

Comparative Study of Intra-Articular Use of Corticosteroid v/s Piroxicam in Internal Derangement of Temporomandibular Joint

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ABSTRACT

Background: Temporomandibular joint disorders (TMJDs) includes disorders of the temporomandibular joint (TMJ), masticatory muscles and associated structures. They are characterized by restricted mandibular movements, pain, and joint sounds. Pharmacological agents commonly used for the treatment of TMJDs include intra-articular injection of non-steroidal anti-inflammatory drugs (NSAIDs), opioids, corticosteroids, muscle relaxants, antidepressants, anticonvulsants, and benzodiazepines.

Material and methods: Sixteen patients suffering from internal derangement of the TMJ and not responding to conservative therapy were randomly classified into two groups. Group-A includes 8 patients out of which 6 were female and 2 were male. Group-B includes 8 patients out of which 5 were female and 3 were male. Group-A patients were treated with arthrocentesis followed by intra-articular injection of Corticosteroid (hydrocortisone sodium succinate) and Group-B patients were treated with arthrocentesis followed by intra-articular injection of Piroxicam. The treatment outcomes were evaluated by maximum mouth opening (MMO), pain, left and right lateral excursion movement, and joint sounds on 1 day, 1 month, 3 months, 6 months, and 12 months post operatively.

Results: Pain relief was faster in Group-B than Group-A on one month follow up. Both drugs were able to demonstrate significant improvement in mouth opening, pain relief, lateral excursion movements, and joint sounds. There was no statistically significant difference observed in mouth opening, lateral excursion movements, and joint sounds between two groups up to 12 months follow up.

Conclusion: We have concluded that arthrocentesis with intra-articular injection of corticosteroid and piroxicam are similarly effective in mouth opening, lateral excursion movements, and joint sounds. Pain relief was comparatively faster with intra-articular injection of piroxicam than corticosteroid.

Keywords: Temporomandibular joint disorders, internal derangement, arthrocentesis, piroxicam.

INTRODUCTION

The temporomandibular joint (TMJ) is a diarthrosis, better defined as a ginglymo-diarthrodial joint, which constitutes the movable attachment of the mandible with the skull. The cranial surface of TMJ

consists of the squamous area of the temporal bone – glenoid fossa, which houses the condyle of the mandible. TMJ apparatus is composed of a synovial cavity, articular cartilage and a capsule that covers

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the same joint. An articular disc between these two joint surfaces divides the synovial cavity into an upper and lower compartment. The lower compartment permits hinge or rotatory motion while upper compartment permits sliding or translator movements. Articular disc is a non-vascularised and non-innervated dense fibrous tissue.¹

Temporomandibular joint disorders (TMJDs) are considered the most common orofacial pain condition of non-dental origin with significantly more frequent and more severe signs and symptoms appearing in women and elderly individuals. The TMJDs are characterized by a classically described “triad” of clinical findings: Muscle and/or TMJ pain, TMJ sounds, and restriction and deviation on wide mouth opening.²

According to Dolwick et al. internal derangement (ID) of the TMJ may be defined as a disruption within the internal aspects of the TMJ in which there is a displacement of the disc from its normal functional relationship with the mandibular condyle and the articular portion of the temporal bone.³

The common causes of ID of TMJ are trauma and parafunctional habits which lead to degenerative changes in the articular structures, increased friction, and gradual disc displacement. Systemic disorders, which can cause ID, include rheumatoid arthritis, psoriatic arthritis, juvenile idiopathic arthritis, pseudogout, ankylosing spondylitis, polymyalgia rheumatica, Ehler-Danlos syndrome, and other connective tissue disorders of TMJ.^{4,5,6}

Management of ID of TMJ could be non-invasive, minimally invasive, and invasive. The non-invasive modalities most commonly include physical therapy, occlusal splints and/or adjustments, pharmacologics, and electro-physical modalities (Transcutaneous electrical nerve stimulation (TENS), and ultrasound). Minimally invasive modalities for management of ID of TMJ symptoms include sodium hyaluronate, corticosteroid, NSAIDs injections, arthrocentesis, and arthroscopy. If non-invasive/minimally invasive methods fail, then open joint surgery may be necessary to restore mandibular motion, including open joint surgery like discopexy, discoplicacy, discoplasty, discectomy, eminectomy, condylotomy, condylectomy, and joint reconstruction.⁷

Arthrocentesis is a simple, safe and minimally invasive technique for the treatment of TMJDs. Significant improvements have been reported in terms of reduction in TMJ pain, mouth opening and clicking or popping sounds in the TMJ following arthrocentesis. Arthrocentesis is joint lavage which washes out these inflammatory mediators, thereby, relieving pain. Most common intra-articular injections following arthrocentesis are corticosteroids and sodium hyaluronate.⁸

Various techniques for arthrocentesis have been mentioned in the literature. Murakami et al. first described a technique of TMJ arthrocentesis with pumping irrigation and hydraulic pressure to the upper joint cavity followed by manipulation of the jaw.⁹ After that, Nitzan et al. described a technique utilizing the insertion of two needles into the upper joint compartment, permitting more effective lavage of the joint.¹⁰ In this technique, the landmarks for the insertion of needles are marked on the skin according to the method suggested by McCain et al. for arthroscopy (posterolateral approach to the upper joint space).^{11,12}

Aims and objectives

The aim of this study was to compare the efficiency of arthrocentesis with adjuvant intra-articular injection like Corticosteroids and Piroxicam in the management of internal derangement of TMJ.

Objectives:

The objective of this study was to compare the results of the arthrocentesis with intra-articular injections of corticosteroidal drug like hydrocortisone sodium succinate and non-steroid anti-inflammatory drug like piroxicam for the treatment of internal derangement of TMJ.

This was done by:

- 1) Assessment of maximum mouth opening by measuring the inter-incisal distance with a vernier caliper and a metal scale.
- 2) Assessment of pain by using VAS (Visual analogue scale).
- 3) Assessment of left and right lateral excursion movements with a metal scale.

4) Assessment of joint sounds by palpating the joint during opening and closing of the mouth and by auscultation with stethoscope.

MATERIALS AND METHODS

The study included 16 patients (11 female and 5 male) within the age group of 18-50 years with mean of 34 years with chief complain of reduced mouth opening, pain, TMJ clicking and were referred to the Department of oral and maxillofacial surgery in College of Dental Science and Research Centre, Bopal Ahmedabad. These patients were diagnosed with ID of TMJD on the basis of clinical and radiographic examination and were randomly divided into two groups, After clearance from the ethical committee of institute.

Group-A (n=8, female-6 and male-2) treated with arthrocentesis and intra-articular injection of Corticosteroid (hydrocortisone sodium)

Group-B (n=8, female-5 and male-3) treated with arthrocentesis and intra-articular injection of Piroxicam.

The study participants had to meet the following inclusion and exclusion criteria.

Inclusion Criteria

1. Patients with Stage II and III of Wilkes classification of ID of TMJ.
2. Painful mouth opening (with a VAS of 4 and above).
3. Reduced mouth opening (approximately 20 to 30 mm) and of sudden onset.
4. Non responders to conservative therapy with persistent symptoms.
5. No history of surgical procedures performed before in and around the joints.
6. Patients with a compromised masticatory status.

Exclusion Criteria

1. Patients with degenerative joint diseases such as osteoarthritis, rheumatoid arthritis, gout causing TMJ dysfunction.

2. Patients with evidence of condylar fractures, systemic joint disorders or muscle diseases, and major jaw deformities were excluded from the study.

3. TMJ ankylosis.

4. Previous surgical intervention in TMJ.

I. Pre-operative

1. Patient questionnaire: Patients's details were recorded in a questionnaire by the single examiner including: Chief complaint, personal data, past history.

2. Clinical examination: General body examination, evaluation of mandibular range of motion, pain, and TMJ sounds. TMJ on unaffected site was also observed.

3. Occlusal splint therapy fabrication and insertion: Hard occlusal splint was constructed for 1 month and adjusted for each patient of ID of TMJD in both groups before arthrocentesis.

II. Treatment procedure (Fig.2 and 3{a-e})

Patient were made to seat inclined at 45° angle with the head turned toward the unaffected side to provide an easy approach to the joint to be treated. The side to be treated was prepared with 10% povidone-iodine solution. External auditory meatus was blocked with cotton. Surface anesthetic agent (EMLA-5%) was applied over the site of needle insertion 30 minutes before giving nerve block. A cantho-tragal line, also known as Holmlund-Hellsing line, was marked on skin according to the method suggested by McCain¹¹. Then the needle entry point located 10 mm away from the middle of tragus on the cantho-tragal line and 2 mm below from 1st point was also marked. Auriculo-temporal nerve block was given through the skin just 1.5 cm anterior to the ear at the level of the tragus, being careful to identify the superficial temporal artery before injection. 26-gauge needle was used and approximately half of the needle was penetrated to reach the posterior neck of the condyle. Aspiration was done in the two planes, and after negative aspiration 1.5 to 2 ml of 2% Lignocaine with 1: 80,000 adrenaline was injected.¹⁰

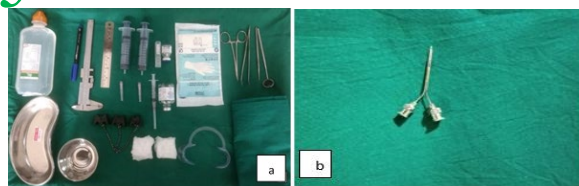


Fig 1a & b: Armamentarium.

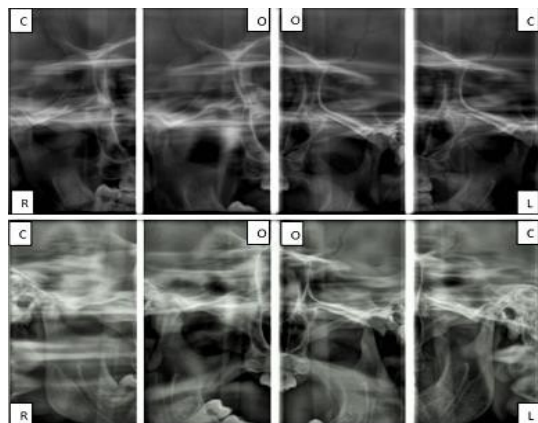


Fig 2: Pre-Procedural and Post-Procedural OPG.

We had used two stainless steel 21- gauge needles with 1.5-inch length, each bent at 300 toward their respective opening and soldered together in a 'Y' fashion with the openings facing outward, so that basically it become single puncture with dual port.

The needle was inserted into the superior compartment as per the marking just posterior to the area of the articular eminence to establish a free flow of the solution through the superior joint space. Approximately 2 ml of Hartmanns (Ringer's lactate) solution was then injected to distend the superior joint space wait for 5 min During the procedure, patients' mouth was kept opened with the aid of mouth prop. A syringe filled with Hartmann's solution is then connected to one port of the needle, and the fluid was injected into the superior joint space and the second port of needle provides an outflow for the solution which was collected in a kidney tray. A total of 100-150 ml of solution was used to lavage the superior joint space.¹⁰

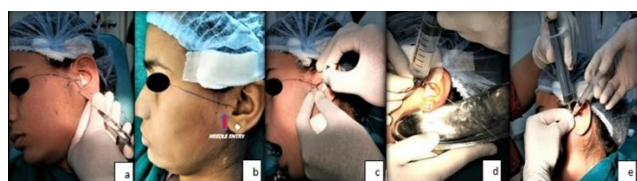


Fig 3: Arthrocentesis procedure (a-e).

After the lavage of joint, 2 ml of injection Cort S (hydrocortisone sodium succinate) was injected in group A patients and 2 ml of injection piroxicam was injected in group B patients.

III. Post-operative

Once the needle was removed, the patient's jaw was gently manipulated in the vertical, protrusive, and lateral excursions direction which helped to relieve further adhesions of the TMJ disc. A small bandage or wrap was placed over the site. A small amount of blood may be noted on the bandage. Ice pack was applied over the affected side (for 20-minute intervals) during the first 48 hours after procedure. After 48 hours ice packs was discontinue. Patients were prescribed a antibiotics, muscle relaxants, analgesics, and/or anti-inflammatory medication for 5 days. For 1 week following the procedure soft diet was advise, as chewing of hard food may disrupt the joint. Patients were instructed to avoid bending over, heavy lifting, or any activities that cause increased pressure in the head region. Patients were advise to continue the use of occlusion splint as they did before procedure.¹³ The day after the procedure patients were instructed to start jaw exercises to reduce stiffness in the joint associated with the procedure. Patients were advise to use tongue blades to stretch the jaw. Patients were also advise to use as many blades as their fit in your mouth. Every day at least one blade was added till mouth opening reach up to 40 mm. These exercises were advised for 7 times per day, with 7 repetitions each time, maintaining each hold for at least 7 seconds.¹³ (Fig.5) Follow up were done at 1 day, 1 month, 3 months, 6 months, and 12 months. On above mention interval mouth opening, pain, lateral excursion movements and joint sounds were evaluated.

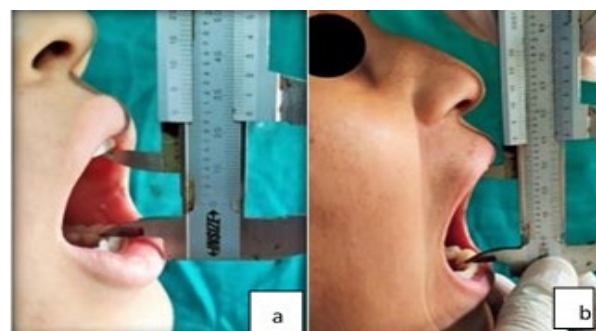


Fig 4: Pre-Procedural and Post-Procedural mouth opening.



Fig 5: Post-Procedural exercise.

Table 1: Group-A data.

			PRE-OPERATIVE	1 DAY	1 MONTH	3 MONTHS	6 MONTHS	12 MONTHS
GROUP- A (n=8)	MMO	MIN.-MAX. (mm)	21-37	25-44	35-47	39-47	40-56	41-57
		(MEAN±SD)	29.63±4.90	32.63±4.60	39.75±4.10	42.88±3.52	47.13±5.22	47.88±4.94
	PAIN (VAS)	MIN.MAX.	2-6	2-6	5-7	6-8	7-8	7-8
		(MEAN±SD)	4.63±1.30	4.88±1.35	6.38±0.74	7.00±0.75	7.38±0.51	7.63±0.51
	LLE	MIN.-MAX. (mm)	6-8	6-8	4-5	2-4	0-2	0-2
		(MEAN±SD)	6.75±0.88	7.25±0.88	4.50±0.53	3.0±0.75	1.25±0.88	1.00±0.75
	RLE	MIN.-MAX. (mm)	3-6	3-6	5-7	5-9	5-9	5-9
		(MEAN±SD)	5.00±1.07	4.88±0.99	6.00±0.93	7.25±1.39	8.00±1.31	7.88±1.25

Table 2: Group B data.

			PRE-OPERATIVE	1 DAY	1 MONTH	3 MONTHS	6 MONTHS	12 MONTHS
GROUP-B (n=8)	MMO	MIN.-MAX. (mm)	20-32	24-35	27-43	29-47	30-50	32-54
		(MEAN±SD)	27.13±4.01	30.25±3.65	37.50±5.12	40.50±5.85	43.00±6.27	46.13±6.68
	PAIN (VAS)	MIN.-MAX.	6-8	7-8	3-4	3-4	0-2	0-2
		(MEAN±SD)	6.87±0.83	7.37±0.51	3.62±0.51	3.37±0.51	1.5±0.75	1.37±0.91
	LLE	MIN.MAX. (mm)	2-5	3-5	4-7	5-7	5-8	5-9
		(MEAN±SD)	4.25±1.03	4.50±0.76	6.13±0.99	6.25±0.70	6.88±0.99	7.38±1.19
	RLE	MIN.-MAX. (mm)	3-6	4-6	5-7	5-7	6-9	6-9
		(MEAN±SD)	4.50±0.92	5.00±0.76	6.25±0.71	6.38±0.74	7.75±0.89	7.75±0.89

MMO: Maximum mouth opening, VAS: Visual analog scale, LLE: Left lateral excursion, RLE: Right lateral excursion, SD: Standard deviation.

Pain intensity

The statistical analysis showed significant difference in pain relief in both the groups comparing pre-procedural pain with pain after 12 months of procedure. Pain relief was faster in Group-B than Group-A on one month follow up. There was no statistically significant difference was observed between two groups on 12 months follow up. (Table-1 and 2)

Lateral excursion movements

The statistical analysis showed significant increased in lateral excursion movements in both the groups

RESULTS

No complains or complications were seen following the arthrocentesis or intra-articular injection of corticosteroid and piroxicam.

Maximum mouth opening

The statistical analysis showed significant increased in MMO in both the groups comparing pre-procedural MMO with MMO after 12 months of procedure. There was no statistically significant difference was observed between two groups in 12 months follow up. (Table-1 and 2)

comparing pre-procedural lateral excursion movements with lateral excursion movements after 12 months of procedure. There was no statistically significant difference was observed between two groups in 12 months follow up. (Table-1 and 2)

Joint sounds

Table-1 and 2 shows comparison of mean changes of joint sound in Group-A and B. In present study, in comparison of the joint sounds, in Group-A pre-operatively by 6 patients had joint sounds. Out of these 6 patients, 2 had reciprocal (opening and closing) clicking, 3 had opening click, and 1 had closing click. In Group-B pre-operatively 7 patients

had joint clicking. Out of these 7 patients, 2 had reciprocal (opening and closing) click, 3 had opening click, and 2 patients had closing click. After end of the 12 month only 1 patient had reciprocal click from Group-A and 1 patient had opening click from Group-B. Around 63.5% reduction was noticed in joint sounds after the arthrocentesis at the end of 12 months in Group-A and 75% reduction was noticed in Group-B. (Table-1 and 2)

DISCUSSION

The TMJ is a highly adaptive apparatus that constantly adjusts to the functional demands made on it by means of remoulding.³ However, when the rate of degradation exceeds that of synthesis, the joint's remoulding capacity will be insufficient to keep up with the demands, resulting in unnatural anatomical changes which may subsequently produce unpleasant symptoms.³

TMJDs occur when there is a disturbance in the anatomic relationship between the normal articular disc and condyle. TMJDs were considered the most common oro-facial pain condition of non-dental origin. The TMJDs are characterized by a classically described "triad" of clinical signs: muscle and/or TMJ pain, TMJ sounds, restriction and deviation on wide mouth opening path.²

It is estimated that up to 25% of the entire population has an ID,¹⁴ which is usually treated with occlusal correction, behavioural education, restricted jaw movements, physiotherapy, soft diet, appliance (splints), analgesic agents, and muscle relaxants, and TENS. If these conservative measures fail, minimally invasive procedures like arthrocentesis and arthroscopy can be performed. In severe cases surgical procedure can be considered.⁷

Pharmacological therapeutics like analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), opioids, corticosteroids, anxiolytics, muscle relaxants, antidepressants, anticonvulsants, and benzodiazepines have been used for many years. These agents act only as analgesics (relieves pain) but do not remove intra-articular adhesions in disc. (Adhesion in TMJ disc)⁷

In the past, joints that did not respond to conservative line treatment were generally subjected to surgical intervention. The mainstay of

these surgical options was based on changing the morphology or position of the disc or removal of the disc with or without replacement. These procedures, although fairly successful, were frequently associated with surgical risks/complications.¹⁵

Arthrocentesis of the TMJ was introduced in 1991 by Nitzan et al.¹⁰ It is the lavage of the TMJ, without viewing the joint space using sterile needles and sterile irrigants. He treated TMJDs with arthrocentesis and he said that it is considered as the first-line surgical treatment for patients who do not respond to conservative treatment.¹⁰

In this study we have used single puncture arthrocentesis (SPA) with two stainless steel 21-gauge needles 1.5 inches long which were bent toward their respective bevel and welded together in "Y" shaped manner as described by Akram Rahal. SPA technique is a safe, fast and easy-to-perform. Only one puncture is required for the procedure and there are all the chances to have both needles in the same upper joint space with this technique.¹⁶ It achieves higher intra-articular pressure during lavage and break the adhesences and it is less traumatic as compared to double puncture arthrocentesis technique. Clinically they have not noticed a decrease in the efficiency of arthrocentesis.¹⁷

Nardini et al. had claimed that the inflow and outflow of liquids through a single puncture site theoretically provides a more stable access to the joint, since the insertion of a second needle may destabilize the first.¹⁸ Laskin et al. stated that the insertion of the second needle could be technically more difficult.¹⁹

Different studys had shown that there were no difference between single puncture and double puncture technique except in number of puncture required for particular technique. Which is two in case of double puncture and one in case of single puncture technique.^{20,21}

In our study, the mean change in MMO was comparable in both groups i.e. in patients with corticosteroid and piroxicam as therapeutic agents in intra-articular injection followed by lavage. (Table-1 and 2) The results of the present study showed a significant improvement in mouth

opening after arthrocentesis. Giraddi et al. had used intra-articular injection of steroid after lavage in arthrocentesis. Results showed significant improvement in MMO similar to the result of our study.²²

In our study, on one month follow up, patients with piroxicam as therapeutic agent experienced less pain compared with patients who received corticosteroids. Whereas at the end of 12 months both groups patients experienced no pain. Piroxicam has an anti-inflammatory effect, which explains the fast effect on pain relief, it also improves and restores normal lubrication of the joint.

This finding was similarly reported by Alpaslan et al, Richie et al, and Helnius et al. 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 movements.^{23,24,25}

Kuruvilla and Prasad showed similar result regarding pain after TMJ arthrocentesis and result showed significant improvement in pain relief.²⁶

AL-Said et al. had showed similar result regarding pain, range of motion and joint sound. The author uses piroxicam as intra articular injection after arthrocentesis in patient with TMJDs. Result showed significant improvement in mouth opening and pain.²⁷ Reddy et al. had also showed similar results in mouth opening and pain. They used intra articular injection of piroxicam after arthrocentesis. Result showed substantial improvement in mouth opening and pain.⁸

In our study, the mean change in left and right lateral excursion movements were comparable in both groups i.e. in patients with corticosteroid and piroxicam as therapeutic agents in intra-articular injection followed by lavage. Nitzan et al. who reported that arthrocentesis proved to be highly effective, providing significant improvement in lateral movements in all patients. There was no significant difference in both the groups.²⁸

In our study, around 63.5% reduction was noticed in joint sounds after the arthrocentesis at the end of 12 months in group-A and 75% reduction was noticed in group-B. According to de Barros Melo et

al. results of his study showed 66.7 % patients with reduced clicking sounds, which was in accordance with our study.²⁹

CONCLUSION

From the results of this study the following conclusions can be:

1. Conservative therapy is very important as initial treatment of TMJDs.
2. Female are more commonly affected than male in ID.
3. Arthrocentesis is recommended as a simple alternative to more invasive TMJ procedures and an effective technique for the treatment of ID of TMJ.
4. Arthrocentesis is a simple, safe, and less invasive method for treating in ID of TMJDs and also washes out inflammatory mediators.
5. SPA technique is rather easier to perform and requires shorter operative time.
6. The patients with piroxicam, as therapeutic agent, experiences less pain compared to the patients who receives corticosteroids.
7. Piroxicam has an anti-inflammatory effect, which explains the early effect of pain relief. Piroxicam also improves and restores normal lubrication of the joint.
8. No significant difference were observed between both the groups in MMO, left and right lateral excursion movements, and joint sounds.
9. No serious intra and/or post-operative complications of arthrocentesis and intra articular injection of corticosteroid and piroxicam, were observed.

CONFLICTS OF INTEREST

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

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