



# **Electromyogram assessment of the efficacy of low level LASER therapy with or without using occlusal splint in management of bruxism**

**Thesis**

**submitted to Faculty of Dentistry Ain Shams University,  
in partial fulfillment requirement of the Master Degree in  
Oral and Maxillofacial Prosthodontics**

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**B.D.S, Ain Shams University**

**(2007)**

**Faculty of Dentistry**

**Ain Shams University**

**2014**

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## **Acknowledgement**

I would like to express my most sincere gratitude to **Dr. Rami Maher Ghali**, Associate Professor of Prosthodontics, Faculty of Dentistry, Ain shams University for his encouragement, help and extreme patience.

No words can express my thanks and appreciation to **Dr .Mona Mohamed Ali Abo El Nagga**, Lecturer of Prosthodontics, **Faculty** of Dentistry ,Ain Shams University for her valuable advice and unique cooperation.

I would like to thank **Dr. Mahmoud El Moutasim Bellah El Homossany**, Lecturer of Prosthodontics, Faculty of Dentistry, Ain Shams University, for his assistance and support.

Last but not least, my most sincere gratitude is expressed to all my colleagues and staff members of Prosthodontic department for their support and cooperation.

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## **Introduction**

Tempromandibular disorders (TMD) is a collective term embracing a broad spectrum of clinical joint and muscle problems in the orofacial area.<sup>(1, 2)</sup>

Para functional disorders are considered as one of the cause of the TMDs. Para function habits are either diurnal habits occurring during day (e.g. clenching, grinding) or nocturnal habits that occur at night.<sup>(2)</sup>

Bruxism which is a sleep disorder results in excessive tooth wear, muscular pain specially at morning, muscle hypertrophy and headache.<sup>(3)</sup>

Treatment modalities for bruxism include interocclusal appliances which try to break the sleeping habit.<sup>(4)</sup>

Low level LASER therapy as one of physical therapy applied in general dental practice with their biostimulatory therapeutic effect on vital cells.<sup>(5)</sup>

Electromyogram (EMG) is a principle tool used to monitor muscle activity pre and post treatment.<sup>(3)</sup>

Pain intensity is evaluated pre and post treatment by using visual scale to assess patients' satisfaction.

This study is conducted to evaluate which of the applied treatment modalities achieved the best patients' satisfaction.

## **Review of Literature**

The stomatognathic system is the masticatory system which is responsible for chewing, speaking, swallowing, tasting and breathing. The masticatory system is made of bones, joints, ligaments, teeth and muscles. In addition, a neurological controlling system regulates and coordinates all these structural components.<sup>(1)</sup>

### **I-Functional anatomy of the masticatory system**

#### **Tempromandibular joint (TMJ)**

TMJ, a joint that connects the mandible to the skull and regulates mandibular movement, TMJ is a bicondylar joint in which the condyles are located at the two ends of the mandible and function together at the same time. Between the condyle and the articular fossa there is a disc made of fibrocartilage that acts as a cushion to absorb stress and allows the condyle to move easily when the mouth opens and closes.<sup>(2,3)</sup>

Tempromandibular joint has a capsule which is attached to the margins of the articular fossa, eminence and to the neck of the mandible; the capsule is very weak except laterally where it is enforced by tempromandibular ligament.<sup>(4,5)</sup>

#### **Muscles of mastication**

The most important functions of the TMJ are mastication and speech so several pairs of strong muscles are attached to the mandible to control the movement of jaws and TMJ during functions.<sup>(4)</sup>

## **Masseter muscle**

It is quadrilateral in shape ,it consists of 2 heads ;superficial head which originates from the zygomatic process of maxilla and lower border of the zygomatic arch, while the deep head originates from the inner surface of the zygomatic arch. Both heads are inserted in the outer surface of the ramus of mandible. The masseter is a powerful muscle that provides the force necessary to chew efficiently as the fibers of the masseter contract, the mandible is elevated and the teeth are brought into contact, its superficial portion may also aid in protruding the mandible, when the mandible is protruded and biting forces are applied, the fibers of the deep portion stabilize the condyle against the articular eminence.<sup>(4,5,6)</sup>

**Clinically:** This muscle contracts excessively and forms trigger points in patients who have noxious habits such as bruxing or clenching. The masseter is also aggravated if the patient has a skeletal closed bite, deep dental overbite, lack of adequate vertical dimension, or short lower face height, which causes the muscles to shorten.<sup>(4,5,6)</sup>

## **Temporalis muscle**

It is a fan shaped muscle .It consists of three groups of fibers, the anterior fiber which are vertical, the posterior fibers which are horizontal and the middle fibers which are oblique .It originates from the inferior temporal line, the floor of temporal fossa and the temporal fascia while all fibers are inserted at the tip , the anterior border and the medial surface of the coronoid process. It acts primarily for elevation of the mandible and its posterior fibers are responsible for retraction of the mandible. The temporalis muscle is

capable of coordinating closing movements; It is a significant positioning muscle of the mandible. <sup>(4,5,6)</sup>

### **Medial pterygoid muscle**

It is a rectangular shaped muscle .It has two heads; superficial head which originates from the maxillary tuberosity and the deep head which originates from the medial surface of lateral pterygoid plate. It runs laterally, posteriorly and inferiorly to be inserted onto the medial surface of mandibular angle .On contraction, it helps to elevate and protrude the mandible and also helps the mandible for side to side movement. Protracts and elevates the mandible and assists in the rotary movements of the mandible. This muscle is frequently sensitive in patients with TMJ dysfunction, so it is palpated gently in the clinical examination. <sup>(4,5,6)</sup>

### **Lateral pterygoid muscle**

It is a short, thick conical muscle. It has two heads; the upper head arises from infra temporal surface and infra temporal ridge of greater wing of sphenoid, while the lower head arises from lateral surface of lateral pterygoid .The whole muscle is inserted onto the front of the neck of mandible, the capsule and articular disk of tempromandibular joint. On contraction, it helps to protrude the mandible and side to side movements when acts with medial pterygoid muscle of the same side .Also both lateral pterygoids help to depress the mandible. If the patient has a deep overbite, the lateral pterygoids will be overworked as the patient goes through lateral excursions. It has been reported that 5 percent of the fibers of the superior head of the lateral pterygoid muscle attach behind the eye. This certainly would account for some of the retro-orbital pain that some TMJ patients experience. <sup>(4,5,6)</sup>

## **Tempromandibular disorders (TMD)**

Tempromandibular disorders (TMD) is a collective term embracing all the problems relating to tempromandibular joint (TMJ) and related musculoskeletal masticatory structures. It refers to a cluster of disorders characterized by pain in the periauricular region, pain in TMJ, or the masticatory muscles ,limitation or deviation in mandibular range of motion and noises in TMJ during mandibular function.<sup>(7,8)</sup>

## **Etiology of tempromandibular disorders (TMDs)**

The etiology of TMDs is complex and multifactorial. Numerous factors can contribute to TMDs , factors that increase the risk of TMDs are called **predisposing factors** which can be systemic, psychological ( personality and behavior),or structural (occlusion, joint),while factors that cause the onset of TMDs are called **initiating factors** (trauma, overloading, or Para function habits),and factors that interfere with healing or enhance the progression of TMDs are called **perpetuating factors** which includes behavioral, social and emotional problems and other forms of stress and general health . In some instances a single factor may serve one or all of these roles. Thus successful management of TMDs depends on identifying and controlling these contributing factors.<sup>(9)</sup>

There are five major factors associated with TMDs the occlusal condition, trauma, emotional stress, deep pain input and Para functional activities.<sup>(1)</sup>

Trauma to the facial structures can lead to functional disturbances in the masticatory system. Trauma seems to have a greater impact on

intracapsular disorder than muscular disorders. TMDs may result from various types of trauma. Macrotrauma (direct trauma) is injury due to impact or extensive stretching, twisting, or compression of the mandible. Macrotrauma is due to sudden force and may result from indirect trauma such as acceleration deceleration injury (whiplash). Micro trauma occurs as a result of sustained and repetitious adverse loading or continued compression due to para functional oral activities (clenching and bruxism).<sup>(7,10)</sup>

Occlusal disharmony and interferences, emotional stress and hyperactivity of the masticatory and neck muscles could be considered as etiologic factors involving TMD. Muscle hyperactivity has a central (stress or emotional disturbances) or a local origin (occlusal and articular interference).<sup>(1,4)</sup>

### **Para function activities:**

The term Para function was introduced to suggest distinction between occlusal stress exerted during mastication and swallowing and occlusal stress which are brought into action beyond the normal function.<sup>(1)</sup>

### **Para function activity can be subdivided into two general types:**

#### **A-Diurnal activity:**

It is Para function activity that occurs during day consists of clenching and grinding, as well as many oral habits that are often performed without the individual even being aware of them (e.g., cheek and tongue biting, finger and thumb sucking, unusual postural habits, occupation related

activities such as biting on pencils, pins, or nails or holding objects under the chin (a telephone or violin).<sup>(1)</sup>

### **B-Nocturnal activity:**

It is a Para function activity that occurs during sleep which takes the form of single episodes referred to as clenching and rhythmic contraction known as bruxing. Sometimes it is difficult to separate both activities for that reason clenching and bruxism are often referred to as bruxing events.<sup>(1)</sup>

Para function activities include clenching (usually occurs during day time in form of single episodes), bruxism (usually occurs during sleep as rhythmic contraction), biting foreign objects, thumb sucking pressing the tongue against the teeth and lip biting.<sup>(11,12,13)</sup>

### **Bruxism**

Looking back for the history of nocturnal Para function activity, the term "la bruxomanie " was first introduced by Marie Pietkiewicz in 1907. It was later adopted as bruxism. The American Academy of Orofacial Pain defines bruxism as parafunctional diurnal or nocturnal activity which includes tooth grinding and clenching. Two types of Bruxism exist according to when it occurs, during day time is commonly a semi voluntary clenching activity known as **Awake Bruxism (AB) or Diurnal Bruxism (DB)** which is associated with life stress caused by familial responsibilities or work pressure.<sup>(11,14,15)</sup>

According to the International Classification of Sleep Disorders, sleep bruxism (SB) is the oral activity characterized by tooth grinding or clenching

during sleep, in general associated to micro arousal .Currently sleep bruxism is considered a movement disorder and no longer parasomnia.<sup>(1,11,14,15,16)</sup>

In primary sleep bruxism, no evident systemic or psychiatric medical causes are evident in contrast to secondary bruxism which is associated to clinical, neurological or psychiatric disorders.<sup>(14, 17, 18, 19, 20, 21)</sup>

### **Etiology of sleep bruxism**

Bruxism is considered to have a multi factorial etiology .SB is associated with peripheral factors, pschychosocial influences and central or patho physiological causes involving brain neurotransmitters or basal ganglia.<sup>(11,17)</sup>

Peripheral factors which include any dental occlusal interference specially in children, but there is no relationship between clinically established bruxism and occlusal factors in adults.<sup>(11,22,23)</sup>

Psychosocial factors; emotional stress seems to influence the nocturnal bruxing activity that is demonstrated by a strong temporal muscle activity when monitored in stressful events in a subject over a long period of time. Bruxers differ from healthy individuals in the presence of depression, increased levels of stress, thus highly stressful life is a significant risk factor for bruxism to occur.<sup>(1,24.....,28)</sup>

Central or patho physiological factors; quality of sleep is strongly associated with somatic health and activity of the body. During sleep many physiological events occur such as sleep talking, sighing, swallowing and bruxism .Along with decreased skeletal muscle activity, heart rate, body temperature and blood flow.<sup>(29-30)</sup>