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NEW REGIMEN FOR REDUCTION ANTERIORLY DISPLACED DISC IN PATIENTS WITH BRUXISM

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ABSTRACT

Aim: This study is aimed to evaluate the efficacy of modified stabilizing splint in reduction anteriorly displaced disc in patients with bruxism.

Patient & Methods: This study was carried out on 26 patients, (14 femal&12male) .Patients complained of severe periauricular pain, inability of eating food, loudly unilateral clicking and severe temporal headache. Tenderness of masseter and temporalis muscles on palpation. All patients underwent unilateral arthrocentesis and delivered with modified stabilizing splint with posterior open bite 6, 4, 2 mm, two weeks for each consecutive posterior open bite.MRI was done for each patient preoperative, one and 12months postoperatively. Follow up period was one year.

Results: All patients showed relief of periauricular pain, no clicking in (18 patients). Perceptible clicking in (8patients). MRI revealed recapture of the anteriorly displaced disc on the condyle in closed &opened positions postoperatively, while anteriorly displaced deformed disc remained in position postoperatively in (8 patients) .

Conclusion: Arthrocentesis and modified stabilizing splint are effective in recapture of the anteriorly displaced non deformed disc on the condyle in patients with bruxism.

KEY WORD: Internal derangement, Stabilizing splint, Arthrocentesis, Bruxism

INTRODUCTION

The term "internal derangement" (ID) of the temporomandibular joint (TMJ) referred to an abnormal position of the disc in relation to the mandibular condyle and the glenoid fossa. Displacement of the disc can occured in any direction, but the most common direction is anterior disc displacement . Disc displacement is usually associated with TMJ pain, muscle tenderness, reduction in the range of mouth opening , abnormal sounds and temporal headache. The causative factors underlying temporomandibular disorders remain a controversial subject. Many of the factors involved are macrotrauma, parafunctional habits, postural problems, dental occlusion, abnormal pattern of chewing, molars missing and muscular imbalance.[1] Magnetic resonance imaging (MRI) is a noninvasive diagnostic method for the diagnosis TMDs that

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enables evaluation bony structures within the joint, as well as the soft tissues, the most part of magnetic resonance imaging (MRI) studies have focused on signal alteration in the joint compartments indicating the presence of fluid derived from the exudation of inflamed retrodiscal tissue and other inflammatory changes in the synovial membrane, resulting in joint effusion.[2] TMJ effusions explain the magnetic resonance imaging finding of a hyperintensity signal within the joint compartments, which obviously appears as a brightness area on T2-weighted magnetic resonance images.[3] TMJ effusion indicated a local factor related to trauma as well as correlated to systemic disease such as rheumatoid arthritis. Also the posture of the disc in TMJ may be one of the causative factors since disc displacement has been accompanied with TMJ effusion. Occlusal splint therapy is one of the conservative forms of initial TMD treatment, although the effects of the different types of splints on the treatment of TMD symptoms are controversial. The most commonly used splint in TMD and bruxism therapy is the Michigan splint (stabilization splint). The use of splint therapy reduces muscular hyperactivity and produces neuromuscular balance. Arthrocentesis is now increasingly recognized as the first choice of surgical intervention in patients who do not respond to conservative therapy. Arthrocentesis is the first surgical line of treatment , easy manipulation, minimally invasive, mostly efficient procedure, which reduces joint pain and increase the range of mouth opening in patients with closed lock of the TMJ. The main action of arthrocentesis, lysis and lavage in the superior joint space is thought to be responsible for the success of this procedure. Uptill now there is no acceptable line of treatment for anterior disc displacement in patient with bruxism.

AIM OF THE PRESENT STUDY

This study aimed to evaluate the efficacy of modified stabilizing splint in reduction anteriorly displaced disc in patients with bruxism.

Concept of the regimen : Modified stabilizing splint (constructed in a centric relation) allows the mandible to move backward and downward as upper & lower anterior teeth in contact with 6 mm separation between upper and lower molar teeth which create space enough for recapture of anteriorly displaced disc over the condyle by the pull of the mandibular weight & where the elevator muscles are in neutral condition for a period of two weeks then reduce the posterior separation by time gradually.

PATIENTS AND METHODS

This study was carried out on 26 patients, (14 femal & 12male) age ranges from 20 to 44 years with a mean of 33.6 years. These patients presented with severe and persistent pain related to periauricular region, not associated with macro-trauma, and which did not respond to non-invasive treatment. The condition was reported to have been present for less than 3-4 days prior to presentation to the clinic and with a history of several episodes of intermittent pain over the previous year. Patients complained of severe periauricular pain, inability of eating food, loudly unilateral clicking and severe temporal headache. On clinical examination, maximum mouth opening was within normal range with deviation of the mandibular incisor midline towards the affected side, loudly unilateral clicking of the affected side. Tenderness of the affected joints and epsilateral masticatory muscles were recorded on palpation. On MRI examination all of the patients demonstrated anterior disc displacement with reduction. Based on these findings in all of the patients, a diagnosis of anterior disc displacement with reduction was made. The following variables were recorded by the same clinician, preoperatively to evaluate the degree of TMJ dysfunction:-joint pain using a visual analogue scale (pain VAS) and jaw dysfunction score (JDS) All patients received conventional non-surgical treatment consisting of medical therapy with non-steroidal anti-

inflammatory drugs and muscle relaxants for 5 days, ice packs for the acute condition, then hot packs as the pain became tolerable. All patients were on a soft diet. All patients in this study were bruxism who did not respond to conservative management. Arthrocentesis of the superior joint compartment was performed in all of the patients under local anesthesia using the technique described by Nitzan (1991).[4] An auricolotemporal nerve block using 0.3-0.5 ml of anesthetic solution was performed. The skin was then penetrated with a 19-gauge needle at the articular fossa followed by the injection of 3 ml of ringer solution to distend the joint space, pumping it in and out repeatedly. Another 19- gauge needle was inserted into the distended compartment in the area of the articular eminence, and the superior joint space was irrigated with 200 ml of Ringer solution, allowing a free flow through the first needle. On completion of the procedure one needle was withdrawn, and 1 ml betamethasone (Celestone Soluspan, 6 mg/ ml, Schering Co.) was injected into the upper joint space. The patients were prescribed an analgesic and a muscle relaxant for 10 days, and were advised to perform range of motion exercises on a daily basis. All patients wore a full coverage modified hard acrylic stabilizing splint (Fig. 1) as all the maxillary anterior teeth were in contact against flat hard acrylic surface appliance with posterior open bite 6, 4, 2 mm, two weeks for each consecutive posterior open bite, as the splint was fabricated in a central relation (CR) and adjusted following arthrocentesis. All patients were instructed to wear their splint at night during sleep and the daytime except during eating food only. The records of preoperative VAS scores for pain and jaw dysfunction score (JDS) were compared with the follow-up scores obtained by the questionnaire and clinical examination at 1, 3, 6, 9, and 12 months. Oblique MRI (sagittal &coronal oblique views) and dynamic sagittal MRI examinations were done for each patient one and 12 months postoperatively (T1&T2) for open &closed mouth positions and the data were gathered. Statistical analysis of the baseline and follow-up data was made using the t-test.

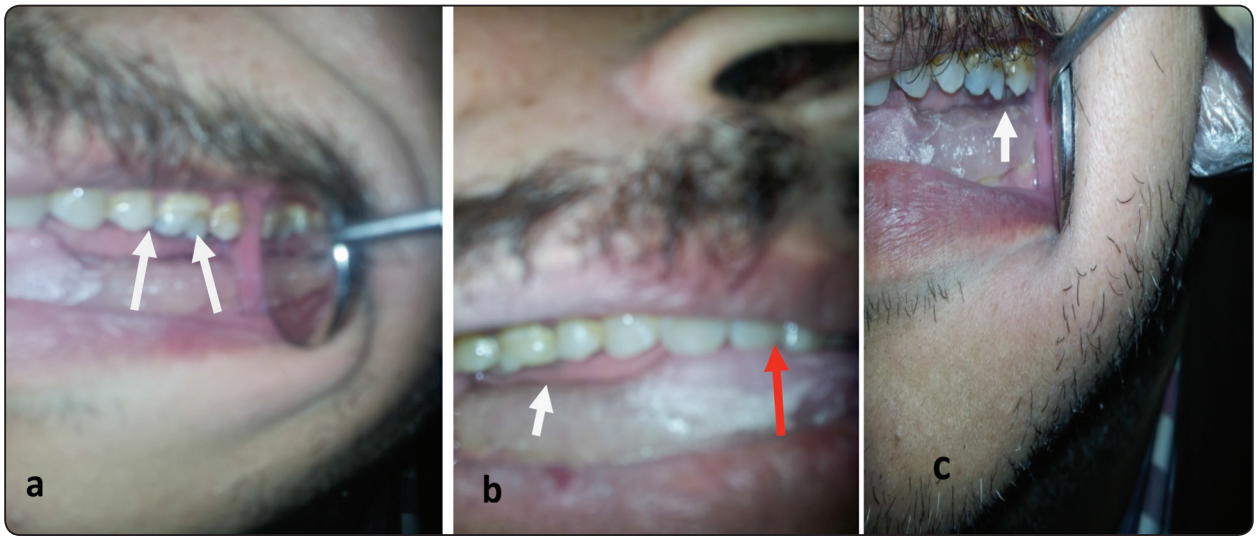


Fig. 1 (a,b,c) Modified stabilizing splint as all the anterior teeth were in contact against flat acrylic surface (red arrow) with: **a)** posterior open bite 6mm (white arrow) **b)** posterior open bite 4mm (white arrow) **c)** posterior open bite 2mm (white arrow)

RESULTS

Based on a questionnaire and clinical examination, all of the patients had had experience of intermittent acute pain within the previous year. No complications or complaints were noted during or after arthrocentesis. The main preoperative complaints of the patients were pain and loudly clicking sound during mouth opening or function. Postoperatively there was marked improvement or resolution of clicking sound, and tenderness of the TMJ and muscles of mastication at the follow-up intervals. No deviation of the mandible towards the affected side during opening was detected postoperatively. The preoperative VAS scores (Table 1) for pain ranged from 5 - 9 with a mean of 7.4± 1.027.The JDSs measured preoperatively ranged between 5 -9 with a mean of 7.23±1.12 (Table 2). The follow-up VAS scores for pain ranged from 3 - 5with a mean of 3. 57± 0.62; and 2-4 with a mean of 3.23 ±0.69. While The follow-up jaw dysfunction scores ranged from 3to7 with a mean of 5.34± 1.20; and 2-4 with a mean of 3 ±0.60 consecutively after 1 &3months postoperatively . The follow-up pain score was significantly (P< 0.003) less than the preoperative pain and t-test value was 4.13. The JDSs at the follow-up were also significantly reduced (P< 0.006) with a t-test value of 6.4. At long-term follow-up, 86% of patients were pain free with a significant reduction(P < 0.007) and a t-test value of 5.23 while JDSs showed a significant reduction(P < 0.005) and t-test value of 3.14 . Sagittal obliqueMRI view T1 with 27 angle projection (27˚) preoperative examinations (closed mouth position) showing the disc prominently anterior to the condyle. (Fig.2a) On coronal obliqueMRI view T1 (27˚)showing the disc displaced medially. (Fig.2b) Beside the anteriorly displaced disc there was marked effusion of the joint cavity and both heads of lateral pterygoid muscle that was diagnosed on sagittal obliqueMRI view T2 (27˚) while the mouth was closed. (Fig.2c) In the opened mouth position sagittal obliqueMRI view T1 (27˚) showing the disc recaptured over the condyle. (Fig.2d) On dynamic sagittal MRI examination confirmed the displaced disc anteriorly in closed position and reduced over the condyle in open position. (Fig.3) Oblique MRI postoperative examinations (closed mouth position) sagittal &coronal oblique MRI views T1(27˚) showing the disc recaptured over the condyle. (Fig.4 a,b) While marked effusion was not diagnose postoperatively. (Fig.4c) In opened mouth position the disc retained its position over the condyle as diagnosed in Sagittal view T1. (Fig.4d) Postoperative dynamic sagittal MRI examinations (1and12 months respectively) confirmed permanent recapture the anteriorly displaced disc over the condyle through closed and open pathway.(Fig.5,6) Also MRI examinations revealed that anteriorly displaced deformed disc remained in position postoperatively in (8 patients). The success rate of arthrocentesis with modified stabilizing splint regimen was 70%. This was followed by the provision of stabilizing splints for all patients 6 weeks postoperatively.

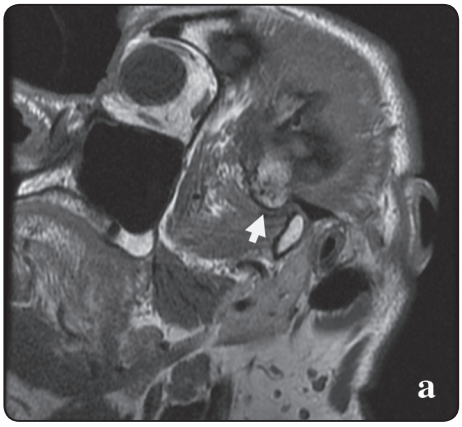
TABLE (1) Show the results of VAS scores throughout study intervals

	Range	Mean	Std. Deviation	T test	P
Pre	5 – 9	7.4231	1.027	6.13	0.004
One month	3 – 5	3.5769	0.621	4.55	0.004
Three months	2 – 4	3.2308	0.690	4.09	0.005
Six months	0 – 2	1.2308	0.620	4.13	0.003
Nine months	0 – 1	.5769	0.403	5.23	0.007
Twelve months	0 – 1	.5769	0.403	5.23	0.007

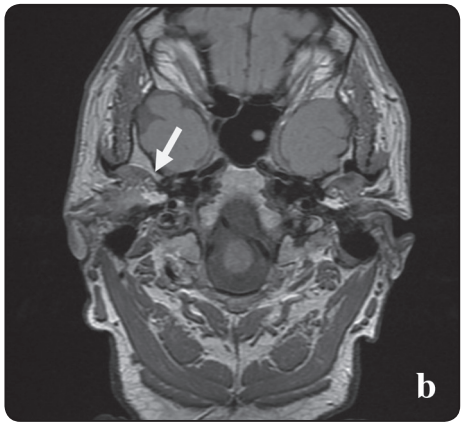
TABLE (2) Show the results of Jaw dysfunction scores throughout study intervals

	Range	Mean	Std. Deviation	T test	P
Pre	5 – 9	7.2308	1.122	5.16	0.004
One month	3 – 7	5.3462	1.201	6.14	0.002
Three months	2 – 4	3.0000	0.604	5.99	0.004
Six months	1 – 3	2.2308	0.750	6.40	0.006
Nine months	1 – 3	1.7308	0.740	4.12	0.007
Twelve months	1 – 3	1.5769	0.550	3.14	0.005

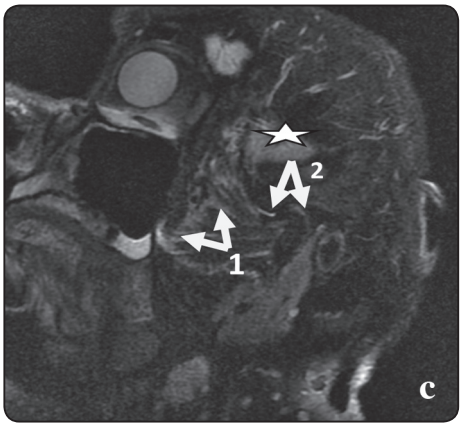
Fig. (2) Preoperative MRI



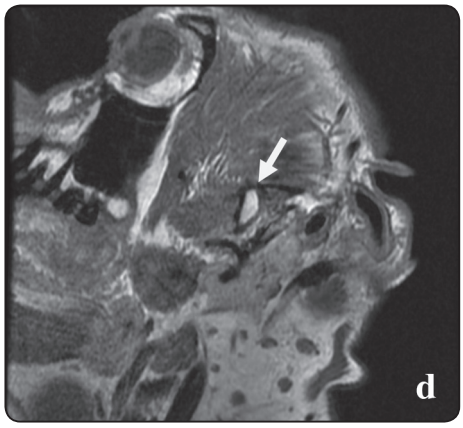
a) Sag oblique view T1 (angle 27) closed mouth position showing anterior disc displacement (white arrow)



b) Coronal oblique viewT1 closed mouth position showing medial displacement of disc (white arrow)



c) Sag oblique view T2closed mouth position showing marked effusion of LPM (white arrows 1), temporalis muscle (white star) and anterior & superior joint cavity(white arrow 2)



d) Sag oblique view T1open mouth position showing recapture of the disc over the condyle (white arrow)

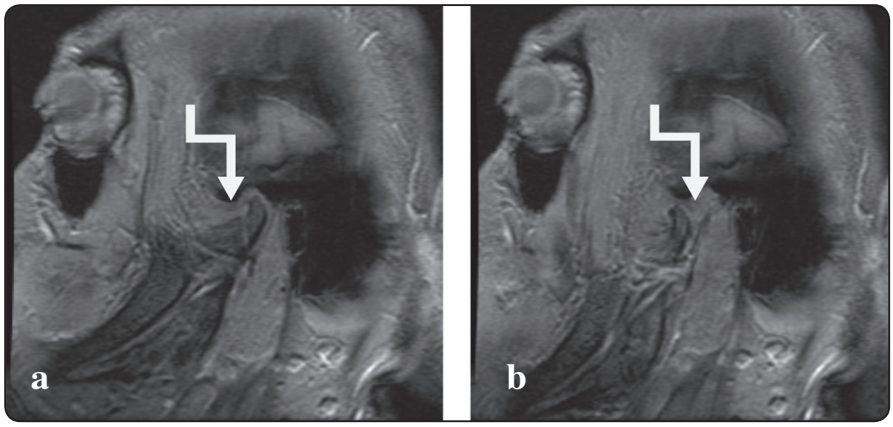
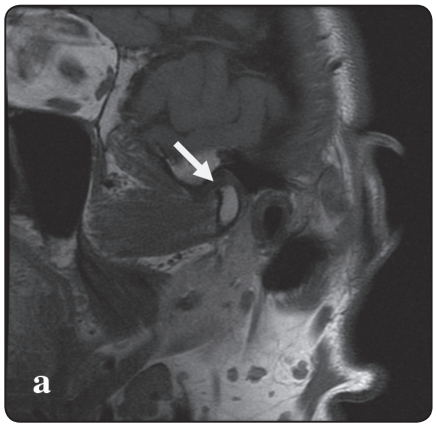
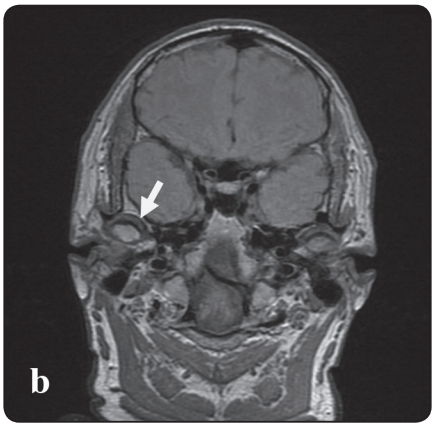


Fig. (3) Preoperatively Dynamic MRI series showing a) anterior disc displacement in front of condyle in closed mouth position (white arrow) b) recapture of disc over condyle in opened mouth position (white arrow)

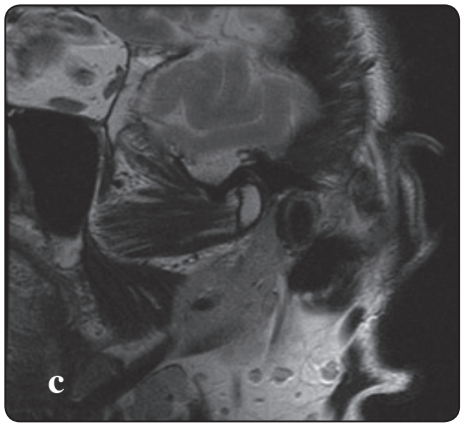
Fig. (4) Postoperative MRI



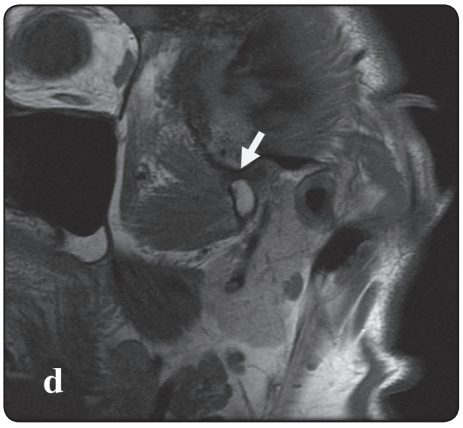
a) Sag oblique view T1closed mouth position showing : recapture of the disc over condyle (white arrow)



b) Coronal oblique viewT1 closed mouth position showing recapture of disc over the condyle (white arrow)



c) Sag oblique view T2closed mouth position showing no effusion of the LPM or joint



d) Sag oblique view T1 open mouth position showing disc position over the condyle (white arrow)

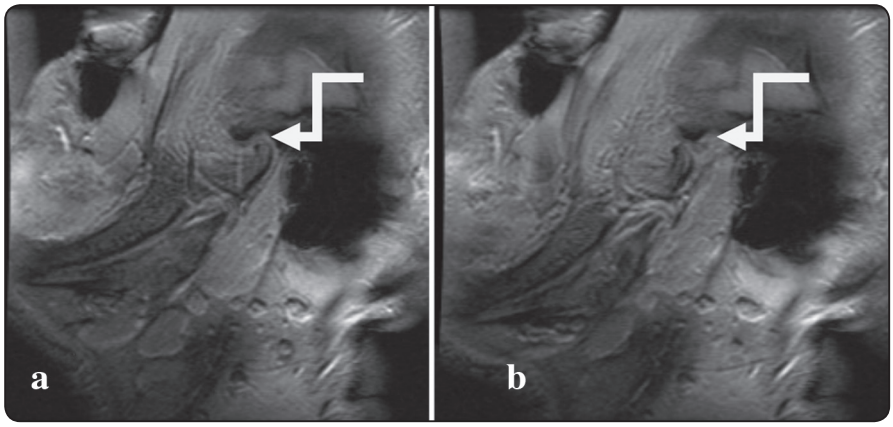


Fig. (5) Postoperative Dynamic MRI views (one month) showing recapture disc position over the condyle in a) closed mouth position b) opened mouth position (white arrows)

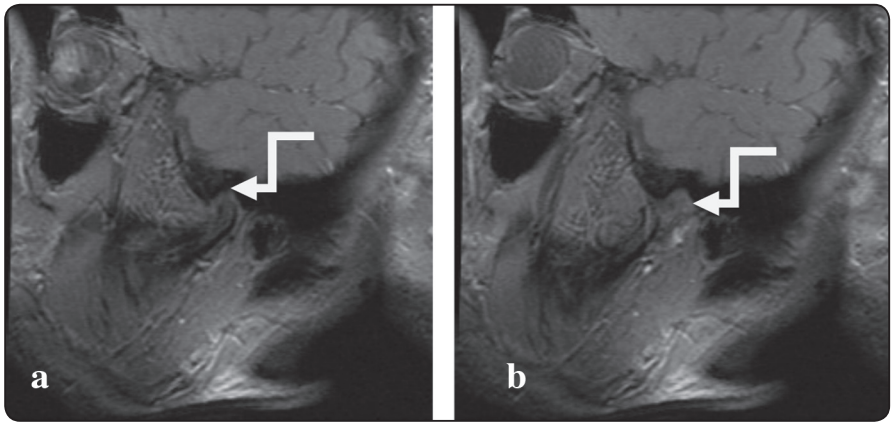


Fig. (6) Postoperative Dynamic MRI views (12 months) showing recapture disc position over the condyle in a) closed mouth position b) opened mouth position (white arrows)

DISCUSSION

Studies have indicated that the prevalence of bruxism is highest between 12 and 49 years, and that it decreases with ages. [5,6] In this study, the age distribution of the subjects was between 20 to 44 years with a mean of 33.6 years. Gender distribution studies have demonstrated that females report parafunctional clenching more than males.[7] In this study, the female to male ratio was approximately 1.16:1. It is difficult to differentiate the effects of bruxism on the soft and hard tissues of the stomatognathic system, because many individuals are unaware of their parafunctional habits.[8] The present study results are consistent, with that of *Westling, et al., 1990*[9] as they reported that there is a significant correlation between bruxism and internal derangement of the TMJ. *Kwang-Joon et al* 2013[10] stated that MRI has the advantage of displaying both soft and hard tissue changes in the TMJ, and clearly shows the shape of the disc. In this present study, the anatomical basis for sounds was seen on MR images from the condyle–disc relationship, and it was found that the presence of TMJ clicking was loudly in unilaterally reducing joints. These findings are similar to those of *Sutton et al,1992*[11] who showed that clinically discernible sounds tend to reveal a change in the relationship between the condyle and the disc at the degree of jaw separation where the sound occurs. *Katzberg 1989*[12] concluded that joint sounds might be caused by a variety of pathological processes such as disc displacement, condylar subluxation, deviations in the form or shape of articulating surfaces, and the presence of fibrous bands or adhesions within the joint. *Spruijt and, Wabeke 1995*[6] reported that bruxism, especially clenching and grinding, may be indirectly related to TMJ sounds. Joint sounds revealed information about the relationship between the disc and the condyle in the present study.

Rugh and Drago1981[13] reported that only minor changes in jaw position could result in large increases in the activity of the masticatory muscles. Muscle hyperactivity is regarded as a cause of masticatory myalgia. Although muscle pain and changes in muscle activity such as bruxism may represent separate conditions, these muscle disturbances frequently occur in response to an articular disorder.[14] The factors that cause articular pain are abnormal mechanical stresses within the joint and accumulation of high concentrations of irritating agents in the tissue fluid. Joint pain probably affects muscle activity to prevent further irritation.[15]

The present study showed that, all patients had tenderness in their masticatory muscles on the side of the affected joint(s). *Westling, et al., 1990* [9] attributed tenderness to clenching. While *Stegenga et al 1992*[16] reported that the level of pain intensity provoked by static biting is highest in patients with internal derangement.

Westesson and Brooks (1992)[17] concluded that strong association between TMJ effusion and joint pain. Joint effusion probably represents an inflammatory response to the dysfunction of the displaced disc. For this reasonsT2 weighted imaging is recommended as a routine part of MRI of the joint. This agrees with the clinical findings of the present study and confirmed by sagittal T2 weighted images. The disc and retrodiscal tissue are subjected to compression during clenching. Stress in the retrodiscal tissue is approximately five times greater in the symptomatic joint and stress relaxation does not occur compared to the asymptomatic joint. Stabilizing splints are used to reduce bruxism, stress and loading on the joint structures. [18]

Study results by ***Ekberg et al. 1998***[19] They found that the stabilization splint changed the condyle-fossa position and they assumed that a positive treatment effect could be the unloading of the TMJ. These results partially confirm that Michigan splint allows the placement of the condyles inside the glenoid fossa, or the settling of the condyles into a more physiologically stable position - centric relation (CR).[20] *Ramford and Ash 1983*[21] documented that tooth interferences to the CR arc of closure hyperactivate the lateral pterygoid muscle. While posterior tooth interferences during excursive mandibular movements cause hyperactivity of the closing muscles.[22] *Williamson and Lundquist 1983*[23] showed that the elimination of posterior excursive contacts by anterior guidance significantly reduces elevator muscle hyperactivity . It follows that a splint with equal-intensity contacts on all of the teeth, with immediate dis-occlusion of all posterior teeth by the anterior teeth and condylar guidance in all movements, will relax the elevator and positioning muscles. *Dylina, TJ.2001*[24] mentioned that as the vertical dimension was opened, muscle activity generally decreased until a point of minimal activity was observed. As the jaw was opened past this null point, activity was found to gradually increase. *Garnick and, Ramfjords 1962* [25] speculated that the decreasing activity observed during the opening phase is due to a reduction in the activity of the jaw closing muscles. The null point is believed to be the point where the inherent elasticity of the muscles and other soft tissues equals the force of gravity. Opening past this point requires activity of the jaw opening muscles which may account for the progressive rise in EMG activity as the jaw is opened past the null point. The average difference between clinical rest position and points of minimal EMG was approximately 6 mm. These results are in agreement with study results by *Feldman et al 1978* [26]which showed that masticatory muscle activity was not minimal or absent at clinical rest position. *Kuboki et al 1999*[27] reported that the elevator muscles are located behind the most posterior tooth and therefore ensure that the joint will always be loaded when the elevators contract. *Yadav and Karani 2011*[28] mentioned that splints that do not cover all teeth with balanced contacts with opposing teeth should not be used for longer period than 4-6 weeks. According to the mentioned data above the modified stabilizing

splint design was fabricated so allowed muscles in spasm to relax (masticatory muscles), protect the teeth and jaws from the adverse effects of bruxism, and normalize periodontal ligament proprioception. This device can also allow repositioning of the condyles and jaws into centric relation (CR), in the same time recapture of the anteriorly dislocated disc. As 18 out of 26 patients with anterior disc displacement with reduction showed recapture of the anteriorly displaced disc with success rate of 70%. *Eberhard et al 2002*[29] concluded that the possibility for disc recapture depends on the disc condyle position & configuration, the integrity of the posterior attachment and the degree of the degenerative changes of the intra-articular structures such as osteophytes, condylar erosion or flattening of the articular disc. These agree with the present study results as 8 out of 26 patients with anteriorly displaced deformed disc with reduction did not recapture, however those patients showed improvement as no tenderness, joint pain, or dysfunction was not detected postoperatively. While ***Simmons and Gibbs, 2004***[30], study results showed that anterior reposition appliance therapy relieves more symptoms in patients with disks that are recaptured than those that do not. The early treatment of disc displacement either with conservative methods or with arthrocentesis is beneficial. However, arthrocentesis seems to be superior regarding acute pain management. [31] Therefore arthrocentesis may be indicated in patients who are overwhelmed by the pain rather than jaw limitations. [32] ***Ghanem 2011***[33] study results showed high success rate with the use regime arthrocentesis &stabilizing splint for the management pain & jaw dysfunction. This agrees with the results of the present study.

CONCLUSION

Arthrocentesis and modified stabilizing splint are effective in recapture of the anteriorly displaced non deformed disc on the condyle in patients with bruxism.

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