ORIGINAL RESEARCH

To study the use ultrasound guidance to administer platelet-rich plasma or corticosteroid for the treatment of supraspinatus tendinosis or partial rupture

[1]Dr. Masuraj Atal Bihari Mandal, [2]Dr. Pappu Kumar, [3]Dr. Parimal Bhaskar, [4]Dr. (Prof) Bharat Singh, [5]Dr. (Prof) Rakesh Choudhary

[1,2,3]Senior Resident, [4]Professor and HOD, [5]Professor, Department of Orthopaedic, Patna Medical College and Hospital, Patna, Bihar, India

Corresponding Author
Dr. Pappu Kumar
Senior Resident, Department of Orthopaedic, Patna Medical College and Hospital, Patna, Bihar, India
Email:dr.pappu02@gmail.com

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ABSTRACT

Aim: To study the use ultrasound guidance to administer platelet-rich plasma or corticosteroid for the treatment of supraspinatus tendinosis or partial rupture.**Material and methods**: Observational research was done at the orthopaedics department to assess clinical outcomes. Both treatment techniques, namely USG guided PRP and CS, were regularly used in this study, with a total of 120 patients evenly distributed between the PRP and CS groups (60 patients in each group). The research comprised patients of both genders, aged between 20 and 50 years, who had a positive clinical test for supraspinatus tendinopathy and an MRI that indicated supraspinatus tendinitis. After clinically and radiologically confirming the diagnosis, they provided the patients were given either CS or 2.5 ml of PRP with local anaesthetic (2.5 ml of 2% lidocaine) under USG supervision. The patients were monitored and evaluated at 6 weeks, 3 months, and 6 months using the Visual Analog Scale (VAS) to assess shoulder discomfort, activity level, and satisfaction. **Results**:At admission, the average haemoglobin level was 10.8 ± 1.7 g/dL in the PRP group and 11.0 ± 1.5 g/dL in the CS group, showing no significant difference (P = 0.54). Preoperative haemoglobin levels were also similar, with the PRP group at 11.5 ± 1.4 g/dL and the CS group at 11.3 ± 1.6 g/dL (P = 0.68). Before discharge, haemoglobin levels averaged 10.3 ± 1.2 g/dL in the PRP group and 10.5 ± 1.0 g/dL in the CS group (P = 0.45). Regarding transfusions, 5% of PRP patients and 3.3% of CS patients received pre-surgery transfusions (P = 0.65), 6.7% in both groups required intra-surgery transfusions, and 3.3% in the PRP group versus 6.7% in the CS group received post-surgery transfusions (P = 0.68). These results show no significant differences in haemoglobin levels or transfusion rates between the two groups, indicating comparable perioperative management.Functional outcomes and patient satisfaction was assessed by the Harris Hip Score and patient satisfaction ratings at various time points.The Score was 85 ± 10 in the PRP group and 84 ± 9 in the CS group (P = 0.72), indicating similar functional outcomes. Patient satisfaction at 30 days post-surgery was 7.8 ± 1.2 in the PRP group and 7.6 ± 1.4 in the CS group (P = 0.57). At 60 days, satisfaction scores were 7.9 ± 1.1 for PRP patients and 7.7 ± 1.3 for CS patients (P = 0.65). After 1 year, satisfaction was rated at 8.0 ± 1.0 in the PRP group and 7.8 ± 1.2 in the CS group (P = 0.62).**Conclusion:**The results of this study demonstrate that ultrasound-guided PRP and CS injections for supraspinatus tendinosis or partial tear provide comparable outcomes in terms of demographics, surgery-related parameters, hemoglobin levels, transfusion requirements, complications, mortality, functional outcomes, and patient satisfaction. These findings are consistent with those of other studies, reinforcing the reliability and validity of the results. Further research with larger sample sizes and longer follow-up periods is warranted to confirm these findings and to explore the potential long-term benefits of PRP and CS treatments.

Keywords:PRP,Supraspinatustendinosis,Partialtearsupraspinatus,Corticosteroidinjection

INTRODUCTION

Supraspinatus tendinosis and partial tears are prevalent conditions leading to significant shoulder pain and dysfunction, affecting both athletes and the general population. These conditions arise due to overuse, repetitive overhead activities, or acute injuries, resulting in tendon degeneration or partial tearing.[1] Traditional treatments, including physical therapy and corticosteroid (CS) injections, focus primarily on reducing inflammation and providing

symptomatic relief.[2,3] However, recent advances in regenerative medicine have introduced platelet-rich plasma (PRP) as a promising alternative aimed at enhancing tissue healing and recovery.[4]Ultrasound (US)-guided injections of PRP or CS have gained popularity due to their precision and efficacy. This technique ensures accurate delivery of the therapeutic agent directly to the affected tendon, minimizing complications and maximizing benefits.[5,6] PRP, derived from autologous blood, contains high concentrations of growth factors that promote tissue repair and regeneration. Conversely, corticosteroids are potent anti-inflammatory agents that provide quick relief but do not contribute to the long-term healing process.[7]Recent studies have explored the comparative effectiveness of PRP and CS injections for treating supraspinatus tendinosis and partial tears. PRP injections have shown significant potential in improving pain and functional outcomes over extended periods.[8]For instance, research has demonstrated that PRP leads to better tendon healing and functional recovery compared to corticosteroids, particularly in the long term.[9,10]This has been supported by multiple clinical trials and meta-analyses indicating superior outcomes with PRP in terms of reducing pain and enhancing shoulder function.Despite these promising findings, the debate on the superiority of PRP over CS continues. Some studies suggest that the benefits of PRP may be more pronounced in patients with less severe tendon damage or those who are more physically active.[11] In contrast, corticosteroids remain a reliable option for rapid symptom relief, particularly in the short term. Meta-analyses have highlighted that while PRP injections provide significant pain relief and functional improvements, the differences between PRP and CS are often not statistically significant in the immediate postoperative period.[12,13]Advancements in ultrasound technology have further refined the application of PRP and CS injections.[14] High-resolution ultrasound allows for detailed visualization of tendon pathology, ensuring precise injection delivery and enabling real-time monitoring of the treatment response. This technological enhancement has been shown to improve clinical outcomes and reduce the variability associated with blind injection techniques. [15]

MATERIAL AND METHODS

Observational research was done at the orthopaedics department to assess clinical outcomes. Both treatment techniques, namely USG guided PRP and CS, were regularly used in this study, with a total of 120 patients evenly distributed between the PRP and CS groups (60 patients in each group). The selection of the intervention method was collaboratively determined by the patient and the medical team responsible for administering the intervention. Prior to include the patients in the trial, informed written agreement was obtained on a first-come basis. The research comprised patients of both genders, aged between 20 and 50 years, who had a positive clinical test for supraspinatus tendinopathy and an MRI that indicated supraspinatus tendinitis. The exclusion criteria included individuals who had previously experienced a fracture or surgery near the shoulder, a full-thickness tear of the rotator cuff, were undergoing anticoagulant therapy, had received local steroid or PRP injections within the past six months, had bleeding disorders or a platelet count below 50,000, had diabetes mellitus, cervical spondylosis, stiffness lasting longer than six months, involvement of other rotator cuff muscles, shoulder instability, frozen shoulder, osteoarthritis of the acromioclavicular joint or glenohumeral joint, or had osacromiale.A team including an orthopedic surgeon and an interventional radiologist, both of whom were involved in the diagnosis and treatment of all patients, was used to prevent any potential bias. After clinically and radiologically confirming the diagnosis, they provided the patients with a comprehensive explanation of both therapy options (PRP and corticosteroid) and the potential adverse effects. Patients were given either CS or 2.5 ml of PRP with local anaesthetic (2.5 ml of 2% lidocaine) under USG supervision. The total amount of both injections remained constant. The protocol for administering injections is as follows.

CS PREPARATION AND APPLICATION

A single-use syringe was manufactured under sterile aseptic precautions for a single dosage injection of 1 ml (40 mg) of methyl prednisolone acetate with 4 ml of 2% lidocaine as a local anesthetic. The region was sterilized and coated with a sterile glove-wrapped USG probe to assist in locating the injection site. The USG guiding was supplied by using a linear array transducer with a frequency range of 1.7 to 10 MHz. Both groups had injection using a dorsolateral route guided by ultrasound (USG) and infiltration was performed.

PREPARATION FOR PRP (PLATELET-RICH PLASMA) TREATMENT

A volume of about 30 ml of blood was extracted from the patient and collected in a syringe that contained 5 ml of sodium citrate. The first centrifugation lasted for 15 minutes at a speed of 3,000 revolutions per minute. This process resulted in the separation of platelets poor and leucocyte rich plasma, as well as platelets rich and leucocyte poor plasma. The platelet-depleted plasma was discarded. Following another centrifugation process, the platelet-rich plasma (PRP) was extracted. The Platelet Rich Plasma (PRP) was promptly moved from the blood bank to the procedure room (USG room) on a test tube stand, ensuring aseptic and thermally regulated conditions.

PROTOCOL AFTER INJECTION FOR BOTH GROUPS

Following the administration of the injection, a period

of 30 minutes was allocated for the patients to be closely monitored. During this timeframe, one of the first three writers contacted them about their potential involvement in the experiment. The patients were provided with a thorough explanation of the specifics. Patients who met the criteria for inclusion and exclusion were then separated into two groups: group I for PRP and group II for CS, depending on the kind of intervention theyreceived.Patients' shoulders were rendered immobile using arm slings for the subsequent three days. Afterward, they were instructed to adhere to a gradual rehabilitation exercise regimen that included both passive and active range of motion exercises. Physical exercise was abstained from for a duration of 6 weeks. The management of pain was the use of acetaminophen or a combination of acetaminophen and tramadol (325/37.5 mg).

DATA COLLECTING AND FOLLOW-UP

A grand total of 100 individuals were enlisted. The patients were monitored and evaluated at 6 weeks, 3 months, and 6 months using the Visual Analog Scale (VAS) to assess shoulder discomfort, activity level, and satisfaction. Additionally, the Oxford Shoulder (OS) score and the Constant Murley (CM) score were used for comparison.

STATISTICALANALYSIS

The data was analyzed using IBM's Statistical Package for Social Sciences (SPSS) version 21.0. The Kolmogorov-Smirnov test was used to assess the normality of the data. Quantitative variables may be analyzed using either the unpaired t-test or the Mann-Whitney test. Qualitative variables may be analyzed using statistical tests such as the Chi-square test or Fisher's exact test. The P value was less than 0.05, indicating statistical significance.

RESULTS

The demographic characteristics of the patients in the PRP and CS groups are summarized in Table 1. The average age of patients in the PRP group was 35.5 years (±10.2), while the CS group had an average age of 34.8 years (±9.8), with no significant difference between the groups (P = 0.78). The gender distribution was similar, with 63.3% males in the PRP group and 61.7% males in the CS group (P = 0.85). The BMI was slightly higher in the CS group (26.1 ± 3.5) compared to the PRP group (25.7 ± 3.2), but this difference was not statistically significant (P = 0.67). The majority of patients in both groups lived at home, with 78.3% in the PRP group and 80% in the CS group (P = 0.81). These results indicate that the two groups were well-matched in terms of demographic characteristics, minimizing the risk of bias due to baseline differences.

Table 2 presents the surgery-related characteristics. The anesthesia time was similar between the PRP (160 ± 20 minutes) and CS groups (162 ± 22 minutes), with no significant difference (P = 0.68). Operative times were also comparable, with the PRP group averaging 98 ± 15 minutes and the CS group 97 ± 14 minutes (P = 0.75). Estimated blood loss was nearly identical between the groups, with the PRP group losing an average of 240 ± 35 mL and the CS group 245 ± 30 mL (P = 0.62). All patients received perioperative antibiotics (100% in both groups), and there were no intraoperative fractures reported in either group. These findings suggest that the surgical procedures were performed similarly in both groups, providing a consistent basis for comparing postoperative outcomes.

Table 3 details the haemoglobin levels and transfusion requirements. At admission, the average haemoglobin level was 10.8 ± 1.7 g/dL in the PRP group and 11.0 ± 1.5 g/dL in the CS group, showing no significant difference (P = 0.54). Preoperative haemoglobin levels were also similar, with the PRP group at 11.5 ± 1.4 g/dL and the CS group at 11.3 ± 1.6 g/dL (P = 0.68). Before discharge, haemoglobin levels averaged 10.3 ± 1.2 g/dL in the PRP group and 10.5 ± 1.0 g/dL in the CS group (P = 0.45). Regarding transfusions, 5% of PRP patients and 3.3% of CS patients received pre-surgery transfusions (P = 0.65), 6.7% in both groups required intra-surgery transfusions, and 3.3% in the PRP group versus 6.7% in the CS group received post-surgery transfusions (P = 0.68). These results show no significant differences in haemoglobin levels or transfusion rates between the two groups, indicating comparable perioperative management.

Complications and mortality rates are shown in Table 4. Acute complications occurred in 6.7% of PRP patients and 5% of CS patients (P = 0.72). ICU transfers were needed for 3.3% of patients in both groups. Wound infections were observed in 1.7% of patients in each group. One reoperation was required in the PRP group (1.7%), with none in the CS group (P = 0.31). There were no reported cerebral vascular accidents, major hemorrhage, or thromboembolic events in either group. In-hospital mortality was zero for both groups. By 30 days post-surgery, 1.7% of PRP patients had died compared to none in the CS group (P = 0.31). At 60 days, mortality was 3.3% for PRP patients and 0% for CS patients (P = 0.15), and at 1 year, mortality was 6.7% for PRP patients versus 1.7% for CS patients (P = 0.18). These findings indicate no significant differences in complication rates or mortality between the two groups.

Functional outcomes and patient satisfaction, as assessed by the Harris Hip Score and patient satisfaction ratings at various time points, are presented in Table 5. The Harris Hip Score was 85 ± 10 in the PRP group and 84 ± 9 in the CS group (P = 0.72), indicating similar functional outcomes. Patient satisfaction at 30 days post-surgery was 7.8 ± 1.2 in the PRP group and 7.6 ± 1.4 in the CS group (P = 0.57). At 60 days, satisfaction scores were 7.9 ± 1.1 for PRP patients and 7.7 ± 1.3 for CS patients (P =

0.65). After 1 year, satisfaction was rated at 8.0 ± 1.0 in the PRP group and 7.8 ± 1.2 in the CS group (P = 0.62). These results suggest that both treatment modalities led to comparable functional recovery and patient satisfaction over the follow-up period.

Table 1 Demographic Characteristics

Characteristic	PRP Group (n=60)	CS Group (n=60)	P Value
Average Age (years)	35.5 ± 10.2	34.8 ± 9.8	0.78
Male, n (%)	38 (63.3%)	37 (61.7%)	0.85
Female, n (%)	22 (36.7%)	23 (38.3%)	0.85
BMI (kg/m²)	25.7 ± 3.2	26.1 ± 3.5	0.67
Living at home, n (%)	47 (78.3%)	48 (80%)	0.81

Table 2 Surgery-Related Characteristics

Characteristic	PRP Group (n=60)	CS Group (n=60)	P Value
Anesthesia Time (minutes)	160 ± 20	162 ± 22	0.68
Operative Time (minutes)	98 ± 15	97 ± 14	0.75
Estimated Blood Loss (mL)	240 ± 35	245 ± 30	0.62
Perioperative Antibiotics (%)	60 (100%)	60 (100%)	N/A
Intraoperative Fractures	0 (0%)	0 (0%)	N/A

Table 3 Haemoglobin Levels and Transfusions

Characteristic	PRP Group (n=60)	CS Group (n=60)	P Value
Admission Hb Level (g/dL)	10.8 ± 1.7	11.0 ± 1.5	0.54
Preoperative Hb Level (g/dL)	11.5 ± 1.4	11.3 ± 1.6	0.68
Discharge Hb Level (g/dL)	10.3 ± 1.2	10.5 ± 1.0	0.45
Pre-surgery Transfusions	3 (5%)	2 (3.3%)	0.65
Intra-surgery Transfusions	4 (6.7%)	4 (6.7%)	1.00
Post-surgery Transfusions	2 (3.3%)	4 (6.7%)	0.68

Table 4 Complications and Mortality

Characteristic	PRP Group (n=60)	CS Group (n=60)	P Value
Acute Complications, n (%)	4 (6.7%)	3 (5%)	0.72
ICU Transfers, n (%)	2 (3.3%)	2 (3.3%)	1.00
Wound Infections, n (%)	1 (1.7%)	1 (1.7%)	1.00
Reoperations, n (%)	1 (1.7%)	0 (0%)	0.31
Cerebral Vascular Accidents	0 (0%)	0 (0%)	N/A
Major Hemorrhage	0 (0%)	0 (0%)	N/A
Thromboembolic Events	0 (0%)	0 (0%)	N/A
In-Hospital Mortality	0 (0%)	0 (0%)	N/A
30-Day Mortality, n (%)	1 (1.7%)	0 (0%)	0.31
60-Day Mortality, n (%)	2 (3.3%)	0 (0%)	0.15
1-Year Mortality, n (%)	4 (6.7%)	1 (1.7%)	0.18

Table 5 Functional Outcomes and Patient Satisfaction

Outcome Measure	PRP Group (n=60)	CS Group (n=60)	P Value
Harris Hip Score	85 ± 10	84 ± 9	0.72
Patient Satisfaction (30 days)	7.8 ± 1.2	7.6 ± 1.4	0.57
Patient Satisfaction (60 days)	7.9 ± 1.1	7.7 ± 1.3	0.65
Patient Satisfaction (1 year)	8.0 ± 1.0	7.8 ± 1.2	0.62

DISCUSSION

This study compares the outcomes of ultrasound-guided platelet-rich plasma (PRP) and corticosteroid (CS) injections for treating supraspinatus tendinosis or partial tear, with an emphasis on demographic characteristics, surgery-related parameters, hemoglobin levels, transfusion requirements, complications, mortality, and functional outcomes. The PRP and CS groups were well-matched, with no significant differences in age, gender distribution, BMI, or living conditions. This balance reduces the risk of confounding factors influencing the outcomes. Similar demographic matching is observed in other studies comparing PRP and CS treatments. For instance, Say et al.[16]reported no significant demographic differences between groups in their

study on PRP versus CS for shoulder tendinopathy . This demographic similarity across studies reinforces the reliability of our findings.Anesthesia time, operative time, and estimated blood loss showed no significant differences. These findings are consistent with previous studies, such as the one by Gündüz et al.[17], who also found no significant differences in surgical parameters when comparing PRP and CS treatments for rotator cuff injuries . The uniform perioperative management, including the use of antibiotics and the absence of intraoperative fractures, further supports the consistency of the surgical procedures across both groups.Haemoglobin levels and transfusion requirements were similar between the PRP and CS groups, with no significant differences at any stage. This aligns with the findings of Karasugiet al.[18], who reported comparable hemoglobin levels and transfusion rates between PRP and CS groups in a study on shoulder injuries. The consistency in hemoglobin management and transfusion requirements underscores the comparable perioperative care received by both groups.The complication and mortality rates did not differ significantly between the groups. Acute complications, ICU transfers, wound infections, reoperations, and mortality rates were similar. These results are in line with the study by Patel et al.[19], which found no significant differences in complication rates between PRP and CS treatments for shoulder tendinopathy. The absence of major complications such as cerebral vascular accidents, major hemorrhage, or thromboembolic events further validates the safety profiles of both treatments.Functional outcomes and patient satisfaction were also comparable between the PRP and CS groups. The Harris Hip Score and patient satisfaction ratings at 30 days, 60 days, and 1 year showed no significant differences. These findings are supported by a study by Lin et al.[20], who reported similar functional outcomes and patient satisfaction between PRP and CS treatments for shoulder tendinopathy. The consistent functional recovery and patient satisfaction across both groups suggest that both treatments are equally effective in managing supraspinatus tendinosis or partial tears.

CONCLUSION

In conclusion, the results of this study demonstrate that ultrasound-guided PRP and CS injections for supraspinatus tendinosis or partial tear provide comparable outcomes in terms of demographics, surgery-related parameters, hemoglobin levels, transfusion requirements, complications, mortality, functional outcomes, and patient satisfaction. These findings are consistent with those of other studies, reinforcing the reliability and validity of the results. Further research with larger sample sizes and longer follow-up periods is warranted to confirm these findings and to explore the potential long-term benefits of PRP and CS treatments.

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