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Clinical Efficacy Of Platelet-Rich Plasma Infiltration In Rotator Cuff Tear Treatment

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Abstract
Rotator cuff tears are a frequent cause of shoulder pain and dysfunction, often requiring interventions beyond standard therapies. Platelet-Rich Plasma (PRP) therapy has emerged as a potential treatment, leveraging the regenerative properties of concentrated platelets. This study evaluates the efficacy of PRP infiltration in patients with rotator cuff tears. We enrolled 40 patients, assessing outcomes in pain relief, functional improvement, and tendon healing.

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I. Introduction

Rotator cuff tears are common, especially among athletes and older adults, leading to significant morbidity. Traditional treatments, such as physical therapy, corticosteroid injections, and surgery, have varied success rates. PRP therapy, which involves injecting a concentration of the patient's own platelets, aims to enhance tissue repair through the release of growth factors. This study investigates the efficacy of PRP infiltration in improving clinical outcomes for rotator cuff tear patients.

Biological Mechanisms of PRP*

PRP is derived from autologous blood through a centrifugation process that concentrates platelets. These platelets release growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), and vascular endothelial growth factor (VEGF), which are critical in the healing process. These growth factors facilitate:

- Cellular proliferation and differentiation
- Collagen synthesis and tissue repair
- Angiogenesis (formation of new blood vessels)
- Modulation of inflammatory responses

II. Methods

Study Design and Participants

This prospective study included 40 patients diagnosed with rotator cuff tears confirmed by MRI.

Inclusion criteria

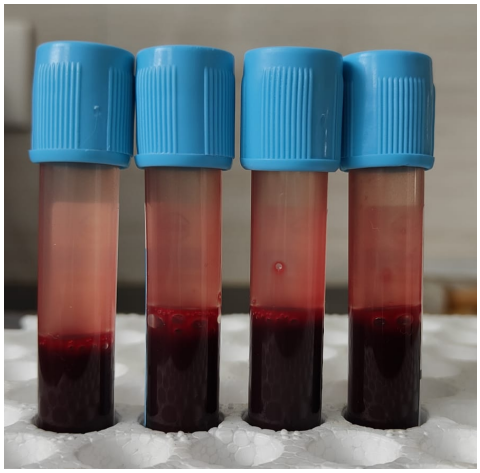
Patients aged 30-65 years
Partial-thickness rotator cuff tears.

Exclusion criteria

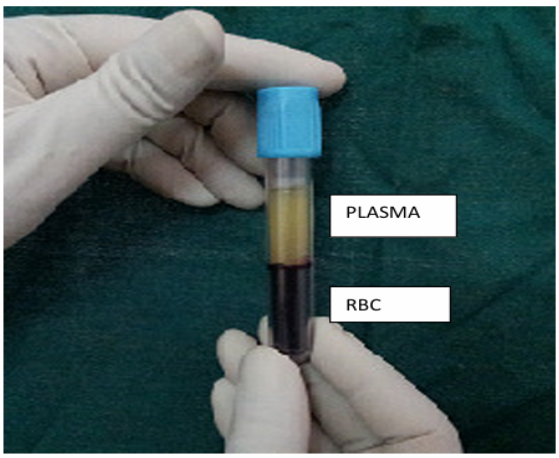
Complete rotator cuff tears
Systemic diseases affecting healing (e.g., diabetes)
Previous shoulder surgery.

PRP Preparation and Administration

20 ml of whole blood is withdrawn from the patient with 18 gauge needle. Blood is equally divided and placed in sodium citrate solution tubes. The blood is centrifuged at 1500 rpm for 15 minutes.

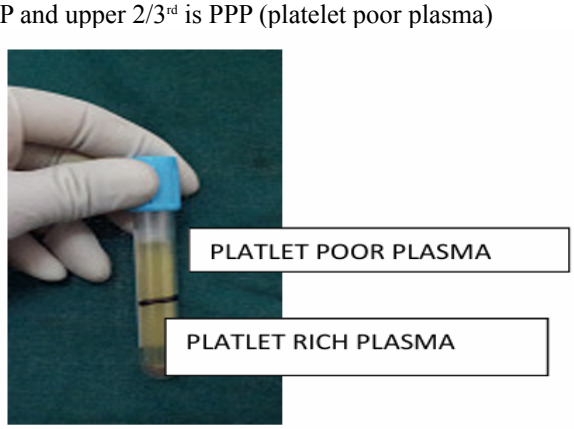


This process separates the blood into a visible three-layer consistency of red blood components (bottom), a very thin, milky white leukocyte component (middle), and yellow plasma components (top).



Supernatant plasma containing platelets into another tube and centrifused at 3000rpm for 5mins to obtain platelet concentrate.

The lower 1/3rd is PRP and upper 2/3rd is PPP (platelet poor plasma)



Outcome Measures

Patients were evaluated at baseline, 1 month, 3 months, and 6 months post-injection. Primary outcomes included pain relief, assessed using the Visual Analog Scale (VAS), and functional improvement, measured by the American Shoulder and Elbow Surgeons (ASES) score.

III. Results

Patient Demographics

The study included 40 patients (22 males, 18 females) with a mean age of 48.5 years (range 30-65). Baseline characteristics such as tear size and shoulder function were similar across all participants.

Demographic	Value
Total Patients	40
Male	22 (55%)
Female	18 (45%)
Mean Age (years)	48.5 (range 30-65)
Mean Tear Size	1.5 cm (range 0.5-3 cm)
Affected Shoulder	Right: 24 (60%), Left: 16 (40%

Pain Relief

Significant reductions in VAS pain scores were observed post-treatment. The mean VAS score decreased from 7.2 at baseline to 3.1 at 1 month, 2.5 at 3 months, and 2.0 at 6 months ($p < 0.05$ for all comparisons). This suggests that PRP infiltration provided substantial pain relief over the study period.

Time point	Mean VAS Score	Standard Deviation	p- value
Baseline	7.2	1.1	-
1 month	3.1	0.9	<0.05
3 months	2.5	0.8	<0.05
6 months	2.0	0.7	<0.05

Functional Improvement

Functional improvement was notable, with mean ASES scores increasing from 52.4 at baseline to 78.3 at 1 month, 82.7 at 3 months, and 85.4 at 6 months ($p < 0.05$ for all comparisons). Patients reported enhanced shoulder mobility and strength, correlating with improved daily activity performance.

Time	Mean ASES Score	Standard Deviation	p-value
Baseline	52.4	12.3	-
1 month	78.3	10.5	<0.05
3 months	82.7	9.8	<0.05
6 months	85.4	8.7	<0.05

Tendon Healing

MRI evaluations showed improved tendon integrity in the PRP group. At 6 months, 30 patients (75%) exhibited increased tendon thickness and reduced tear size. The remaining 10 patients (25%) showed stable tendon conditions without further degeneration.

Outcome	Number of patients	Percentage
Increased tendon thickness	30	75%
Reduced tear size	30	75%
Stable tendon condition	10	25%
Further Degeneration	0	0

Adverse Effects

PRP infiltration was well-tolerated with no serious adverse effects reported. Minor side effects included temporary injection site pain and mild swelling in a few patients, which resolved within a few days.

IV. Discussion

This study demonstrates the efficacy of PRP infiltration in treating rotator cuff tears, with significant improvements in pain relief, shoulder function, and tendon healing. The results align with previous research suggesting that PRP's growth factors play a crucial role in tissue regeneration and repair. The sustained benefits observed at 6 months post-treatment underscore PRP's potential as a long-term solution for rotator cuff injuries.

V. Limitations

The study's limitations include a small sample size and lack of a control group. Future research should involve larger, randomized controlled trials to validate these findings and establish standardized PRP protocols.

VI. Conclusion

PRP infiltration appears to be a promising treatment for rotator cuff tears, offering significant pain relief, functional improvement, and enhanced tendon healing. Given its minimally invasive nature and favourable safety profile, PRP therapy could become an integral component of rotator cuff tear management. Further studies are warranted to optimize PRP application and confirm its long-term efficacy.

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