

Soft Versus Hard Occlusal Splint Therapy In The Management of Temporomandibular Disorders

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ABSTRACT

Background: To compare between soft and hard occlusal splint therapy for the management of myofascial pain dysfunction (MPD) or internal derangement (ID) of the temporomandibular joint (TMJ) with reciprocal clicking.

Materials and methods: This study included 30 patients (age range: 24–47 years) who had been diagnosed with MPD or ID of the TMJ in the form of reciprocal clicking. Patients were divided into two groups.

1) soft splint group: They were treated for 6 months with either a vacuum-formed soft occlusal splint constructed from 2-mm-thick elastic rubber sheets

2) hard splint group: a hard flat occlusal splint fabricated from transparent acrylic resin

Monthly follow-up visits were performed during the treatment period. Before treatment and 1, 2, 3 and 6 months after treatment, we measured all parameters of TMJ function (pain visual analog scores, tenderness of masticatory muscles, clicking and tenderness of the TMJ, and range of mouth opening).

Results: All parameters of TMJ function showed significant improvement in both groups during the follow-up period, with a statistically significant difference between the two groups at the 4-month follow-up visit.

Conclusions: Both forms of occlusal splints (soft and hard) improved TMJ symptoms in patients with MPD or ID of the TMJ. However, the soft occlusal splints exhibited superior results after 6 months of use.

Keywords: Soft occlusal splint, hard flat occlusal splint, myofascial pain dysfunction.

INTRODUCTION

The temporomandibular joint (TMJ) is interrelated with other neuromuscular components. Defects of any of these components or factors preventing them from working in harmony could lead to temporomandibular disorders (TMDs). The American Academy of Orofacial Pain classifies TMD broadly into myogenous and arthrogenous types, both of which can be present at the same time,

making diagnosis and treatment more difficult (1). TMDs have a multifactorial etiology, with bruxism, psychological illness, and traumatic injuries from mastication, extreme mouth opening, and dental treatments being considered as the main causes (2,3). TMDs are characterized by clicking and pain, either confined to the TMJ region or radiating to the eyes, shoulder, and neck. Headaches, tinnitus, jaw

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deviation, locking, and limited mouth opening are common symptoms (4,5). Pain is the most crucial symptom for which patients seek medical care (6). TMJ locking could progress to complete jaw motion inability. Symptoms range from minor to disabling (7). Management of TMD includes conservative and surgical interventions. Examples of conservative treatments are physical therapy, localized steam application, external muscle massage (8), analgesia, psychotropic medication, splint therapy alternative therapies such as acupuncture (9), as well as treatment modalities such as ultrasound, soft laser, diathermy, and infrared radiation. Surgical treatments include meniscoplasty, meniscectomy, and meniscectomy with disk replacement using the Proplast-Teflon interpositional implant (10,11). Occlusal adjustment involves repositioning the mandible to a centric position by using prosthodontic or orthodontic appliances. Intraoral occlusal splints are designed to provide even and balanced occlusal contact without forcefully altering the mandibular rest position or permanently altering the dental occlusion. Usually made of processed hard acrylic, a splint is worn on the teeth like retainer or a removable denture. Types of occlusal splints include the stabilization splint, modified Hawley splint, and repositioning splint (12). Nevertheless, the use of occlusal splints to alleviate TMD signs and symptoms is controversial. Most comparative studies of different splint designs have relied only on medical history and clinical examination to diagnose disk displacement. Soft splints, which are more convenient for patients than hard splints, can be used immediately after provisional diagnosis with tmd. The rationale for using soft splints is that the soft resilient material may help in distributing the heavy load associated with parafunctional habits (13). Hard splints are thought to reduce TMD symptoms by altering the occlusal equilibrium, changing the afferent impulses to the central nervous system, improving the vertical dimension, correcting the condylar position, and aiding cognitive awareness (14). reported that hard splints offer more successful outcomes than soft splints for patients with functional disorders of the masticatory system. However, other studies have shown that both soft and hard appliances are equally beneficial in improving masticatory muscle pain in the short term. Given these contradictions, this study aimed to evaluate soft and hard occlusal splint therapies for the management of myofacial

pain dysfunction (MPD) or internal derangement (ID) of the TMJ in patients with reciprocal clicking.

MATERIALS AND METHODS

PATIENT SELECTION The study sample included 30 patients (11 males and 29 females).

Inclusion criteria: 1) diagnosis of MPD or ID of the TMJ reciprocal clicking.

2) Patients with a history of previous treatment for TMD were excluded.

Selected patients were divided into two groups and treated for 6 months with either vacuum-formed soft occlusal splints constructed from 2-mm-thick elastic rubber sheets (soft splint group), or hard flat occlusal splints fabricated from transparent acrylic resin (hard splint group).

PREOPERATIVE EXAMINATION: At the first visit after study selection, each patient provided a thorough medical history that included a description of the pain (type, frequency, and intensity) and reaction to jaw movements during chewing, speaking, and swallowing. To record pain intensities, patients used the Visual Analog Scale (VAS, 10-cm line), which ranged from 0 (no pain) to 10 (worst possible pain). A clinical evaluation was performed, which included measurement of the maximum comfortable jaw opening using a Boley gauge, as well as assessments of clicking, tenderness at rest and during various jaw movements, and deviation during opening and closing movements. Tenderness of the extraoral masticatory and neck muscles was evaluated by digital palpation. Resistance testing and functional manipulation were used to evaluate the medial and lateral pterygoid muscles. Symptom severity of clicking and tenderness of the TMJ and muscles were graded as 1 (negative), 2 (moderate), or 3 (severe).

SPLINT CONSTRUCTION: Splints were constructed for the upper arch of each patient. For both splint types, a master cast of the maxilla was fabricated by taking an alginate impression of the maxillary arch. For the soft splint, a vacuum pressure molding device was used for fabrication with 2-mm-thick rubber sheets measuring 13 × 13 cm. The rubber sheet was completely and properly adapted to the cast in the vacuum former. The sheet was removed, and sharp scissors were used to trim the splint

edges. The palatal portion of the splint was removed to obtain the final shape. For the hard splint, self-curing transparent acrylic resin was used to fabricate the splint in the form of a flat anterior bite plane with a thickness of 2–3 mm, which separated the posterior teeth while allowing contact between the anterior teeth. The hard splint was retained by Adam's clasps on the upper first molars. All splints were disinfected with 2% glutaraldehyde and then tried in the patient's mouth to check retention. Patients were advised to wear the splint for 6 months. Instructions were given to the patients for progressively increasing the duration of splint use, starting from 2 h on the first day. The time that the splint was used was increased by 2 h each day to reach 14 h per day by the end of the first week. This splinting time was maintained during the second week. At the beginning of the third week, the splinting time was increased by 2 h per day to reach 24 h per day by the end of the week. Subsequently, patients were advised to wear the splint at all times except during meal times and while performing oral hygiene procedures.

DATA AND STATISTICAL ANALYSES Patients were recalled weekly during the first month and then monthly after 1, 2, 3, and 6 months of treatment. For statistical analysis

RESULTS

The study comprised of 30 patients (age range: 24–47 years) who had been diagnosed with MPD or ID of the TMJ with reciprocal clicking. Patients in both groups responded well to splint therapy. Pain, maximum jaw opening, TMJ clicking, and muscle tenderness improved in all patients during all follow-up intervals. The maximum mouth opening significantly increased over the follow-up period in both groups, with increases starting from 1 M in the soft splint group and 2 M in the hard splint group. At 4 M, but not at any other follow-up interval, the soft splint group showed significantly higher values of mouth opening. VAS scores for pain significantly decreased in both groups throughout the entire follow-up period, with no significant differences between the two groups at any interval. Clicking scores significantly decreased in both groups throughout the follow-up period, starting from 2 M with the hard splint and 3 M with the soft splint. However, there were no statistically significant differences between the two groups at any follow-

up interval. Statistically significant improvements in the tenderness of the TMJ, masticatory muscles, and neck muscles were found in both groups throughout the follow-up period. TMJ tenderness did not differ between the groups at any follow-up interval. However, tenderness of the masticatory muscles showed a significantly greater percentage of improvement in the soft compared to the hard splint group, with complete disappearance of tenderness at 3 M versus 4M. Similarly, the tenderness of the neck muscles showed a greater percentage of improvement in the soft compared to the hard splint group. Neck tenderness disappeared by 3 M in the soft splint group, but remained at 4 M in the hard splint group.

DISCUSSION

As most TMD symptoms have a high incidence of remission over time, usually within 2–4 weeks (4), conservative treatment is considered more appropriate than surgery for these disorders. As a conservative treatment of TMDs, soft splints have some advantages, such as their relative simplicity, reversibility, noninvasiveness, and cost. These splints could be made to fit either the maxillary or mandibular arch and often are inserted immediately (Wright et al., 1995). Owing to their soft and resilient material features, soft splints easily distribute the heavy loads encountered during parafunctional activities, and they have been associated with a high degree of patient tolerance (15). In contrast, (16) found that hard splints had successful outcomes in patients complaining of masticatory system disorders. Offering a third opinion, (17) claimed that both soft and hard occlusal appliances are equally useful in improving masticatory muscle pain in the short term. Given these conflicts of opinions, the present study was conducted to compare the efficiency of soft versus hard occlusal splint therapies for the management of TMDs. In the current study, gradual rehabilitation using occlusal splints was applied to allow patient accommodation to the intraoral bulk and avoid splint rejection. VAS scores for pain showed significant improvement throughout all study intervals. Similarly, Raphael et al. (2003) reported a decrease in VAS scores and the number of painful muscles in patients with myofascial pain after 6 weeks of occlusal splint therapy. A significant improvement in mouth opening was attained in both groups across the study period. This

improvement was significant after 1 or 2 months of treatment in the soft or hard splint group, respectively. These results are comparable to those of Suvinen and Reade (1989), who reported a 7.4-mm increase in jaw opening after splint therapy. The early improvement in mouth opening observed with the soft splint therapy might be due to the material resiliency, which helped to distribute the heavy functional occlusal forces and hastened relief from muscle spasms. This resiliency could also underlie the early relief from masticatory muscle tenderness compared to the hard splint group. Nevertheless, both splint therapies alleviated the pain and tenderness of the TMJ and muscles, leading to an increase in maximal jaw opening. This result is in accordance with (18), who concluded that almost 74% of patients with TMDs had complete remission of symptoms after 6 weeks of occlusal splint therapy. The early improvement in TMJ clicking observed with hard splint therapy might be due to the wider TMJ space created by the hard occlusal splint. The increased TMJ space allows the meniscus to return to its original position with ease, thus reducing the chance for clicking. The improvement in TMJ clicking and alleviation of tenderness in the TMJ and masticatory muscles observed in this study are in agreement with (13), who reported improvements in TMJ clicking and tenderness after 2 months of occlusal splint therapy. Another study reported that 87% of patients showed a reduction in pain, 50% showed a reduction in VAS scores, and 70% had no clicking after splint therapy. In another study, soft splint therapy reduced facial myalgia and TMJ clicking by 74% (Harkins et al., 1988). These improvements can be attributed to the even intensity of contacts among all teeth, with disocclusion of the posterior

teeth and condylar guidance in all movements. These conditions lead to a relaxation of the elevator and positioning muscles and contribute to reduce the abnormal muscle hyperactivity (20). Occlusal splint insertion alters the resting position, and adapting to this new position increases the occlusal vertical dimension beyond the free space. The new resting position complaining of masticatory system disorders. Offering a third opinion, (11) claimed that both soft and hard occlusal appliances are equally useful in improving masticatory muscle pain in the short term. Given these conflicts of opinions, the present study was conducted to compare the

efficiency of soft versus hard occlusal splint therapies for the management of TMDs. In the current study, gradual rehabilitation using occlusal splints was applied to allow patient accommodation to the intraoral bulk and avoid splint rejection. VAS scores for pain showed significant improvement throughout all study intervals. Similarly, Raphael et al. (2003) reported a decrease in VAS scores and the number of painful muscles in patients with myofacial pain after 6 weeks of occlusal splint therapy. A significant improvement in mouth opening was attained in both groups across the study period. This improvement was significant after 1 or 2 months of treatment in the soft or hard splint group, respectively. These results are comparable to those of Suvinen and Reade (1989), who reported a 7.4-mm increase in jaw opening after splint therapy. The early improvement in mouth opening observed with the soft splint therapy might be due to the material resiliency, which helped to distribute the heavy functional occlusal forces and hastened relief from muscle spasms. This resiliency could also underlie the early relief from masticatory muscle tenderness compared to the hard splint group. Nevertheless, both splint therapies alleviated the pain and tenderness of the TMJ and muscles, leading to an increase in maximal jaw opening. This result is in accordance with Block et al. (1978), who concluded that almost 74% of patients with TMDs had complete remission of symptoms after 6 weeks of occlusal splint therapy. The early improvement in TMJ clicking observed with hard splint therapy might be due to the wider TMJ space created by the hard occlusal splint. The increased TMJ space allows the meniscus to return to its original position with ease, thus reducing the chance for clicking. The improvement in TMJ clicking and alleviation of tenderness in the TMJ and masticatory muscles observed in this study are in agreement with (15), who reported improvements in TMJ clicking and tenderness after 2 months of occlusal splint therapy. Another study reported that 87% of patients showed a reduction in pain, 50% showed a reduction in VAS scores, and 70% had no clicking after splint therapy (Tsuga et al., 1989). In another study, soft splint therapy reduced facial myalgia and TMJ clicking by 74% (Harkins et al., 1988). These improvements can be attributed to the even intensity of contacts among all teeth, with disocclusion of the posterior teeth and condylar

guidance in all movements. These conditions lead to a relaxation of the elevator and positioning muscles and contribute to reduce the abnormal muscle hyperactivity (Boero, 1989). Occlusal splint insertion alters the resting position, and adapting to this new position increases the occlusal vertical dimension beyond the free space. The new resting position

CONCLUSIONS

Both hard and soft occlusal splint therapies are beneficial in the treatment of TMD; however, soft splint therapy results in earlier improvement of some TMD symptoms. Three months is considered to be the minimum period for splint therapy to improve TMD symptoms. Therefore, this study supports the use of splint therapy for managing MPD and TMDs in patients with anterior disk displacement and reduction.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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