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Stabilization Splint Treatment on Complete Denture – Two Reported Cases

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Abstract - *The pre-prosthetic treatments of two female patients with osteoarthritis of the temporomandibular joints were presented in this paper. In the first case report, an 83-year-old patient wore complete dentures (CDs) for 30 years. The second patient (71 years of age) wore a three-year-old upper CD and a lower removable partial denture with a two-unit fixed dental prosthesis. Pain was successfully eliminated by the stabilization splint on the upper CD. Magnetic resonance imaging was used to confirm the diagnosis and clinical follow-up of the splint treatment.*

KEY WORDS: temporomandibular joint, osteoarthritis, stabilization splint, complete denture, magnetic resonance imaging

INTRODUCTION

Temporomandibular disorders (TMD) consist of a group of clinical problems manifested as the following: pain in the muscles of the orofacial region, pain and sounds in the temporomandibular joint (TMJ), and limited mandibular mobility. The results of epidemiologic studies on the prevalence of TMD in population groups of different ages and the mutual dependence of etiological factors are controversial. When clinically evaluating TMD, recognising a discrepancy between the radiograph and the pain expressed by the patient is possible; this discrepancy is also characteristic of other musculoskeletal disorders in the human body[1,2].

The aim of this study is to provide two clinical case reports of patients who, despite having osteoarthritis of the TMJs, underwent initial splint treatment so that definitive prosthetic treatment could be carried out.

TMD and the elderly population

According to epidemiological findings, TMD symptoms generally appear during and after adolescence. A higher prevalence is found in women, and the prevalence is lower in the elderly [1]. Egermark et al.[3] showed that TMD symptoms fluctuated during a period of long-term follow-up. Earlier investigations of TMDs found that the dental status and occlusal relationship of missing teeth were involved in TMD pathogenesis[4]. These findings are the reason some clinical studies have excluded patients with many missing teeth or have included complete denture (CD) wearers only [5].

Some studies have focused on the elderly population, especially those wearing CDs. Hiltunen et al.[6] found that TMD symptoms do not depend only on posterior teeth loss. A small number of complete RDP wearers show mild TMD signs and symptoms, and these do not depend on the number of CD worn by patients. The most common clinical signs of TMD are crepitation in the TMJ (24%) and pain in the masticatory muscles (39%)[7,8].

The TMD signs and symptoms in CD wearers are more frequent in women, particularly during the postmenopausal period of their lives. Edentulism or the absence of CDs have not been proven to be related to TMD[9,10]. Despite the great prevalence of abnormal changes in the condylar surfaces of the CD wearers, only a small number of wearers show TMD symptoms[11].

From a prosthodontic view, an increased number of edentulous patients change their CDs several times throughout their lives. The factors that affect the need for a new CD are the following: facial contours, occlusal relations, occlusal vertical dimension (OVD), retention of the prosthesis, shape of the prosthesis base, colour of the teeth, and the patient's wishes[12,13]. A traditional point of view is that TMD symptoms are found more in patients needing prostheses. Almost half of the Swedish dentists that were interviewed believed that it is necessary to replace molars because of the risk of developing TMD and compromising masticatory function[14].

Magnetic resonance imaging (MRI) and clinical diagnostics

Laskin[4] recommends the use of an exact diagnosis of a muscle- or joint-related disorder, because degenerative joint disease or osteoarthritis have clinical manifestations such as the following: joint sounds such as more crepitations than clicking, pain during mouth opening, limited range of motion, and pain on palpation of the TMJ. There are some limitations to clinical examination according to the Research Diagnostic Criteria (RDC)/TMD diagnostic system (Axis I) because the diagnoses of "osteoarthritis" and "osteoarthrosis" are grouped with the diagnosis/symptom "arthralgia" (Group III), which was noted by Palla at the time of publishing of the RDC/TMD system. The two other diagnostic groups of the RDC/TMD criteria are muscle disorder (Group I) and disc displacement (Group II)[15].

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According to eli et al.[16] that used RDC/TMD criteria, the epidemiological data in Croatian TMD patients showed the following: Group I diagnoses were found in 64.9% of patients; Group II disorders were found in 31.8% of the right TMJs and 27.3% of the left TMJs; Group III disorders were found in 21.4% of the right TMJs and 26% of the left TMJs; TMJ arthralgia was a much more prevalent diagnosis (18.8% of the right TMJs and 22.1% of the left TMJs); TMJ arthritis was found in 1.9% of the right TMJs and 2.6% of the left TMJs; and TMJ arthrosis was found in 0.6% of the right TMJs and 1.3% of the left TMJs.

In the future, clinical diagnostics can be improved by including orthopaedic tests in the examination of the TMJ and by having a clinical differentiation of various diagnoses that fall under the umbrella of TMD[17].

Stabilization splint

The initial treatment of TMD is carried out by the stabilization splint to correct a disrupted OVD, change the occlusal contacts, and give a neuromuscular impulse to improve the function of the mandible. The goal is to obtain an even distribution of posterior teeth contacts and ensure centric and therapeutic positioning of the mandible.

Occlusal stability is ensured by the stabilization splint so that the occlusal configuration (glenoid fossa and articular eminence) of tooth alignment is replicated on which the splint is to be positioned. The factors that indicate the need for a stabilization splint are as follows: the need for stabilization of occlusal relations, the need for relief and elimination of pain caused by osteoarthritic changes of the TMJ, and abrasion or loss of teeth that need OVD correction[18].

The splint was made from a transparent cold-curing acrylate. Borders of the splint embraced the anterior teeth, exceeding incisal margins by 2-3 mm on labial surfaces and buccal surfaces over the circumference of the teeth. On the palate, the border of the splint was about 20 mm from the prosthetic teeth.

The initial stabilization splint treatment is a reversible form of therapy, whereby the vertical and horizontal maxillomandibular relationship is altered and the anterior/canine-guided occlusion is tested. When correcting a reduced vertical dimension, the splint should normalize myogenic tone and improve neuromuscular coordination. Depending on the possibility of neuromuscular adaptation and the degree of derangement of the vertical maxillo-mandibular relationship, the interocclusal distance is recommended to be increased for splint thickness by an individual measurement[19].

On delivery, the accurate adaptation, retention, and stabilization of the splint on the CD are tested. The stabilization splint is worn simultaneously with the CD. It is necessary to practice impeccable oral hygiene with both the prosthesis and the splint[18,19].

CASE REPORT 1

In this case report, an 83-year-old female patient wore CDs for 30 years. The OVD, occlusal relationships, and prosthesis stability were disrupted by excessive abrasion of the prosthetic teeth. Due to long wear of the prosthesis, satisfactory adaptation to the basal seat was lost and the patient complained of crepitations and bilateral pain in the TMJs. The patient experienced crepitation in both TMJs for a long time; although it did not compromise oral function, she was forced to visit the dentist 4 months before the study was completed due to pain. It was necessary to start the splint treatment prior to the fabrication of the new CDs to reduce the signs of osteoarthritis, as well as to test the OVD and centric relation of the TMJs.

The diagnosis of osteoarthritis in both joints was made according to RDC/TMD (Axis I) criteria[15] and by using manual functional analysis according Bumann and Groot Landeweer[20]. The following diagnoses were made: Group III for left and right TMJs and osteoarthritis.

MRI was used to confirm the diagnosis and the clinical follow-up of the splint treatment. In a T1-weighted spin-echo MRI image of the right TMJ held in closed mouth position in sagittal cross-section, a deplaned condylar head with a partial loss of cortical bone and articular eminence caused by osteoarthritis was shown. The articular disc takes a physiological position against the condyle (Figure 1a). MRI was performed to confirm the improved clinical condition of the patient who wore the splint for two months (Figure 2). MRI of the right TMJ in closed mouth position with the applied stabilization splint showed no change in the width of articular space and condylar position. The articular disc takes a physiological position within the joint (Figure 1b).

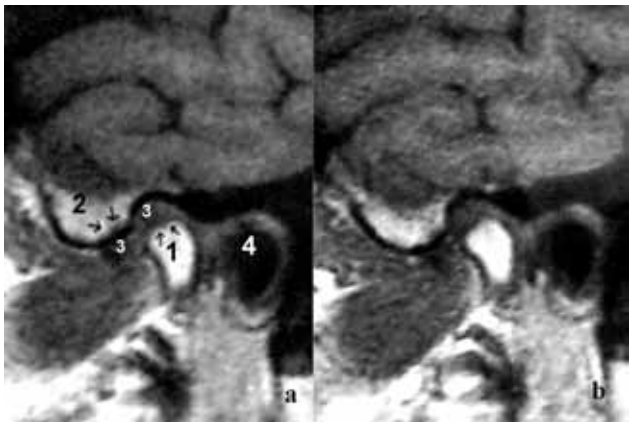

Figure 1. *MRI of the right TMJ in closed mouth position prior to splint treatment (a) and the same MRI with the applied stabilization splint (b) Note: degenerative changes with subchondral sclerosation (arrows) (1 condyle, 2 articular eminence, 3 articular disc, 4 external auditory meatus)*

Figure 2. *Stabilization splint on a maxillary complete denture – case report 1.*

Satisfactory subjective findings (the increased OVD was well accepted and pain in the TMJs was eliminated) and objective findings (the assessment of the splint retention, occlusal relationships, and parafunctions) were attained by the splint treatment. In the obtained therapeutic position, new CDs were fabricated and physiological contours of the patient's lower third of face were established. Since pain in the TMJs was eliminated and a normal functioning masticatory system was regained, it was determined that occasional crepitation in the TMJs was not a symptom requiring treatment.

CASE REPORT 2

A female patient, 71 years old, was referred to the Department of Prosthodontics at the School of Dental Medicine in Zagreb for pain, clicking, and occasional crepitations in the left TMJ. The symptoms appeared suddenly two weeks prior to her arrival in the clinic. She experienced pain in the left TMJ and along the lower margin of the mandible. She had difficulty opening her mouth and was forced to eat soft food. She put her index finger in her mouth to relieve the pain while at rest and prior to going to sleep.

The patient wore a three-year-old upper CD and a lower removable partial denture (RPD) with a two-unit fixed partial denture (FPD). The remaining anterior mandibular teeth had denuded cervices, but they were in good periodontal condition.

The diagnostic procedure was carried out according to RDC/TMD criteria and by using dynamic manual methods[15,20]. During clinical examination, painful reciprocal clicking and simultaneous crepitations were established, with limited mouth opening. Crepitation is an obvious clinical sign of osteoarthritis. Meanwhile, clinical data could not determine the type of disc displacement (DD).

Anterior DD, pronounced subchondral sclerosis of the condylar head with partial destruction and a deplaned, indented contour, and subchondral sclerosis of the glenoid fossa and articular eminence were diagnosed by MRI. In addition to osteoarthritis, during the open mouth position, the anterior DD including a fragment of disc posterior to the condylar head was persistently present, thus indicating a disc perforation (Figure 3).

The initial stabilization splint treatment lasted for 6 months, after which the pain stopped and only occasional crepitations remained in the left TMJ (Figures 4, 5). Regardless of the unfavourable finding of osteoarthritis obtained by the MRI, the splint had a favourable clinical effect on the patient, and the definitive prosthetic treatment was carried out. The definitive prosthetic treatment was the following: CD in the maxilla and a RPD with a two-unit FDP in the mandible.

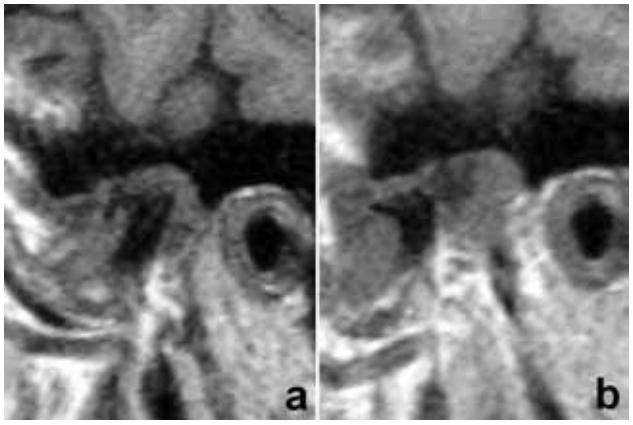

Figure 3. *MRI of the left TMJ prior to splint treatment: closed mouth position (a) open mouth position (b)*

Figure 4. *Applied stabilization splint on a maxillary complete denture – case report 2.*

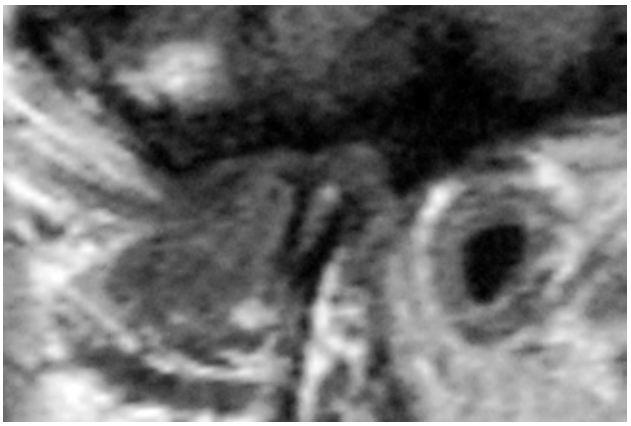

Figure 5. *MRI of the right TMJ with the applied stabilization splint on a maxillary complete denture.*

DISCUSSION

Contrary to all accepted knowledge of successive aggravation of musculoskeletal disorders (especially degenerative joint disorders) during ageing, Green[21] in 1994 concluded that TMD pain decreased with advancing age. However, clicking or crepitation without pain in the TMJ was found more often in the elderly than in younger patients with a more painful condition[22]. Johansson et al.[23] found a difference between two TMD populations: more pain and dysfunction were found in a younger group of the population. More people in the elderly population are expected to wear CDs; however, there is a lack of clinical data about the relationship between TMD symptoms and the quality of prosthetic treatment by the use of removable dentures.

Symptoms of osteoarthritis in the TMJ are more frequent in women. The clinical symptoms usually appear in the early thirties[24]. Bernhardt et al.[25] used MRI to detect osteoarthritis in a non-patient population on the basis of well-selected clinical symptoms (25% of subjects exhibited osteoarthritic changes as shown on the MRI film). Not only is there a high percentage of subjects who do not show signs of osteoarthritis, but there is also no difference between the degenerative changes of the condyle of the TMJs with and without clinical signs of osteoarthritis in the group of patients with osteoarthritis in one or both TMJs.

Although the anterior DD is the most frequent type of TMD, the prevalence of anterior DD was not higher in elderly patients with CDs[26]. TMDs in patients with CDs should not be associated with prosthesis retention, stability, occlusal errors, decreased OVD, nor the age of the present prosthesis[27].

Since the aetiopathogenesis of TMD is not known and there is no gold standard for TMD treatment, various and mostly symptomatic treatment modalities are required. The occlusal splint is primarily indicated for a non-invasive reversible form of the initial dental treatment. The potential results of this initial occlusal treatment are as follows: the mandible can be reprogrammed, myogenic and arthrogenous pain can be eliminated, the centric and eccentric occlusal concepts of occlusion can be tested, and optimal occlusal relationships can be attained, all of which can then be incorporated into the definitive prosthodontic treatment. The occlusal splint is to be worn on a daily basis in the initial treatment while fabricating new CDs. Subsequently, the planned definitive treatment should be carried out after six months at the latest. Therefore, the occlusal splint can be efficient in pain removal, despite the exclusion of causal treatment modalities[28-30].

Therapeutic action by the occlusal splint shall change the habitual occlusal relationship and evaluate the increase of vertical dimension in centric relation. It is unrealistic to expect that the occlusal splint can improve degenerative osseous changes and correct displaced or perforated articular discs. Achieving functional compensation without pain in the irreversibly changed TMJs, as well as in other musculoskeletal disorders, is the main goal of the occlusal splint and other treatment modalities.

Pharmacological treatment, such as the chemical heterogenic group of non-steroidal anti-inflammatory drugs (NSAIDs), is widely accepted as an assistance modality. Its main therapeutic goal is to remove or control pain, and it is commonly used in rheumatology. However, one of the main pharmacological characteristics of NSARs is having relatively numerous side effects (primarily gastroenterological and cardiological); therefore, the type of NSAR used should be carefully evaluated with regard to the length of use and the dosage. Higher prevalence of chronic conditions can be expected in the elderly and those conditions could easily be aggravated by uncontrolled use of NSARs[31]. A combination of locally applied NSARs and methods of physical therapy might be a solution. Physical therapy enhances normal function of the mandible. Active and passive movements, manual treatment, and relaxation exercises have been proven useful in the treatment of osteoarthritis. An ultrasound is a modality of physical treatment that improves penetration of local NSARs in the deep intraarticular tissues[32]. Arthrocentesis and surgical treatment are seldom a treatment of choice[33].

In conclusion, symptomatic, non-invasive, and reversible treatment modalities are particularly indicated for elderly patients whose quality of life should be preserved and maintained. A more satisfactory, increased OVD and centric relation of the condyle to the TMJs were tested reversibly by the stabilization splint, which was well tolerated by the patients. At the same time, the pain in the TMJs was eliminated. However, the still-present TMJ sound was not accepted as a sufficient symptom for prolonged treatment. MRI is diagnostically useful for definitive confirmation of clinical findings, and it showed variable pathological changes of TMJ structures. The stabilization splint enabled the definitive prosthetic treatment by new CDs in new cranio-mandibular relations.

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MANUFACTURERS' DETAILS

- Magnetom Harmony, Siemens, Germany (with field force of 1 Tesla, T_1 weighted image, Spin Echo technique SE 700/40 msec)
- Transparent cold-curing acrylate Futura Jet, Schütz Dental, Rosbach, Germany

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