

Efficacy of arthrocentesis with injection of hyaluronic acid in the treatment of internal derangement of temporomandibular joint

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ABSTRACT

Background: Temporomandibular joint disorders refer to a group of heterogeneous pain and dysfunction conditions involving the masticatory system, reducing life quality of the sufferers. Arthrocentesis is simple and less invasive surgical procedure for the treatment of internal derangement than arthroscopy and better than other conservative procedures such as drugs, occlusal appliances and physiotherapy. The aim of the study was to evaluate the effect of arthrocentesis with injection of hyaluronic acid in the treatment of internal derangement of temporomandibular joint for the restoration of its function, reducing pain and preventing further deterioration of the temporomandibular joint dysfunction.

Materials and methods: This study was performed in Al-Sheed Ghazi Al-Hariri Hospital, Department of Oral and Maxillofacial Surgery, from November 2012 to October 2013, included 60 patients, aged 18 to 45 years with symptoms of temporomandibular joint pain, clicking during function and limited mouth opening. Temporomandibular joint internal derangement was assessed with clinical examination and confirmed with computed tomography scan. Arthrocentesis was done with insertion of two 18 gauge needles in the upper joint compartment, lavaged with ringer's lactate solution and at the end of the procedure 1ml of hyaluronic acid was injected. Intensity of temporomandibular joint pain was assessed using visual analog scale, maximum mouth opening was assessed with ruler scale and joint clicking was assessed clinically by stethoscope and manual palpation. All the parameters were measured before the procedure then 1 and 3 months later.

Results: During 4 months follow-up, clinical examination and comparison of the results showed reduction in pain with success rate 95%, improvement in mouth opening with success rate 100% and clicking disappeared in 95% of patients.

Conclusion: The technique of arthrocentesis using Sodium Hyaluronate injection, used in patients who presented with internal derangement, showed therapeutic benefits, simplicity, safety, patients acceptance of the technique and lack of significant side effects and complications.

Key words: TMJ pain, clicking, internal derangement, arthrocentesis, hyaluronic acid. (J Bagh Coll Dentistry 2015; 27(2):105-109).

INTRODUCTION

Temporomandibular joint dysfunction (TMJD) is a therapeutic challenge for oral and maxillofacial surgeons. The term TMJD is used to describe a group of conditions that include painful myofascial problems involving the muscles of mastication. Internal derangements (ID) of the joint space contents is one of most frequent cause of temporomandibular joints dysfunction.⁽¹⁾ Temporomandibular joint internal derangement (TMJID) or articular disk displacement is abnormal relationship between the disk, the mandibular condyle and the articular eminence resulting from stretching or tearing of attachment of the disk to the condyle and glenoid fossa, TMJID is later characterized by pain during mandibular movement, abnormal joint sounds (clicking) and limitation in range of mandibular motion.⁽²⁾

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The specific etiology in majority of cases of disc displacement is laxity of joint. The primary goal of therapeutic management of TMJ is pain relief, maintain normal range of motion and prevention of joint damage. Many conservative approaches include para-functional habits control, physiotherapy, soft diet and non-steroid anti-inflammatory drugs (NSAIDs) before any invasive procedure is considered.⁽³⁾ Arthrocentesis is a minimal invasive technique, simple, less expensive, with low morbidity used for flushing out TMJ that is performed by double access to the upper joint space.⁽⁴⁾

The effectiveness of joint lavage in those cases may be explained by the joint space expansion with Ringer Lactate and washing out the intra articular inflammatory mediators and catabolytes to release the articular disc and to remove adhesions between disc surface and mandibular fossa and combined technique providing the injection hyaluronic acid (10 mg/ml) 1ml sterilized syringe at the end procedure to improve joint lubrication of synovial membrane and replacement of synovial fluid in TMJ joint.⁽⁵⁾

Hyaluronic acid (HA) is a very important component of the articular cartilage and has a significant role in maintaining the articular lubrication and nutrition for the articular tissues. Sodium hyaluronate (SH) is indicated in case of replacement and/or complementing of synovial fluid damaged following degenerative or traumatic origin diseases of the articulation. The administration of SH results in a marked pain reduction and improvement of mobility. In pathological conditions, like rheumatoid arthritis and osteoarthritis, the concentration and molecular weight of SH in the synovial fluid are diminished which synthesized by synoviocytes with consequent impact on the SH articulation. So the pathological fluid is removed and the exogenous SH material is infiltrated thus bring the synovial fluid back to normal and is able to restore the physiological conditions of the joint that has failed to respond to conservative medical and physical therapies.⁽⁶⁾

MATERIALS AND METHODS

This prospective study include 60 patients (40 females and 20 males), their ages ranged from 18-45 years with mean of age 31.5 years. These patients were seen and treated in the consultation clinic of oral and maxillofacial surgery in Ghazi AL-Hariri hospital in medical city (from November 2012 to October 2013) in which all patients were accepted to be involved in the study.

Inclusion criteria:

1. Clinical signs of ID, (pain, crepitus and limitation mouth opening with close lock of TMJ more than six months).
2. Previous conservative treatment failed to resolve symptoms (homecare, dietary restriction and pharmacotherapy).
3. Age of patients range from 18-45 years.
4. Patients signed a special consent on the procedure.

Exclusion criteria:

Patients suffering from degenerative joint disease (osteoarthritis, rheumatoid arthritis and gout) were excluded from the study.

The following materials and instruments used:

1. Ringer Lactate solution (Na 130 /Cl 109 /K 4 /HCO₃ 28 /Ca 3 meq/L)
2. Sodium Hyaluronate 10 mg/ml (Hyalgan; Fida, Albano, Italy).

3. Local anesthesia (1 cartridge) Septodont 1:80000 lignocaine with adrenaline
4. Disposable syringe 60 cc.
5. Two needles with 18 gauges.
6. Soft plastic ruler.
7. Plastic mouth gag.
8. Antiseptic (Betadine).

The patient was placed in supine position with head in opposite direction. The pre-auricular area of the affected site was prepared aseptically with betadine solution. A line was drawn from mid tragus of the ear to lateral canthus of the eye. The first point was marked 7 mm anterior from tragus and 1 mm downward in the tragalcanthal line. The second point was marked 10 mm posterior and 2 mm downward in the same line. Auriculotemporal nerve was blocked through the skin just anterior to the junction of the tragus and ear-lobe. The needle was advanced behind the posterior aspect of the condyle in anteromedial direction to depth of 1cm and 1.5ml of 1:80000 lignocaine with adrenalin was deposited. An eighteen gauge needle was inserted from first point upward, inward and forward at 45 degree angle to corresponding plane during injection until feel joint space by decrease the resistance to the needle this approach to the upper joint compartment and approximately 2 ml Ringers lactate solution deposited to distend the upper joint compartment (UJC). A second needle was inserted in second point backward, upward and inward to correspond the area of articular eminence to establish a free flow of irrigating solution from the UJC. The joint was irrigated with at-least 200 ml of ringer's lactate solution. During the procedure patients were advised to keep the mouth open to distend the joint and then at the end of lavage 1 ml of HA was injected, see figure in page 3. Both needles were removed and Patients were advised for soft diet and NSAID (Olfen 100 mg once daily) prescribed for 3 days with prophylactic antibiotic Augmentin 625mg three times daily. Post-operatively follow up period for 4 months, with 1st follow-up visit at 1 month from 1st injection procedure and 2nd follow-up visit 3 months after 2nd injection procedure with all the parameters for TMJ functions measured with the same technique. The criteria for success was no pain (VAS) equal to 0, clicking absent and maximum mouth opening ranged from (35-45)mm.

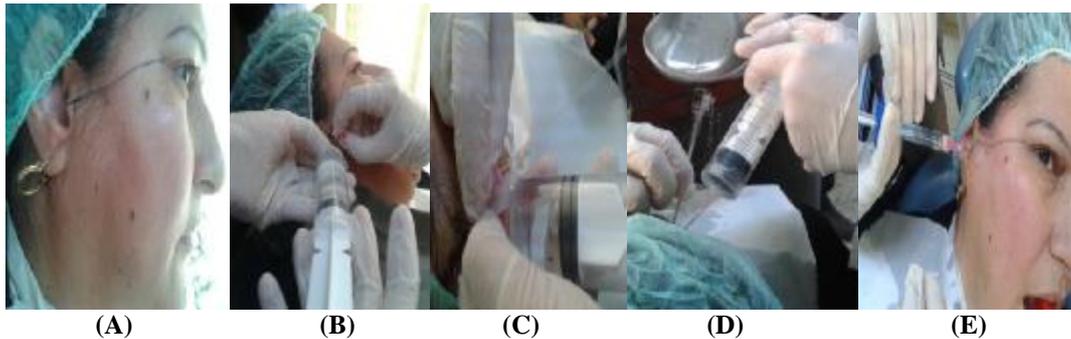


Figure 1: The procedure of arthrocentesis with injection of Hyaluronic Acid.
(A)The drawn line from mid tragus of the ear to the lateral canthus of eye (Holmlund-Hellsing line); **(B)** the two needles procedure; **(C)** and **(D)**Irrigation with Ringer`s lactate with the spurt of the solution from the second needle during the lavage; **(E)**Injection of 1 ml of HA.

RESULTS

This study included 60 patients, there were 40 females (60.6%) and 20 males (33.4%), their ages ranged from 18 years to 45 years with a mean age of 31.5 years . All patients received the same treatment modalities with follow up period for 4 months. Pre-treatment, treatment and follow up data were collected. The evaluation between different follow up results was done by (F-test)

and mcnemar Chi square test. The results were considered significant if P value < 0.05.

Description and Statistics of Data:

1 –Pain level : The studied data elicited from AVS showed significant reduction in pain from (6.25 to2.1) at 4months follow up with a (p value<0.01), with success rate (95%).The data of pre-treatment and post-treatment for degree of pain are illustrated in table (1).

Table 1: The comparison of pre-treatment and post-treatment for the degree of pain

	Pre-treatment				Post-treatment								ANOVA
	No.	%	Mean	SD	1 st follow-up visit (1 month)				2 nd follow-up visit (3 month)				P-value
					No.	%	Mean	SD	No.	%	Mean	SD	
VAS pain	60	100	6.25	0.312	Total 60	100%	4.35	0.198	Total 20	33.4%	2.12	0.134	F-test=53.58 P<0.01 HS
					Improved 40	66.6%			Improved 17	28.3%			

*(VAS) score = visual analogue score, * highly significant improvement in pain (p value <0.01), *success rate in pain improvement 95%

2 – Joint clicking

All patients (100%) included in the study were suffering from joint clicking. The study revealed complete TMJ clicking sound disappearance in

57 patients (95 %), while no change in joint clicking in 3 patients (5 %) at 4 months following treatment , (P value < 0.01), as demonstrated in table (2).

Table 2: Comparison of pre-treatment and post treatment for TMJ sound clicking.

		Pre-treatment	Post-treatment		Total improved patients	Non improved patients	P-value
			Patients improved at 1 st follow up visit (1 month)	Patients improved at 2 nd follow up visit (3 month)			
TMJ clicking	No	60	50	7	57	3	Chi-square=23.4 P<0.01 HS *
	%	100%	83.3%	11.7%	95%	5%	

*highly significant improvement in sound clicking (p value <0.01), *success rate in sound clicking improvement 95%

3 – Maximal mouth opening(MMO)

Initial measurements of maximal mouth opening revealed a limited mouth opening in only 20 patients included in this study.This study

demonstrates a success rate of 100% in complete improvement in MMO, (P value < 0.01), as illustrated in table (3).

Table 3: Comparison of pre-treatment and post treatment for maximum mouth opening evaluation

		Pre-treatment	1 st follow up visit (1 month)	2 nd follow up visit (3 month)	P-value
Mouth opening evaluation	No.	20	20	20	Chi-square=19.6 P<0.01 HS*
	Mean	30mm	35.7mm	40mm	

* normal MMO = 35 – 45 mm., *highly significant improvement in MMO (p value <0.01).

DISCUSSION

In the present study the mean age was 31.5 years ranged between 18-45 years old with maximum age group ranging from 26 to 30 years. This can be explained that certain age groups have a greater risk for developing TMJD than others. The most prevalent age group for TMJD are people between the 2nd and 3rd decades. The condition is extremely uncommon after the age of 55 years and the reduced prevalence of TMJD signs and symptoms in older age groups supports the probability that most TMJD are self-limiting. These results are in agreement with Edmond LT et al⁽⁷⁾ and Blasberg B and Greenberg MS et al⁽²⁾ studies who showed the same results. The result of sex distribution in the present study, showed evidence of high predilection to female, with female to male ratio of 2:1. This can be explained by the fact that females suffered higher levels of pain and dysfunction, and greater persistence of symptoms over a longer time. As with most other health conditions, females are more likely to seek treatment for the problem more than males, leading to the erroneous assumption that females have a higher incidence of TMD. This study was in agreement with researches of Steven G. et al 2007⁸ that showed functional estrogen receptors have been identified in the female TMJ but not in the male TMJ.

Estrogen may also promote degenerative changes in the TMJ by increasing the synthesis of specific cytokines, whereas testosterone may inhibit these cytokines. All patients had improvement in symptoms related to the intra-articular derangement and increased mandibular movements. Results are in agreements with studies done by Guarda-Nardini⁹, Puffer et al¹⁰. Lavage of the upper joint space reduces pain by removing inflammatory mediators from the joint, increasing mandibular mobility by removing intra-articular adhesions, eliminating the negative pressure within the joint, recovering disc and fossa space and improving disc mobility, which reduces the mechanical obstruction caused by the disc displacement. This is in agreements with researches of Carvajal and Laskin¹¹ and Totsuka¹². The final outcome of this study explain safety of Ringer Lactate and Sodium hyaluronate, no serious complications, no side effects and patient

could be tolerant under local anesthesia, just mild to moderate pain due to injection and enhancement inflammatory process (normal healing) according to mechanism of action of sodium hyaluronate. Hyaluronic acid (HA) is a very important component of the articular cartilage and has a significant role in maintaining the articular lubrication and nutrition for the articular tissues and these results were in agreement with other studies like in Umut Tuncel⁽¹³⁾ and Luca Guarda-Nardini et al⁽¹⁴⁾. The effectiveness of arthrocentesis with injection of hyaluronic acid in this study was based on 3 clinical parameters: reduction in pain and clicking sound during function and increase in maximum mouth opening. Many researchers and clinicians have reported the results of series of patient treated with arthrocentesis and they are uniformly positive. In this study all patients were suffering from TMJ pain. Their pain score was equal to 6.25 (ranging from 5 to 8).

At 1st follow-up visit the mean of pain score reduced to 4.35 (ranged from 3 to 5) for all the patients. For 40 patients (66.6%) the mean of pain score was 0 (complete relief after single injection only), the remaining 20 patients (33.4%) need a 2nd injection. The study data elicited from (AVS) showed significant reduction in pain from (6.25 to 2.1) with a (p value <0.01) with success rate (95%). These results are in agreement with studies that performed by Nitzan et al^{15,16} who described the high success rate (95%) in 39 cases treated with Arthrocentesis only. The study data elicited significant improvement in MMO of patients (P value < 0.01), with success rate (100%). These results are in agreement with studies that performed by Nitzan et al^(15,16) which report a 3 years long term outcome for 39 patients with closed lock TMJ in which high success (95 %) was achieved with the average mean for MMO (23.1 to 44.3mm) with a P value < 0.01. In the present study all the patients (60 patients) were suffering from TMJ clicking. At 1st follow-up visit 50 patients (83.3 %) show significant disappearance of TMJ clicking. At 2nd follow-up visit 7 patients (11.6 %) show significant disappearance of TMJ clicking. From total 60 patients only 3 patients (5%) showed no improvement of joint clicking. The final outcome

of the study showed significant TMJ clicking sound disappearance in 57 patients (95 %) with a P value < 0.01. In this study the success rate of arthrocentesis for joint clicking was similar to Sato et al⁽¹⁷⁾ show absence of clicking in 52 patients (88 %) from the total number of patients (59) that were included in his study. Kanayama K et al⁽¹⁸⁾ reviewed 25 treated cases with absent of clicking in represent of 97% success rate at duration 6 month.

As conclusion; in this study, the technique of arthrocentesis using Sodium Hyaluronate injection, used in patients who presented with internal derangement, showed therapeutic benefits, simplicity, safety, patients acceptance of injection technique and lack of significant side effects and complications.

All patients who were refractory to the conservative methods and psychologically depressed due to lack of proper treatment reported subjectively improvement in pain levels, improvement in joint clicking episodes and improvement in mouth opening with great psychological benefit.

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