



COMPARISON OF EFFICACY OF PLATELET RICH PLASMA INJECTION VERSUS CORTICOSTEROID INJECTION IN TREATMENT OF SUPRASPINATUS TENDINOPATHY

Sports Science

Dr. Aditya Sood	M.B.B.S., P.G. (Sports Medicine), Sports Injury Centre, V. M. M. C & Safdarjung Hospital, New Delhi, India- 110029
Dr. (Prof.) Deepak Joshi	M.B.B.S., M.S.(Orthopaedics), Sports Injury Centre, V. M. M. C & Safdarjung Hospital, New Delhi, India- 110029
Dr Sushmita Kushwaha*	M.B.B.S., M.D.(Sports Medicine), Sports Injury Centre, V. M. M. C & Safdarjung Hospital, New Delhi, India- 110029 *Corresponding Author
Dr. (prof.) R. K. Arya	M. B. B. S., M.S.(Orthopaedics), Sports Injury Centre, V. M. M. C & Safdarjung Hospital, New Delhi, India- 110029
Dr. (prof.) Sunil Ranga	Department of Pathology & Blood Bank, V. M. M. C & Safdarjung Hospital, New Delhi, India- 110029

ABSTRACT

Introduction: Rotator cuff tendinopathy is one of the most common cause of chronic shoulder pain and disability.

Aim: To compare the efficacy of PRP injection versus corticosteroid injection in the treatment of Supraspinatus tendinopathy.

Design: Prospective randomized study.

Methods: 100 patients with Supraspinatus tendinopathy were randomized into two groups of 50 each. Group A received subacromial corticosteroid injection while group B received Platelet rich plasma injection. Treatment outcomes were assessed at 2 weeks, 6 weeks and 3 months following injection using CMS, VAS and SPADI scores.

Results: Reduction in pain and improvement in functional scores were evident in both the groups at each follow up, as assessed by VAS, Constant and SPADI scores. Mean VAS scores were significantly better in Corticosteroid group at 2 weeks ($p=0.003$) and in PRP group at 3 months ($p=0.037$) following injection. Constant score (CMS) showed better percentage improvement with Corticosteroid injection than the PRP injection at 2 weeks ($p<0.0001$) and 6 weeks (0.004) but not at 3 months ($p=0.093$). Mean SPADI scores were non-significant in both the groups at each follow ups.

Conclusion: /Corticosteroid injection is better in short term relief but in long term term both PRP and steroid had similar effects.

KEYWORDS

corticosteroid; platelet rich plasma; rotator cuff tendinopathy.

INTRODUCTION

The rotator cuff of the shoulder is composed of 4 muscles Supraspinatus, Infraspinatus, Teres Minor & Subscapularis. Their primary function is to provide dynamic stability throughout the range of motion. Stability is achieved by compression of humeral head on the glenoid by rotator cuff tendons especially supraspinatus tendon. Rotator cuff tendinopathy is one of the most common cause of chronic shoulder pain and disability(1,2). This injury is common in overhead athletes although it may occur to anyone during everyday activities or with chronic overuse.

Supraspinatus tendinopathy is believed to originate from extrinsic or intrinsic causes or combination of both. Extrinsic causes include anatomical variants of acromion, thickened coracoacromial ligament, subacromial bursitis or postural abnormalities(3). Intrinsic causes include age related degeneration that may vary in severity according to genetic predisposition, deficient vascular supply or a history of trauma(4).

Diagnosis is made on the basis of clinical and radiological examination(5). On examination there may be tenderness over the supraspinatus tendon proximal to or at the insertion in greater tuberosity of humerus. Active movements may reveal a painful arc on abduction between 70-120 degree range of motion. Symptoms can be reproduced with impingement test. Pain will also occur with resisted contraction of supraspinatus muscle.

Non operative management of supraspinatus tendinopathy includes rest, activity modification, physical therapy, exercise & non-steroidal anti-inflammatory drugs (6). If there is no improvement with non-invasive therapy, a sub-acromial corticosteroid injection may be used for pain control but inhibition of collagen synthesis & risk of tendon failure are concern with corticosteroid injections(7). Tendons have a limited regeneration capacity(8), therefore, biological agents such as Platelet rich plasma (PRP) could be an option to the treatment which may provide the necessary cellular mediation to induce a healing cascade(9).

There are few study in literature comparing both corticosteroid and

PRP injection in treatment of partial rotator cuff tears. The aim of this study was to compare the efficacy of PRP injection versus corticosteroid injection in the treatment of Supraspinatus tendinopathy.

MATERIAL AND METHODS

This is a Prospective randomized study conducted from 2017-2018 at Sports Injury Center, VMMC and Safdarjung hospital, New Delhi. Patients above 18 years of age with evidence of isolated supraspinatus tendinopathy (tendinosis & <50% thickness tears) with persistent pain in one shoulder for at least 2 months despite conservative methods and consenting to be a part of this study were included in the study. Ethical clearance was taken prior to start of study (S.No. IEC/ VMMC /SJH/ Thesis/October/2017-2015).

Patients with >50% thickness tears of the Supraspinatus tendon on MRI, with associated tendinopathy of other rotator cuff muscles, with generalized inflammatory arthritis, including Ankylosing Spondylitis, Rheumatoid Arthritis or Psoriatic Arthritis, pregnant patients, patients with severe infection, known malignancy, bleeding disorder or who had received previous corticosteroid injection or PRP injection were excluded from the study.

A total of 100 patients were enrolled in the study. The patients were randomly divided into two groups A and B using a computer generated randomization schedule. Group A received a corticosteroid injection containing Methyl Prednisolone Acetate (80mg) and group B received a PRP injection into the subacromial space(10). The PRP is prepared by extraction of 20 ml of patient peripheral blood and further processed by centrifugation in a ROTOFIX machine. Pre and post preparation platelet count was taken from patient blood sample and PRP respectively. After the procedure patients were instructed to apply ice on to the injected area for pain control. Only Paracetamol tablets (maximum 3 tablets a day) of 500 mg strength were allowed to the patients.

Outcome Measures

Patients were assessed for level of pain and functional status before,

2weeks, 6weeks and 3months following subacromial injection. The patients were asked to rate their pain on a Visual Analog scale (VAS), which is a subjective scale with 0 indicates no pain and 10 indicates the worst pain possible. Constant-Murley Score (CMS) and Shoulder Pain and Disability Index (SPADI) were used to measure the functional outcomes.

Statistical Analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. Quantitative variables were compared using Unpaired t-test and qualitative variables were compared using Chi-Square test. A p value of <0.05 was considered statistically significant.

RESULTS

100 consecutive patients of Supraspinatus tendinopathy not responding to conservative treatment were enrolled in the study with 50 patients in each group. Our patients ranges from 18-60 years of age. There were 34% males and 66% in this study. Amongst 50 individuals of PRP group, 30% were females and 70% were males. Whereas amongst 50 individuals of corticosteroid group, 38% were females and 62% were males. In terms of site involved, right side(58%) was more frequently involved than left side(42%).

Pain Evaluation And Functional Status Evaluation

Pain and functional status was evaluated in both the groups at each follow up. VAS scores improved with time in both the groups. There was no difference in mean VAS scores in both the groups at the start of this study (p=0.541). But there was statistically significant improvement in mean VAS scores(p=0.003) at 2weeks in corticosteroid group and at 3months (p=0.037) follow up in PRP group.

Mean Constant scores were statistically significant in PRP group before injection(p=0.011) and 3months following injection(p=0.027). But the percentage improvement in Constant score over 2weeks (p<0.0001) and 6weeks (p=0.004) were statistically significant in corticosteroid group compared to PRP group. Percentage improvement in constant scores over 3months (p=0.093) were found to be non significant.

There were no difference statistically in mean SPADI scores before injection(p=0.35) and 2weeks(p=0.72), 6weeks(p=0.40) and 3months(p=0.11) following injection. But percentage improvement in SPADI scores over 2weeks(p<0.009) were statistically significant in corticosteroid group.

Table 1.VAS at each follow up

Mean ± Stdev	PRP INJECTION	STERIOD INJECTION	P value
VAS SCORE DAY 0	7 ± 1.12	7.14 ± 1.03	0.541
VAS SCORE 2 WEEKS	6.24 ± 1	5.68 ± 0.87	0.003
VAS SCORE 6 WEEKS	4.82 ± 1.02	4.86 ± 0.95	0.692
VAS SCORE 3 MONTHS	3.18 ± 1.37	3.72 ± 1.26	0.037

Table 2: Constant scores at each follow up.

Mean ± Stdev	PRP INJECTION	STERIOD INJECTION	P value
CONSTANT SCORE DAY 0	55.66 ± 9.41	51.02 ± 8.52	0.011
CONSTANT SCORE 2 WEEKS	60.1 ± 8.23	58.46 ± 7.79	0.309
CONSTANT SCORE 6 WEEKS	69.06 ± 7.67	66.66 ± 7.66	0.121
CONSTANT SCORE 3 MONTHS	77.9 ± 8.56	74.14 ± 8.2	0.027
Percentage improvement in CONSTANT SCORE 2 WEEKS	8.8 ± 8.46	15.68 ± 11.25	<.0001
Percentage improvement in CONSTANT SCORE 6 WEEKS	25.77 ± 13.93	32.46 ± 15.8	0.004
Percentage improvement in CONSTANT SCORE 3 MONTHS	42.22 ± 18.7	47.75 ± 20.79	0.093

Table 3: SPADI scores at each follow up.

Mean ± Stdev	PRP INJECTION	STERIOD INJECTION	P Value
SPADI SCORE DAY 0	78.2 ± 10.5	80.2 ± 10.9	0.352
SPADI SCORE 2 WEEKS	69.64 ± 10.67	68.9 ± 9.87	0.720
SPADI SCORE 6 WEEKS	55.04 ± 12.41	57.02 ± 11.2	0.404
SPADI SCORE 3 MONTHS	41.26 ± 13.22	45.28 ± 12.08	0.116

Figure 1: VAS trend at each follow up

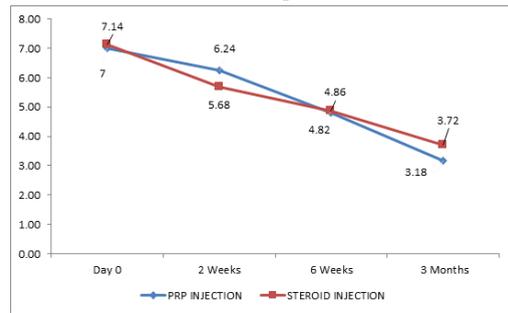


Figure 2: Constant score trend at each follow up

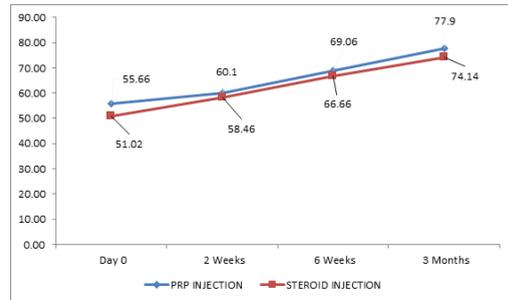
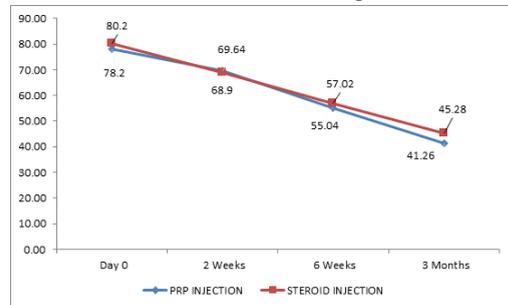


Figure 3: SPADI score trend at each follow up



DISCUSSION

In this study VAS had improvement in both the groups at each follow up. The short term percentage improvement at 2weeks was better with steroids but at 3 months, PRP injection showed a better improvement in VAS Score. Overall steroid group was significantly better at 2 weeks and PRP was significantly better at 3 months & no significant difference was seen between two groups at 6 weeks.

On the other hand, functional improvement as measured by Constant score (CMS) showed better percentage improvement with Corticosteroid injection than the PRP injection at 2 and 6 weeks but not at 3 months. SPADI Score also showed that although corticosteroid injection initially showed a better percentage improvement at 2 weeks but at 6 weeks & 3 months of follow up there was no significant difference between two groups. This showed that subacromial steroid injection was beneficial in short term treatment of Supraspinatus tendinopathy but in long term both PRP and steroid had similar effects.

Similarly, in a study by Wehren et al.(11) and Lin et al.(12) steroid injection proved early benefits and PRP showed benefits at 12 weeks. But it was seen that at 6 months of follow up there was no statistically significant difference between two groups.

At the end of this study we found that constant scores and VAS improved but not fully. Ideally, VAS & SPADI Score must be zero at the end of this study but it ended at greater values. This is due to the fact that in our study we kept a shorter follow up of 3 months. We need more studies with longer follow up to see the same outcome.

In terms of constant score we see that most of them had a value >50 because the score has maximum components of ROM (Range of motion) in its scoring & most of them had almost near full ROM so score was >50. The most common complaint was pain & loss of abduction strength which interfered in their activities of daily living. To gain maximum abduction strength, longer follow ups would be required which was not possible for the study. This explains why

constant score did not improve much on a short period of time.

A better comparison of these individual treatments could have been done if a placebo group was also chosen separately in study. Based on a study by Damjanov et al.(13), where he took 3 groups of ACS, Betamethasone & Placebo. ACS (Autologous conditioned serum) appears to be a more effective treatment than glucocorticoids and could enhance the quality of life in patients with chronic rotator cuff tendinopathy.

Numerous studies have documented the beneficial effects of individual growth factors on tendon healing. Studies done by Rha et al.(14) found better results for PRP injections as compared to dry needling in patients with partial rotator cuff tears or tendinosis. Also Scarpone et al.(15) had shown significant improvement in pain & function in cases of refractory rotator cuff tendinopathy.

Our study has also shown that steroid is better in short term but it also has some associated potential complications. Study by Maman et al.(16) on rat models showed that repeated doses of corticosteroids significantly weaken rat RC and negatively affect bone quality in addition to possibly causing deterioration of the osteotendinous junction.

Strength of study was that the population consisted of individuals from all age groups having different occupation, including sportspersons. Study had a good sample size and a well supervised rehabilitation protocol which was given to all subjects in the study. This study had some limitations in form of its short duration and no placebo group was kept. Further people of different age groups were in same group, so study had heterogeneous population.

CONCLUSION

In this study, sub acromial Corticosteroid injection shows better improvement in pain and function at short term. In long term PRP is better in pain reduction as compared to corticosteroid but in case of functional improvement both PRP & Steroid are similar. Hence Steroids are a good alternative for short term, where early recovery is required for example in season athletes. But steroid is contraindicated in certain medical conditions like Diabetes/ Immunosuppression, which makes PRP injections a relatively safer choice in these candidates.

PRP can be used effectively in off season athletes because it gives them adequate time for its full effects and also better recovery by a supervised rehabilitation protocol. Since a lot of research is going on in the field of orthobiologics, PRP can have a promising future for patients with various type of tendinopathies including rotator cuff tendinopathy.

REFERENCES

1. Chakravarty K, Webley M (1993) Shoulder joint movement and its relationship to disability in the elderly. *J Rheumatol* 20(8):1359–1361.
2. Kim HM, Dahiya N, Teeffey SA et al (2010) Location and initiation of degenerative rotator cuff tears. *J Bone Joint Surg (Am)* 92(5):1088–1096.
3. Luime J, Koes B, Hendriksen I, Burdorf A, Verhagen A, Miedema H, Verhaar J (2004) Prevalence and incidence of shoulder pain in the general population; a systematic review. *Scand J Rheum* 33(2):73–81.
4. Neer CS (1972) Anterior acromioplasty for the chronic impingement syndrome in the shoulder: a preliminary report. *J Bone Joint Surg* 54(1):41–50.
5. Scarpone M, Rabago D, Snell E et al (2013) Effectiveness of platelet-rich plasma injection for rotator cuff tendinopathy: a prospective open-label study. *Glob Adv Health Med* 2(2):26–31.
6. Mantone JK, Burkhead WZ Jr, Noonan J Jr. Nonoperative treatment of rotator cuff tears. *Orthop Clin North Am.* 2000;31:295-311.
7. Browning DG, Desai MM. Rotator cuff injuries and treatment. *Prim Care.* 2004;31:807-829.
8. Ho JO, Sawadkar P, Mudera V. A review on the use of cell therapy in the treatment of tendon disease and injuries. *J Tissue Eng* 2014;18(5):204–213.
9. Anitua E, Andia I, Sanchez M, Nurden TA, Nurden P, Azfora J et al. Autologous preparations rich in growth factors promote proliferation and induce VEGF and HGF production by human tendon cells in culture. *J Orthop Res* 2005;23:281–286.
10. S Saunders, S Longworth. Injection Techniques in Musculoskeletal Medicine: A Practical Manual for clinicians in Primary & Secondary Care; Churchill Livingstone, 2011
11. Wehren LV, Blanke F, Todorov A, Patricia H, Sailer J, Majewski M. The effect of sub acromial injections of autologous conditioned plasma versus cortisone for the treatment of symptomatic partial tears. *European Society of Sports Traumatology, Knee Surgery, Arthroscopy (ESSKA)* 2015;24(12):3787-3792.
12. Lin MT, Chiang CF, Wu CH, Huang YT, Wang TG et al. Comparative Effectiveness of Injection Therapies in Rotator Cuff Tendinopathy: A Systematic Review, Pairwise and Network Meta-analysis of Randomized Controlled Trials. *Archives of Physical Medicine & Rehabilitation* 2019;100(2):336-349.
13. Damjanov N, Barac B, Colic J, Tulic G, Zekovic V et al. The efficacy and safety of autologous conditioned serum (ACS) injections compared with betamethasone and placebo injections in the treatment of chronic shoulder joint pain due to supraspinatus tendinopathy: A prospective, randomized, double-blind, controlled study. *Med Ultrason* 2018;20(3):335-341.

14. Rha DW, Park GY, Kim YK, Kim MT, Lee SC. Comparison of the therapeutic effects of ultrasound-guided platelet-rich plasma injection and dry needling in rotator cuff disease: a randomized controlled trial. *Clin Rehabil.* 2013;27:113-122.
15. Scarpone M, Rabago D, Snell E, Pritchard P, Ruppert K, Wilson JJ et al. Effectiveness of platelet-rich plasma injection for rotator cuff tendinopathy: a prospective open-label study. *Glob Adv Health Med* 2013;2(2):26–31.
16. Maman E, Yahuda C, Pritsch T, Morag G, Brosh T et al. Detrimental Effect of Repeated & Single Subacromial Corticosteroid Injections on the Intact and Injured Rotator Cuff: A Biomechanical & Imaging study in Rats. *American Journal Of Sports Medicine* 2015; 44(1):177-182.