e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(2); 1516-1521

Original Research Article

# Can Platelet Rich Plasma Injection Outperform Hydrodissection in Adhesive Capsulitis of the Shoulder? A Comparative Clinical Evaluation

**Alok Prusty[1], Chekuri Jeetendra[2], Prajnadipta Rout[3]**

[1]Assistant Professor, Department of Orthopaedics, IMS and SUM Hospital, Phulnakhara, Bhubaneswar, Odisha, India

[2]Assistant Professor, Department of Orthopaedics, IMS & SUM 2 Hospital, Phulnakhara, Bhubaneswar, Odisha, India

[3]Assistant Professor, Department of Orthopaedics, IMS & SUM 2 Hospital, Phulnakhara, Bhubaneswar, Odisha, India

**Received: 24-12-2025 / Revised: 23-01-2026 / Accepted: 25-02-2026**

**Corresponding Author: Alok Prusty**

**Conflict of interest: Nil**

**Abstract:**

**Background:** Adhesive capsulitis of the shoulder is a chronic, progressive condition characterized by pain and global restriction of shoulder movements, significantly affecting daily activities and quality of life. Various treatment modalities are available, including hydrodissection and biological therapies such as autologous platelet-rich plasma (PRP). This study aimed to compare the efficacy and functional outcomes of PRP injection versus hydrodissection in patients with adhesive capsulitis.

**Methods:** A prospective cohort study was conducted over two years at IMS and SUM Hospital, Phulnakhara. A total of 200 patients were screened, of whom 165 met the eligibility criteria and were enrolled. Participants were allocated into two groups: Group A received intra-articular PRP injection and Group B underwent hydrodissection. Pain and functional outcomes were assessed using the Visual Analog Scale (VAS) and Disabilities of the Arm, Shoulder and Hand (DASH) score at baseline, 1 month, 6 months, and 12 months. Statistical significance was determined using p-values ($<0.05$ considered significant).

**Results:** Baseline demographic characteristics were comparable between the groups. Both interventions resulted in clinical improvement; however, the PRP group demonstrated significantly greater reduction in VAS scores at 1, 6, and 12 months ($p < 0.001$). DASH scores also showed statistically significant improvement in the PRP group at 6 months ($p = 0.005$) and 12 months ($p = 0.01$) compared to hydrodissection. These findings indicate superior pain relief and functional recovery with PRP therapy.

**Conclusion:** Autologous PRP injection is more effective than hydrodissection in reducing pain and improving functional outcomes in adhesive capsulitis of the shoulder, making it a promising biological treatment option.

**Keywords:** Adhesive capsulitis, Frozen shoulder, Platelet-rich plasma, Hydrodissection, VAS score, DASH score, Shoulder stiffness.

**DOI:** 10.25258/ijcpr.18.2.251



## Introduction

Adhesive capsulitis of the shoulder, commonly referred to as frozen shoulder or periarthritis of the shoulder, is an idiopathic, progressively evolving, and chronic inflammatory disorder of the glenohumeral joint. It is characterized by excessive adhesion formation and capsular thickening within the joint, leading to persistent shoulder pain, progressive stiffness, and marked restriction of both active and passive movements [1]. The condition typically follows a self-limiting but prolonged course, often described in freezing, frozen, and thawing stages. The painful limitation of movement significantly interferes with activities of daily living such as dressing, grooming, and overhead activities, thereby adversely affecting functional independence and overall quality of life.

The incidence of adhesive capsulitis is estimated to be approximately 3–5% in the general population, with a markedly higher prevalence of nearly 20% among individuals with diabetes mellitus [2]. It is most commonly observed in individuals between 40 and 60 years of age and has a slight female predominance. Several systemic conditions, including thyroid disorders, prolonged immobilization, and previous shoulder trauma or surgery, have been associated with an increased risk of developing adhesive capsulitis. Despite these associations, the exact etiology remains

incompletely understood, and the condition is frequently classified as either primary (idiopathic) or secondary to identifiable causes.

Histopathological evaluation of the contracted joint capsule reveals synovial inflammation and significant capsular fibrosis. There is proliferation of fibroblasts with increased deposition of type I and type III collagen within the capsule, resulting in thickening and loss of elasticity [3,4]. The transformation of fibroblasts into myofibroblasts, coupled with altered matrix metalloproteinase activity, further contributes to progressive fibrosis, capsular contracture, and reduced joint volume [5]. These structural and biochemical alterations ultimately restrict glenohumeral joint mobility and perpetuate pain and stiffness.

Management strategies for adhesive capsulitis range from conservative non-operative measures to surgical intervention. Initial treatment typically includes analgesics, nonsteroidal anti-inflammatory drugs, physiotherapy, and intra-articular injections aimed at pain relief and restoration of range of motion. In refractory cases, procedures such as manipulation under anesthesia or arthroscopic capsular release may be considered. Among emerging minimally invasive modalities, autologous platelet-rich plasma injection and hydrodissection have gained attention for their potential to reduce inflammation, modulate fibrosis, and improve functional outcomes. The present study aims to evaluate and compare the efficacy and functional outcomes of autologous platelet-rich plasma injection and hydrodissection in patients with adhesive capsulitis of the shoulder.

## Materials and methods

**Study Design and Setting:** This prospective cohort study was conducted at IMS and SUM Hospital, Phulnakhara, a tertiary care hospital, over a study period of two year March 2023 to March 2025. A total of 200 patients presenting with symptoms suggestive of adhesive capsulitis of the shoulder were initially screened. After applying the inclusion and exclusion criteria, 165 patients satisfied the eligibility criteria and were enrolled in the study. All 165 participants formed the final study population.

**Group Allocation:** The 165 enrolled patients were allocated into two treatment groups. Group A received autologous platelet-rich plasma (PRP) injection, and Group B underwent hydrodissection of the shoulder joint as per the study protocol.

**Inclusion Criteria:** Patients with painful and restricted shoulder movements not relieved by conservative management for at least one month, individuals with a confirmed diagnosis of adhesive capsulitis, patients willing to undergo PRP injection or hydrodissection as per protocol, and those compliant with regular outpatient follow-up were included in the study.

**Exclusion Criteria:** Exclusion criteria included hemoglobin levels <10 g/dL, platelet count $<10^5/\mu L$, corticosteroid injection at the treatment site within the preceding one month, presence of local infection at the procedure site, HIV infection, Hepatitis B or C, septicemia, other systemic illnesses, and refusal to undergo the proposed interventions.

**Pre-procedural Assessment:** Institutional Ethics Committee approval was obtained prior to commencement of the study, and written informed consent was secured from all participants. Detailed clinical evaluation was performed to exclude other causes of painful shoulder stiffness. Baseline investigations included complete hemogram, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), renal function tests, random blood glucose, serological testing for HIV 1 and 2 and HBsAg, along with radiographic evaluation of the affected shoulder joint.

### Preparation of PRP

Autologous platelet-rich plasma (PRP) was prepared under strict aseptic precautions using a standardized double-centrifugation technique. Approximately 20 mL of venous blood was drawn from each participant into sterile tubes containing acid citrate dextrose as an anticoagulant. The first centrifugation (soft spin) was performed to separate red blood cells from plasma, followed by a second centrifugation (hard spin) to concentrate the platelets. The upper platelet-poor plasma was discarded, and the lower fraction containing concentrated platelets was collected to obtain approximately 3 mL of PRP. The final PRP preparation was gently mixed to ensure uniform platelet suspension and was used immediately for intra-articular injection under fluoroscopic guidance.

**Intervention Procedure:** In both groups, the shoulder joint was approached posteriorly, 1 cm inferior to the tip of the acromion under strict aseptic precautions and fluoroscopic guidance. Patients in Group A received a single intra-articular injection of 3 mL autologous PRP. Patients in Group B underwent hydrodissection using a mixture of 20 mL normal saline and 5 mL lignocaine. Gentle shoulder mobilization was performed 10 minutes after the procedure in both groups. A structured home-based shoulder strengthening program was advised.

**Post-procedural Care and Follow-up:** Weight-bearing activities were restricted for a minimum of two weeks. Pain management was provided with paracetamol, and a cuff-and-collar sling was advised during the immediate post-procedural period. Follow-up assessments for pain and range of motion were conducted using the Visual Analog Scale

(VAS) and Disabilities of the Arm, Shoulder and Hand (DASH) score at baseline (day 0), and at the end of the 1st, 6th, and 12th months post-procedure.

**Statistical Analysis:** Descriptive statistics were expressed in terms of percentages (%) for categorical variables and proportions of patients in each group. Comparative analysis between the two groups was performed, and statistical significance was determined using p-values. A p-value of <0.05 was considered statistically significant.

## Results

A total of 165 patients were included in the study, with 83 patients in Group A (PRP group) and 82 patients in Group B (hydrodissection group). The gender distribution between the two groups was comparable and did not show a statistically significant difference (p = 0.41). The mean age in Group A was 52.10 ± 10.20 years, whereas Group B had a significantly higher mean age of 57.30 ± 10.10 years (p = 0.01), indicating a statistically significant difference in age distribution between the groups (Table 1).

**Table 1: Patient Demographic Characteristics (n = 165)**

| Variables | Group A (n=83) | Group B (n=82) | p-value |
|---|---|---|---|
| **Sex** | | | 0.41 |
| Male | 48 (57.8%) | 52 (63.4%) | |
| Female | 35 (42.2%) | 30 (36.6%) | |
| **Age (years)** | | | 0.01 |
| Mean ± SD | 52.10 ± 10.20 | 57.30 ± 10.10 | |
| Range | 36–74 | 39–78 | |

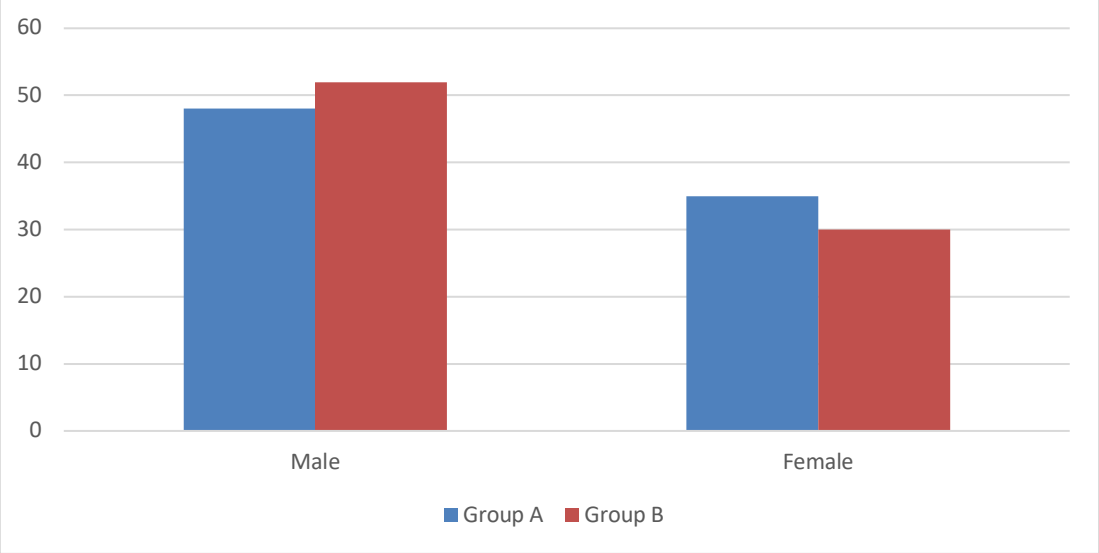


**Figure 1: Characteristics of study population.**

At baseline, both groups had comparable VAS and DASH scores, with no statistically significant differences (VAS: p = 0.06; DASH: p = 0.83). At the 1-month follow-up, a statistically significant difference was observed in VAS scores (p < 0.001), while DASH scores remained statistically comparable (p = 0.26). At the 6-month and 12-month follow-ups, both VAS and DASH scores showed statistically significant differences between the groups (VAS: p < 0.001 at both intervals; DASH: p = 0.005 at 6 months and p = 0.01 at 12 months), demonstrating sustained improvement in pain and functional outcomes over time (Table 2).

Within-group analysis demonstrated a progressive and statistically significant reduction in VAS scores over the follow-up period in both groups. In Group A (PRP), mean VAS scores decreased from 8.95 ± 0.60 pre-procedure to 2.10 ± 1.30 at 12 months, indicating substantial long-term pain relief. In Group B (hydrodissection), VAS scores initially showed marked improvement at 1 month (4.50 ± 1.30) but increased at 6 months (6.05 ± 1.40) before declining again at 12 months (3.95 ± 1.90), suggesting comparatively variable pain control over time.

Similarly, DASH scores in both groups demonstrated consistent functional improvement from baseline to 12 months. Group A showed a steady decline in mean DASH scores from 78.00 ± 5.10 pre-procedure to 30.10 ± 4.60 at 12 months, reflecting marked enhancement in shoulder function and daily activity performance. Group B also exhibited improvement, with scores decreasing from 78.20 ± 5.00 to 32.30 ± 3.70 at 12 months; however,

the magnitude of improvement was comparatively less than that observed in the PRP group at later follow-ups. These findings suggest that while both interventions are effective, PRP injection demonstrated more sustained and consistent long-term benefits in terms of pain reduction and functional recovery.

**Table 2: Comparison of VAS and DASH Scores Between Groups (n = 165)**

| Follow-up | Group A (n=83) Mean ± SD | Group B (n=82) Mean ± SD | p-value |
|---|---|---|---|
| **VAS Score** | | | |
| Pre-procedure | 8.95 ± 0.60 | 9.20 ± 0.40 | 0.06 |
| 1st Month | 7.00 ± 1.10 | 4.50 ± 1.30 | <0.001 |
| 6th Month | 3.90 ± 1.90 | 6.05 ± 1.40 | <0.001 |
| 12th Month | 2.10 ± 1.30 | 3.95 ± 1.90 | <0.001 |
| **DASH Score** | | | |
| Pre-procedure | 78.00 ± 5.10 | 78.20 ± 5.00 | 0.83 |
| 1st Month | 63.80 ± 4.20 | 65.50 ± 7.10 | 0.26 |
| 6th Month | 45.30 ± 6.60 | 48.70 ± 4.50 | 0.005 |
| 12th Month | 30.10 ± 4.60 | 32.30 ± 3.70 | 0.01 |

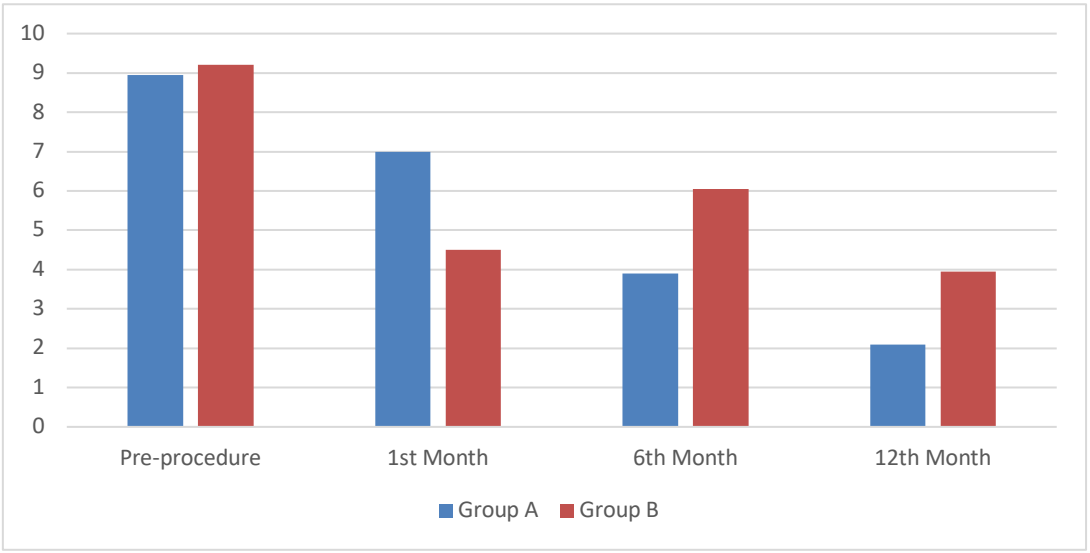


**Figure 2: Comparison of VAS scores across the two groups**

A consolidated analysis of overall treatment outcomes demonstrated that both groups showed significant improvement in pain and functional status over the 12-month follow-up period. However, Group A (PRP) exhibited greater mean reduction in VAS scores (6.85 points) compared to Group B (5.25 points), indicating superior long-term pain relief. Similarly, the mean reduction in DASH scores was higher in the PRP group (47.90) than in the hydrodissection group (45.90), reflecting better functional recovery. At 12 months, both VAS and DASH scores remained significantly lower in Group A compared to Group B, suggesting that PRP provided more sustained and consistent clinical improvement overall (Table 3).

**Table 3: Overall Treatment Outcome Summary (n = 165)**

| Parameter | Group A – PRP (n=83) | Group B – Hydrodissection (n=82) | p-value |
|---|---|---|---|
| **Baseline VAS (Mean ± SD)** | 8.95 ± 0.60 | 9.20 ± 0.40 | 0.06 |
| **12th Month VAS (Mean ± SD)** | 2.10 ± 1.30 | 3.95 ± 1.90 | <0.001 |
| **Mean VAS Reduction** | 6.85 | 5.25 | — |
| **Baseline DASH (Mean ± SD)** | 78.00 ± 5.10 | 78.20 ± 5.00 | 0.83 |
| **12th Month DASH (Mean ± SD)** | 30.10 ± 4.60 | 32.30 ± 3.70 | 0.01 |
| **Mean DASH Reduction** | 47.90 | 45.90 | — |

## Discussion

Adhesive capsulitis previously referred to as "scapulohumeral periarthritis" or "frozen shoulder," is characterized by the profound restriction of motion and the difficulty in understanding and managing the condition [6,7]. In 1945, Neviaser

coined the term “adhesive capsulitis” after demonstrating inflammatory and fibrotic changes within the contracted capsule and adjacent bursa [8]. The disorder, also termed periarthritis or arthrofibrosis of the shoulder, is classified into primary (idiopathic) and secondary forms, the latter associated with trauma, tendinitis, or systemic illnesses, and commonly affects individuals in the fourth and fifth decades of life [2]. The disease typically progresses through inflammatory, freezing, frozen, and thawing stages, ultimately leading to capsular fibrosis and global restriction of glenohumeral movements [2].

Clinically, adhesive capsulitis affects 3–5% of the general population and up to 20% of individuals with diabetes mellitus [1,2]. Diagnosis is primarily clinical and often one of exclusion, requiring elimination of other causes of painful shoulder stiffness. Histopathological findings demonstrate myofibroblast proliferation with type I and III collagen deposition, altered matrix metalloproteinase levels, and increased expression of inflammatory mediators such as TGF-β and VEGF, along with neoangiogenesis and neoinnervation within the contracted capsule. In diabetic individuals, accumulation of advanced glycation end products such as glucosepane contributes to collagen cross-linking, extracellular matrix alterations, and increased capsular stiffness [1].

Multiple treatment modalities have been described, ranging from physiotherapy, pharmacological therapy, and intra-articular steroid injections to hydrodissection, manipulation under anesthesia, arthroscopic capsular release, and biological therapies such as platelet-rich plasma (PRP). Previous studies have reported favorable outcomes with hydroplasty, demonstrating immediate improvement in range of motion and up to 70% excellent results [9]. Intra-articular steroid injections have shown significant short-term pain relief [10,11], while comparative studies suggest that PRP therapy provides superior and sustained functional improvement compared to steroid injections and ultrasonic therapy [12-14]. Arthroscopic capsular release has also demonstrated rapid gains in motion within two months [15], although it is more invasive.

In the present study involving 165 patients, both PRP injection and hydrodissection resulted in clinical improvement; however, PRP demonstrated superior outcomes in terms of pain reduction and functional recovery. Statistically significant improvement in VAS scores ($p < 0.001$) and DASH scores ($p = 0.01$ at 12 months) favored the PRP group over hydrodissection. Patients receiving PRP exhibited greater improvement in range of motion and quality of life over follow-up. These findings support the role of autologous PRP as an effective biological therapy in adhesive capsulitis, offering sustained pain relief and functional benefit compared to hydrodissection.

## Conclusion

Autologous platelet-rich plasma (PRP) injection demonstrated superior efficacy compared to hydrodissection in the management of adhesive capsulitis of the shoulder. In this study of 165 patients, PRP therapy resulted in significantly greater improvement in pain relief and functional outcomes, as evidenced by statistically significant reductions in VAS and DASH scores at follow-up. The findings support PRP as an effective and safe biological treatment modality that provides sustained clinical benefits and improved quality of life in patients with adhesive capsulitis.

## References


1. Le HV, Lee SJ, Nazarian A, Rodriguez EK. Adhesive capsulitis of the shoulder: review of pathophysiology and current clinical treatments. J Shoulder Elbow Surg. 2017;9(2):75–84.
2. Reeves B. The natural history of the frozen shoulder syndrome. Scand J Rheumatol. 1976;4:193–196.
3. Watanabe M, Hoso M, Hibino I, Matsuzaki T, Kojima S. Histopathological changes of joint capsule after joint immobility compared with aging in rats. Journal of Physical Therapy Science. 2010;22(4):369-74.
4. Ralphs JR, Benjamin M. The joint capsule: structure, composition, ageing and disease. Journal of anatomy. 1994 Jun;184(Pt 3):503.
5. Hildebrand KA, Zhang M, Hart DA. Myofibroblast upregulators are elevated in joint capsules in posttraumatic contractures. Clinical Orthopaedics and Related Research®. 2007 Mar 1;456:85-91.
6. Duplay E. De la periarthrite scapulo-humerale et des raideurs de l’epaule qui en sont la consequence. Arch Gen Med. 1872;20:513–542.
7. Codman EA. Tendinitis of the short rotators. In: The shoulder: rupture of the supraspinatus tendon and other lesions in or about the subacromial bursa. Boston (MA): Thomas Todd; 1934.
8. Neviaser JS. Adhesive capsulitis and the stiff and painful shoulder. Orthop Clin North Am. 1980;11(2):327–331.
9. Agarwal A, Khera R. Shoulder hydroplasty in periarthritis shoulder: an outpatient procedure. Int J Orthop Sci. 2017;3(4):390–393.
10. Rawat MS, Juyal A, Agarwal A. Evaluation of the role of intra-articular steroid injection in frozen shoulder. Int J Orthop Sci. 2018;4(1):792–794.
11. Shah N. Shoulder adhesive capsulitis: systematic review of randomized trials using

multiple corticosteroid injections. Br J Gen Pract. 2007;57(54):27–35.
12. Aslani H, Nourbakhsh ST, Zafarni Z, Bani MA, Ebrahim M. Platelet-rich plasma for frozen shoulder: a case report. Arch Bone Jt Surg. 2016;4(1):90–93.
13. Kumar R, Bansal N, Sidhu AS, Kulkarni PS, Sharma S, Jain G, et al. An observational study to compare the outcome of local steroid injections and ultrasonic wave therapy in frozen shoulder patients. Int J Orthop Sci. 2018;4(1):98–101.
14. Jadhav U, Gotecha D. Arthroscopic 360-degree capsular release for treatment of adhesive capsulitis: a study of 40 cases. Int J Orthop Sci. 2017;3(1):649–654.
15. Kothari SY, Srikumar V, Singh N. Comparative efficacy of platelet-rich plasma injection, corticosteroid injection and ultrasonic therapy in the treatment of periarthritis shoulder. J Clin Diagn Res. 2017;11(5):RC15–RC18.