

SODIUM HYALURONIC ACID, PLATELET RICH PLASMA AND DEXTROSE PROLOTHERAPY IN MANAGEMENT OF TEMPORO-MANDIBULAR JOINT INTERNAL DERANGEMENT. A COMPARATIVE STUDY

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ABSTRACT

Introduction: Internal derangement of temporomandibular joint (TMJ) is characterized by displacement of the intra-articular disc, results in clicking or popping sounds.

Aim of study: Is to compare the efficacy of arthrocentesis followed by hyaluronic acid, PRP versus dextrose prolotherapy in management of temporomandibular joint internal derangement.

Patients and methods: The present study included 45 adult patients suffering from internal derangement of Temporo-mandibular joint selected from those attending oral and maxillofacial surgery department, faculty of dentistry, October 6 University. **Group I:** Composed of 15 patients (10 females, 5 males) where arthrocentesis followed by hyaluronic acid was injected intra-articular. **Group II:** Composed of 15 patients (9 females, 6 males) where 1ml of platelet rich plasma was injected intra-articular. **Group III:** Composed of 15 patients (9 females, 6 males) where dextrose prolotherapy was injected (3 times) at 0, 2 and 4 weeks.

Results: there was no statistically significant difference between Group I and Group III; both showed the statistically significantly highest mean MIO values. Group II showed the lowest mean MIO. Group I and Group III; both showed statistically significantly lower mean VAS scores after 12 months compared to pre-operative measurement. After 6 months, Group III showed the highest prevalence of deviation followed by Group I while Group II showed no deviation.

Conclusions : arthrocentesis followed by sodium hyaluronic acid and Prolotherapy is a successful technique to improve maximum inter-incisal opening as well as assisted interincisal opening and improved higher significant changes in pain intensity, however PRP was effective in improvement of deviation

KEYWORDS: TMJ, internal derangement, PRP, hyaluronic acid, arthrocentesis, dextrose prolotherapy.

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INTRODUCTION

Internal derangement of temporomandibular joint (TMJ) is defined as a disruption within the internal aspects of TMJ, ⁽¹⁾ characterized by displacement of intra-articular disc, results in clicking or popping sounds. ⁽²⁾ Those conditions may be painless or may be associated with pain, especially during function.

(TMD) is a generic term used for any problem concerning jaw joint. Injury to jaw, temporomandibular joint or muscles of head and neck may cause TMD. Other causes includes clenching of teeth, in which pressure on TMJ induced; dislocation of disc; presence of osteoarthritis or rheumatoid arthritis in TMJ; stress, aging. The most common TMJ disorders are pain dysfunction syndrome, internal derangement, arthritis, and traumas. TMD is seen most commonly in people between ages of 20 and 40 years, and occurs more often in women than in men. ⁽³⁾

The most frequent complaint is pain and a decrease in the maximal interincisal opening (MIO), which normal values are between 35 - 50 mm. The following symptoms as pain at rest, during maximum mouth opening and chewing, tenderness to palpation of joint, sounds are clicking, crepitation, difficulty in opening the mouth, intermittent lock, closed lock, stiffness of joint in early morning are noticed. ⁽⁴⁾

Imaging of temporomandibular joints and associated structures is necessary to establish presence or absence of pathology and stage of disease in order to select the appropriate treatment, assist in prognosis, and to assess patient response to therapy that include plain films, panoramic films, and tomograms (frontal and lateral), Magnetic resonance imaging (MRI) ^(5,6) or arthrography,⁽⁷⁾ Computed tomography (CT) ⁽⁸⁾ 3-D CT, stereo lithography model of a patient's maxillofacial skeleton can be fabricated utilizing 3-D CT technology. ^(9,10) Cine MRI, ^(11,12) arthrography,⁽¹³⁾ Radioactive isotope bone scans have a high sensitivity for detecting metabolic activity and inflammation. ⁽¹⁴⁾ Single Photon Emission Computed Tomography (SPECT)

is a form of isotope imaging utilizes the computer techniques to improve visualization of plane of interest.

Internal derangements TMJ are treated with non-surgical methods which include medications, physiotherapy and occlusal splints in initial stages. ⁽¹⁵⁾ Non-surgical methods such as modification of the diet ⁽¹⁶⁾, occlusal splints, ⁽¹⁷⁾ physical therapy, pharmacotherapy, ⁽¹⁸⁾ transcutaneous electrical nerve stimulation (TENS) and stress reduction technique followed by surgical methods such as arthroscopy, reconstruction arthroplasty (disk repositioning), meniscectomy, and repair of perforation of disk. ^(19,20)

When these methods are unsuccessful, they are managed by surgical methods. ⁽²¹⁾

Nitzan who described arthrocentesis, simplest and minimal invasive form of surgery in TMJ, aim to release articular disc and to remove adhesion between disc surface and mandibular fossa by means of hydraulic pressure from irrigation of upper chamber of TMJ. ⁽²²⁾

Intra articular injection of cortico -steroids alone ^(23,24) or after arthrocentesis provides long-term palliative effects on subjective symptoms and clinical signs of TMJ pain .

Sodium Hyaluronate (SH) has been proposed as an alternative therapeutic agent which is high viscous, high molecular substance plays an important role in joint lubrication and protection of cartilage. ⁽²⁵⁾

Various studies have demonstrated the use of drugs like Morphine, Fentanyl, Bupivacaine, Corticosteroids and SH for the management of TMJ disorders. Corticosteroids have a potent anti-inflammatory action on synovial tissue and well known to reduce effusion, decrease pain and brings about an increase in range of motion of synovial joints; 1 ml of betamethasone is routinely used at the end of lysis and lavage of superior compartment of TMJ. ^(26,27)

PATIENTS AND METHODS

I. Inclusion criteria:

Patients included in this study were suffered from internal derangement .Age (20-50) years

Exclusion criteria:

- 1- Patients suffering from haematologic disorders (platelet function disorders & anticoagulation therapy)
- 2- Renal & or hepatic insufficiency
- 3- Patients with prosthetic joint replacement
- 4- Patients allergic to any components of the injectable solution.

II. Patient's examination

History

All patients were subjected to prepared medical questionnaire relied upon by the American Dental Association (ADA) (included in the appendix). Medical history was taken from all patients and documented in the patient's own chart.

Chief complaint & history of chief complaint was taken from patient's own words

Dental history and history of any surgical procedure previously done in the area of interest.

Clinical Examination

A comprehensive intraoral examination of oral structures was carried out in conjugation with the dental history

For the assessment of patients with TMJ ID, all patients were undergone;

- Clinical examination:

1. Occlusion
 2. Muscles of mastication
- TMJ examination
1. Joints noises
 2. GAIT
 3. Inter-incisal opening / PROM/AROM (passive/ active range of motion) .

A- Radiographic Examination:

- Radiographic examination, including:
- Preoperative magnetic resonance imaging (MRI) was done for all patients. Figure (1)

III. Study design

❖ The patients was divided randomly into three equal groups:

- **Group I: (study group)** Composed of 15 patients wherearthrocentesis followed by hyaluronic acid was injected intra-.
- **Group II:(study group)** Composed of 15 pa-

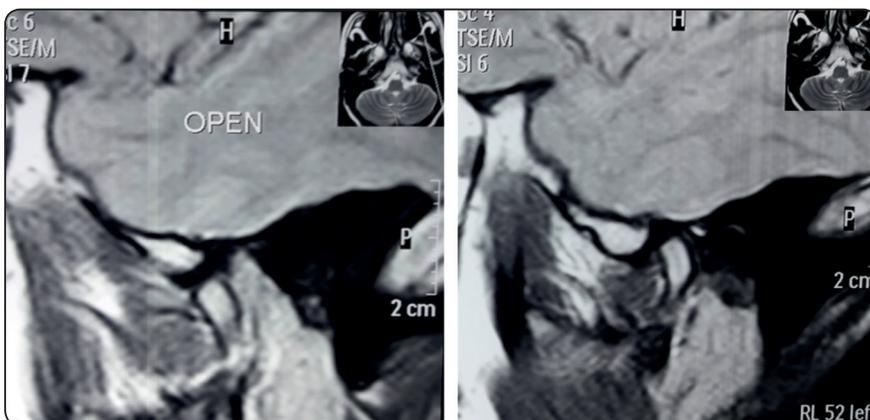


Fig. (1) Preoperative T1 magnetic resonance imaging, sagittal view showing anterior disc displacement

tients where 1ml of platelet rich plasma was injected intra-articular.

- **Group III: (control group)** Composed of 15 patients where dextrose prolotherapy was injected (3 times) at 2 weeks, 4 weeks .

Patient preparation :

Before administering injection, the skin over the target area is cleansed with appropriate antiseptic, draping around areas of injection with sterilized towels. the lateral TMJ fossa rim and condylar head located by palpation, then the target areas marked with a washable felt-tip pen.

Group I: (study group) arthrocentesis followed by hyaluronic acid :

Composed of 15 patients where arthrocentesis followed by hyaluronic acid was injected intra-articular. Figure (2-3)

Group II: (study group) Platelet rich plasma (PRP)

Composed of 15 patients where 1ml of platelet rich plasma was injected intra-articular.

PRP preparation:

Set was prepared for PRP collection, figure (4). PRP was prepared from a 10 mL autologous venous blood sample taken from the antecubital vein. The blood was drawn into test tubes containing sodium citrate and then centrifuged for 6 min at 1500 rpm. The blood was separated into 3 layers: a red bottom layer containing red blood cells; a pink middle layer containing PRP; and a yellow top layer containing PPP. The middle plasma layer (PRP) was then drawn from the test tubes.⁽⁴¹⁾

Group III: (control group) Prolotherapy technique :

Composed of 15 patients where dextrose prolotherapy was injected (4 times) at 2 weeks , 4 weeks and 6 weeks intervals over a total of 12 weeks. This



Fig. (2) : Clinical photograph showing the prepared set for sodium hyaluronic acid injection intra-articular



Fig. (3) : Clinical photograph showing sodium hyaluronic acid (CuraVisc) injection intra-articular



Fig. (4) : Clinical photograph showing the prepared set for PRP injection intra-articular PRP was then injected intra-articular, figure (5).



Fig. (5) : Clinical photograph showing for PRP injection intra-articular

consists of 25% dextrose and 2% lidocaine into a 3-mL syringe for each TMJ. The result is a dextrose concentration of approximately 12.5%. figure (6)

A. Patient Posture and Head Position: The patient was preferably positioned supine or reclined with the head turned to the opposite side away from the injection site.

B. Pre-injection Procedure and Selection of Injection Tools: 12.5% Dextrose which is the most commonly used prolotherapy solution, Before administering injection, the skin over the target area is cleansed with appropriate antiseptic, draping around areas of injection with sterilized towels. Then, the target areas were palpated and subsequently marked with a washable felt-tip pen.

C. Articular injection approach: The face and TMJ are highly sensitive areas and hence, injections in this area must be as atraumatic as possible.

Patients were then asked to open their mouth and a needle was inserted 10 mm in front of tragus and 2 mm below lateral cantho-tragal line.

Since, anterior disc displacement of TMJ is the commonest, the priority is to accomplish repair of extended or torn posterior disc attachment. The first target area was Posterior joint space, which was palpated as the depth of the depression that forms



Fig. (6) : clinical photograph showing the prepared set for Prolotherapy injection intra-articular

immediately anterior to tragus of ear as the condyle translates forward and down when patient opened his mouth.

Then, a disposable bite block was placed between the patient's anterior teeth so that patient becomes unable to close his mouth during the procedure.

The injection needle penetrates skin at previously marked point, directing medially and slightly anteriorly and needle usually penetrates to, or nearly to, its full one-inch length before encountering medial wall of the fossa. Following aspiration, 1 mL of prolotherapy solution is deposited at this site. Figure (7)



Fig. (7): clinical photograph showing for Prolotherapy injection intra-articular

The second target is the anterior disc attachment, where disc connects to superior portion of lateral pterygoid muscle. Spasm of this muscle is common in cases of chronic disc displacement. Injecting prolotherapy solution here can strengthen the tendinous attachment of this muscle to disc.

This target area was palpated as the slight depression just anterior to condyle when mouth is closed. This point should be marked before injecting the posterior aspect of joint, as it becomes difficult to palpate this depression after the posterior joint recess has been injected.

For this injection, the bite block was removed and the patient was instructed to close gently, which moves condyle back into fossa. Then, needle was inserted at marked point, again directing the tip medially and angulated slightly anteriorly to, or nearly to, its full one-inch length. Following aspiration, another 1ml of prolotherapy solution was injected here.

The next target was the attachment of masseter muscle, which was palpated along inferior border of zygomatic arch and marked at same time when posterior and anterior aspects of the condyle are being evaluated.

Asking the patient to clench his teeth makes the masseter prominent, and area that was most rigid to palpation is usually the tenderest as well. Then, the patient was told to relax jaw and the final ml was injected directly into this area, again at or near the full one-inch length of the needle.

If the opposite joint is affected, the head is turned to other side and same procedure is repeated on opposite joint.

D. Injection Frequency Protocol: The standard program is to repeat the injections two times, at one month interval. At each appointment, the joints were palpated for pain and noise, and the affected muscles for pain. The range of jaw motion also was measured inter-incisally.

- Data was tabulated and statistically analysed.

RESULTS

Follow up

Patients were followed up for a period of 12 months at the following intervals (1, 3, 6 and 12 months) from the last injection.

Postoperative clinical assessment included:

➤ Subjective evaluation :

1. Visual Analogue Scale (pain – tenderness – chewing).

➤ Objective evaluation:

1- Interincisal opening / PROM/AROM (passive/ active range of motion).

2- Mandibular deviation.

Statistical Analysis

Numerical data were explored for normality by checking the distribution of data and using tests of normality (Kolmogorov-Smirnov and Shapiro-Wilk tests).

Maximum Inter-incisal Opening (MIO), Assisted Inter-incisal Opening (AIO) showed normal (parametric) distribution while pain (VAS) scores showed non-normal (non-parametric) distribution. Data were presented as mean, median, standard deviation (SD), minimum, maximum and 95% Confidence Interval (95% CI) values.

For parametric data, repeated measures ANOVA test was used to compare between the three groups as well to study the changes by time within each group. Tukey's post-hoc test was used for pair-wise comparisons when ANOVA test is significant.

For non-parametric data, Kruskal-Wallis test was used to compare between the three groups. Friedman's test was used to study the changes after treatment in each group. Dunn's test was used for pair-wise comparisons.

Qualitative data were presented as frequencies and percentages. Fisher's Exact test was used to

compare between the three groups. Friedman’s test followed by Dunn’s test was used to study the changes by time in qualitative data.

The significance level was set at $P \leq 0.05$. Statistical analysis was performed with IBM® SPSS® Statistics Version 20 for Windows.

A. Maximum Inter-incisal Opening (MIO)

1. Descriptive statistics

Descriptive statistics of MIO in the three groups.

2. Comparison between the three groups

Pre-operatively, Group II showed the statistically significantly highest mean MIO. Group III showed statistically significantly lower mean value. Group I showed the statistically significantly lowest mean MIO.

After 1 month, there was no statistically significant difference between MIO in the three groups.

After 3, 6 as well as 12 months, there was no statistically significant difference between Group I and Group III; both showed the statistically significantly highest mean MIO values. Group II showed the statistically significantly lowest mean MIO .

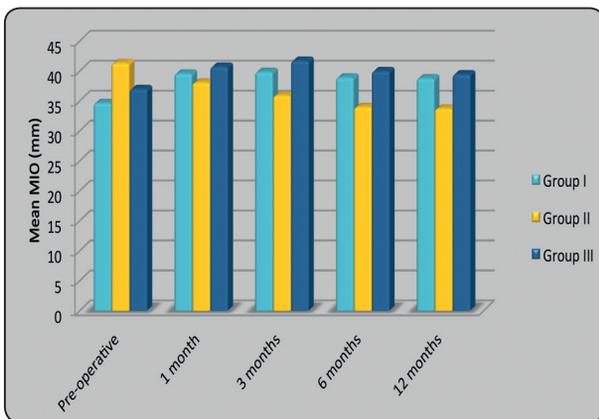


Fig. (8): Bar chart representing comparison between mean MIO in the three groups

3. Changes after treatment within each group

In Group I as well as Group III; there was a statistically significant increase in MIO after 1 month. There was no statistically significant change in mean MIO from 1 to 3, 3 to 6 as well as from 6 months to 12 months. The mean MIO after 12 months showed statistically significantly higher mean value compared to pre-operative measurement.

While in Group II; there was a statistically significant decrease in mean MIO after 1 month as well as from 1 to 3 months. There was no statistically significant change in mean MIO from 3 to 6 as well as from 6 months to 12 months. The mean MIO after 12 months showed statistically significantly lower mean value compared to pre-operative measurement.

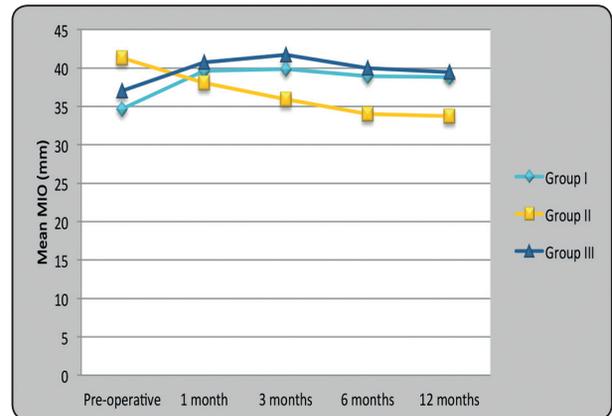


Fig. (9): Line chart representing comparison between mean MIO at different time periods in each group

Assisted Inter-incisal Opening (AIO)

Descriptive statistics

Comparison between the three groups

Pre-operatively, Group II showed the statistically significantly highest mean AIO. Group III showed statistically significantly lower mean value. Group I showed the statistically significantly lowest mean AIO.

After 1 month, there was no statistically significant difference between AIO in the three groups.

After 3, 6 as well as 12 months, there was no statistically significant difference between Group I and Group III; both showed the statistically significantly highest mean AIO values. Group II showed the statistically significantly lowest mean AIO.

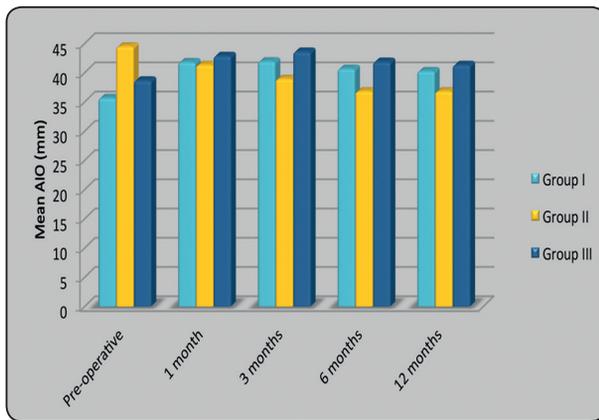


Fig. (10): Bar chart representing comparison between mean AIO in the three groups

Changes after treatment within each group

In Group I as well as Group III; there was a statistically significant increase in AIO after 1 month. There was no statistically significant change in mean AIO from 1 to 3, 3 to 6 as well as from 6 months to 12 months. The mean AIO after 12 months showed statistically significantly higher mean value compared to pre-operative measurement.

While in Group II; there was a statistically significant decrease in mean AIO after 1 month, from 1 to 3 as well as from 3 to 6 months. There was no statistically significant change in mean AIO from 6 months to 12 months. The mean AIO after 12 months showed statistically significantly lower mean value compared to pre-operative measurement.

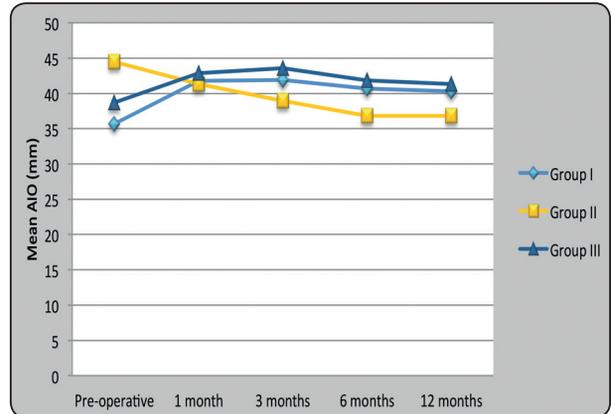


Fig. (11): Line chart representing comparison between mean AIO at different time periods in each group.

Pain (VAS scores)

Descriptive statistics

Descriptive statistics of VAS scores in the three groups.

Comparison between the three groups

Pre-operatively, after 1 month as well as after 3 months; there was no statistically significant difference between VAS scores in the three groups.

After 6 as well as 12 months, there was no statistically significant difference between Group I and Group III; both showed the statistically significantly highest mean VAS scores. Group II showed the statistically significantly lowest mean VAS scores.

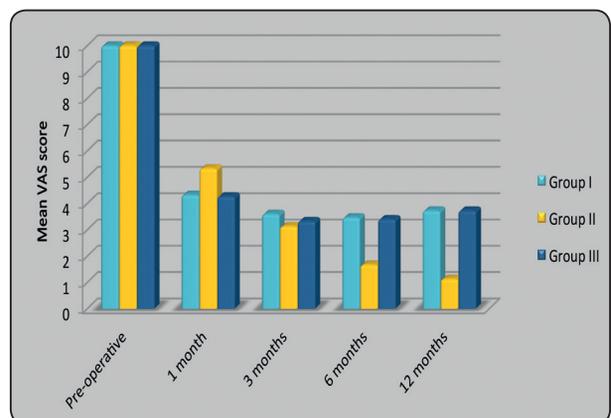


Fig. (12): Bar chart representing comparison between mean VAS scores in the three groups

Changes after treatment within each group

In Group I as well as Group III; there was a statistically significant decrease in VAS scores after 1 month as well as from 1 month to 3 months. There was no statistically significant change in mean VAS scores from 3 to 6 as well as from 6 months to 12 months. The mean VAS scores after 12 months showed statistically significantly lower mean score compared to pre-operative measurement.

While in Group II; there was a statistically significant decrease in mean VAS scores after 1 month, from 1 to 3 as well as from 3 to 6 months. There was no statistically significant change in mean VAS scores from 6 months to 12 months. The mean VAS scores after 12 months showed statistically significantly lower mean value compared to pre-operative measurement.

B. Deviation

Comparison between the three groups

Pre-operatively, all cases showed deviation.

After 1 month, there was a statistically significant difference between the three groups. Group II showed the highest prevalence of deviation followed by Group III while Group I showed the lowest prevalence of deviation.

After 3 months, there was no statistically significant difference between prevalence of deviation in the three groups.

After 6 months, there was a statistically significant difference between the three groups. Group III showed the highest prevalence of deviation followed by Group I while Group II showed no deviation.

After 12 months, there was a statistically significant difference between the three groups. Group I showed the highest prevalence of deviation followed by Group III while Group II showed no deviation.

Changes after treatment within each group

In Group I; there was a statistically significant change in prevalence of deviation by time. There was a decrease in prevalence of deviation after 1 month and no change from 1 month to 3 months. There was an increase in prevalence of deviation from 3 to 6 as well as from 6 months to 12 months.

In Group II; there was a statistically significant change in prevalence of deviation by time. There was a decrease in prevalence of deviation after 1 month, from 1 month to 3 months as well as from 3 months to 6 months. There was no deviation after 6 as well as 12 months.

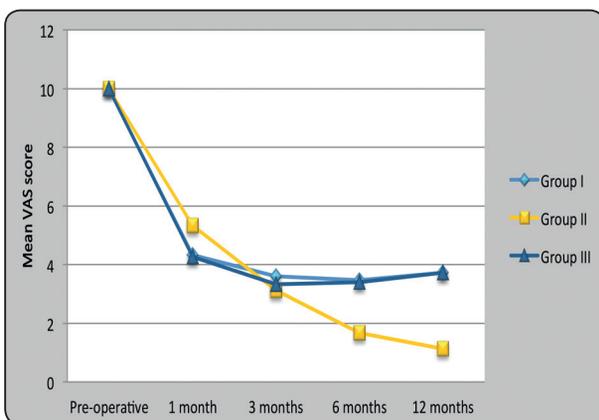


Fig. (13): Line chart representing comparison between mean VAS scores at different time periods in each group

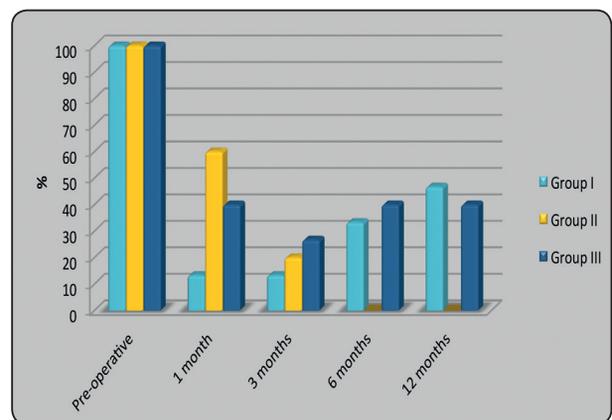


Fig. (12): Bar chart representing comparison between mean VAS scores in the three groups

In Group III; there was a statistically significant change in prevalence of deviation by time. There was a decrease in prevalence of deviation after 1 month as well as from 1 month to 3 months. There was an increase in prevalence of deviation from 3 to 6 months then no change in prevalence of deviation from 6 to 12 months.

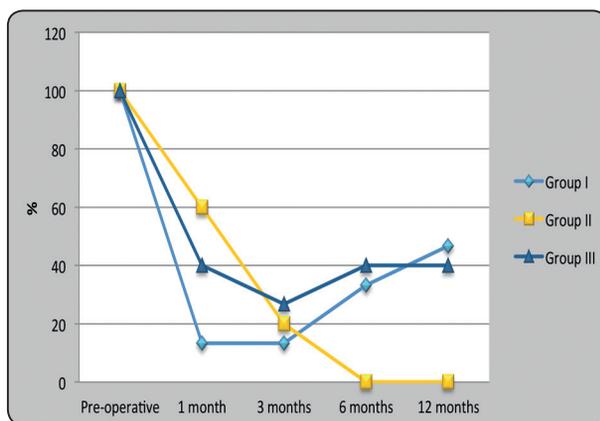


Fig. (15): Line chart representing prevalence of deviation at different follow up times

DISCUSSION

The most frequent complaint is pain and a decrease in the maximal interincisal opening (MIO), which normal values are between 35 - 50 mm. The following symptoms as pain at rest, during maximum mouth opening and chewing, tenderness to palpation of joint, sounds are clicking, crepitation, difficulty in opening the mouth, intermittent lock, closed lock, stiffness of joint in early morning are noticed. ⁽⁴⁾

Although the cause of most TMD remains idiopathic yet certain hypothesis have been proposed such as occlusal disharmony, a muscular cause, and intracapsular reasons. ^(28,29)

It is found that 28% of adult population have symptoms and clinical signs of Temporomandibular joint disorder. ^(30,31)

Inflammation mainly affects posterior disc attachment. ^(32,33) Several inflammatory mediators

play an important role in pathogenesis of TMJ disorders like tumor necrosis factor alpha (TNF-alpha), interleukin-1beta (IL-1 beta), prostaglandin E2 (PGE2), leukotriene B4 (LkB4), matrix metalloproteinases (MMPs), serotonin-5-hydroxytryptamine (5-HT). ^(30,34)

MMPs are the early marker or detector to determine temporomandibular joint arthritis. ⁽³⁵⁾

Serotonin is the mediator of pain and inflammation is produced in enterochromaffin cells of gastrointestinal mucosa and absorbed by platelets. It is also produced in synovial membrane and in synovial fluid which causes TMJ pain in cases of systemic inflammatory joint diseases. ^(30,34)

Platelet-rich plasma (PRP) has been used medicinally since the 1970s ⁽³⁵⁾ and is obtained from autologous blood because the platelet concentration in PRP is at least 5-fold greater than that in physiological blood. PRP is prepared by centrifuging autologous blood with anticoagulants, such as sodium citrate, which cause the blood to separate into 3 layers in the test tube: Platelet Poor Plasma (PPP), PRP and some red blood. ^(35,36)

The purpose of current study was designed to evaluate the clinical effect of intra-articular injections of platelet rich plasma for management of temporomandibular joint internal derangement through comparative study with dextrose prolotherapy.

In our study, in Group I as well as Group III; there was a statistically significant increase in MIO after 1 month. There was no statistically significant change in mean MIO from 1 to 3, 3 to 6 as well as from 6 months to 12 months. The mean MIO after 12 months showed statistically significantly higher mean value compared to pre-operative measurement.

This was in agreement with retrospective analysis of patients who received dextrose prolotherapy to their temporomandibular joints. Each

patient received four to six injections of a 15% dextrose, 0.2% lidocaine solution with a total of two to four cc's of solution used per temporomandibular joint. Typically, one cc of solution was injected into the joint and the remaining solution was injected onto the TMJ ligament and capsular attachments on the zygomatic arch and mandibular condyle and neck. Over 71% percent had retained at least 75% of the improvements and 91% noted that they retained at least 50% of their improvements in their pain, crunching, and stiffness levels since the last treatment session.⁽³⁷⁾

Ninety-three percent of patients reported that pain relief was at least 50% while 57% reported greater than 75% pain relief. Patients were asked to rate their range of motion on a scale of 1 to 7, with 1 being no motion, 2 through 5 were fractions of normal motion, 6 was normal motion, and 7 was excessive motion. The average starting range of motion was 4.3 and ending range of motion was 5.1. Before prolotherapy, 29% had very limited motion (49% or less of normal motion). This decreased to only 7% after treatments were concluded.⁽³⁷⁾

In our study pain intensity showed significant difference among each group, Pre-operatively, after 1 month as well as after 3 months; there was no statistically significant difference between VAS scores in the three groups.

After 6 as well as 12 months, there was no statistically significant difference between Group I and Group III; both showed the statistically significantly highest mean VAS scores. Group II showed the statistically significantly lowest mean VAS scores

In Group I as well as Group III; there was a statistically significant decrease in VAS scores after 1 month as well as from 1 month to 3 months. There was no statistically significant change in mean VAS scores from 3 to 6 as well as from 6 months to 12 months. The mean VAS scores after 12 months showed statistically significantly lower mean score compared to pre-operative measurement.

This was in agreement with a study done by **Alpalsan et al**(25) who conclude the increase in maximal mouth opening in the SH group may be explained by the lubricant effect of SH and the relief of pain. The lubricating effect of SH was highly effective in the first 3 months. SH either maintains lubrication and minimizes wear and tear mechanically, or plays a role in nutrition of the avascular parts of the disc and condylar cartilage.⁹ Intraarticular injection of either corticosteroid or SH has a significant long-term effect on chronic arthritis of the TMJ, and SH might be the best alternative due to the lower risk of side-effects.¹⁰ Bertolami et al¹¹ showed that a single intra-articular injection of SH offered clear and consistent benefit for at least 6 months, primarily in patients with disc displacement with reduction, and this was attributed to the mechanical effect of SH. The long-term lubricating effect of SH, which prevents the onset of inflammatory mediators that are responsible for pain.

HA injection plus arthrocentesis is more effective in achieving symptom management.⁽³⁸⁾

While in Group II; there was a statistically significant decrease in mean VAS scores after 1 month, from 1 to 3 as well as from 3 to 6 months. There was no statistically significant change in mean VAS scores from 6 months to 12 months. The mean VAS scores after 12 months showed statistically significantly lower mean value compared to pre-operative measurement.

This was in agreement with study done in 2015 by *Hanci et al*, on their clinical study on twenty patients (female: male; 15.5 age 26,3 +_ 9.3 years) for a total of 32 joints with reducible anterior disc displacement, as confirmed by Magnetic Resonance Imaging (MRI), were divided into two groups. PRP was used for the study group, and arthrocentesis was used for the control group. Pain intensity, maximal interincisal opening, and TMJ sounds were assessed and compared for evaluation of treatment success.

There was a statistically significant reduction in pain intensity and joint sound and an increase in mouth opening in the study group when compared with the control group. This study shows that intra-articular PRP injection for the treatment of reducible anterior disc displacement of the TMJ is more effective than arthrocentesis.⁽³⁹⁾

Also, *Pihut et al* in their study in 2014, compare the intensity of pain following intra-articular PRP injection which conclude that PRP injections has a positive impact on the reduction of the intensity of pain experienced by patients treated for temporomandibular joint dysfunction.⁽⁴⁰⁾

Although, in 2013 *Vadimir et al*, proved in his study that the use of Platelet-Rich-Plasma (PRP) may provide a new and improved treatment option for early Temporomandibular Joint (TMJ) Osteoarthritis (OA). This study compares 30 early onset OA patients divided equally into 3 groups who had experienced no pain reduction following conservative and minimally invasive arthrocentesis and arthroscopy treatment.⁽⁴¹⁾

All patients had retrodiscitis and synovitis on arthroscopic examination and were without systemic joint disease, septic, or autoimmune arthritis. Only patients with unilateral TMJ symptoms were included in this study. Pain intensity was recorded for each patient using a 0-10 VAS scale. Maximum Interincisal Opening (MIO) was also recorded. This assessment was performed at the pretreatment and then at an examination 3 months after administration of 2 intra-articular applications of autologous PRP (Group A), 2 intra-articular injections of Hyaluronic Acid (HA) (Group B), or commencement of conservative therapy only with soft diet and analgesics (Group C).⁽⁴¹⁾

The results after 3 months revealed that intra-articular injection of autologous PRP appeared to be an effective treatment method for patients with early OA in this study. At the 3-month follow-up, patients from group A improved their mouth opening

significantly. Majority of PRP patients (Group A) showed decreased pain. The average pain score before PRP administration was 7, while 3 months after PRP administration the pain score was 3.5. In conclusion, the use of PRP is an effective treatment option for early TMJ OA.⁽⁴¹⁾

Our study was in agreement with many researchers who studying PRP treatments highlight the high efficacy of this method of management of musculoarticular disorders and its safety due to the use of autologous material as well as the low costs of treatment.⁽⁴²⁻⁴⁸⁾

In our study, all cases showed deviation preoperatively.

However, after 1 month, there was a statistically significant difference between the three groups. Group II showed the highest prevalence of deviation followed by Group III while Group I showed the lowest prevalence of deviation.

After 3 months, there was no statistically significant difference between prevalence of deviation in the three groups.

After 6 months, there was a statistically significant difference between the three groups. Group III showed the highest prevalence of deviation followed by Group I while Group II showed no deviation.

After 12 months, there was a statistically significant difference between the three groups. Group I showed the highest prevalence of deviation followed by Group III while Group II showed no deviation.

In Group I; there was a statistically significant change in prevalence of deviation by time. There was a decrease in prevalence of deviation after 1 month and no change from 1 month to 3 months. There was an increase in prevalence of deviation from 3 to 6 as well as from 6 months to 12 months.

In Group II; there was a statistically significant change in prevalence of deviation by time. There

was a decrease in prevalence of deviation after 1 month, from 1 month to 3 months as well as from 3 months to 6 months. There was no deviation after 6 as well as 12 months.

In Group III; there was a statistically significant change in prevalence of deviation by time. There was a decrease in prevalence of deviation after 1 month as well as from 1 month to 3 months. There was an increase in prevalence of deviation from 3 to 6 months then no change in prevalence of deviation from 6 to 12 months,

CONCLUSION

Arthrocentesis followed by sodium hyaluronate and Prolotherapy is a successful technique to improve maximum inter-incisal opening as well as assisted interincisal opening and improved higher significant changes in pain intensity.

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