



Clinical Evaluation of Treating Temporo Mandibular Joint Disorders through Arthrocentesis with Corticosteroids or Hyalgan

Mohammed Abdelatty Tawfeek ; Amr El-Swify ; Mohammed Hassan Eid

Oral and Maxillofacial Surgery, Faculty of Dentistry, Suez Canal University, Egypt.

Corresponding author: **Mohammed Abdelatty Tawfeek,**

M.abdelaty20142014@gmail.com

ABSTRACT

Background: Internal derangement of Temporomandibular joint (TMJ) is one of the common intra-articular disorders. It has always presented a therapeutic challenge to the oral and maxillofacial surgeons. **Objective:** The aim of the present study was to evaluate sodium hyaluronate and corticosteroids intra articular injection After arthrocentesis in the treatment of internal derangement of TMJ. **Patients and methods:** The prospective, interventional comparative study was conducted on 15 patients (5 males and 10 females) ranging from 18-45 years old. All patients suffered from TMJ internal derangement with severe pain and history of unsuccessful medical treatment. Patients in this study were classified into three groups to receive arthrocentesis with Ringer's solution followed by hyaluronic acid injection(group A1), arthrocentesis followed by corticosteroid injection (group A2), arthrocentesis only (group A3). **Results:** There were no serious complications occur. Although, all cases in the three groups had significant improvement from the first month, only (group A1) cases had significant long-term improvement for six months. **Conclusion:** The combination of arthrocentesis with HA injection showed much better outcome than arthrocentesis alone or in combination with corticosteroid injection. It can be concluded that HA injection combined with arthrocentesis is effective protocol in relieving pain and clicking.

Keywords: Temporo Mandibular Joint Disorders; Arthrocentesis; Corticoste

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INTRODUCTION

Temporomandibular joint (TMJ) disorders are the main cause of chronic facial pain and disability. The prevalence of clinically significant TMJ related jaw pain is 50% of the general population ⁽¹⁾.

It is estimated that up to 25% of the entire population has an internal derangement which is usually treated with non-surgical methods initially such as, diet modification, occlusal splint therapy, physiotherapy, pharmacotherapy, transcutaneous electrical nerve stimulation (TENS) and stress reduction techniques followed by surgical methods such as arthroscopy, reconstruction arthroplasty (disk repositioning), meniscectomy (discectomy), eminectomy, and repair of perforation of disk Development of TMJ arthroscopic surgery, a minimally invasive treatment and open arthrotomy, procedure has filled the clinical void between failed non-surgical methods ^(2,3).

Numerous studies have since proved the value of arthroscopy for management of symptomatic TMJs with internal derangement ^(4, 5).

The physical action of lysis and lavage in the superior joint space, rather than disc repositioning, is now believed to be responsible for success of arthroscopic surgery. This has led to the use of TMJ arthrocentesis as a relatively less invasive alternative technique ⁽⁵⁾.

Nitzan first described arthrocentesis as the simplest form of surgery in the TMJ, aiming to release the articular disc and to remove adhesion between the disc surface and the mandibular fossa by means of hydraulic pressure from irrigation of the upper chamber of the TMJ ⁽⁶⁾. Arthrocentesis is considered as an intervening treatment modality between nonsurgical treatment and arthroscopic surgery ⁽⁷⁾.

Besides being the least invasive and simplest form of surgical interventions into the TMJ, arthrocentesis carries a very low risk and is relatively easy to accomplish as an in-office procedure under local anaesthesia alone or in combination with conscious sedation ⁽⁸⁾.

Many intra articular injectable material can be used after arthrocentesis. sodium hyaluronate (SH) has been proposed as an alternative therapeutic agent with similar therapeutic effects. This highly viscous, high-molecular substance plays an important role in joint lubrication and protection of the cartilage ⁽⁹⁾. Intra-articular injection with corticosteroids seems to be an effective method for treating internal derangements of the TMJ ⁽¹⁰⁾.

The current study were conducted to evaluate sodium hyaluronate and corticosteroids intra articular injection After arthrocentesis in the treatment of internal derangement of TMJ using double puncture technique that could be of great value.

PATIENTS AND METHODS

This prospective, interventional comparative study included fifteen patients, none of them had any significant medical disorder. Details of the procedure have been explained simply to each patient. They were asked to sign a written consent before starting the treatment. An approval of the study was obtained from Suez Canal University Academic and Ethical Committee. Written informed consent of all the participants was obtained. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Inclusion criteria

The patients were selected as age > 18 years, adult males and females, ability to give an informed consent, presence of pain, limited mouth opening, and clicking sounds.

Exclusion Criteria

Patients with myofascial pain dysfunction as the sole or primary source of pain. Systemic arthropathy and limited opening secondary to extra-articular pathology. Edentulous patients, current use of physical therapy, muscle relaxants, and anti-seizure medications, and current use of occlusal splint issued within the prior 12 weeks. Active infection or skin disease, previous T.M.J surgery, and allergy to study medications were excluded.

Patient grouping:

The 15 patients included in the present study were randomly allocated into three groups (A1, A2, A3):

- **Group A1:** intra-articular injection of hyaluronic acid after arthrocentesis by lactated ringer.
- **Group A2:** intra-articular injection of corticosteroids after arthrocentesis by lactated ringer .

- **Group A3:** Arthrocentesis by lactated ringer solution only .

Pre-operative evaluation

All patients had not any significant medical disorder. All patients had past history of administration of medication without improvement. The medications prescribed to the patients were included muscle relaxant, analgesics, and tranquilizers. Clinical evaluation were performed for all patients.

Pain usually increased by eating, yawning, bruxism, and psychological distress. The condition severely impaired activities of daily living. All patients had depression due to this pain. Pain was assessed using visual analogue scale (VAS) 0-10, 0 reading of VAS will be recorded as absence of pain and 10 as the maximum pain ⁽¹¹⁾.

Trismus and clicking (opening click and closing click sounds) were assessed by recording their presence or absence ⁽¹¹⁾.

Operative procedure

Arthrocentesis procedure was performed under local anesthesia. The procedure was performed using the standard technique as described by Frost as follows:

- One 21gauge needle inserted into the superior joint space at a point 10 mm anterior to the tragus and 5 mm inferior to the tragal-canthal line.
- A second 21gauge needle inserted into the superior joint space at a point 20 mm anterior to the tragus and 5 mm inferior to the line.
- Two hundred mL of lactated ringer's solution then irrigated.
- The most anterior needle removed.
- Through the remaining posterior needle the subject injected with either:
 - Group A₁:** One mL of hyaluronic acid (Hyalgan)(10mg/mL) or
 - Group A₂:** One mL of corticosteroid (Betamethazone)(5 mg/mL) or
 - Group A₃:** One mL of lactated ringer's solution.

The syringe and drug were masked and labeled only with the subject name, and the surgeon blinded to the drug received by each patient. The drug injected blindly. All patients were asked to open their jaw maximally if the procedure was performed under local anesthetic or they have their jaw manipulated if performed under intravenous sedation. A small dressing then applied to the skin ⁽¹²⁾.

Post-operative evaluation:

Clinical evaluation of the patient was done at 1 week following the procedure, and 1,3 and 6 months postoperatively as follows :

- 1- Pain was assessed using visual analogue scale (VAS).
- 2- Trismus and clicking in internal derangement of TMJ was decided on the basis of the proportion of improvement at the end of the treatment by noting either their presence or absence ⁽¹²⁾.

All patients were given postoperative instructions and pain relief medications were prescribed for five days. A soft diet was recommended for the first few days. Patients were assessed for all the parameters preoperatively, immediate post-operative, one week, 1,3, and 6 months after the procedure. Any postoperative complications were detected.

Statistical analysis:

Data collected and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) software for analysis. According to the type of data qualitative represent as number and percentage , quantitative continues group represent by mean \pm SD. Differences between quantitative independent multiple by ANOVA. P value was set at <0.05 for significant results $\&<0.001$ for high significant result.

RESULTS

The present study showed visual Analog Scale (VAS) of group-I treated with hyaluronic acid both pre-operative and postoperative (1-24weeks) were presented in Table (1). The VAS in group-I treated with hyaluronic acid groups preoperative recorded an average (SD) of 9.80 ± 0.45 , however, postoperative recorded an average of 2.8 ± 2.05 , 1.0 ± 2.24 , 0.60 ± 1.34 , and 0.40 ± 0.89 after 1, 4, 12, and 24weeks; respectively. There was a highly significant difference ($p<0.001^{***}$) in visual analogue scale (VAS) over timepoints either preoperative or postoperative as revealed by analysis of variance (ANOVA) . The VAS decreased significantly ($<0.001^{***}$) from 9.80 preoperative to an average of 1.2 postoperatively (Table 1).

VAS in group-II treated with corticosteroid groups preoperative recorded an average (SD) of 10.0 ± 0.00 , however, postoperative recorded an average of 2.8 ± 1.10 , 2.0 ± 1.22 , 0.4 ± 0.55 , and 0.40 ± 0.55 after 1, 4, 12, and 24 weeks; respectively. There was a highly significant difference ($p<0.001^{***}$) in visual analogue scale (VAS)after treatment with corticosteroids over time points either preoperative or postoperative as revealed by analysis of variance (ANOVA) (Table, 2). The VAS decreased significantly ($<0.001^{***}$) from 10.0 preoperative to an average of 1.4 postoperatively (Table 2).

VAS in group A3 (Arthrocentesis) preoperative recorded an average (SD) of 9.8 ± 0.45 , however, postoperative recorded an average of 3.4 ± 0.89 , 2.8 ± 2.8 , 1.8 ± 1.3 , and 0.80 ± 0.45 after 1, 4, 12, and 24 weeks; respectively. There was a highly significant difference ($p<0.001^{***}$) in visual analogue scale (VAS) in Arthrocentesis group over time points either preoperative or postoperative as revealed by analysis of variance (ANOVA) (Table, 6). The VAS decreased significantly ($<0.001^{***}$) from 9.80 preoperative to an average of 2.2 postoperatively (Table 3).

Overall data of “clicking” recorded the highest percentage was “None” (68.0 %), followed by “Multiple” (28.0%) and “minimal” (12.0%). Clicking data revealed the highest percentage of Multiple clicking were recorded preoperative (100.0%) which decreased significantly post-operative ($p<0.001^{***}$) to a level of 0.0 % as revealed by Friedman’s test for related nonparametric samples. After 4-24weeks a 100% “No clicking” was recorded significantly with a 0.0% minimal and 0.0% multiple (Table 4).

Overall data of “clicking” recorded the highest percentage was “No clicking” (100.0 %), and both “Multiple” (0.0%) and “minimal” (0.0%). Clicking data proved the highest percentage of Multiple clicking were recorded preoperative (100.0%) and decreased significantly post-operative ($p<0.001^{***}$) to a level of 0.0 % and the “minimal” recorded 100% after 1 week postoperative. Both Multiple and Minimal decrease significantly over follow up time points and “No clicking” increase to a level of 80% at 24 m (Table 5).

Table 1. The Visual Analog Scale (VAS) in Group A1 treated with Hyaluronic acid.

Time of measure	Visual analogue scale (VAS) / A1
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		Mean	SD	SE
Pre- operative		9.8	0.45	0.20
Postoperative (week)	1	2.8	2.05	0.92
	4	1.0	2.24	1.00
	12	0.6	1.34	0.60
	24	0.4	0.89	0.40
	Postoperative	1.2	1.6	0.7
ANOVA (repeated measure)		<0.001***		

*, **, ***; Significant at $p < 0.05$, < 0.01 , < 0.001 ; NS, non-significant at $p > 0.05$

Table2. The Visual Analog Scale (VAS) in Group A2 treated with corticosteroid.

Time of measure		Visual analogue scale (VAS) / A2		
		Mean	SD	SE
Pre-operative		10.0	0.00	0.00
Postoperative (week)	1	2.8	1.10	0.49
	4	2.0	1.22	0.55
	12	0.4	0.55	0.24
	24	0.4	0.55	0.24
	postop.	1.4	0.9	0.4
ANOVA (repeated measure)		<0.001***		

*, **, ***; Significant at $p < 0.05$, < 0.01 , < 0.001 ; NS, non-significant at $p > 0.05$

Table 3. The Visual Analog Scale (VAS) in Group A3 (Arthrocentesis).

Time of measure		Visual analogue scale (VAS) / A3		
		Mean	SD	SE
Pre- operative		9.8	0.45	0.20
Postoperative (week)	1	3.4	0.89	0.40
	4	2.8	2.8	1.25
	12	1.8	1.30	0.58
	24	0.8	0.45	0.20
	postop.	2.2	1.4	0.6
ANOVA (repeated measure)		<0.001***		

*, **, ***; Significant at $p < 0.05$, < 0.01 , < 0.001 ; NS, non-significant at $p > 0.05$

Table 4. Clicking recorded of group I treated with hyaluronic acid both pre-operative and postoperative (1-24 weeks).

Treatment Pre/Post	Clicking / group A1								Chi-square
	None		Minimal		Multiple		p-value		
	N	%	N	%	n	%			

Pre- operative	0.0	0.0	0.0	0.0	5.0	100.0	N/A
Post-operative (weeks)	1	2.0	40.0	3.0	60.0	0.0	> 0.05 ns
	4	5.0	100.0	0.0	0.0	0.0	N/A
	12	5.0	100.0	0.0	0.0	0.0	N/A
	24	5.0	100.0	0.0	0.0	0.0	N/A
Total	17.0	68.0	3.0	12.0	5.0	20.0	
Time (Friedman's Test)	17.88						
Sign.(2-sided)	0.001***						

*, **, ***; Significant at p<0.05, <0.01, <0.001; NS, non-significant at p>0.05

Overall data of “clicking” recorded the highest percentage was “No clicking” (100.0 %), and both “Multiple” (0.0%) and “minimal” (0.0%). Clicking data proved the highest percentage of Multiple clicking were recorded preoperative (100.0%) and decreased significantly post-operative (p<0.001***) to a level of 0.0 % and the “minimal” recorded 100% after 1 week postoperative. Both Multiple and Minimal decrease significantly over follow up time points and “No clicking” increase to a level of 80% at 24 m (Table 6).

Table 5. Clicking recorded of group A2 treated with corticosteroids both pre-operative and postoperative (1-24 weeks).

Treatment Pre/Post	Clicking / group A2							Chi-square
	None		Minimal		Multiple		p-value	
	N	%	n	%	N	%		
Pre- operative	0.0	0.0	0.0	0.0	5.0	100.0	N/A	
Post-operative (weeks)	1	0.0	0.0	5.0	100.0	0.0	0.0	N/A
	4	2.0	40.0	3.0	60.0	0.0	0.0	> 0.05 ns
	12	4.0	80.0	1.0	20.0	0.0	0.0	> 0.05 ns
	24	4.0	80.0	1.0	20.0	0.0	0.0	> 0.05 ns
Total	10.0	40.0	10.0	40.0	5.0	20.0		
Time (Friedman's Test)	17.33							
Sign.(2-sided)	0.002**							

*, **, ***; Significant at p<0.05, <0.01, <0.001; NS, non-significant at p>0.05

Table 6. Clicking recorded of group A3 treated with Arthrocentesis both pre-operative and postoperative (1-24 weeks).

Treatment Pre/Post	Clicking / group A3							Chi-square
	None		Minimal		Multiple		p-value	
	N	%	N	%	n	%		
Pre-operative	0.0	0.0	0.0	0.0	5.0	100.0	N/A	
Post-operative (weeks)	1	2.0	40.0	3.0	60.0	0.0	0.0	> 0.05 ns
	4	3.0	60.0	2.0	40.0	0.0	0.0	> 0.05 ns
	12	5.0	100.0	0.0	0.0	0.0	0.0	N/A
	24	5.0	100.0	0.0	0.0	0.0	0.0	N/A
Total	15.0	60.0	5.0	20.0	5.0	20.0		
Time (Friedman's Test)	16.89							

Sign.(2-sided)	0.002**			
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*, **, ***; Significant at $p < 0.05$, < 0.01 , < 0.001 ; NS, non-significant at $p > 0.05$

DISCUSSION:

Tempromandibular joint disorders (TMJD) are a heterogeneous group of pathologies that cause complaints including pain in masticatory area, headache radiating to the lateral neck, limitation of jaw movements or various sounds as clicking on jaw opening or closing and ear complaints such as pain and tinnitus. The initial treatments include conservative approaches such as local heat applications, oral use of anti-inflammatory drugs or correction of occlusal abnormalities by dental appliances^(13,14).

Hyaluronic acid is a mucopolysaccharide acid present in ground substance animal tissues. It is the major component of the synovial fluid and has an important role in lubrication, nutrition, homeostasis and load absorption of articular tissues. and it is often preferred in intra-articular injection is Its therapeutic effect is also explained by the normalization of hyaluronate synthesis, and alleviation of synovitis. HA has shown to be beneficial in controlling inflammation by inhibiting the movement and reactivity of granulocytes at high concentrations^(15,16).

Patients of group 1 after one month of injection with hyaluronic acid (HA) with a dose of 1ml (conc. 10mg/ml) there were marked improvement in the clinical signs as pain was nearly relieved and clicking was obviously disappeared. After 3 months of injection with HA all signs and symptoms was almost disappeared and after 6 months all the signs were completely disappeared. This was in accordance with previous studies⁽¹⁷⁻¹⁹⁾ who reported that HA has been shown to relieve joint pain by reducing the levels of inflammatory mediators.

Also our results agreed with Bertolami et al.⁽²⁰⁾ who reported that a multicentre study with duration of 6 months in which they examined the effects of the intra-articular injection of HA in 80 TMJD patients. Also our results agreed with El Hakim results who reported that, significant improvement with HA application versus the placebo group. In addition, repeated intra-articular TMJ injection of hyaluronic acid were found to be a safe and effective in human and animal studies⁽²¹⁾.

It has been reported that repeated applications of HA on experimentally induced Osteoarthritis in the sheep TMJ minimal osteoarthritic changes developed compared with the untreated group⁽²²⁾. They indicated that HA can prevent progression of TMJ-OA. Sato et al.⁽²³⁾ administered HA into the upper tempromandibular joint space of the patients with unreduced disc dislocation and reported a 73.1% reduction in symptoms during a 6-month follow-up period⁽²⁴⁾.

Alpaslan reported promising results with HA injections following arthrodesis in cases with internal irregularities, especially in relieving complaints of pain that was also reported by us⁽²⁴⁾.

Corticosteroids are one of the tools used in the management of TMJ internal disorders, generating the best anti-inflammatory effect due to the inhibition of the production and secretion of proinflammatory cytokines such as interleukins, tumour necrosis factor alpha, interferon gamma and factor stimulating granulocytic and macrophage colonies by direct interference on cascades and genomic mechanisms. They also inhibit the accumulation of macrophages and neutrophils in inflammatory foci because they repress the expression of endothelial adhesion molecules and the synthesis of the plasminogen activator. There is

evidence that they are effective in controlling pain and functional capacity, with few side effects ⁽²⁵⁾.

Corticosteroids administered locally or systemically suppress the inflammation and pain by passing through the cellular membrane and bind to corticosteroid receptors in the cytoplasm ^(26,27). Activated receptors inhibit the expression of genes for pro-inflammatory cytokines, enzymes, receptors, and adhesion molecules, while increasing the expression of genes coding for anti-inflammatory proteins like interleukin-10 and interleukin-1 receptor antagonist ⁽²⁷⁾.

Patients of group 2 after one month of injection with corticosteroids with a dose of 1ml of betamethasone 5 mg/ml there were obvious improvement in the clinical signs as pain was relieved, clicking was obviously decreased. After 3 months of injection with betamethasone all signs and symptoms was nearly disappeared and after 6 months all the signs were almost disappeared.

The corticosteroid is known as an effective anti-inflammatory agent by intra-articular administration. Previous studies have also demonstrated a good short-term as well as longterm effect of intra-articular corticosteroids on pain and dysfunction in the TMJs of patients resistant to conservative treatment ⁽²⁸⁻³¹⁾.

Injection of corticosteroid has powerful anti-inflammatory effect on reducing localized clinical symptoms. Several studies manifested that glucocorticoids pass through the cellular membrane and bind to glucocorticoid receptors in the cytoplasm ^(27,32,33).

Activated receptors inhibit the expression of genes for proinflammatory cytokines, enzymes, receptors, and adhesion molecules, while increasing the expression of genes coding for anti-inflammatory proteins, like interleukin-10 and interleukin-1 receptor antagonist ⁽²⁷⁾.

As a result, intra-articular injection of glucocorticoids after lavage has an effect of mechanical irrigation as well as inhibiting the regeneration of pain-producing substance ⁽³⁴⁾.

Our results agreed with previous study that concluded that Treatment with intra-articular corticosteroids of the temporomandibular joint (TMJ) has proved efficient in pain, tenderness to digital palpation of the lateral aspect of the joint, and mobility for 4-6 weeks Although numerous investigations have been conducted in an attempt to identify the optimal corticosteroid agent, and its optimal dosing regimen for the intra-articular treatment of osteoarthritis, a consensus has not been established ⁽³⁵⁾.

The results of the present study showed a significant reduction in pain intensity after arthrocentesis. This finding is in agreement with the results obtained by several authors; ⁽³⁶⁻³⁸⁾ who reported an improvement in the pain level post arthrocentesis in their studies by washing out of inflammatory mediators by arthrocentesis which had its effect in pain reduction and increasing range of movement.

Internal derangement (ID) is often associated with inflammation of joint space and on physical examination, a clicking sound is heard on opening or closing of the jaw, with associated pain. The popping is due to the noise that the condyle makes as it moves under the anteriorly displaced disc ⁽²⁶⁾.

Also our results coincided with Nitzan et al. ⁽³⁹⁾ who reported that the subjective outcomes of significantly reduced pain and dysfunction at follow up, with most patients complaining of no or just mild pain and dysfunction.

CONCLUSION:

The combination of arthrocentesis with HA injection showed much better outcome than arthrocentesis alone or in combination with corticosteroid injection. It can be concluded that HA injection combined with arthrocentesis is effective protocol in relieving pain and clicking.

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