement of the veneering systems is especially required as chipping was the most frequent mechanical complication **(Johansson, 2011).**

1.7.4 Bruxism and dental implants

A possible association of the loss of implants due to excessive occlusal forces has been reported, for this reason, it is important to know whether excessive masticatory muscle activity may or may not be a factor that contributes to biological and mechanical failures in implants, it was investigated the possible association between implant failure and bruxism patients, with a follow-up of 1 to 10 years, showing that failures in implant rehabilitation and bruxism are related **(Zhou *et al.*, 2016).**

Other study on implants concludes that bruxism may be associated with an increased risk of implant failure **(Chrcanovic *et al.*, 2016)**.

A later study also analyzed the complications that can occur in implants placed in sleep bruxism patients, where it is suggested that implant failures are influenced by bruxism, generating mainly mechanical failures on implant-supported restorations **(Chrcanovic, 2017)**.

Other authors reported mechanical failures for screwed and cemented restorations in 640 implants in sleep bruxism patients **(Chitumalla *et al.*, 2018)**. However, it was investigated the association between temporomandibular disorders and self-reported bruxism with implant failure, and it was found that the relationship of bruxism and temporomandibular symptoms were not significant, that there is no negative association when has adequate and periodic monitoring of patients that performed bruxism with implant-supported restorations **(Chatzopoulos *et al.*, 2020; Ladino *et al.*, 2020)**.

An example is a patient with maxillary and mandibular implant supported fixed dental acrylic prostheses (FDPs) as shown in (fig 1.15) with gradual wear due to bruxism **(Johnasson *et al.*, 2011)**.

Figure 1.15 Implant supported FDP A) At delivery, B) after only 2 years a definite wear pattern emerged, which is indicative of patient being probably a bruxer with heavy load and function, C) four years later the FDP fractured **(Johnasson *et al.*, 2011)**.

1.7.4.1Treatment Planning for Bruxism Patients with Dental Implants

To combat the detrimental effects of bruxism, numerous modifications to the standard treatment protocols may be implemented.

A. Progressive Bone Loading

The time intervals between prosthodontic restoration appointments may be increased to provide additional time to produce load-bearing bone around the implants through progressive bone loading techniques, by using the progressive bone-loading technique poorer bone density may be transformed into better quality bone, which is more ideal for adapting to excessive occlusal loads **(Misch, 1995).**

B. Greater Surface Area

Anterior implants that are subjected to parafunctional forces are problematic because they usually have nonaxial or shear forces applied to them. The use of implants with a diameter as large as possible should be considered, as well as the longest length allowed by the remaining bone to reduce stress in the cortical bone, more implants than necessary to obtain favorable biomechanics **(Narita *et al.*, 2009)**.

This recommendation is justified by studies that indicate a reduction of forces received on each implant individually when the number of implants is increased **(Sarmento *et al.*, 2012)**.

C. Occlusion

With parafunctional habits, the occlusion must be strictly designed and monitored. Ideally the patient should be maintained in a canine-guided occlusion, as long as the canines are healthy, a finite element analysis study on bruxism patient with implant found that canine-guided occlusion cause less stress on implants components compared with group function occlusion and that stresses in implants, abutments, and abutment screws mainly concentrate around the neck portions of the components **(Komiyama *et al*., 2012).**

Researchers concluded that the occlusal scheme for an implant prosthesis should be designed to decrease cuspal interferences, centralize forces along the long axis, and minimize lateral forces; that is, it should be like that of a similar prosthesis on a natural dentition **(Göre and Evlioğlu, 2014)**.

D. Prosthesis Design

The prosthesis may be designed to improve the distribution of stress throughout the implant system with centric vertical contacts aligned with the long axis of the implant whenever possible. Narrow posterior occlusal tables to prevent lateral forces and to decrease the occlusal forces are beneficial as shown in (Fig. 1.16) **(Paesani *et al.*, 2013)**.

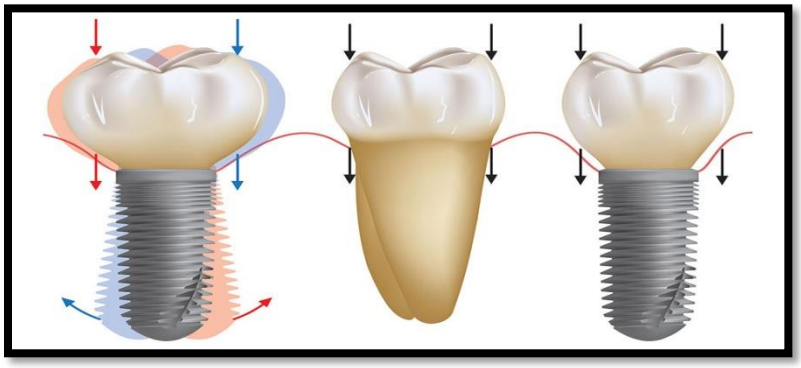

Figure 1.16 the direction of occlusal forces on a poorly designed implant restoration versus those exhibited on natural dentition and a properly designed implant restoration **(Manfredini *et al.*, 2011)**

E. Occlusal Guard

The most important treatment for a patient with parafunctional habits is the use of an occlusal guard. Ideally patients should wear a hard, processed acrylic occlusal guard during times of parafunctional activity showed patients exhibiting bruxism and with no night guard had approximately seven times the rate of porcelain fracture in patients with implants **(Kinsel and Lin, 2009)**.

Alderman related that during occlusal excursions in the absence of posterior contacts, fewer fibers of the temporalis and masseter muscles are stimulated, and

the forces applied on the anterior implant/teeth system are reduced by as much as two-thirds. The guard will absorb the majority of the parafunctional forces, reducing the damaging forces to the implant system. Patients should also be instructed to wear the guard during any time they might exhibit parafunction, such as stressful time periods, driving, and working at a computer **(Misch, 2021)**.

CHAPTER TWO

CONCLUSION AND SUGGESTIONS

2.1 Conclusion

Within the limitation of our review we conclude that:

1. Parafunctional activity may result in various pain presentations and have deleterious effects on the dentition and other oral structures.
2. Bruxism is a common parafunctional habit, occurring both during sleep and wakefulness, and sleep bruxism and awake bruxism should be differentiated.
3. Tooth wear is a natural and generally slow process, and worn teeth seldom need prosthetic rehabilitation.
4. When prosthetic intervention is indicated in a patient with bruxism, efforts should be made to reduce the effects of likely heavy occlusal loading on all the components that contribute to prosthetic structural integrity.
5. Although no specific treatment exists to stop sleep bruxism, but treatments based on behavior modification may eliminate awake bruxism.
6. Interocclusal appliances are the most common and accepted way to prevent wear of teeth and prosthodontic restorations in spite of lack of strong evidence for its efficacy and are useful adjuncts in the management of sleep bruxism but do not offer a definitive or curative treatment of bruxism or signs and symptoms of temporomandibular disorders.
7. The night denture may be recommended for patients having a few remaining occlusal contacts with sleep bruxism-induced complications in patients with RPDs.
8. In an implant retained posterior fixed partial denture and in existing of bruxism, group function loading may result excess stresses on the components compared with canine guidance loading.

2.2 Suggestions

1. A high quality research in the field of bruxism and its relation to implant complication.
2. A comparative study for the different materials in occlusal splints among Iraqi population.
3. A comparative study regarding the survival rates of implant supported overdenture vs. tooth supported overdenture in bruxism patients.
4. Raise awareness about the importance of early diagnosis of bruxism.

References

(A)

- Alrethia R. (2020) Prosthodontic Management of Bruxer Patients. *International Journal of Dental Sciences and Research*, 8 (6), 159-162.
- Amin A, Meshramkar R and Lekha K. (2016) Comparative evaluation of clinical performance of different kind of occlusal splint in management of myofascial pain. *Journal of Indian Prosthodontic Society*, 16 (2), 176–181.

(B)

- Baba K, Aridome K, Pallegama R. (2008) Management of Bruxism-Induced Complications in Removable Partial Denture Wearers Using Specially Designed Dentures. *Journal of Craniomandibular & Sleep Practice*, 26 (1), 71-76.
- Basic V and Mehulic K. (2004) Bruxism: An unsolved problem in dental medicine. *Acta Stomat Croat*. 38,93-96.
- Bender S. (2009) Occlusion, Function, and Parafunction: Understanding the Dynamics of a Healthy Stomatagnathic System. *Academy of Dental Therapeutics and Stomatolog*.

(C)

- Carlsson GE and Magnusson T. (1999) Management of temporomandibular disorders in the general dental practice. Chicago: Quintessence.
- Chatzopoulos G and Wolff L. (2020) Symptoms of temporomandibular disorder, self-reported bruxism, and the risk of implant failure: A retrospective analysis. *Cranio Journal*, 38, 50-57.

- Chitumalla R, Halini K, Mohapatra A, Parihar A and Anand K. (2018) Assessment of survival rate of dental implants in patients with bruxism: a 5-year retrospective study. *Contemporary Clinical Dentistry*, 9, 278-282.
- Chrcanovic B, Kisch J, Albrektsson T and Wennerberg A. (2016) Bruxism and dental implant failures: A multilevel mixed effects parametric survival analysis approach. *Journal of Oral Rehabilitation*, 43, 813-823.
- Chrcanovic B, Kisch J, Albrektsson T and Wennerberg A. (2017) Bruxism and dental implant treatment complications. *Clinical Oral Implants Research*, 28, 1-9.

(D)

- Dylina T. (2001) A common sense approach to splint therapy. *Journal of Prosthetic Dentistry*, 86, 539-545.

(E)

- Eliasson A, Arnelund C and Johansson A. (2007) A clinical evaluation of cobalt– chromium metal–ceramic fixed partial dentures and crowns: a three- to seven-year retrospective study. *Journal of Prosthetic Dentistry*, 98, 6–16.

(G)

- Goldstein R. and Wendy C. (2017) The clinical management of awake bruxism. *The Journal of the American Dental Association*, 148, 387-391.
- Göre E, Evlioğlu G. (2014) Effect of occlusal concepts on implant supported FPD's. *Journal of Oral Implantology*, 40 (1), 68-75.
- Grossi M. (2014) Should occlusal splints be a routine prescription for diagnosed Bruxers undergoing implant therapy. *International Journal of Prosthodontics*, 27, 413–414.

(J)

- Jagger R. (2016) *Functional Occlusion in Restorative Dentistry and Prosthodontics*, *Occlusion and Removable Prosthodontics*. Mosby, Chapter 18, 225-233.
- Johansson A, Omar R, Gunnar E and Carlsson. (2011) ”Bruxism and prosthetic treatment: A critical review”. *Journal of Prosthodontic Research*, 55 (3), 127-136.

(K)

- Kanathila H., Pangi A., Poojary B. and Doddamani M. (2018) Diagnosis and treatment of bruxism: Concepts from past to present. *International Journal of Applied Dental Sciences*, 4 (1), 290-295.
- Kinsel RP and Lin D. (2009) Retrospective analysis of porcelain failures of metal ceramic crowns and fixed partial dentures supported by 729 implants in 152 patients: patient-specific and implant-specific predictors of ceramic failure. *Journal of Prosthetic Dentistry*, 101(6), 388–394.
- Komiyama O, Lobbezoo F, De Laat A, Iida T, Kitagawa T, Murakami H, Kato T and Kawara M. (2012) Clinical Management of Implant prostheses in Patients with Bruxism. *International Journal of Biomaterials*, 6 pages.
- Kumar M. and Duncan H. (2012) Radiographic evaluation of the technical quality of undergraduate endodontic 'competence' cases in the Dublin Dental University Hospital: an audit. *Journal of the Irish Dental Association*, 58 (3), 162-6.

(L)

- Ladino L, Vargas M, Rodriguez J and López E. (2020) Bruxism Management: A Comprehensive Review. *ClinMed International Library*, 7 (8), 316.

- Lal S and Weber K. (2022) Bruxism Management. StatPearls.
- Lavigne G, Khoury S, Abe S, Yamaguchi T and Raphael K. (2008) Bruxism physiology and pathology: an overview for clinicians. *Journal of Oral Rehabilitation*, 35, 476-494.
- Lobbezoo F, Hamburger HL and Naeije M. (2010) *Etiology of bruxism*. In: Paesani DA, editor. Bruxism. Theory and practice. London: Quintessence, p. 53–65.
- Lobbezoo F, Zaag J, Selms M, Hamburger H and Naeije M. (2008) Principles for the management of bruxism. *Journal of Oral Rehabilitation*, 35(7), 509-23.
- Longridge N and Milosevic A. (2017) The bilaminar (Dual-Laminate) protective night guard. *Dental Update Journal*, 44 (7), 648-654.

(M)

- Manfredini D, Bucci M, Sabattini V and Lobbezoo F. (2011) Bruxism: overview of current knowledge and suggestions for dental implants planning. *Cranio*, (4), 304-12.
- Mapelli A, Galante D, Lovecchio N, Sforza C and Ferrario VF. (2009) Translation and rotation movements of the mandible during mouth opening and closing. *Clinical Anatomy*, 22 (3),311-8.
- Mehta N. and Spierings E. (2014) *Practical Management of Pain (Fifth Edition)*. Elsevier. 1087-1115.
- Misch CE. (1995) Progressive bone loading. *Dent Today*, 14 (1), 80–83.
- Misch CE. (2002) Clenching and its effects on implant treatment plans. *Oral Health*. 92:11–24.

(N)

- Narita N, Funato M, Ishii T, Kamiya K and Matsumoto T. (2009) Effects of jaw clenching while wearing an occlusal splint on awareness of tiredness, biteforce and EEG power spectrum. *Journal of Prosthodontics Research*, 53, 120-125.

(O)

- Okeson J. (2019) Management of temporomandibular disorders and occlusion. *Elesvier*. 8th edition.
- Ozkan Y. (2018). Movements and Mechanics of Mandible Occlusion Concepts and Laws of Articulation. In: Özkan, Y. (eds) Complete Denture Prosthodontics. *Springer, Cham*.

(P)

- Paesani D, Lobbezoo F, Gelos C, Guarda-Nardini L, Ahlberg J and Manfredini D. (2015) Correlation between self-reported and clinically based diagnoses of bruxism in temporomandibular disorders patients. *Journal of Oral Rehabilitation*. 40(11), 803-9.
- Paesani D. (2010). Introduction to bruxism. *Bruxism Theory and practice. London: Quintessence*, p.3-19.
- Pjetursson B. and Lang N. (2008). Prosthetic planning on the basis of scientific evidence. *Journal of oral rehabilitation,* 35 (1), 1365-2842.

(R)

- Reddy S, Kumar M, Sravanthi D, Mohsin A and Anuhya V. (2014) Bruxism: A literature review. *Journal of International Oral Health*, 6 (6), 105-9.

(S)

- Sarmento H, Dantas R, Pereira-Cenci T and Faot F. (2012) Elements of Implant-Supported Rehabilitation Planning in Patients with Bruxism. *Journal of Craniofacial Surgery*, 23, 1905-1909.

(T)

- Türp J, Komine F and Hugger A. (2004) Efficacy of stabilization splints for the management of patients with masticatory muscle pain: A qualitative systematic review. *Clinical Oral Investigation*, 8, 79–95.

(W)

- Wilmont K, Saczuk K, Pawlak L and Szymańska M. (2018) The most commonly used methods of treatment for bruxism. *Journal of Stomatology*, 71 (4), 350-355.
- Wostmann B, Budtz-Jorgensen E, Jepson N, Mushimoto E, Palmqvist S and Sofou A. (2005) Indications for removable partial dentures: a literature review. *International Journal of Prosthodontics*, 18,139–45.

(Y)

- Yadav S and Karani J. (2011) The essentials of occlusal splint therapy. *International Journal of Prosthetic Dentistry*, 2,12–21.
- Yip K, Smales R and Kaidonis J. (2004) Differential wear of teeth and restorative materials: clinical implications. *International Journal of Prosthodontics*, 17, 350–6.

(Z)

- Zarb G, Hobkirk J, Eckert S, Jacob R. (2013) *Prosthodontic Treatment for Edentulous Patients*. Elsevier, 13th Ed, 15-18.

- Zhou Y, Gao J, Luo L and Wang Y. (2016) Does bruxism contribute to dental implant failure? a systematic review and meta-analysis. *Clinical Implant Dent Relat Research*, 18, 410-420.