International Research Journal of Medicine and Surgery (IRJMedS), 2026; 3(1): 33-41 IRJMedS

Original Article | ISSN (O): 3048-6955 DOI: 10.47857/irjmeds.2026.v03i01.053

Arthrocentesis of Internal Derangement Pain with or Without Corticosteroids Outcomes

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Abstract

Arthrocentesis (AC) of the temporomandibular joint (TMJ), commonly referred to as joint lavage, is a minimally invasive procedure widely employed in the management of internal derangement (ID) associated pain. This study aimed to evaluate the effectiveness of AC with and without intra-articular corticosteroid injection in alleviating ID-related symptoms. A total of 20 patients diagnosed with TMJ internal derangement were randomly allocated into two Groups of ten each. In both Groups, AC of the upper joint space was performed under local anaesthesia using Ringer's lactate solution. Group 1 additionally received a single intra-articular injection of triamcinolone acetonide (40 mg), while Group 2 underwent lavage alone. Clinical assessments were conducted at baseline (T0), 7 days (T1), 1 month, and 3 months (T2) post-procedure, evaluating pain severity using the Visual Analogue Scale (VAS), maximum mouth opening (MMO), mandibular deviation, and joint sounds. Variables such as age, sex, and skeletal maxillomandibular relationship showed no significant differences between Groups. Although no statistically significant changes were observed regarding joint clicking and deviation, a significant reduction in pain intensity was noted between the two Groups across follow-up intervals ($P < 0.05$). Arthrocentesis proved effective in short-term symptom relief; however, the addition of corticosteroids demonstrated earlier and superior pain reduction outcomes, supporting its enhanced therapeutic benefit in TMJ internal derangement management.

Keywords: Arthrocentesis (AC), Corticosteroids, Deviation of jaw and maximal mouth opening (MMO), Internal Derangement (ID), Pain, Ringer lactate (RL) solution, Temporomandibular joint (TMJ).

Introduction

In patients presenting with internal derangement (ID) of the temporomandibular joint (TMJ), arthrocentesis (AC) has emerged as a widely accepted minimally invasive therapeutic option and is commonly described as lavage of the joint. Arthrocentesis involves irrigation of the upper joint space to eliminate inflammatory mediators, release adhesions, and restore joint mobility. Numerous studies have established AC as a simple, relatively non-invasive, and cost-effective procedure with a low incidence of complications when used as a first-line treatment for both acute and chronic closed lock conditions of the TMJ (1–3). Owing to its simplicity and favourable risk profile, AC has increasingly been preferred over more invasive surgical interventions in the initial management of TMJ internal derangements.

The therapeutic efficacy of arthrocentesis is attributed primarily to its mechanical and biochemical effects. Mechanical lysis of adhesions between the articular disc, fossa, and eminence allows for improved disc mobility and reduction of joint stiffness. Simultaneously, lavage of the joint helps remove inflammatory mediators, degraded cartilage fragments, and pain-inducing substances such as prostaglandins and cytokines. These mechanisms collectively contribute to the reduction of pain, improvement in mandibular function, and enhancement of maximum mouth opening. Several investigators have reported that AC significantly improves TMJ functionality, decreases joint noises such as clicking or crepitus, and alleviates pain associated with internal derangement (4).

Arthrocentesis is most commonly indicated in patients with anterior disc displacement without reduction, commonly referred to as closed lock, as well as in cases involving disc adhesion. In addition to these indications, AC has also been employed as a palliative treatment modality for acute inflamma-

(Received 21st November 2025; Accepted 29th January 2026; Published 28th February 2026)

tory exacerbations associated with degenerative joint disease and rheumatoid arthritis affecting the TMJ (5, 6). In such cases, AC serves not only to relieve pain but also to improve joint mobility and patient quality of life.

Over the years, several techniques and modifications of TMJ lysis and lavage have been proposed. These techniques vary with respect to needle placement, volume of irrigating solution, pressure applied during lavage, and the adjunctive use of pharmacologic agents. Various irrigating solutions have been used in TMJ lavage procedures, including Ringer's lactate solution and normal saline, either alone or in combination with other therapeutic agents (7–9). Among adjunctive substances, sodium hyaluronate has been widely studied for its lubricating and viscoelastic properties, which may enhance joint function and reduce friction within the articular surfaces (10).

In addition to hyaluronic acid, the intra-articular administration of corticosteroids following arthrocentesis has gained attention among researchers. Corticosteroids are known for their potent anti-inflammatory effects and their ability to suppress synovitis, decrease capillary permeability, and inhibit the production of inflammatory mediators. Several authors have proposed the injection of corticosteroids at the conclusion of the lavage procedure as a means of reducing inflammation within the joint capsule and prolonging the therapeutic effects of arthrocentesis (11, 12). Triamcinolone acetonide, in particular, has been commonly used due to its prolonged duration of action and favourable safety profile when administered intra-particularly.

Despite the growing acceptance of arthrocentesis, the prognosis and long-term consistency of this procedure remain subjects of debate. Some studies have suggested that arthroscopic surgery should always be considered when conservative measures fail, citing superior visualization and direct surgical intervention as advantages (13). However, other investigators have demonstrated that AC provides strong and consistent outcomes comparable to arthroscopic techniques, while avoiding the increased morbidity, technical complexity, and cost associated with more invasive TMJ surgeries (14–16). These findings support the use of arthrocentesis as an effective intermediate treatment option between conservative therapy and open surgical intervention.

Given the variability in reported outcomes and the ongoing debate regarding the optimal use of adjunctive pharmacologic agents, further investigation into the effectiveness of arthrocentesis alone versus arthrocentesis combined with corticosteroid injection is warranted. Therefore, the aim of the present study was to evaluate the relative effectiveness of arthrocentesis in reducing pain associated with TMJ internal derangement and to assess the additional therapeutic benefit of intra-articular corticosteroid administration following arthrocentesis.

Methodology

The research was conducted in a period of over two years in the department of oral and maxillofacial surgery whereby the subjects were enrolled in the outpatient department. The medical ethics committee of the institution consented to the study. The selection criteria of patients included previous medical history and clinical manifestations of idiopathic disorder (ID) including clicking and pain in the joints over more than six months either on one side or both sides of the joints. Individuals who did not record any improvement in symptoms following the initial conservative therapy, which included nonsteroidal anti-inflammatory drugs, muscle relaxants, splint therapy, and physical therapy, were also included. The exclusion criteria were maxillofacial fractures, psychological, and systemic bone/joint diseases and orthognathic surgery. Twenty volunteers were randomly divided into two Groups, Group 1 which was given arthrocentesis (AC) Ringer solution plus dexamethasone, Group 2 was given AC Ringer solution. The participants were not informed that Group 1 used corticosteroids.

We conducted a preoperative clinical assessment of the temporomandibular joint (TMJ) problems, including pain, deviation of the jaw, opening of the mouth and noises in the joints. Visual Analogue Scale (VAS) was used to measure pain on a scale of 0 to 10. The participants were asked that VAS of 0-3 represented no or slightly experienced pain, 4-6 was mild to moderate pain that did not affect daily operations, and 8-10 was severe pain that interfered with functioning. In bilateral interventions, the mean amount of pain in both sites was stated.

The measuring device was used to measure the interincisal distance at its maximum in millimeters. All the parameters were measured during preoperational period (T0), 7 days after AC (T1) and 3 months after AC (T3).

We felt the TMJ and listened to the sounds using a stethoscope. TMJ sounds were categorized as below:

Reciprocal click: the opening and closing are noisy due to central occlusion,

Clicking opening: sound on each opening,

Closing click: noise with every closing,

Crepitus: sound in opening or closing.

The variables of the study were age, gender, and skeletal relationships. Predictive factors were lavage materials (the solution by Ringer with or without corticosteroid). The measures of outcomes included presence or absence of temporomandibular disorder (TMD) signs, which included clicking, pain, and maximum opening of the mouth (MMO).

Arthrocentesis was performed in the superior joint space using Ringer lactate solution. Lavage using the single-needle technique is demonstrated in Figure 1**.** The needle insertion and lavage procedure are shown in Figure 2**.** Irrigation using the double-needle technique is illustrated in Figure 3**,** and the intra-articular administration of triamcinolone acetonide after completion of lavage is shown in Figure 4**.**

Figure 1: Lavage of TMJ joint with Ringer Lactate Solution (Single Needle Technique)

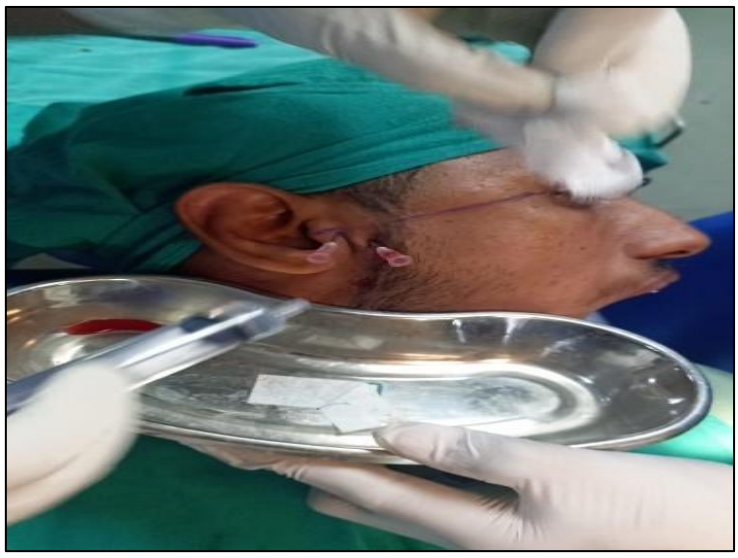

Figure 2: Needle Inserted for Lavage, Lavage of Joint

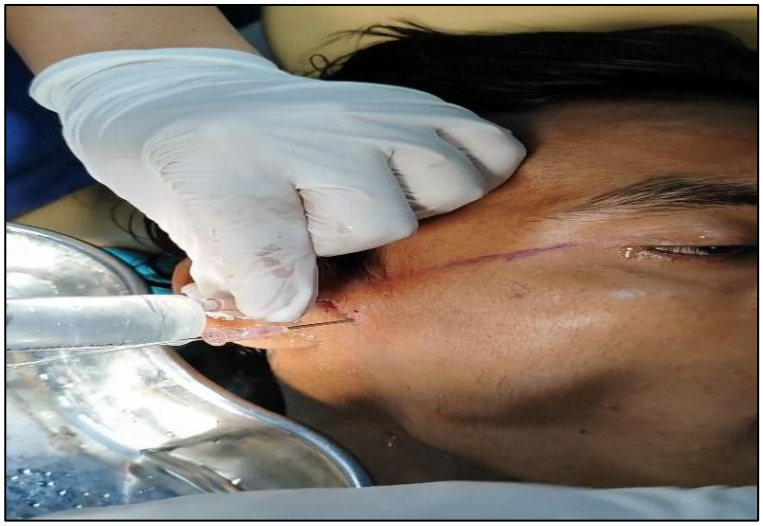

Figure 3: Irrigation of the joint with double needle technique

Figure 4: Triamcinolone acetonide injection

AC Technique

The applied AC was done either on the affected joints unilaterally (and bilaterally) according to the complaint and the doctor (assessment). By following aseptic precautions, the patient was placed at 45 degrees and AC was applied to the superior joint space. The McCain method was used in the marking of the skin where the needles had been inserted.17 A line was drawn on the centre of the tragus through to the outside canthus. This canthotragal line was used to mark the entry points. The first point was at the glenoid fossa 10 mm below the midtragus and 2 mm below the line. The second point, which was an articular eminence, was made 10 mm below the line and 10 mm away the first point. The articular branch of the auriculotemporal nerve was anaesthetised with 1-2 mL of 2% Lignocaine. The mandible was left in the protruded position as patients were asked to open their mouths as wide as possible.

Then, a 18-gauge needle was inserted at the first point in the first Group of patients and 2 mL of saline was injected with the help of this needle to open the joint space. In the second site, a second 18-gauge needle was introduced so as to develop a free flow of the solution out through the area of the joint. A syringe that had Ringer solution was then forced by the use of the first needle to the superior joint space and the other needle was the saline outflow. The lavage solution in Group 1 was 200-mL, and the needles were extracted; the triamcinolone acetonide 40 mg was applied to the patients after the lavage was completed. The

choice of 40 mg intra-articular triamcinolone acetonide was based on its established use as a standard single-dose intra-articular corticosteroid for synovial joint inflammation, including the TMJ, where the goal is to achieve maximum local anti-inflammatory action with minimal systemic exposure.

For the statistical analysis IBM SPSS Statistics 21 is used.

Results

In Group 1 [7 males, 3 females] ten subjects and in Group 2 [5 males, 5 females] ten subjects were studied. All subjects were followed after post-AC evaluation periods. In Group 1, there were 6 subjects in the class I skeletal, 3 subjects in the class II skeletal, and 1 subject in the class III skeletal. Group 2 consisted of 5 subjects were class I skeletal, 3 subjects were class II skeletal and 2 subjects were class III skeletal.

Table 1: Comparison of Clicking sound Between the 2 Groups in 3 Evaluation Times

Time	Group 1 with Dexamethasone	Group 2 without Dexamethasone	Fisher Exact Test, P
7th Day	8 with click, 2 without click	9 with click, 1 without click	0.500
1 month	6 with click, 4 without click	6 with click, 4 without click	0.675
3 months	2 with click, 8 without click	5 with click, 5 without click	0.175

At baseline, both Group 1 and Group 2 had 10 subjects with hada click in TMJ (unilaterally or bilaterally) prior to AC. On the 7th day, 8 subjects in Group 1 and 9 subjects in Group 2. Another month later, 6 subjects received a click in Group1 (unilaterally or bilaterally), and 6 subjects received a click in Group 2. The results indicated that, 2 subjects of Group 1 and 5 subjects of Group 2 had a clicking sound after 3 months. Data analysis did not show any statistical difference of the 2 Groups in terms of click in the varying evaluation times [P > 0.05] as shown in Table 1.

Table 2: Comparison of MMO Between the 2 Groups in 4 Evaluation Times

Time	Group 1 with Dexamethasone		Group 2 without Dexamethasone		t- test, p value
	Mean	SD	Mean	SD	
Baseline	26.000	1.4907	25.200	1.2293	0.207
7th Day	26.900	1.5239	26.200	1.2293	0.273
1 month	28.200	1.5492	26.900	1.2867	0.056
3 months	29.900	2.7669	28.500	1.1785	0.010

At baseline, the mean (SD) MMO in the Group 1 was 26 [1.49] mm and in Group 2 was 25.2 [1.22] mm, the mean (SD) MMO at the 7th day was 26.9 [1.52] mm and 26.2 [1.22] mm respectively, in the two-evaluation time the results were not significant [P > 0.05]. The mean (SD) MMO was28.2 [1.54] mm in Group 1 and 26.9 [1.28] mm in Group 2 at one months, after 3 months the data assessment shows that there was statistically difference between the Groups in the MMO after one and three months [P < 0.05] as shown in Table 2.

Table 3: Comparison of Deviation Between the 2 Groups in different Evaluation Times

Time	Group 1 with Dexamethasone	Group 2 without Dexamethasone	Fisher Exact Test, P
Baseline	8 with deviation, 2 without deviation	10 with deviation	0.237
7th Day	7 with deviation, 3 without deviation	9 with deviation, 1 without deviation	0.582
1 month	4 with deviation, 6 without deviation	5 with deviation, 5 without deviation	0.500
3 months	2 with deviation, 8 without deviation	5 with deviation, 5 without deviation	0.350

In Group one, 8 subjects and Group 2 had 10 subjects. On 7th day, 7 and 9 subjects of Group 1 and 2 respectively. A month later, Group 1 had 4 subjects and Group 2 had 5 subjects to deviate. The findings revealed that in Group 1 and 5 respectively, 2 and 5 subjects respectively deviated after 3 months. The data analysis did not indicate the statistical differences in click between the 2 Groups in various evaluation times [P > 0.05] as shown in Table 3.

Table 4: Comparison of Pain Between the 2 Groups in 4 Evaluation Times

Time	Group 1 with Dexamethasone		Group 2 without Dexamethasone		t- test, p value
	Mean	SD	Mean	SD	
Baseline	7.500	0.9718	6.700	0.6749	0.210
7th Day	4.700	1.4944	4.000	0.8165	0.017
1 month	2.700	1.7670	2.800	0.7888	0.020
3 months	0.200	0.4216	1.200	1.0328	0.012

The baseline levels of the mean (SD) of the pain were 7.5 [0.97] in Group 1 and 6.7 [0.67] in Group 2. The mean (SD) of severity of pain 4.7 [1.49] in Group 1, 4.0 [0.81] in Group 2, 2.7 [1.76] in Group 1 and 2.8 [1.03] in Group 2 respectively after 7th day and after 1 month. The 7th day, one month and 3 months comparing the pain levels of the 2 Groups reveal statistically significant differences [$P < 0.05$] as shown in Table 4.

Discussion

All the disorders that affect the capacity to chew food are covered under the umbrella term of temporary mandibular joint disorder (17-18). It is always a therapeutic dilemma. It has already been proved that the AC is a helpful treatment method of the patients who have clinical results which confirm the diagnosis of inner TMJ dysfunction. Intra-articular dislocation is possible in ID and is accompanied by popping and clicking. Its main cause is chronic parafunction or degenerative alterations of the articular surfaces, augmentation of friction, and progressive displacement of the disc, or the injury, which results in an instantaneous disc displacement. The research indicates that nearly a quarter of the entire population is affected by TMJ dysfunction; nonsurgical methods of treatment, such as the use of medication, physical therapy, and the use of occlusal splints in the initial stages have also been commonly used (19, 20). In one of the reviews papers the overall success rate of AC was 83.5% (21). 96% percent pain reduction has been achieved with the use of AC as reported by Neeli et al. The authors proposed that the cause of the reduction in the pain was the high-pressure irrigation which eliminates the inflammatory mediators and reduces pain. Thus, although the morbidity rate of AC is low, it can be argued that it is an easy, non-invasive, inexpensive, and very effective treatment. TMJ AC is now applied to other forms of temporomandibular issues as well as acute closed lock cases. Therefore, an acute anterior movement of the articular disc and disc adhesions (stuck disc) and neither reduction nor hypomobility of the joint are the main manifestations. TMJ irrigation in the case of acute problems and in patients with a history of temporary problems has yielded excellent treatment outcomes (22, 23). The experiment conducted by researchers showed that AC achieved quicker rate of treating patients with pain and functional impairment in comparison to conservative treatment (24). In two treatment Groups, our study established that pain had reduced one month and immediately after AC. The two Groups experienced a reduction in the severity of the pain with statistically significant difference whereby the increases or reduction of the pain were greater in Group 1 than in Group 2. The intense pressure that was applied in our research can have minimized the level of discomfort since inflammatory mediators are eliminated. There is controversy regarding the long-term effects of AC. As per some theories, the early management of TMD pain is better as compared to late management of TMD (25). According to the outcome of the treatment that involves reduction of pain, it emerges that AC is ineffective in treating patients with persistent TMJ pain.(22) The effect of high pressure of corticosteroid has an anti-inflammatory effect on synovial tissue and it is known to reduce pain and lower the viscosity of synovial fluid as well as reduce the level of discomfort, reduce effusion, and increases the range of motion of the synovial joints. The palliative effect of intraarticular dexamethasone on AC symptomatic effects and clinical manifestations has been a topic of debate (26). The findings on the use of intraarticular dexamethasone after AC differ in a randomized blind study of 72 subjects. The impact of AC on the symptoms and the clinical manifestation of TMJ arthralgia was not the same in one of the recent clinical studies. (27). The corticosteroids were discovered to do better in treating pain and

clicking sound. Other studies also supported our study indicating that corticosteroids were effective in the treatment of the TMJ in patients with rheumatoid arthritis (28, 29). A study by another research found that intra-articular injection of sodium hyaluronate or corticosteroids did not help in any of the patients who had TMJ pain (30). Subsequently, betamethasone and sodium hyaluronate are possible to administer at the same time with identical effect (26). It is also well known that inflammatory mediators play their part in TMJ pain. The elevation of these mediators in synovial fluid was seen in TMD animal model (31).

Researchers tested the influences of intra-articular and intraperitoneal injection of dexamethasone on TMJ trauma caused synovitis in rats. Although the rats were given a single injection of intra-articular dexamethasone, the condylar heads of those rats had resorption with high osteoclastic activity (32). This may be a warning of one or more severe negative outcomes following a local dexamethasone injection. They need longer follow-up after the treatment because the short time taken to follow up the investigation hinders the generalization of the findings. The location of the disc in the study was also restricted since the subjects were not assessed through magnetic resonance imaging. Accessibility and financial issues were some of the factors that hindered the use of magnetic resonance imaging in the analyzed country.

The absence of major postoperative complications in both Groups supports the clinical safety of arthrocentesis as a minimally invasive procedure. However, larger studies with longer follow-up are needed to evaluate rare adverse events and the long-term effects of intra-articular corticosteroid administration.

In medically compromised patients and especially in the case of abnormally disabled patient we have performed arthrocentesis with less invasive alternative and reduced chances of complications. The Inter maxillary fixation may not be the optimal choice over AC technique. What presents reduction of pain and mouthopening.so AC can be other technique in such kind of patients.

No significant difference was found in relation with and clicking sound and deviation in our study, however, significant reduction in pain and increase in MMO was observed.

Conclusions

Arthrocentesis is a reliable and minimally invasive therapeutic approach for the short-term management of temporomandibular joint (TMJ) internal derangement, producing meaningful reductions in pain and significant improvements in mandibular function, particularly with respect to maximum mouth opening.

Key Contributions of the Present Study

The present findings demonstrate that the adjunctive administration of intra-articular corticosteroid following joint lavage yields superior clinical outcomes compared with arthrocentesis alone. Patients receiving corticosteroid injections experienced greater early postoperative pain relief and more pronounced functional recovery, suggesting that corticosteroids may enhance the therapeutic effects of arthrocentesis through their anti-inflammatory properties.

Clinical Implications and Consequences

These results support the potential value of incorporating corticosteroids as an adjunctive treatment to optimize short-term symptom control in patients with TMJ internal derangement. Improved pain reduction and functional gains may contribute to faster recovery, enhanced patient comfort, and reduced reliance on additional pharmacologic or surgical interventions during the early healing phase.

Study Limitations

Despite these promising outcomes, the findings must be interpreted cautiously. The relatively small sample size and the limited follow-up period of three months restrict the generalizability of the results and prevent conclusions regarding long-term efficacy, recurrence rates, and potential adverse effects associated with repeated corticosteroid use.

Future Research Directions

Further research is warranted to substantiate these preliminary observations. Large-scale randomized controlled trials with extended follow-up periods are essential to assess long-term outcomes, safety profiles, and optimal dosing protocols. Such investigations will be critical in establishing evidence-based clinical guidelines for the routine use of corticosteroids as an adjunct to TMJ arthrocentesis.

Abbreviations

AC: Arthrocentesis, ID: Internal Derangement, MMO: Maximum Mouth Opening, RL: Ringer Lactate, TMD: Temporomandibular Disorders TMJ: Temporomandibular Joint, VAS: Visual Analogue Scale.

Acknowledgement

We would like to acknowledge the contributions of the staff at the Department of Oral and Maxillofacial Surgery for their assistance and support throughout the execution of this clinical study. Special thanks to all the patients who participated in this study for their cooperation and consent, which contributed significantly to the understanding and management of temporomandibular joint internal derangement pain.

Author Contributions

Manisha Solanki: Conceptualization, writing of the manuscript, Harish Vaishnav: Surgical procedure execution, supervision, writing of the manuscript, Vinod Mehra: Literature review, data analysis, writing of the manuscript, Abhishek Kumar: Clinical assessment, patient follow-up, manuscript support, Shweta Nehe: Case documentation, patient data collection, review of the manuscript, Azaram Khan: Critical review, manuscript editing and final approval.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

Declaration of Artificial Intelligence (AI) Assistance

The authors confirm that the research, writing, and analysis were conducted by the listed authors. AI assistance was not involved in any part of the writing or review process.

Ethics Approval

The study was conducted in accordance with institutional ethical guidelines. Ethical clearance was obtained from the Institutional Ethical Committee prior to commencement of the study. All clinical procedures were performed as part of standard patient care and no experimental interventions were performed.

Informed Consent: Informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this article.

Funding

This research was not funded by any external sources.

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How to Cite: Solanki M, Vaishnav H, Mehra V, Kumar A, Nehe S, Khan A. Arthrocentesis of Internal Derangement Pain with or Without Corticosteroids Outcomes. Int Res J Med Surg. 2026; 3(1): 33-41. DOI: 10.47857/irjmeds.2026.v03i01.053