

## FIXED ANTERIOR REPOSITIONING SPLINT

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**ÖZET:** SABİT ANTERİOR REPOZİSYON SPLİNTİ. Bu çalışmanın amacı, temporomandibular eklemde akut kapalı kilitlemelerinde mandibulanın anteriorda konumlan-dırılması için kullanılabilecek yeni bir apareyi sunmaktır. Temporomandibular eklemde para-fonksiyona bağlı akut kapalı kilitleme meydana gelen 19 yaşındaki bayan hasta kliniğe başvurdu. Fonksiyonel manüplasyonla normal disk-kondil ilişkisinin sağlanmasını takiben hastaya "Sabit Anterior Repozisyon Apareyi" (SARA) uygulandı. Hastanın tedavi öncesi ve sonrası TME manyetik rezonans görüntüleri sunulmuştur. SARA temporomandibular diskin büyük ağız açma gibi durumlarda öne kaçmasını engellemiştir. Disk muskuloskeletal pozisyona lanmış ve burda stabilize edilmiştir. Bu yeni aparat sabit olması ve hasta kooperasyonu gerektirmemesi gibi özellikleriyle, geleneksel anterior repozisyon apareyine bir alternatif olabilir.

**Anahtar Kelimeler:** Anteriora Yeniden Konumlandırma, Akut Kapalı Kilitleme

**SUMMARY: FIXED ANTERIOR REPOSITIONING SPLINT.** This paper aims to describe a new type of anterior repositioning splint, which can be used for the anterior repositioning of the mandible in cases with acute closed lock of temporomandibular joint in non-compliant patients. A nineteen year old female patient that present an acute dislocation of the condylar disc without reduction secondary to para-functional activity underwent splint therapy with the "Fixed Anterior Repositioning Appliance (FARA)" following recapture of the disc with functional manoeuvre. Pre and post-treatment magnetic resonance imaging of temporomandibular joint is presented. The FARA prevented the disc from unintentional dislocation, which is possible with wide mouth opening. The disc was hold and retained in the musculoskeletally stable position at 6-month follow-up. The new appliance can serve as a comfortable alternative to conventional anterior repositioning splints.

**Keywords:** Anterior Repositioning, Acute Closed Lock

### INTRODUCTION

Different types of disk displacement are the most frequent findings when imaging the temporomandibular joint (TMJ) of patients having signs and symptoms of

temporomandibular disorders.(1) The most frequent type of disk displacement described in the publications has been anterior displacement..(2-5) Some other studies with arthrography (6) and magnetic resonance imaging (MRI) (7) have shown that lateral and medial displacements also occur. A few cases of posterior displacement have been described as well. (8)

Clicking is often the result of anterior displacement of the disk, (9-11) although joint sounds may occur because of adhesions between a normally positioned condyle and disk.(12) Displacement often is associated with reciprocal clicking (10); the opening click generally is louder than the closing click and occurs at a point of more condylar translation.(11) The disk does not undergo active remodeling, but passively deforms and/or displaces to accommodate changes in the temporal and condylar units.(13) However, osseous structures of the joint can remodel in response to biomechanical stress to maintain equilibrium between joint form and function.(14-17)

Disc dislocation without reduction is a clinical condition in which the disc is dislocated, most frequently anteromedially, from the condyle and does not return to normal position with condylar movement. The most common causes for this type of dysfunction are macrotrauma and microtrauma. Patients most often report the exact onset of this disorder. A sudden change in range of mandibular movement occurs that is very apparent to the patient. The history may reveal a gradual increase in intracapsular symptoms before the dislocation. Most joint sounds are no longer present immediately following the disc dislocation.(18)

When the condition of disc dislocation without reduction is acute (1 week or less), the initial therapy should include an attempt to reduce or recapture the disc. This manipulation can be very successful with patients who

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are experiencing their first episode of locking. In these patients, there is a great likelihood that tissues are healthy and not morphologically changed.(18)

Keeping the recaptured disc in place constitutes the second step of the treatment. Anterior repositioning appliances worn whole day are used for this purpose. Patient cooperation may become a major concern under these conditions.

A new fixed appliance is presented in this study to maintain the mandible and the disc in the stable position following functional maneuver.

#### Case:

Nineteen years old female college student referred our clinic with complaints of sudden limitation of mouth opening the day before yesterday, pain on left ear region, and shift of lower jaw to right side while opening. She stated that there had been sounds from both joints, which were more apparent during exam periods.

Clinical examination revealed tenderness of the right TMJ and clicking of left TMJ. The maximum interincisal opening was 31-mm. She had a normal range of lateral movement to right side but that of left side was limited to 6-mm and elicited pain. The MRI revealed a restricted pattern of movement in the right TMJ. The disc was in front of the condyle at open and closed monitoring. The articular surfaces of both joints looked normal.

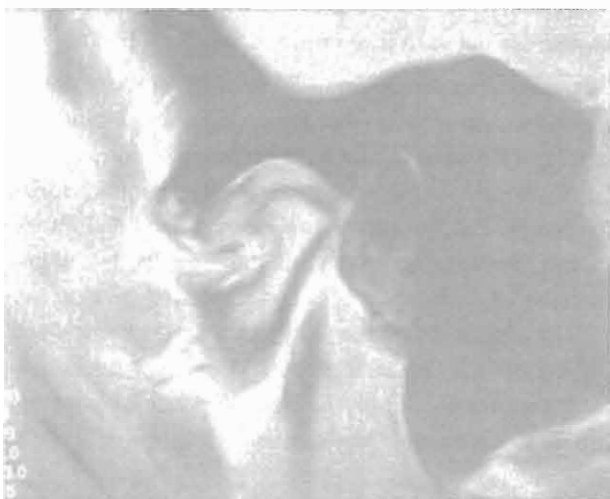


Figure 1: Pre-operative right TMJ closed.

The patient had her right upper and lower first permanent molars extracted due to gross caries at an early age.



Figure 2: Pre-operative right TMJ open.

There were no other significant findings in the history or clinical examination.

The patient's symptoms were typical for the condition known as the closed lock (acute dislocation without reduction). In this dysfunction, the articular disc, which separates the articulating components of the TMJ, becomes anteriorly displaced and prevents mandibular condyle translation. This causes mandibular deviation toward the affected side and limits the opening<sup>1</sup>. If this condylar position results from significant occlusal dysfunction and is chronic, occlusal changes following appropriate splint use will be necessary for satisfactory long-term treatment results. However, this patient's closed lock is acute, the patient is very young and morphological changes of the joint structures are unlikely. Therefore, we felt that the disc could be repositioned and maintained without further occlusal changes.

#### Treatment Procedure

In acute displacement of the disc, the first step was to apply the functional manipulation described by Okeson.(18) The clinician's thumb is placed intraorally over the mandibular second molar on the affected side. The clinician's fingers are placed on the inferior border of the mandible anterior to the thumb position. The clinician's thumb produces firm but controlled downward force on the molar at the same time that upward force is placed by the clinician's fingers. The clinician's opposite hand helps stabilize the patient's cranium above the joint

that is being distracted.<sup>18</sup> The patient was instructed to relax and move her jaw to the opposite side. Thus, the condyle was separated from the fossa and distracted; the pressure was applied for approximately 30 seconds.



Figure 3: Functional manipulation of the disc.

Maximum opening was increased to 39 mm following functional distraction of the joint.

#### Fixed Anterior Repositioning Appliance (FARA)

As the patient's mouth opening did not allow for a full impression before the manipulation, impressions were taken following the functional maneuver. In order to prevent the disc from dislocating again, a specially designed fixed appliance was constructed to hold the mandible in the anterior position and immediately inserted.

The FARA was similar to a Nance button from the aspect that it retains in the mouth. Upper and lower impressions and a construction bite that eliminates the joint sounds and positions the mandible in a forward position was taken. The upper molars were banded and a modified

Nance appliance was constructed on the study models according to the construction bite.

This modification consisted of adding an inclined plane to the Nance button guiding the mandible in a more forward position by lower incisors. The appliance was constructed to position the mandible in a slightly anterior position. Constant use of this type of appliance allows keeping the disc in the stable position without patient compliance. An additional lower appliance was constructed for the patient to use while eating.



Figure 4: Fixed anterior repositioning appliance(FARA) on dental cast.



Figure 5: FARA, occlusal view.



Figure 6: FARA, frontal view.

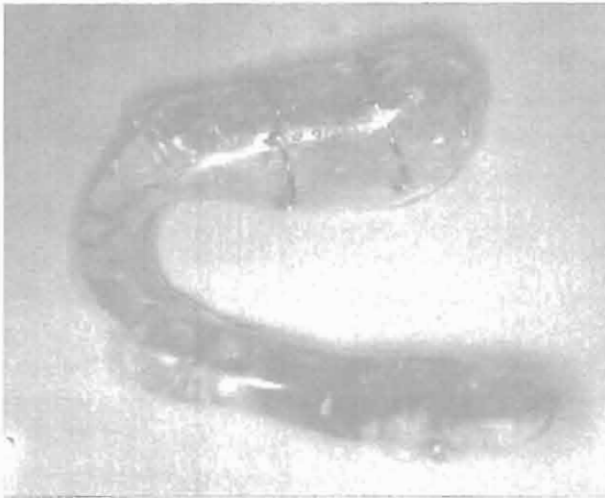


Figure 7: Occlusal bite plane for lower arch.

Range of motion was checked again following insertion of the finished appliances. The maximum opening was 39 mm and clicking disappeared. The patient was instructed to wear the appliance constantly for at least two weeks and specific myorelaxants were prescribed.

### Results

The use of the appliance was gradually discontinued 4 weeks after the jaw was unlocked. Clinical examination revealed that the range of motion was even more increased (44 mm) probably due to the resolution of mus-

cle hyperactivity. The MRI examination demonstrated that disc is being maintained in the stable position at closed and open positions of the right TMJ.



Figure 8: Post-operative right TMJ closed.

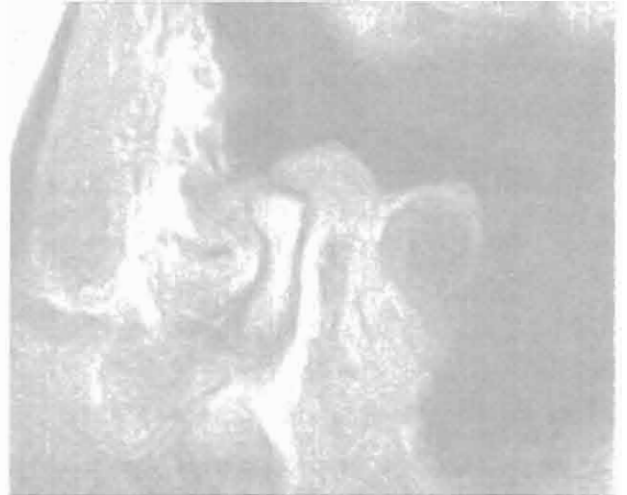


Figure 9: Post-operative right TMJ open.

Patient was instructed to visit the office every 6 months for monitoring. The first 6-month control did not reveal any sign or symptom of TMD.

### DISCUSSION

In the study of treatment for TMD's, careful description of the patient population is necessary to understand the

treatment response of specific TMD diagnoses to specific treatments. There are many problems in developing a reliable diagnostic scheme for TMDs. The major problem is a lack of specific, reliable diagnostic criteria for each disorder. In this study, the diagnosis was based on the clinical findings supported with the MRI.

When a disc has become anteriorly displaced, a prerequisite for normalization is that the condyle can move downward and forward, passing over the posterior thick part of the disc. Muscle activity in the elevator muscles opposes the downward movement of the condyle pulling against the tubercle. During opening, the anteriorly displaced disc thus acts as a wedge rendering correction of disc position more difficult. In joints with reducing disc displacement, it is likely that non-functional muscle activity of the masseter and temporal muscles during opening aggravates the development of a closed-lock condition. Since such activity may prevent the condyle from passing over the posterior band of the disc to restore normal disc/condyle relationships.(23)

Different treatment modalities including splint therapy, arthrocentesis, surgery, and eminectomy have been advocated for closed lock patients.(24-31) Different studies reported different success rates for all these methods varying between 50% to 91%. The functional manipulation (mandibular manipulation, functional manoeuvre) technique is another widely used and acceptable conservative therapy for an acute closed lock of the temporomandibular joint and can be performed by various methods.(26,30,32-37) In this patient, we carried out functional manipulation as described by Okeson.(21) The disc was recaptured and retained in the stable position six months after manipulation.

Some authors studied disc position of patients with closed lock 3-6 months after functional manipulation and found that half of the disc were not actually captured.(32,38) These authors concluded that complete anatomic reduction of the disk by mandibular manipulation is difficult and clinical symptoms do not always correspond to how well the disk has been reduced by this treatment. Reestablishment of mouth opening appeared to occur may not be by recapturing of the disks but by improvement in condylar mobility and the adaptation of the posterior attachment still anteriorly displaced and

deformed and their relationships with the condyles were unchanged. In our patient successful recapture and the retention of disc in the stable position was monitored by MRI. A successful manipulation is really a challenging procedure as a main reason for failure when manipulating a mandible with acute closed lock is a lack of coordination.(37) The patient should be well informed about and concentrated on the problem and should assist the clinician during procedure. Another factor that effect the success is the case being acute. When the lock is chronic, it is hard to retain the disc in the recaptured position. Thus, this procedure should be avoided in chronic cases. After the disc is successfully recaptured, the patient should keep the mandible in a forward position and maintain this position with the help of a positioning appliance to allow the posterior ligament to recover from the abnormal stretch position and retract. However retaining this position is not as easy. Mandible may move back re-dislocating the disc during wide opening. The JAR appliance prevents this with holding the mandible in the anterior position in whole range of opening with the help of Jasper-Jumpers.

Another unpleasant side effect with anterior repositioning appliances is occurrence of a posterior open-bite.(39) This is also prevented by JAR appliance as it holds both arches. Adjustment of anterior displacement of mandible is possible by bending the helices located in the lower part of the JAR. Moreover, the appliance is more aesthetic when compared with conventional splints. However, the construction of the appliance requires additional laboratory work and the cooperation is still dependent on the patient.

## CONCLUSION

The JAR proved to be effective and comfortable in keeping the mandible in a more forward position. The mandible is free to move laterally while not allowed going posteriorly. The new splint design is adjustable and aesthetic. Protrusion of lower anterior or spontaneous posterior open-bite is not likely to occur as the upper arch is completely covered and lower arch is hold by the JAR. However, cooperation is still dependent on the patient. We may conclude that JAR may be a comfortable alternative to conventional anterior repositioning appliances.

The FARA proved to be effective in keeping the mandible in a more forward position for the non-compliant patient. The main drawback of the new appliance is that it may cause artifacts in MRI.

We may conclude that FARA can be used as an alternative to conventional anterior repositioning appliances in cases of poor cooperation.

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