Section: Orthopedics

Original Research Article

TO STUDY THE EFFICACY OF PLATELET-RICH PLASMA INJECTIONS FOR PAIN REDUCTION IN PARTIAL THICKNESS ROTATOR CUFF TEARS: A PROSPECTIVE STUDY

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Abstract

Background: Partial thickness rotator cuff tears (PTRCTs) are a common cause of shoulder pain and dysfunction. While various treatment options exist, the optimal management strategy remains controversial. Platelet-rich plasma (PRP) has emerged as a potential biological treatment to enhance tissue healing. This study aimed to evaluate the efficacy of PRP injections in the treatment of Partial thickness rotator cuff tears. **Materials and Methods:** In this prospective study, 40 patients with MRI-confirmed PTRCTs were treated with ultrasound-guided PRP injections. Patients were assessed pre-treatment and at 4 weeks, 6 weeks, and 6 months post-injection using the Visual Analog Scale (VAS) for pain. Demographic data, including age, gender, and affected side, were recorded. **Result:** The mean VAS pain score decreased from 8.125 pre-treatment to 4.625 at 6 weeks (43% reduction, $p<0.001$), and further to 2.85 at 6 months (64% reduction from baseline). The majority of patients (57.5%) were between 31-50 years old, with a higher proportion of females (57.5%) than males (42.5%). Right-sided injuries (55%) were slightly more common than left-sided (45%). Follow-up imaging was performed to assess structural healing. **Conclusion:** PRP injections demonstrated significant pain reduction in patients with PTRCTs, with improvements maintained at 6 months post-treatment. These findings suggest that PRP may be an effective treatment option for PTRCTs. However, further research with longer follow-up and comparison to control groups is needed to fully establish the long-term efficacy of this treatment.

INTRODUCTION

Rotator cuff tears are a common cause of shoulder pain and dysfunction, significantly impacting patients' quality of life and functional ability.[1] Partial thickness rotator cuff tears, in particular, present a unique challenge in orthopedic management due to their propensity for progression and the debate surrounding optimal treatment strategies.[2] These tears are estimated to affect 13-32% of the population, with prevalence increasing with age.[3]

Traditional management approaches for partial thickness rotator cuff tears have included conservative treatments such as physical therapy, nonsteroidal anti-inflammatory drugs, and corticosteroid injections.[4] However, these methods often provide only temporary relief and may not address the underlying pathology. Surgical intervention, while effective in many cases, carries inherent risks and prolonged recovery times that may not be suitable for all patients.[5]

In recent years, there has been growing interest in biological approaches to tendon healing, with platelet-rich plasma (PRP) emerging as a promising treatment option.[6] PRP is an autologous concentration of platelets in plasma, containing various growth factors and bioactive proteins that are thought to enhance tissue repair and regeneration.[7] The potential of PRP to stimulate cell proliferation, promote angiogenesis, and modulate inflammation has made it an attractive option for treating tendinopathies, including rotator cuff tears.[8]

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Despite the increasing use of PRP in clinical practice, evidence regarding its efficacy in treating partial thickness rotator cuff tears remains mixed, with some studies reporting significant improvements in pain and function, while others show more modest or equivocal results.[9] This variability in outcomes underscores the need for further research to elucidate the true potential of PRP therapy in this context.

Our study aims to evaluate the functional outcomes and complications of PRP therapy in patients with partial thickness rotator cuff tears. By assessing pain levels and functional scores over a 6-month period, we seek to contribute to the growing body of evidence on PRP efficacy and help inform clinical decision-making in the management of this common shoulder pathology.

MATERIALS AND METHODS

This prospective study was conducted at the Department of Orthopedics, BLDE (Deemed to be University) Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura, India, from August 1, 2022, to May 31, 2024. The study protocol was approved by the Institutional Ethics Committee, and all participants provided informed written consent.

Patients aged 18 years or older with clinically and radiologically confirmed partial thickness rotator cuff tears were considered for inclusion. Exclusion criteria included lack of prior conservative treatment, infection or ulcer at the injection site, pregnancy, uncontrolled diabetes mellitus, and local steroid injections in the affected shoulder within the past two months.

Diagnosis was established through clinical examination, detailed history, and radiological evaluation, including MRI of the affected shoulder. The sample size of 40 patients was calculated using the formula $n = z^2 p*q / d^2$, based on an expected proportion of moderate limitation of activity of 0.08%, with a 95% confidence level and 10% absolute precision.

PRP was prepared using a standardized double-spin protocol. Fifteen milliliters of venous blood was initially centrifuged at 1500 rpm for 5 minutes, followed by a second centrifugation of the resulting plasma at 3500 rpm for 10 minutes. The final PRP product was obtained from the lower third of the centrifuged plasma.

For the injection procedure, patients were seated with the affected shoulder exposed. The area was prepared with 7.5% povidone-iodine scrub, followed by spirit cleansing and 10% povidone-iodine solution. Under ultrasound guidance and strict aseptic conditions, 3-4 ml of PRP was injected into the subacromial space using a lateral approach. The procedure was performed by experienced orthopedic surgeons to ensure accurate placement and minimize complications.

Post-injection, patients were advised to limit activity for one week, using acetaminophen and topical ice as needed. After one week, patients were instructed to resume normal activities with continued adherence to pre-treatment activity modifications. Nonsteroidal anti-inflammatory drugs were prohibited for the first two weeks and discouraged throughout the study period.

Follow-up assessments were conducted at 4 weeks, 6 weeks, and 6 months post-injection. The primary outcome measures were pain intensity assessed using the Visual Analogue Scale (VAS) and shoulder function evaluated using a modified version of the Harris Hip Score (HHS) adapted for shoulder use. The VAS ranges from 0 (no pain) to 10 (worst possible pain).

RESULTS

This prospective study included 40 patients who received platelet-rich plasma (PRP) injections for partial thickness rotator cuff tears at BLDE Hospital and Research Center from August 1, 2022, to May 31, 2024. The demographic analysis revealed interesting patterns in age, gender, and affected side distribution.

The age distribution of patients showed a concentration in the middle-age groups. The largest proportion of patients (30%) fell within the 41-50 year age bracket, closely followed by the 31-40 year group at 27.5%. Younger patients aged 21-30 years comprised 17.5% of the cohort, while those in the 51-60 year range made up 15%. The smallest group was patients over 60 years, accounting for 10% of the study population. The mean age of all participants was 43.9 years.

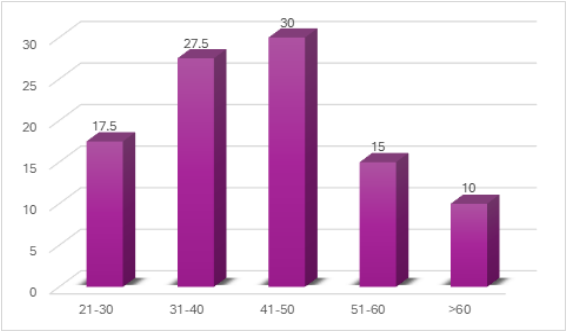

Figure 1: Age Distribution of Patients with Partial Thickness Rotator Cuff Tearss

The gender distribution analysis in [Table 2] revealed a slight predominance of female patients. Out of the 40 participants, 23 (57.5%) were female, while 17 (42.5%) were male. This gender disparity, though not substantial, may be worth considering in the interpretation of results and could potentially inform future research directions.

The study also analyzed the distribution of the affected shoulder. Interestingly, there was a slight predominance of right shoulder involvement. Twenty-two patients (55%) presented with right shoulder partial thickness rotator cuff tears, while 18 patients (45%) had left shoulder involvement. This

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relatively even distribution suggests that the pathology does not show a strong side preference, at least in this sample.

The primary outcome measure for this study was the Visual Analog Scale (VAS) for pain, which was used to assess the functional improvement following PRP treatment. The VAS scores were recorded at three time points: pre-treatment, 6 weeks post-treatment, and 6 months post-treatment.

Prior to treatment, the mean VAS score was 8.125 (SD = 1.343), indicating a high level of pain among the patients. At the 6-week follow-up, a significant improvement was observed. The mean VAS score decreased to 4.625 (SD = 1.917), representing a mean difference of 3.5 points or a 43% reduction in pain intensity. This improvement was statistically significant (Wilcoxon signed-rank test, $p < 0.001$), suggesting a strong short-term effect of the PRP treatment.

The long-term efficacy of the treatment was evaluated at the 6-month follow-up. Remarkably, the improvement in pain scores not only persisted but showed further enhancement. The mean VAS score at 6 months post-treatment was 2.85 (SD = 1.791), indicating a mean difference of 5.2 points from the pre-treatment score, or a 64% reduction in pain intensity. While this improvement was substantial, it's important to note that the Wilcoxon signed-rank test yielded a p-value of 0.098, which falls just short of the conventional threshold for statistical significance ($p < 0.05$). [Tables 4 and 5] present the detailed VAS score analysis at 6 weeks and 6 months, respectively.

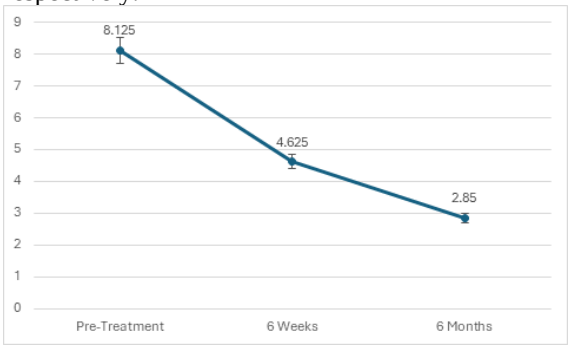

Figure 2: Mean VAS Pain Scores Before and After PRP Treatment

These results demonstrate a clear pattern of pain reduction following PRP treatment for partial thickness rotator cuff tears. The effect is pronounced in the short term (6 weeks) and appears to be maintained, and even enhanced, in the medium term (6 months). The slight loss of statistical significance at 6 months, despite a larger absolute improvement, may be due to increased variability in individual responses over time or other factors that warrant further investigation.

Overall, these findings suggest that PRP therapy could be a promising treatment option for patients with partial thickness rotator cuff tears, potentially offering a less invasive alternative to surgical intervention with significant pain reduction benefits.

Table 1: Age Distribution.

Age (years)	Percent
21-30	17.5
31-40	27.5
41-50	30
51-60	15
>60	10
Total	100

Table 2: Sex Distribution

Gender	Frequency	Percent
Female	23	57.5
Male	17	42.5
Total	40	100

Table 3: Side Distribution.

Side affected	Frequency	Percent
Left	18	45
Right	22	55
Total	40	100

Table 4: VAS Score Analysis at 6 Weeks.

Time Point	N	Mean	Mean Difference	% Reduction	SD	Wilcoxon signed-rank test	P Value
Pre-Treatment Score	40	8.125	3.5	43	1.343	820	< 0.001
Score at 6 Weeks	40	4.625			1.917		

Table 5: VAS Score Analysis at 6 Months

Time Point	N	Mean	Mean Difference	% Reduction	SD	Wilcoxon signed-rank test	P Value
Pre-Treatment Score	40	8.125	5.2	64	1.343	0.953	0.098
Score at 6 Months	40	2.85			1.791		

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DISCUSSION

Our study evaluated the effectiveness of platelet-rich plasma (PRP) injections for partial thickness rotator cuff tears (PTRCTs). We observed significant improvements in pain and function scores over a 6-month follow-up period after PRP treatment.

The mean VAS pain score in our study decreased from 8.125 pre-treatment to 4.625 at 6 weeks, representing a 43% reduction. This improvement continued, with the mean VAS score further decreasing to 2.85 at 6 months, a 64% reduction from baseline. These findings are comparable to those of Zafarani et al,[10] who reported a decrease in mean VAS score from 7.5 to 2.5 (66.7% reduction) at 3 months post-PRP injection. Our results also align with those of Prodromos et al,[11] who found a reduction in mean VAS score from 50.2 to 22.4 (55.4% reduction) at 1 year follow-up.

We observed an improvement in pain and function scores throughout the follow-up period. Our study found that 77.9% of patients showed significant improvement (defined as ≥30% improvement) at 6 months. This is comparable to Prodromos et al,[11] who reported 71.6% of patients showing significant improvement at 1 year. However, they observed a slight decline to 68.8% at 2 years, suggesting the need for longer follow-up in future studies.

Interestingly, our study found better outcomes in patients with more severe partial tears. The >50% partial tear group showed the highest percentage of significantly improved patients (88.9% at 6 months), while the tendinitis group had the lowest (63.2% at 6 months). This aligns with Prodromos et al,[11] who also found better outcomes in patients with more structural damage.

In contrast to our findings, Kesikburun et al,[12] reported no significant differences between PRP and placebo injections for PTRCTs at 1 year follow-up. They found similar improvements in both groups, with mean ASES scores increasing from 31.1 to 67.8 in the PRP group and from 33.2 to 65.9 in the placebo group. This discrepancy might be due to differences in PRP preparation methods or patient selection criteria.

A recent study by Mohammadivahedi et al,[13] compared PRP alone to PRP combined with vitamin C. They reported improvements in both groups, with ASES scores increasing from 33.20 to 71.24 in the PRP-only group and from 32.76 to 73.05 in the PRP + vitamin C group at 3 months. While both groups showed significant improvement, there was no statistically significant difference between them, suggesting that PRP alone may provide the key therapeutic effects.

Han et al,[14] conducted a meta-analysis of 13 randomized controlled trials and found that PRP significantly improved pain scores and functional outcomes compared to controls. They reported a mean difference in Constant scores of 2.31 points favoring PRP treatment, supporting our positive findings.

Limitations of our study include the lack of a control group and a relatively short follow-up period compared to studies like Prodromos et al.[10]

CONCLUSION

In conclusion, our study's results are consistent with several recent high-quality studies, supporting PRP as an effective treatment option for PTRCTs. The significant improvements in pain and function align closely with those reported in the literature. However, further research with longer follow-up periods and assessment of structural healing is needed to fully elucidate the long-term benefits of PRP for rotator cuff pathology.

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