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Original Research

Benefit of temporomandibular joint lavaging by low molecular weight sodium hyaluronidase versus intra articular steroid - study

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ABSTRACT:
Arthrocentesis is a method of flushing out the TMJ by placing needles into the upper joint compartment using local anaesthesia or sedation; it can also be used for diagnostic purposes. Arthrocentesis was considered as an intervening treatment modality between nonsurgical treatment and arthroscopic surgery. The major indications for arthrocentesis are acute and chronic limitation of motion due to disk displacement, adhesions and hypomobility due to restriction of condylar translation in the upper joint space; this procedure increases the hydraulic pressure of upper chamber of the TMJ, which removes adhesions and increases the range of motion.[2] The major indications for arthrocentesis are acute and chronic limitation of motion due to disk displacement, adhesions and hypomobility due to restriction of condylar translation in the upper joint space.To do a comparative study between efficacy of low-molecular weight sodium hyaluronidase and betamethasone in temporomandibular joint arthrocentesis.Twenty patients visiting to the outpatient department of Oral and MaxillofacialSurgery GDC Srinagar and Pacific Institute Of Dental College, with history of temporomandibular jointinternal derangements.Results according to the visual analogue scale for pain intra articular injection low molecular weight Hyaluronic acid proved to be better compared to injection betamethasone and there were statistically significant results between two groups.TMJ arthrocentesis is a simple, less invasive and less expensive technique with low morbidity and an effective and efficient alternative to more invasive surgical procedures. Arthrocentesis has been reported to reduce joint pain, improve function, and reduce clicking and is ideal for early management of TMJ disorders.[6] In patients who fail to respond to conventional conservative measures, in a joint that is not deemed to be grossly mechanically deranged, we advocate the use of TMJ arthrocentesis. It is observed that arthrocentesis followed by intra articular injection of low molecular weight hyaluronic acid was better than betamethasone and however additional research may require for long term evaluation of the results.

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INTRODUCTION

Temporo-mandibular disorders (TMD) are a heterogeneous group of pathologies affecting the temporomandibular joints (TMJ), the masticatory muscles or both. The disorders are characterized by a classically described triad of clinical signs: muscle and/or TMJ pain, TMJ sounds and restriction, deviation or deflection of mouth opening path. The objective of management for any disease process is the full restoration of function with improvement of the quality and quantity of life. Many non-invasive approaches have been developed to alleviate the pain and functional complaints of patients suffering from temporomandibular disorders among which are occlusal splint therapy, physiotherapy, complimentary medicine, pharmacotherapy and occlusal treatments. Recent reports have pointed out the importance of joint lubrication for a correct joint function, also hypothesizing that abnormalities of the joint lubrication system may play a role in the onset of TMJ dysfunctions.

Temporomandibular joint (TMJ) arthrocentesis was introduced approximately 21 years ago; Since the description of arthrocentesis by Nitzan in 1991, the procedure has gained wide acceptance among maxillofacial surgeons in treating internal derangement of temporomandibular joint (TMJ).[1] It is considered by many health professionals as the first line of surgical treatment for patients with temporomandibular disorders (TMD) who do not respond to conservative therapy such as interocclusal devices, physical therapy, drugs, light diet,

behavioural and lifestyle changes, because it can be done on outpatient basis under local anaesthesia and is easy to perform.

Arthrocentesis is a method of flushing out the TMJ by placing needles into the upper joint compartment using local anaesthesia or sedation; it can also be used for diagnostic purposes. Arthrocentesis was considered as an intervening treatment modality between nonsurgical treatment and arthroscopic surgery. The major indications for arthrocentesis are acute and chronic limitation of motion due to disk displacement, adhesions and hypomobility due to restriction of condylar translation in the upper joint space; this procedure increases the hydraulic pressure of upper chamber of the TMJ, which removes adhesions and increases the range of motion.[2] The major indications for arthrocentesis are acute and chronic limitation of motion due to disk displacement, adhesions and hypomobility due to restriction of condylar translation in the upper joint space.

The traditional procedure uses 2 needles inserted through 2 different puncture sites. One of the needles serves for the inflow of the lavage solution and second for the outflow. Since the insertion of second needle is difficult; we are using a dual needle device with single puncture technique in order to avoid multiple puncturing and for ease of needle adaptivity in the site. Rahal et al. demonstrated that single puncture arthrocentesis using the dual-needle is fast and easy to perform.[3] Intra-articular corticosteroid injection alone or after arthrocentesis provides long-term palliative effects on subjective symptoms and clinical signs of TMJ pain. Unfortunately, intra-articular corticosteroid injection has an unpredictable prognosis and also can cause local side effects on joint tissues. Recently, 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, which diminishes granulation tissue formation and diminished formation of adhesions. Intra-articular sodium hyaluronate might be the best alternative due to reduced risk for side effects.

Various studies have demonstrated the use of Morphine, Fentanyl, Bupivacaine, Corticosteroids and SH for the management of TMJ disorders. Corticosteroids have a potent anti-inflammatory effect on synovial tissue and are known to reduce effusion, decrease pain and bring about an increase in range of motion of synovial joints. Intra-articular corticosteroid injection alone or after arthrocentesis provides long-term palliative effects on subjective symptoms and clinical signs of TMJ pain. 1 ml of betamethasone is routinely used at the end of lysis and lavage of superior compartment of TMJ.

Several randomized comparisons of intra-articular hyaluronic acid (Sodium Hyaluronate) and corticosteroid (Betamethasone) TMJ injections; which is highly viscous, high-molecular substance playing an important role in joint lubrication and protection of the cartilage but there are very few studies done with the Low-Molecular Sodium Hyaluronidase. Hence there is a need for the study in order to compare the efficacy of low-molecular weight sodium hyaluronidase and betamethasone in temporomandibular joint arthrocentesis.

AIM OF THE STUDY & OBJECTIVES OF THE STUDY

a) Aim: To do a comparative study between efficacy of low-molecular weight sodium hyaluronidase and betamethasone in temporomandibular joint arthrocentesis.

b) Objectives: The objectives of the study are:

(i) Clinical evaluation of postoperative pain intensity, clicking sounds (opening and closing click sounds) maximum incisal mouth opening, protrusive and Right & Left lateral excursions.

(ii) Evaluation of efficacy of low-molecular weight sodium hyaluronidase inalleviating the symptoms.

(iii) Evaluation of efficacy of Betamethasone inalleviating the symptoms.

MATERIALS AND METHODS

(i) Study design: An *in vivo* prospective, comparative randomized clinical study.

(ii) Study setting: Clinical settings

Department of Oral and Maxillofacial Surgery,

(iii) Study Duration: 2 years

(iv) Source of data: Patients visiting to the outpatient department of Oral and Maxillofacial Surgery,

Twenty patients visiting to the outpatient department of Oral and MaxillofacialSurgery Pacific Institute Of Dental College, with history of temporomandibular jointinternal derangements

(v) Inclusion criteria

1. Patients of age group 18 -60 years
2. Patients who have been diagnosed with internal derangement (anterior disc displacement with or without reduction)
3. Patients with moderate to severe and intractable pain in TMJ due to temporomandibular disorders
4. Patients with pain in TMJ due to degenerative joint disorders such as rheumatoid arthritis, Synovial arthritis
5. Patients with hemarthrosis due to recent trauma requiring TMJ arthrocentesis and lavage.
6. Patients with limited mouth opening and painful joint noises occurring during mandibular excursions.
7. Patients with TMJ pain due to synovitis or capsulitis.

(vi) Exclusion criteria

1) Patients with uncontrollable severe systemic disease or medically compromised

2) Patients with the presence of other disorders involving the TMJ (e.g., myalgia or collagen vascular disease)
3) Patients with history of major jaw trauma or dentofacial deformity
4) Patients with psychiatric illness
5) Patients with history of previous TMJ surgery
6) patients who are unwilling to participate in the study.

(vii) Sample size: Sample size comprises of TWENTY patients requiring TMJ arthrocentesis and lavage

Sample size calculation:

F tests – ANOVA: Repeated measures, within-between interaction

Analysis: A priori: Compute required sample size

A power analysis was established by G*power, version 3.0.1 (Franz Faul Universitat,Kiel,Germany). A sample size of 20 subjectswould yield 80% power to detect significant differences, with effect of 0.3 and significance level at 0.05

Sample Size: N = 20

(viii) Methodology: An informed written consent will be obtained from the twenty patients participating in the study.

Patients are divided into two groups. (Group A and Group B).

Group A patients will receive 1 ml of 10mg Sodium hyaluronate and Group B patients will receive 1 ml of 0.05mg of Betamethasone.

The following procedure will be obtained during this study:

Pre-operative screening evaluation (1st visit):

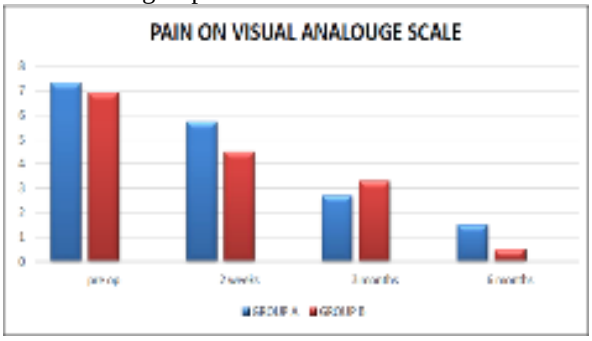
- A signed written consent will be obtained
- Proper Medical and dental history and demographics will be recorded
- Parameters such as temporomandibular joint pain intensity, clicking sounds (opening and closing click sounds) maximum incisal mouth opening, protrusive and Right & Left lateral excursions will be recorded.

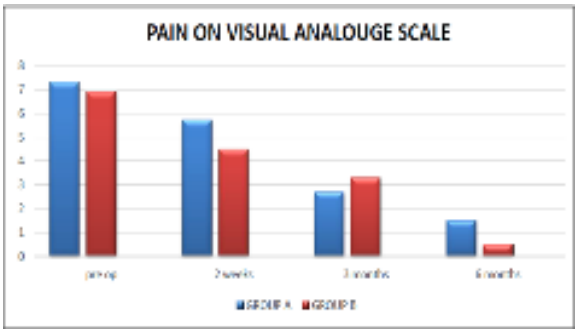
Intra-operative procedure for arthrocentesis (2nd visit):

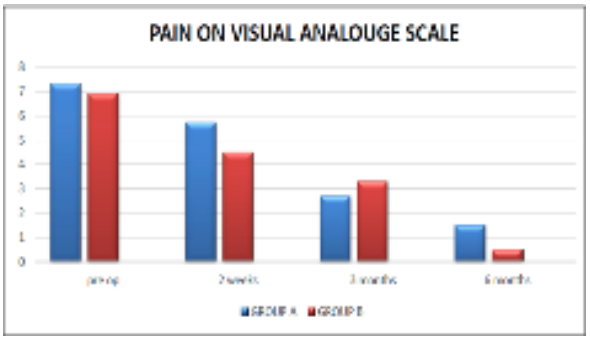
- Marking for Auriculotemporal, Deep Temporal and Masseteric nerve block; A line is drawn from middle of tragus to lateral canthus (Holmund - Hellsing line). A point is marked 10mm anterior to Mid Tragus and 2mm below the H - H Line correlates with the posterior recess.
- An 18-gauge modified double lumen single barrel needle is penetrated in the marked area.
- In order to arthroscopic lysis and lavage 50 – 100ml of Ringer's Lactate Solution is used.
- Once Lavaging is done; For Group A patients 1ml of 10mg Sodium hyaluronate and Group B patients will receive 1 ml of 0.05mg of Betamethasone is deposited within the fossa and while depositing the outlet line of needle is closed.
- Post-operative Parameters such as temporomandibular joint pain intensity, clicking sounds (opening and closing click sounds) maximum incisal mouth opening, protrusive and Right & Left lateral excursions will be recorded at 1st, 2nd, 3rd, 4th weeks and 3rd and 6th months intervals

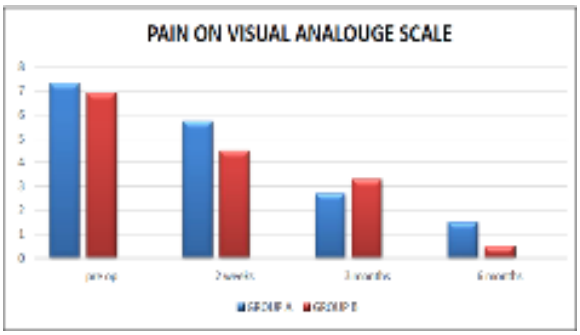
RESULTS

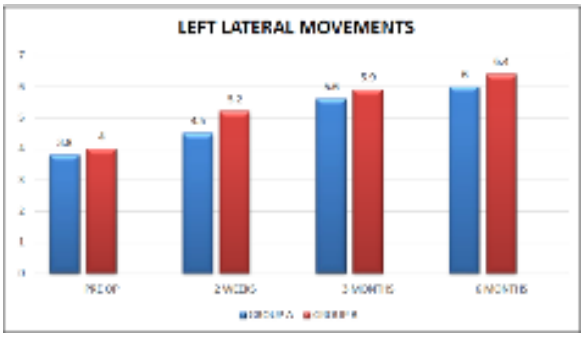
Out of twenty patients twelve cases were diagnosed as anterior disc displacement with reduction, eight cases were diagnosed as anterior disc displacement without reduction. The patients were between ages 19 to 46. Out of twenty patients 9 were female patients and 11 were male patients. Pain was decreased in both the groups postoperatively at 2 weeks and 3rd month and 6th month follow up compared to preoperative pain. According to the visual analogue scale for pain intra articular injection low molecular weight Hyaluronic acid proved to be better compared to injection betamethasone and there were statistically significant results between two groups. Preoperative maximum mouth opening in group A patients ranged from 20 to 31 mm with a mean of 25.50, while postoperative maximum mouth opening ranged from 26 to 32 mm with a mean of 30.50 mm at 2 weeks and 32 to 40 mm with a mean of 35.60mm at 3months follow-up and 38 to 42 with a mean of 39.90 at 6months follow up. The preoperative maximum mouth opening in Group B patients opening ranged from 23 to 31 mm with a mean of 27.10, while postoperative maximum mouth opening ranged from 23 to 36 mm with a mean of 32.60 mm at 2 weeks and 34 to 40 mm with a mean of 37.00mm at 3months follow-up and 40 to 40 with a mean of 41.70 at 6months follow up. The maximum mouth opening, protrusive movements, left lateral excursions, right lateral excursions were increased in both the groups post operatively at 2 weeks and at 3rd and 6th month follow up compared to preoperative maximum mouth opening. There was no statistically significant difference between two groups. The joint sounds reduced in both the groups post operatively at 2 weeks, 3rd and at 6th month follow up compared to preoperative joint sounds .There was decrease in joint sounds from 90% to 10% in group A and from 80% to 10% in group B. There was no statistically significant difference between two groups.

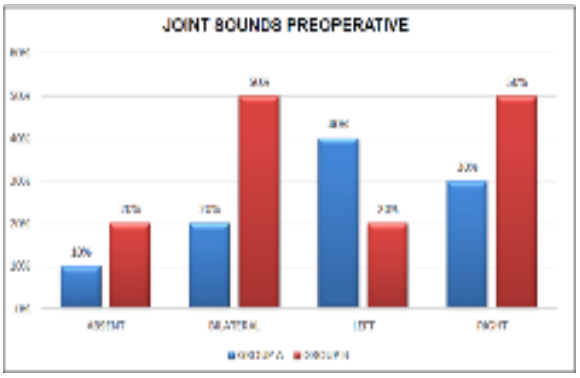


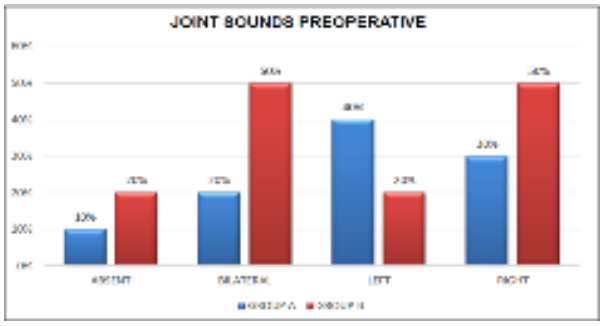


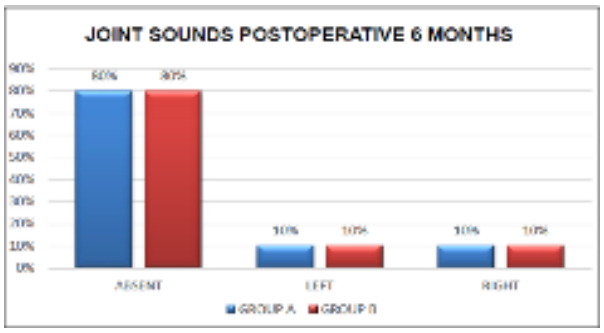












DISCUSSION

The Temporomandibular joint (TMJ) is a highly adaptive organ that constantly adjusts to the functional demands made on it by means of remodeling. However, when the rate of degradation exceeds that of synthesis, the joint's modeling capacity will be insufficient to keep up with the demands, with resultant changes occurring in the joint structure.[2] The TMJ disorders are characterized by a classically described triad of clinical signs: muscle and/or TMJ pain, TMJ sounds and restriction, deviation or deflection of mouth opening path.

Primary goals of the treatment for TMD are to increase the range of motion and relieve the functional pain of the TMJ. The current conservative treatments suggested for TMD include patient behavioral education, resting the jaw, soft diet, analgesic agents, splints, and physiotherapy; surgical interventions include arthrocentesis, disc repositioning, or discectomy for patients with resistant internal derangement.[3,4] Recent reports have pointed out the importance of joint lubrication for a correct joint function, also hypothesizing that abnormalities of the joint lubrication system may play a role in the onset of TMJ dysfunctions.[1] An efficient lubrication system in the TMJ is absolutely necessary so the disc can slide along the slope of the eminence. Hyaluronic acid probably plays an important indirect role in joint lubrication by adhering to surface-active phospholipids. It was found that the mechanical lysis of adhesions and lavage of the TMJ was often successful in treating various internal derangements.[5] Nitzan et al first described TMJ arthrocentesis as the simplest form of surgery in the TMJ, aiming to release the articular disc and to remove adhesions between the disc surface and the mandibular fossa by means of

hydraulic pressure from irrigation of the upper chamber of the TMJ.[6] Arthrocentesis, by definition, refers to the aspiration of fluid from a joint space and injection of a therapeutic substance.[7,8] It is based on two previous treatment modalities; so- called pumping manipulation procedure to manage TMJ closed lock, and the arthroscopic lysis and lavage. 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] Nitzan et al then described a technique whereby two needles instead of one were introduced into the upper joint space and this technique of arthrocentesis was used in the present study.[10]

Various pharmacological agents (Intra-articular injections) used for alleviating TMJ pain and dysfunction after arthrocentesis. They are corticosteroids like hydrocortisone, dexamethasone, triamcinolone acetanoide, methylprednisolone, Non-steroidal anti-inflammatory drugs like Piroxicam, Tenoxicam, opioids like Morphine, Local anaesthetic agents like Bupivacaine, Mepivacaine and hyaluronidase, Hyaluronic acid injections. Intra articular injections of 50 mg hydrocortisone and 20 mg hyaluronic acid have been used after arthrocentesis and compared their efficacy in reducing TMD symptoms like pain, restricted mouth opening, restricted jaw movements and joint sounds.

Hyaluronic acid is a linear polysaccharides. It is available in the extracellular matrix of various mammalian tissues including skin, cartilage, umbilical cord, and synovial fluid.[11] In 1939, Mayer at al first identified it in synovial fluid. Hyaluronic acid may act as a shock absorber that protects cartilage cells from shock waves, and it may also act as a barrier.[12] Hyaluronic acid also has anti-inflammatory actions such as scavenging for free radicals and reducing vascular permeability, as well as inhibition and phagocytosis of polymorphonuclear leucocytes and macrophages. It also has analgesic properties. Several reports have indicated that intra-articular injection of hyaluronic acid may be effective treatment for rheumatoid arthritis, osteoarthritis, and also disorders of the TMJ.

Corticosteroids have a potent anti-inflammatory effect on synovial tissue and are known to reduce effusion, decrease pain and bring about an increase in range of motion of synovial joints.[13] Intra-articular corticosteroid injection alone or after arthrocentesis provides, long-term palliative effects on subjective symptoms and clinical signs of TMJ pain.[14,15] The anti-inflammatory effects of intra-articular corticosteroids on synovial tissues have been well documented. They are useful for alleviating pain, swelling, and dysfunction in patients with inflammatory diseases of the joints such as rheumatoid arthritis and gout, as well as in those with primarily non-inflammatory joint diseases such as osteoarthritis. There are many glucocorticoid preparations such as cortisone, hydrocortisone, betamethasone, methylprednisolone acetate, triamcinolone acetonide, and triamcinolone hexacetonide.

In the immediate postoperative phase, the patient may experience some tenderness and swelling over the treated TMJ. There may also be a slight change in the bite, and on occasions, a minor hearing impairment, all of which resolve completely in a few days. Soft splint is continued and soft diet is recommended for the first few days, however active jaw opening exercises are encouraged immediately upon completion of the procedure.

No complications were encountered in our study. The complications though rare documented in the literature were infection, external auditory canal perforation, fluid extravasation into the soft tissues, bite change, scuffing of the cartilage of the TMJ, and hematoma.[7] The incidence of these can be lowered by strict asepsis and using the least traumatic technique, particularly the avoidance of extravasation of fluid.

Local side effects of the intra-articular injection of glucocorticosteroids such as destruction of articular cartilage, infection, and progression of already recognized joint disease, have been reported. However, the cause of these deleterious effects has not been fully explained and adequate controls are lacking. In long-term treatments, serious side effects appear, limiting the effectiveness of glucocorticoids in chronic diseases. According to our study arthrocentesis followed by injection of low molecular weight hyaluronic acid was better than arthrocentesis followed by betamethasone because exogenous hyaluronic acid can stimulate the synthesis of endogenous hyaluronic acid-forming synoviocytes of osteoarthritic joints, so reducing joint friction coefficient and decreasing risk of damage and it has lesser side effects.

CONCLUSION

TMJ arthrocentesis is a simple, less invasive and less expensive technique with low morbidity and an effective and efficient alternative to more invasive surgical procedures. Arthrocentesis has been reported to reduce joint pain, improve function, and reduce clicking and is ideal for early management of TMJ disorders.[6] In patients who fail to respond to conventional conservative measures, in a joint that is not deemed to be grossly mechanically deranged, we advocate the use of TMJ arthrocentesis. It is observed that arthrocentesis followed by intra articular injection of low molecular weight hyaluronic acid was better than betamethasone and however additional research may require for long term evaluation of the results.

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