

Complications Related to Platelet-Rich Plasma Injections for the Treatment of Rotator Cuff Tendon Dysfunction: A Systematic Review and Meta-Analysis

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INTRODUCTION:

Rotator cuff tendinopathy is one of the most common causes of shoulder pain. Nonoperative treatment of rotator cuff injuries can decrease pain, increase range of motion and strength, and facilitate return to normal activities without the need for anesthesia or invasive surgery. One of the fastest-rising agents in the field of conservative rotator cuff treatment is platelet-rich plasma (PRP). Despite the growing body of research investigating the efficacy of PRP, complications of the procedure have not been thoroughly studied. The purpose of this review is to analyze the existing literature assessing the rate and types of complications associated with PRP injections compared to comparison injections for the nonoperative treatment of rotator cuff tendinopathy.

METHODS:

PubMed, Embase, Web of Science, and Cochrane databases were queried for all articles published prior to February 2025. Studies were included if they were randomized-controlled trials (RCTs) that compared complications following an isolated PRP injection to a comparable injectable for treatment of rotator cuff tendon dysfunction in a non-operative setting. Studies were excluded if they were non-RCTs, meta-analyses, systematic reviews or review articles, cohort studies, basic science research, technique articles, editorial articles, studies with non-human subjects, not published in English, or those looked at operative use of PRP for tendon dysfunction were excluded. Data including publication year, sample size, type of comparison injection, number of injections, outcome measures, complication numbers, types of complication, post-injection routine, and follow-up period were extracted from included studies. Summary statistics, tests of significance, complication rates, and assessment of absolute risk increase (ARI) and number needed to harm (NNH) were performed. Study comparisons were analyzed using the Chi square or Fisher exact tests. Random-effects DerSimonian-Laird models were generated to compare complications across studies. Significance for all statistical tests was determined at $p < 0.05$.

RESULTS:

Of 1966 articles identified, 25 compared PRP to an alternative treatment for rotator cuff pathologies with adequate randomization. A total of 1623 patients were included, 707 (44%) of which were treated with a PRP injection. The mean follow-up time ranged from 8 weeks-12 months. The comparison groups of included studies were as follows: saline injection alone, corticosteroids alone, corticosteroid group and prolotherapy group, prolotherapy alone, collagen, and ketorolac tromethamine. Fifteen (60%) studies reported no complications following either PRP or comparison treatment. There was a total of 102 complications, 48 of which occurred after PRP injections (Table 1). There was no statistically significant difference between the cumulative complication rate for the PRP group and that of the comparison group ($p = 0.48$).

Pain lasting greater than two days was the most common complication observed across both PRP and comparison groups, and it was not different among groups, occurring at a rate of 3.68% in the PRP group and 3.17% in the comparison group ($p = 0.58$). The pain was described as either persistent following the injection, a flare up, or as mild pain lasting one week, and was not reported as severe. Frozen shoulder following treatment was the second most common complication and it was the only complication type that was significantly different, occurring at a greater rate in the PRP group compared to the alternative treatment group ($p < 0.01$). Five patients in the comparison group (0.55%) experienced allergic reactions. One study reported that patients in the comparison group experienced side effects such as arterial hypertension, facial erythema, moon face, and headache, while another study reported patients in the same group experienced insomnia, changes in skin pigmentation, and subcutaneous fat wasting. There were no reported infections across the studies. Other complications such as worsening of tear and bursitis occurred in both groups.

Meta-analysis was completed to compare complication rates in the PRP group to complication rates in both the saline and steroid comparison injections. Patients who received a saline injection did not have significantly higher odds of experiencing complications (OR 0.77, I² = 58.37%, $p = 0.80$) (Figure 1) and neither did patients who received a steroid injection (OR 0.55, I² = 0.00%, $p = 0.14$) (Figure 2).

DISCUSSION AND CONCLUSION: This review found 102 complications across 25 RCTs that compared a PRP injection to an alternative injection for treatment of rotator cuff tendinopathy. The pooled complication rates for the PRP group were statistically similar to complication rates of saline and steroid injections. There were no reports of serious events across all studies. The results of this review suggest that PRP injections are generally safe for treating rotator cuff pathologies.

Figure 1. Pooled Odds Ratios of Complications Reported from Patients Receiving PRP Compared to Saline Injections.

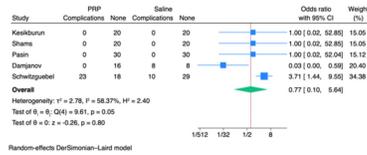


Figure 2. Pooled Odds Ratios of Complications Reported from Patients Receiving PRP Compared to Corticosteroid Injections.

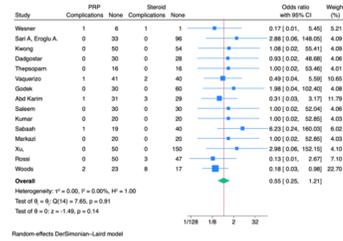


Table 1. Complications Reported from Study Outcomes.

Complication	PRP Group (%) n=707	Comparison (%) n=916	p-value	NNH
Worsening of tear	5 (0.71)	2 (0.22)	0.25	205
Pain ~48h	26 (3.68)	29 (3.17)	0.58	196
Frozen shoulder	13 (1.84)	3 (0.33)	<0.01	67
Allergic reaction	0	5 (0.55)	0.07	-183
Pain on infiltration	1 (0.14)	0	0.44	707
Bursitis	2 (0.28)	4 (0.44)	0.70	-650
Decreased ROM	1 (0.14)	0	0.44	707
Arterial Hypertension	0	2 (0.22)	0.51	-458
Facial Erythema	0	2 (0.22)	0.51	-458
Facies Lunata	0	1 (0.11)	1.00	-916
Headache	0	3 (0.33)	0.26	-305
Insomnia	0	1 (0.11)	1.00	-916
Change in Skin Pigmentation	0	1 (0.11)	1.00	-916
Subcutaneous Fat Wasting	0	1 (0.11)	1.00	-916
Total Complications	48	54		
Overall Complication Rate	6.79%	5.90%	0.477	
Overall ARI	0.89%			
Overall NNH	112			

Abbreviations: PRP = platelet rich plasma, ARI = absolute risk increase, NNH = number needed to harm