Stabilization splint and its role in overcoming temporomandibular joint disorders

Splint stabilisasi dan perannya dalam mengatasi gangguan sendi temporomandibula

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ABSTRACT

The objective of this article is to discuss the role of stabilization splints in overcoming the temporomandibular joint disorders (TMD) experienced by a 24-year-old woman who came to the Prosthodontics clinic of RSGM FKG Unpad with chief complaints of pain and sounds that appear in the temporomandibular joints (TMJ) when opening the mouth, limited mouth opening, and muscle tension in the neck and face region. The patient wanted her problem to be resolved. The treatment procedure started with the extraction of the impacted right and left upper third molars followed by a stabilization splint with a control duration every two weeks. During the treatment phase, the patient was instructed to perform self-management therapy for eliminating the bad habits. After using the stabilization splint for 3 months the TMD gradually recovered. It is concluded that the use of stabilizing splints as occlusal therapy was considered an effective method in overcoming TMD.

Keywords: disk displacement with reduction, osteoarthritis, stabilization splint, temporomandibular joint disorder, temporomandibular joint

ABSTRAK

Tujuan dari artikel ini membahas peranan splint stabilisasi dalam mengatasi kelainan pada sendi temporomandibula (STM) yang dialami oleh seorang wanita berusia 24 tahun yang datang ke klinik Prostodonsia RSGM FKG Unpad dengan keluhan nyeri serta suara yang muncul di sekitar sendi pengunyahan saat membuka mulut, keterbatasan bukaan mulut, serta adanya ketegangan pada otot leher dan wajah. Pasien ingin keluhannya teratasi. Prosedur perawatan dimulai dengan ekstraksi gigi molar tiga atas kanan dan kiri yang impaksi diikuti oleh pembuatan splint stabilisasi dengan durasi kontrol dua minggu sekali. Selama fase perawatan pasien diinstruksikan untuk melakukan *self-management therapy* untuk mengeliminasi kebiasaan buruknya. Setelah pemakaian splint stabilisasi selama 3 bulan gangguan pada sendi berangsur-angsur berkurang, nyeri dan bunyi sendi menghilang, bukaan mulut kembali normal, dan pasien merasa sangat nyaman. Disimpulkan bahwa penggunaan splint stabilisasi sebagai terapi oklusal dianggap sebagai metode yang efektif dalam mengatasi gangguan pada STM.

Keywords: *disk displacement with reduction*, osteoartritis, splint stabilisasi, gangguan sendi temporomandibula, sendi temporomandibula

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INTRODUCTION

The phenomenon that occurs in modern society is starting to appear in patients who come to the dental clinic related to problems with their masticatory joints. This certainly requires serious attention from health practitioners, especially prosthodontists who deal directly with patients.

The main signs and symptoms of temporomandibular joint disorders (TMD) are pain in the masseter muscle, temporomandibular joint (TMJ), and/or temporalis muscle, mouth opening, and sounds in the TMJ joint. TMD pain is the most common reason for patients seeking treatment.[1] Embracing the concept of a *holistic dentist* always puts the customer first. Every patient has the right to a complete examination and explanation regarding his illness and the treatment plan to be carried out. Almost every complaint on the teeth or masticatory joints can increase the problems if not detected and treated properly and correctly.[2]

The TMJ can undergo inflammation, trauma, infection, congenital abnormalities, developmental disorders, and malignancies like other joints. However, the most common disorder of the TMJ is a functional group disorder called TMDs.[3] Successful treatment of the TMJ in most circumstances depends on the etiology and a comprehensive examination of the clinical situation and a multidisciplinary approach to achieve an adequate outcome.

Disc dislocation with reduction is a disorder that shows the early stages of disc derangement disorders where clinical signs and symptoms are associated with changes or disorders of the disc-condyle complex. Disc derangement disorder results from elongation of the capsular and disc ligaments followed by thinning of the articular disc caused by macrotrauma (e.g. motor vehicle accident or blow to the face) or microtrauma (hypoxia-reperfusion injury, bruxism, and orthopedic instability due to habitual parafunction).[3]

While osteoarthritis (OA) is the most common degenerative disease affecting the TMJ, occurring in bone, cartilage, and supporting tissues. In OA, there is a complaint of joint pain that is confirmed by palpation, and/or there is crepitus originating from the involved joint. Radiographs show damage to the bone surface, flattening

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condyle, decreased condyle-disc space, irregular condyle shape, osteophyte condyle, or erosion of the condyle. This disorder can occur due to macrotrauma, repeated microtrauma such as parafunctional habits, or inflammation of the joints.[4] The pain scale in patients with TMDs can be measured using the *visual analog scale* (VAS), which is a linear scale that will visualize the gradation of the level of pain suffered by the patient.[5]

American Association for Dental Research (AADR)[6] has issued a policy statement, that the management of TMD should be evidence-based and aim to provide therapy with the greatest potential for long-term symptom relief. Many different therapeutic options can relieve symptoms in the jaw muscles and joints, and these include the use of occlusal appliances, pharmacological therapy, physical therapy, cognitive behavioral therapy (CBT), counseling, and self-care management or a combination of these. One of the therapies of choice for treating patients with TMDs is a stabilization splint (SS), which is a flat occlusal plate made of hard acrylic material. The SS is designed to increase occlusal stability and reduce muscle tension.[7]

The purpose of treating TMDs is to reduce pain and increase joint movement. Occlusal devices such as SS can be used because long-term effects on occlusion can be minimized. The SS are designed to eliminate orthopedic instability between occlusion and joint positions and are expected to eliminate the etiology of TMD. When this tool is used, the condyle is in the most stable musculoskeletal position. This tool is indicated for treating muscle pain disorder, intra-articular joint disease, and degenerative disorders, as well as testing the results of treatment 4-6 weeks before a definitive restoration is prepared.[3] This tool can also be used as a safe alternative method for diagnosing and managing tension-type headaches which are common in the community.[8]

This article describes the use of SS as occlusal therapy in cases of TMDs in the form of intra-articular joint disease (disc displacement with reduction) accompanied by degenerative joint disease like OA.

CASE

A 28-year-old woman came to the Prosthodontics Clinic of Oral and Dental Hospital (RSGM) Universitas Padjadjaran with complaints of pain near her right ear when opening her mouth and limited mouth opening in the last 1 month ago. The patient has a history of open-lock, she couldn't close his mouth easily when yawning 3 days ago. She also felt the joint *clicking* and rustling when opening his mouth in the last 2 years, muscle tension in the neck and face area, and occasional headaches in the temporal region. She admitted to taking NSAID drugs if the pain was unbearable. The patient has a habit of chewing only on the right side, using a sling bag on the right shoulder, sucking candy, supporting his chin, sleeping with his neck bent, sleeping on his right side, and crossing his legs while sitting. She denied a history of systemic disease and the habit of grinding his teeth during sleep.

After taking the history, it was performed the extra-traoral, intraoral, and panoramic radiographs. The pattern of mouth opening was straight with a wide opening distance without the pain of 15 mm, the maximum opening with pain at a distance of 32.2 mm, and the maximum opening assisted by the operator at a distance of 34.6 mm.

On palpation, the masseter and sternocleidomastoid muscles were felt rather hard, there was a clicking sound and crepitus on the right side when the mouth opened. A clicking sound occurred at the opening distance of 16.3 mm. Clicking and crepitations also appeared during right and left excursive movements. Measurement using VAS pain in the face and neck area was felt on a scale of 4-5, namely moderate to severe pain. On Axis 2 Diagnostic Criteria for Temporomandibular Disorders (DC-TMD) examination, the results of the depression scale were normal.

On intra-oral examination, there was crowding in the right and left posterior regions, impacted teeth 18, 28, 38, and 48, and a history of extraction of teeth #14 and #24 et causa ectopic. The median line of the mandible was shifted 1.4 mm to the right. Overbite and overjet were normal on 1.1 mm (Fig. 1).

Figure 1 Intra-oral view of the patient

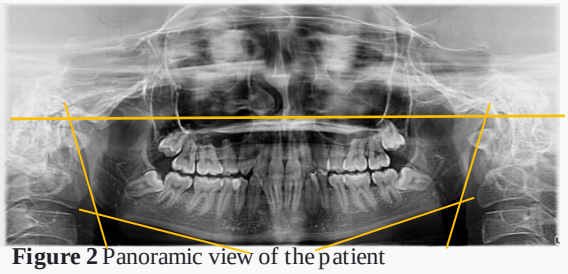

Figure 2 Panoramic view of the patient

The results of the panoramic examination of the patient showed that the right condyle was irregular and jagged, there were slight osteophytes and flattening on the top surface of the condyle, and there was a slight area of calcification in the medial part while the left condyle was regular. The height of the right condyle is 4 mm shorter than the left condyle. The right and left gonial angles were 120° respectively, and 18, 28, 38, and 48 teeth were impacted with the position of 38 and 48 were very close to the mandibular canal (Fig. 2).

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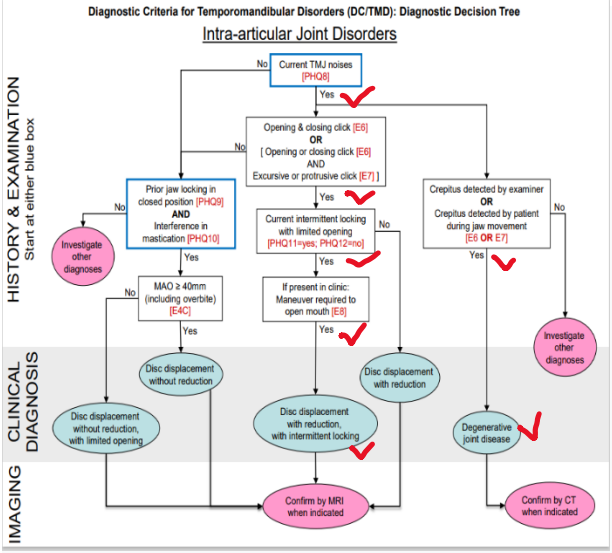

Figure 3 Diagnostic decision tree of DC-TMD 9

From the history, clinical and supporting examinations, and also the DC-TMD Diagnostic Decision Tree scheme (Fig.3), the diagnosis of this patient was intra-articular joint disease (disc displacement with reduction with intermittent locking) accompanied by degenerative joint disease (osteoarthritis). The treatment plan will be carried out as combination therapy to eliminate the patient's bad habits by performing self-management therapy, as well as extraction of teeth 18 and 28, followed by the fabrication of stabilization splints and orthodontic treatment.

MANAGEMENT

After taking the history, clinical, and supporting examinations, the patient was educated to carry out self-management therapy for eliminating the bad habits, including getting used to chewing on both sides in a balanced way, sleeping in a balanced position, using a balanced bag on the right and left shoulders, not supporting the chin, reduce habits such as sucking candy, crossing legs, reading in bed with a bent neck position. Patients were also instructed to do hot/cold compresses, a soft food diet, avoid wide mouth opening, posture exercises, and relaxation (yoga, relax, exercise).

The patient was referred to the Oral Surgery Clinic for extraction of teeth 18 and 28. Two weeks after tooth extraction, the patient's mouth opening without pain was increased to 26.9 mm, but the right joint still felt pain, and there was still a clicking sound and smooth crepitus in the right joint when opening the mouth. VAS pain in the face and neck area decreased to 3. At this phase, the dentist took an impression to create a study model. Bite wax (Fig.4) was conducted for the fabricating of a stabilizing splint (Fig.5A) on the upper jaw with a thickness of 2-3 mm according to the freeway space. In the insertion phase (Fig.5B), the operator checks the instrument adaptation, occlusion, and the patient's condition. Joint sounds and joint pain gradually improved on the opening mouth. Use of tools 24 hours per day except for eating and certain public activities. Periodic checks are carried out every 2 weeks.

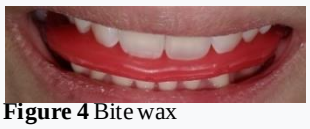

Figure 4 Bite wax

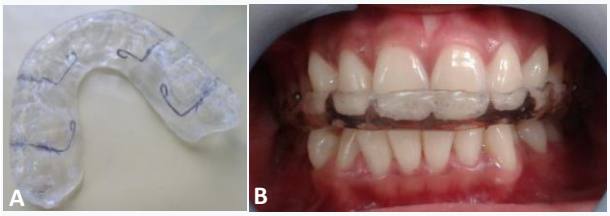

Figure 5A The stabilization splint; **B** insertion phase

In the second month after insertion, the mouth opening increased to 3 fingers (±50 mm), and joint pain as well as joint sounds such as clicking or crepitations disappeared. The frequency and duration of using the tool were reduced to only at night and then the removal of the tool was carried out gradually. One month later the appliance was removed and the patient was referred to the orthodontics department for orthodontic treatment.

DISCUSSION

According to the American Academy of Orofacial Pain, TMD is defined as a group of disorders of the TMJ that include the muscles of mastication, TMJ, and related structures.[3] The most common TMDs are pain-related and intra-articular disorders.[9] Intra-articular TMJ disorder is defined as an abnormal positional relationship between the disc and the condyle, articular eminence, and/or articular fossa. Among TMJ intra-articular disorders, disc displacement with reduction (DDWR) is one of the most common intra-articular disorders of the TMJ,[10] accounting for 41% of clinical diagnoses of TMD.[11] Some people with this condition can move the mandible laterally or protrusively to accommodate movement of the condyle across the posterior border of the disc, and the locking condition can be managed independently without assistance.[3]

Osteoarthritis is the most common joint disease worldwide, characterized by the destruction of the articular joint tissue and gradual remodeling of the underlying bone.[12] The OA of the TMJ can differ from other joints.[13] The TMJ is known to be relatively less affected by age compared to other joints. The epidemiology of TMJ-OA in the literature suggests that degenerative changes in TMJ can occur in adolescents, with prevalence in women peaking in those aged 20 until 40 years.[14] Osteoarthritis of the TMJ can occur if the joints are subjected to continuous overload. Osteoarthritis of the TMJ can also be associated with disc displacement. When the disc is dislocated and the retro-

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discal tissue is damaged, the condyle articulates directly with the fossa, accelerating the damage process. Over time the density of the fibrous articular surface is damaged and bone changes occur. Movement on the surface causes pain so functional muscle movement becomes limited.[3]

A SS is a device made of hard acrylic and is temporary, removable, and reversible. The use of this device allows the relationship between the teeth in the coordination of muscles and joints of mastication ideal. This condition will reduce abnormal muscle activity and produce *neuromuscular balance*.[15] This device is also called a muscle relaxant because it can effectively reduce muscle pain.[7] Furthermore, this stabilizing device allows the condyle to be in the most stable musculoskeletal position, and at the same time, the teeth are in contact simultaneously in the centric position. The purpose of using this device is to eliminate orthopedic instability between the occlusal position and the joint position.[3]

The SS can be used on the maxilla or mandible, but placement on the maxilla is preferable. The upper jaw splint is usually more stable and covers more tissue, so it is more retentive and tends to be more resistant to breakage. The maxillary splint can also be used in all molar and skeletal relationships. While the lower jaw splint allows the patient to speak more easily, is less visible so it is more aesthetic.[3]

A good occlusal splint will place the condyle in the most anterosuperior position in the centric relation, resulting in anterior disclusion (canine guidance), simultaneous posterior and incisal occlusal contact points, especially with functional cusps of opposing teeth, and prevent posterior contact of the various excursions. The splint should not have occlusal indentations where the opposing teeth will lock and produce a heavy lateral force that damage. A flat occlusal surface eliminates sensory feedback due to disruption of tooth contact and results in the elevator muscles moving the mandible so that the condyle can move posteriorly and up the slope of the eminence for a complete seat in centric relation.[3]

In this case, a 24-year-old female patient experienced disorders of the TMJ including limited mouth opening, sounds and pain in the opening mouth, headache, and tension in the masticatory muscles. After taking the history, a clinical examination and panoramic radiograph were carried out. The etiology and predisposing factors that led to a series of disorders in the masticatory joints were investigated. The main possibility is related to the patient's lifestyle habits such as the habit of chewing on one side (right side), using a sling bag on the right shoulder, sucking candy, supporting the chin, sleeping with the neck bent, sleeping on the right side and crossing legs while sitting. This habit takes place continuously, causing excessive load on one side of the joint, namely the right joint. Regarding this bad habit, dentists provide education to patients to carry out self-management therapy.

In addition, all third molars were impacted. Impacted mandibular third molars were a major factor in the development of TMD. Third molars can cause problems in the orofacial area, including recurrent infections, difficulty eating, crowding of teeth, facial swelling, headaches, and pain. Symptoms that appear can also resemble mild to severe TMD symptoms, such as trismus/limited mouth opening, pain when chewing, otalgia, and stiffness in the masticatory region.[16] The position and difficulty of impacted mandibular third molars can affect the development of TMDs probably because of their proximity to the TMJ. Therefore, some authors have suggested that TMDs are prevalent in patients referred for extraction of impacted mandibular third molars.[17] The study of a Bhardwaj, et al[16] suggests that TMDs are relatively common in patients who have an impacted mandibular third molar. This study also highlights the propensity of the type of impaction likely to cause severe TMDs.

In this patient, all four third molars were impacted, however, only the maxillary third molars were extracted because the position of the mandibular third molars was very close to the mandibular canal which could pose a high risk if extracted. After the extraction of the third maxillary molars, the patient's mouth opening began to increase even though it was not normal and other complaints of TMD were still present, so the treatment was continued by making a stabilization splint. After using the SS for 3 months, the patient's complaints have completely disappeared. Mouth opening is normal, and pain and joint sounds have also disappeared. On palpation, the muscles of mastication are no longer tense/stiff.

The results of this treatment are in line with the treatment of Zhao et al,[18] that stabilization splint therapy gives satisfying results to eliminate TMD symptoms and identify the true mandibular position. It is also in line with the study of Janicka et al,[8] that occlusal SS effectiveness in patients with a myofascial pain disorder and tension-type headache. The network meta-analysis of randomized controlled trials of Al-Moraissi et al[19] also proves that occlusal SS is effective for the management of TMDs.

It is concluded that TMD treatment is carried out by tracing the etiology and predisposing factors so that the treatment can be carried out comprehensively. The choice of occlusal treatment using a SS in cases of intra-articular joint disease (DDWR) with intermittent locking) accompanied by degenerative joint disease (osteoarthritis) provides significant results. So, it can be concluded that this treatment can be considered an effective method for overcoming TMDs.

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