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رسالة

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Effect Of Occlusal Splint Therapy On Masticatory Muscles In Patients With Myofascial Pain Dysfunction Syndrome (Clinical Study).

Thesis

Submitted to Faculty of Oral and Dental Medicine, Cairo University, in partial fulfilment of the requirements of Master's Degree in Oral and Maxillofacial Surgery.

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Abstract

OBJECTIVE: The aim of this study was to asses the effect of occlusal splints on masticatory muscles in patients with myofascial pain dysfunction syndrome (MPD) using electromyography (EMG), and correlate this effect to the clinical outcome.

MATERIALS AND METHODS: Twenty patients were selected from those attending the out clinic of Maxillofacial Surgery Department, Faculty of Oral and Dental Medicine, Cairo University. Participating patients met criteria for the myofascial subtype of TMD according to the research diagnostic criteria, or RDC, 1 in which a facial pain complaint was associated with localized tenderness in response to palpation at three or more of 20 muscle sites. Their ages ranged from 20-40 years. Proper case history and complete diagnostic chart were done for every patient. The clinical signs and symptoms were recorded according to Helkimo's index. Also panoramic radiography was carried out to examine the osseous component of the TMJ. All patients were treated via occlusal splints for six months. Electromyographic assessment of the temporalis and masseter muscles was formed bilaterally before the treatment, after four and six months to evaluate the effect of occlusal splints on the activity of masticatory muscles. Also clinical assessment of the patients using Helkimo's index was done before the treatment, after four and six months.

RESULTS: The results showed that after six months of therapy 55% of the patients were successfully treated with 15% showing complete recovery and 40% showing clinical improvement. There was a significant decrease in the mean clinical dysfunction scores both after four and six months and through the period from four to six months of therapy. Electromyographic assessment showed that the mean amplitude EMG scores for all cases after four months decreased significantly in the masseter muscle, but there was no significant change in the temporalis muscle. After six months there was a statistically significant decresase in the mean amplitude EMG scores, for the left masseter and temporalis muscles, but there was no significant change for the right masseter and temporalis muscles. In the eight successfully treated cases after four months, there was a statistically significant decrease in mean EMG scores for both masseter and temporalis muscles. Also in the eleven successfully treated cases after six months, there was a statistically significant decrease in mean EMG scores for both muscles.

CONCLUSION: The results indicate that an occlusal splint can eliminate or diminish signs and symptoms of myofascial pain dysfunction syndrome and reduce muscle activity in the temporal and masseter muscles. The splint causes a slow and steady improvement in signs and symptoms.

KEY WORDS: Myofascial pain dysfunction syndrome (MPD), Masticatory muscles, Occlusal Splint.

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INTRODUCTION

Occlusal appliances are commonly used in the treatment of patients with temporomandibular disorders (TMD) and their effectiveness in reducing symptoms has been reported to vary between 70% and 90% [1]. Nevertheless, as the demand for evidence-based dentistry has increased, the efficacy of occlusal appliances for treatment of TMD has been questioned. For instance, Major and Nebbe [2] concluded from their study that splint therapy is not the treatment of choice to manage joint pain.

The study of Marbach and Raphael [3] was also not able to identify evidence for their long term efficacy. Therefore they recommended in another study [4] that appliances should not be used for musculoskeletal facial pain. Furthermore, a published systematic study of randomized controlled trials on the occlusal treatment of TMD concluded that occlusal splints may be of some benefit in the treatment of TMD and that there is an obvious need for well-designed controlled studies to analyse the current clinical practices [5].

Indeed, the few randomized clinical studies [6, 7] that have been published have lead to inconclusive results. In one of these studies, performed on patients recruited through a newspaper announcement, no difference in the improvement was found with the use of either occluding or non-occluding appliance [6]. On the contrary, a third randomized controlled trial by Ekberg, Vallon and Nilner [7] reported that both signs and symptoms improved significantly with a stabilization appliance than with a control, non-occlusal appliance.

On the other hand, a recent follow-up study conducted by Naikmasur et al [8], to evaluate the efficacy of occlusal splint therapy and compare it with pharmacotherapy (using analgesics and muscle relaxants) in the management of myofascial pain dysfunction syndrome concluded that occlusal splint therapy has better long-term results in reducing the symptoms of MPDS. It has a better patient compliance, fewer side effects, and is more cost-effective than pharmacotherapy; hence, it can be chosen for the treatment of patients with MPDS [8].

An article written by Littner et al [9], reviews the different opinions in the treatment of TMD with special attention to hard and soft occlusal appliances. Based upon much research and despite the many disagreements regarding its efficacy, the hard splint is a customary application which has the most successful outcome in patients who suffer from functional disorders of the masticatory system. The stabilization splint has an important benefit for being a non-penetrating and reversible appliance. However, despite this, the dentist should evaluate the joint or muscular problem, and seriously consider the various available treatments before deciding to use the appliance as a means of treatment [9].

In a randomized trial by Wahlund, List & Larsson [10]; the effects of occlusal appliance and relaxation therapy, each combined with brief information, were compared with brief information only, in adolescents with temporomandibular disorder (TMD) pain. Occlusal appliance was found to be superior to both relaxation therapy and brief information regarding pain reduction. Therefore, it can be recommended when treating adolescents with TMD pain [10].

A further problem, as reported by Dao and Lavigne [11] in a comprehensive literature review, is the fact that it is still largely unknown how splints work. Therefore, the authors concluded that oral splints should be used as an adjunct for pain management rather than as a specific treatment modality. Because of these diverse opinions, there is obviously strong need for evaluating and identifying if an occlusal appliance is really effective in the management of pain and dysfunction in TMD patients.

REVIEW OF LITERATURE

Anatomically the temporomandibular joint (TMJ) is a diarthrodial joint **,** which is a discontinuous articulation of two bones permitting freedom of movement that is dictated by associated muscles and limited by ligaments [12]**.** The bones of the temporomandibular articulation are the glenoid fossa, on the undersurface of the squamous part of the temporal bone and the condyle of the mandible.

The glenoid fossa is limited posteriorly by the squamotymanic and petrotympanic fissures. Medially it is limited by the spine of the sphenoid bone, and laterally by the root of the zygomatic process of the temporal bone. Anteriorly, it is bounded by a ridge of bone described as the articular eminence, which is also involved in the articulation [13]**.**

The condyle is the articulating surface of the mandible. Its articular surface is strongly convex in the anteroposterior direction and slightly convex mediolaterally. The medial pole extends farther beyond the condylar neck than the lateral pole does and is positioned more posteriorly so that the long axis of the condyle deviates posteriorly and meets a similar axis drawn from the opposite condyle at the anterior border of the foramen magnum [13]**.**

Unlike most synovial joints, whose articular surfaces are covered by hyaline cartilage, the temporomandibular articulation is covered by a layer of fibro cartilage tissue [11, 13-15]. The fibrous layer covering the condyle sits on a prolifirative zone of cells associated with the formation of condylar cartilage [16, 17]. The glenoid fossa is always covered by a thin fibrous layer that directly overlies the bone, but this layer becomes appreciably thicker where it covers the slope of the articular eminence· There is firm evidence; however, that fibrocartilage is associated with the articulation deep to the fibrous layer both on the condyle & on the articular eminence [13, 16].

The mandibular condyle has a multidirectional growth capacity and its cartilage can proliferate in any combination of superior and posterior directions as needed to provide for the best anatomic placement of the mandibular arch. A transient growth cartilage has also been found in association with development of the articular eminence. At birth there is no eminence; its development starts with a slender strip of growth cartilage situated along the slope of the eminence. Whereas the life span of these cartilages differs-the condylar cartilage existing until the end of the second decade, the eminence cartilage lasting a much shorter time- the subsequent history is the same for both [13].

The proliferative activity of the cells in the proliferative layer ceases, but the cells persist. The cartilage immediately below converts to fibrocartilage and, in the mandible, eventually mineralizes to a degree even greater than that of the mineralized bone [16, 17]. Thus fibrocartilage is found both in the mandible and on the slope of the articular eminence. It seems certain that in both instances cells of the proliferative layer can, if the occasion demands, resume their proliferative activity. Thus remodeling of the articular surfaces can occur in response to functional changes throughout life and in response to orthodontic treatment [16].

The TMJ is divided into two compartments by a disk and surrounded by a capsule lined with synovial membrane [18]. The capsule, as it surrounds the joint, includes the articular eminence and consists of dense collagenous tissue, with its upper half, above the articular disk, forming a loose envelope that is attached to the squamotympanic fissure behind, the articular eminance infront, and the margins of the glenoid fossa elsewhere [19, 20]. It is also attached at its medial and lateral margins to the articular disk. Below the disc it attaches tightly to the neck of the condyle [18, 20].

The capsule is lined on its inner surface by a synovial membrane. Generally the synovial membrane is considered to line the entire capsule, with folds or villi of the membrane protruding into the joint cavity [21]. The synovial membrane does not cover the articular surfaces or the disk, except for its bilaminar posterior region [21].

Essentially, any synovial membrane consists of two layers, a cellular intima resting on a vascular subintima, which in turn blends with the fibrous tissue of the capsule. The subintima is a loose connective tissue containing vascular elements together with scattered fibroblasts, macrophages, mast cells, and fat cells. The intima varies in structure, having one to four layers of synovial cells embeded in an amorphous fibre-free intercellular matrix [13, 22]. Often there are cellular deficiencies, so that the subintimal connective tissue directly borders the joint cavity. The cells forming this discontinous layer are of two types, a predominant type A, macrophage-like, cell and a type B, fibroblast-like, cell [13, 22]. Type A cells exhibit significant phagocytic properties, and the type B cells synthesize the hyaluronate found in the synovial fluid. The synovial membrane is responsible for the production of synovial fluid, which is characterized by well-defined physical properties of viscosity, elasticity, and plasticity. Synovial fluid contains a small population of varying cell types such as monocytes, lymphocytes, free synovial cells, and occasionally polymorphnuclear leukocytes [13].

The chemical composition of the synovial fluid indicates that it is a dialysate of plasma with some added protein and mucin. Its function is to provide (1) a liquid environment for the joint surfaces and (2) lubrication to increase efficiency and reduce erosion [22].

An inward circumferential extension of the capsule forms a tough, fibrous disk that divides the joint into upper and lower compartments, provides an articular surface for the head of the condyle, and because the lower half of the capsule is tightly bound to the condyle, moves with the condyle during translation [20]. The disc consists of a dense fibrous tissue and its shape conforms to that of the opposing articular surfaces. Thus, its lower surface is concave and generally matches the convex contour of the condyle [13]. The upper surface of the disc also presents a concave surface since its posterior and anterior components are considerably thickened, deliminating a central thinner component. [19,20] The type I collagen bundles that constitute the disk are generally loosely arranged and randomly oriented, except in the central region, where they are more tightly bound in organized bundles [13].

The anterior portion of the disk fuses with the anterior wall of the capsule. Above the point of fusion, the capsule runs forward to blend with the periosteum of the anterior slope of the articular eminence [20]. Below, the capsule merges with the periosteum of the front of the neck of the condyle. This appearance in section creates the impression that the anterior portion of the disk splits into two lamellae [16]. Posteriorly, the disk also appears to divide into two lamellae, but again these lamellae represent the posterior wall of the capsule. The upper part of the capsule, or lamella, consists of fibrous and elastic tissue, and inserts into the squamotympanic fissure. The lower part of the capsule consists of collagen only, and blends with the periosteum of the condylar neck. Between these two lamellae a space is created, that is filled with a loose, highly vascular connective tissue [20].

The lateral aspect of the capsule is thickened to form a fan shaped ligament known as the temperomandibular ligament, which runs obliquely backward and downward from the lateral aspect of the articular eminence to the posterior aspect of the condylar neck. Three other ligaments are included in conventional discripions of the joint, although neither has a functional role. The first is the sphenomandibular ligament, running from the lingula to the spine of the sphenoid. The second is the styomandibular ligament, running from the styloid process to the angle of the mandible. The third is the mandibular-malleolar ligament, connecting the neck and anterior process of the malleus to the medioposterosuperior part of the capsule , disc and the sphenomandibular ligament [13].

All the muscles attached to the mandible influence its movement to some degree. Only the large four muscles that attach to the ramus of the mandible are considered the muscles of mastication; however, a total of 12 muscles actually influence mandibular motion all of which are bilateral. [12] Muscles influencing mandibular motion may be divided into two groups by anatomic position. The supramandibular muscle group consisting of the temporalis, masseter, medial pterygoid and lateral pterygoid muscles. This group functions predominantly as the elevators of the mandible. However, the lateral pterygoiod muscle has a depressor function as well [13] The inframandibular group attaches to the symphyseal area and the hyoid bone and functions as the depressors of the mandible.

TEMPEROMANDIBULAR DISORDERS (TMD)

Temporomandibular disorders (TMDs) is a collective term used to describe a number of related disorders affecting the temporomandibular joints, masticatory muscles, and associated structures, all of which have common signs and symptoms which include complaints of facial and TMJ pain, tenderness to palpation on the face and TMJ, uncoordinated mandibular movement and the presence of joint sounds [23].

Temporomandibular disorders (TMDs) have signs and symptoms that affect the masticatory muscles, temporomandibular joint (TMJ) or both. These signs and symptoms include complaints of facial and TMJ pain, tenderness to palpation on the face and TMJ, uncoordinated mandibular movement and the presence of joint sounds [23].

As has been described by de Bont and Collaeges [24], temporomandibular disorders (TMD) are classified into non-articular and articular categories. Non-articular disorders most commonly manifest as masticatory myalgia and include muscle disorders such as myofacial pain and dysfunction, muscle spasm, chronic conditions such as fibromyalgia and less commonly, myositis ossificans. The articular disorders were divided into inflammatory and non inflammatory. Non inflammatory articular disorders include osteoarthrosis, temporary or permanent disc displacement, degenerative changes within bone and cartilage, avascular necrosis or structural damage to the joint cartilage resulting in disc displacement and/or perforation. The inflammatory articular disorders are primarily due to rheumatoid arthritis, juvenile rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, or arthritis resulting from infectious causes. Also, it could be secondary to synovitis, capsulitis, traumatic arthritis or gout [(24)].

Myofascial pain is one of the most common types of temporomandibular joint disorders, or TMDs [(30)]. There are many synonyms for this condition including facial arthromylagia, TMJ dysfunction syndrome, myofacial pain dysfunction syndrome, craniomandibular dysfunction, pain dysfunction syndrome (PDS), and myofacial pain dysfunction [(26)].

Myofascial pain (MFP) is a regional, dull muscular ache characterized by localized tender spots known as "trigger points" in the involved muscle and its associated fascia. MFP is a medical condition treated by both dentists and physicians. Clinically, it may be localized to one muscle group, such as the masticatory muscles, or have a more generalized distribution throughout the body [(27)].

Laskin [(28)] proposed the term myofascial pain dysfunction syndrome (MPD) to identify a sub group of temporomandibular joint patients