



## Clinical evaluation of partial Supraspinatus tears managed with Platelet Rich Plasma

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### General Note

 Article is recommended to print as color digital version in recycled paper.

### ABSTRACT

*Introduction:* According to the World Health Organization (WHO), musculoskeletal injuries are the most common cause for severe long-term pain and physical disability and affect hundreds of millions of people around the world. The continued popularity of sporting activities has brought with it an epidemic of musculoskeletal disorders focusing attention on tendons and ligaments.

Tendon injuries in the shoulder account for overuse injuries in sports as well as in jobs that require repetitive activity. The role of platelet rich plasma in partial Supraspinatus tears has not been studied exclusively. Therefore, we have designed our study for the clinical evaluation of partial supraspinatus tears managed with Platelet Rich Plasma. *Methodology:* We conducted a study at the Orthopaedics department of A.V.B.R.H, Sawangi. Prior to study initiation, the protocol and informed consent documents were taken by the Institutional Ethics Committee. Written informed consent was obtained from each study participant. We assessed all the patients who have been enrolled in AVBRH. The patients were screened with USG/MRI scan for partial supraspinatus tears, after documentation of a clinical and radiological diagnosis, the patient was subjected to 2ml of PRP injection under USG guidance. Subsequent follow up was on 3<sup>rd</sup> and 6<sup>th</sup> weeks. *Results:* out of 50 patients included in the study, 36% (18) were males and 64% (32) were females. The age distribution shows a higher rate of incidence after the age of 40. The clinical test for the partial tear of Supraspinatus i.e. abduction strength test was positive for 80% of cases which was further confirmed by usg/mri. The diagnostic criteria were USG for majority of the patients (70%) because of the cost affordability and criteria of diagnosis. *Conclusion:* The current investigation represents clinically based outcome study to evaluate and compare the effectiveness of treating partial supraspinatus tears with USG guided PRP infiltration. Our observation and results suggest that this treatment may be an effective and safe treatment option for patients presenting with partial supraspinatus tears. The patients showed better improvement in terms of relief from pain, restoration of mobility and duration of time required for clinical improvement with local infiltration of platelet rich plasma. However, it can also be concluded that the platelet rich plasma can be a good treatment option for the patients with partial supraspinatus tears.

**Keywords:** supraspinatus tears, musculoskeletal disorders, platelet, plasma

## 1. INTRODUCTION

According to the World Health Organization (WHO), musculoskeletal injuries are the most common cause for severe long-term pain and physical disability and affect hundreds of millions of people around the world. The continued popularity of sporting activities has brought with it an epidemic of musculoskeletal disorders focusing attention on tendons and ligaments. Tendon injuries in the shoulder account for overuse injuries in sports as well as in jobs that require repetitive activity (Camargo et al., 2009; Cools et al., 2008; Martins et al., 2012; Marcondes 2013). Excessive mechanical loading is considered the major causation factor. Although tendon problems are very frequent, they are not always easy to manage. The supraspinatus tendon is the most common injured tendon of the shoulder due to its location just under the coracoacromial ligament (Burke WS., et al., 2002). Apoptosis (Tuoheti et al., 2005) vascular changes (Carr et al., 2005) tears (Bunker et al., 2003) and calcifications (Hughes PJ and Bolton-Maggs B, 2002) of the supraspinatus tendon have already been described in subjects who were treated with subacromial decompression. As a type of connective tissue, tendon properties are determined primarily by the amount, type and arrangement of an abundant extracellular matrix (Culav EM et al., 1999). Thus, the tendon has a multi-unit hierarchical structure composed of collagen molecules, fibrils, fiber bundles, fascicles and tendon units that run parallel to the tendon's long axis (Wang JH et al., 2003). Tissue repair in musculoskeletal lesions is often a slow and sometimes incomplete process.

In sports patients or professional athletes, the impact of musculoskeletal lesions on life and work is great and fast recovery of full efficiency and return to competition is of primary importance. The clinical improvement offered by available treatment is not always sufficient for high demanding patients to return to their previous level of activity. The use of autologous growth factors in the form of platelet rich plasma (PRP) may be just the beginning of a new medical frontier known as "orthobiologics." Platelet-rich plasma (PRP) is a new technology focused on enhancing the healing response after injury of different tissue types ( Kraushaar B et al., 1999, Eppley B et al., 2004). Platelets arise from cytoplasmic fragmentation of the megakaryocyte in the bone marrow. Like red blood cells, platelets enter the circulation as nuclear cells and therefore have a limited life span. Whereas the red blood cells live for about 120 days, platelets live for about 7 to 10 days. The platelet in particular, actively synthesizes growth factors throughout its lifespan and actively secretes them in response to clotting. The alpha granules in platelet are the storage granules of growth factors. They contain pre-packaged growth factors in an incomplete and therefore bio-inactive form. The growth factor proven to be contained in these granules are three isomers of platelet derived growth factors (PDGF-aa, PDGF-bb and PDGF-ab), the two isomers of transforming growth factor beta (TGFβ1 and TGFβ 2), vascular endothelial growth factor (VEGF) and epithelial growth factor (EGF). The alpha granules are rich in cell adhesion molecule vitronectin, which is required for osteo-induction and osteo-integration. The circulating platelets participate in natural wound healing based on its number in the circulating blood.

Different theories have been advanced to explain pain and chronicity mechanisms of supraspinatus tears both complete and partial, but these mechanisms remain largely unknown. However, the management of partial Supraspinatus tears varies from activity modification and rest to surgical intervention. However, there are many non operative treatment modality discussed in the literature eg. Infiltrations of steroid, hyaluronate and needling. The "Conventional" treatments are generally employed empirically to fight pain and inflammation but they do not modify the histological structure of the tendon. The use of biological material has been extensively studied in recent years. Platelet rich plasma has been successfully used in many sports injury eg. lateral epicondylitis, Tendo achillis injuries. The role of platelet rich plasma in partial Supraspinatus tears has not been studied exclusively. Therefore, we have designed our study for the clinical evaluation of partial supraspinatus tears managed with Platelet Rich Plasma.

### Objectives

To define the ultrasonographic profile of patients with partial supraspinatus tears.

To compare the results on the basis of clinical outcome of the patients treated with platelet rich plasma.

## 2. METHODOLOGY

We conducted a study at the Orthopaedics department of A.V.B.R.H, Sawangi. Prior to study initiation, the protocol and informed consent documents were taken by the Institutional Ethics Committee. Written informed consent was obtained from each study participant. We assessed all the patients who have been enrolled in AVBRH. The patients were screened with USG/MRI scan for partial supraspinatus tears, after documentation of a clinical and radiological diagnosis, the patient was subjected to 2ml of PRP injection under USG guidance. Subsequent follow up was on 3<sup>rd</sup> and 6<sup>th</sup> weeks.

*Clinical Methods-* Jobs test/Empty can test, abduction strength test.

*Radiological Method-* primarily patient underwent MRI, but for patients who had affordability problem, USG was the screening method of choice.

*Study setting:* This study was conducted in the Department of Orthopaedics of Acharya Vinoba Bhave Rural Hospital, DMIMS, Sawangi (Meghe), Wardha.

*Subjects-* Patient Attending AVBRH with complaints of shoulder pain, and difficulty in shoulder movements, specifically abduction.

*Study duration-* 2 months (2019)

*Study Population-* Patients of all age group.

*Type of study design-* the study was conducted in two parts. In the 1<sup>st</sup> part of the study, the retrospective data of all the patients of partial supraspinatus tear was collected and analyzed. In the 2<sup>nd</sup> part, we continued the study prospectively, to diagnose, analyse and study the patients coming to the orthopaedic department on regular opd and emergency days.

*Sample size-* 50 patients (by using non-randomise purposive sampling we selected 50 patients in the study).

### Selection criteria

#### *Inclusion criteria*

All the patients of partial supraspinatus tear

Age between 18-70 years of age

Patient willing for PRP injection

#### *Exclusion criteria*

1. Patient not willing for any treatment and follow up.
2. Patient who was not willing to give consent for participation in the study.
3. Patients below the age of 18.
4. Patients with open injuries, infections, or any inflammatory diseases.
5. Patients with Diabetes.

### Consent

Prior to the examination of each patient, consent was taken.

### Data collection procedures

All the patients coming to the department of Orthopaedics with complaints of shoulder pain, and difficulty in shoulder movements, specifically abduction

### Plan of analysis

All patients who met the inclusion criteria were included in the study. Clinical history of each patient was recorded as per the Proforma. Clinical details including risk factors complete Haemogram and other biochemical parameters were also recorded. Diagnostic clinical tests were performed on patients and those with probability of supraspinatus tears were sent for radiological confirmation of diagnosis. After the clinical and radiological diagnosis, patients were subjected to PRP infiltration. After the PRP infiltration, the patients were followed up after 3<sup>rd</sup> and 6<sup>th</sup> weeks for clinical evaluation.

### Statistical analysis

The tabulation and cross tabulation was done. Results are expressed in percentage. Statistical analysis was performed on the intent-to-treat (ITT) population. For statistical analysis, data was first entered in Microsoft excel database and subsequently processed by standard statistical software: Statistica version 6.

### Ethical consideration

Approval of institutional ethics committee was taken prior to the study. IEC no.- DMIMS(DU)/IEC/2019/7971

### Implications

As according to the literature, the partial supraspinatus tears were subjected to either arthroscopic surgeries or were managed with conservative treatment with physiotherapy. But with this study, we tried to manage the patients with partial supraspinatus tears with PRP infiltration with the expectation of anatomical healing of the supraspinatus tendon tear and aim to achieve better clinical outcome as compared to the old methods of conservative management of partial supraspinatus tears and indeed avoid the need of surgery.

## 3. OBSERVATION AND RESULTS

Out of 50 patients included in the study, 36% (18) were males and 64% (32) were females (table 1).

**Table 1** male to female ratio

SEX	Count	Parentage
Male	18	36%
Female	32	64%
Total	50	100%

The age distribution shows a higher rate of incidence after the age of 40 (table 2).

**Table 2** distribution according to age group

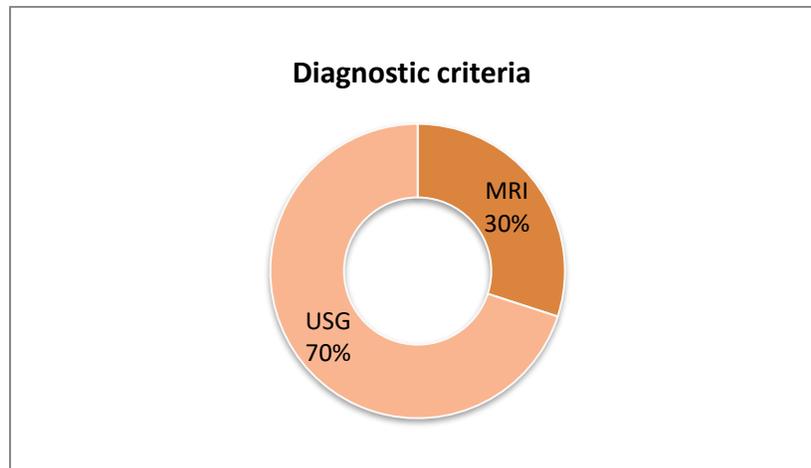
Age Group	Count	Parentage
<30	7	14%
31-40	7	14%
41-50	12	24%
51-60	12	24%
>61	12	24%
Total	50	100%

The clinical test for the partial tear of Supraspinatus i.e. abduction strength test was positive for 80% of cases which was further confirmed by usg/mri (table 3).

**Table 3** clinical test results

Abduction strength test(before PRP)	Total	Parentage
Negative	10	20%
Positive	40	80%
Total	50	100%

The diagnostic criteria were USG for majority of the patients (70%) because of the cost affordability and criteria of diagnosis (chart 1).

**Chart 1** diagnostic criteria results

The healing was complete by 6<sup>th</sup> week in 88% of the patients included in the study which was assessed by the clinical tests.

**Table 4** results of healing

Healing (6th week)	Total	Parentage
complete	44	88%
partial	6	12%
Total	50	100%

#### 4. DISCUSSION

The majority of overuse tendon injuries occur in men. Randelli et al., 1999 found  $66.6 \pm 9.04$  years were the mean age in their study group. In our study maximum age group were of beyond 40 years of age. 48% of patients were above 50 years of age. Our findings were supported by the study of Peter G. Hamilton (Hamilton 1986) in which the age incidence figures show clearly the excess of cases of tendon injuries in the 35-54 years age group. The mean age of incidence was 45 years. Our sample demonstrated heterogeneity in the age group distribution owing to their profession and type of work they are involved in. In our study we observed female gender was predominantly having partial supraspinatus tears. The most probable reason for that could be their occupation and life style. We observed that the patients who were indulged in over head laborer activity were female and hence the gender difference can be explained. However, the gender difference was not statistically significant. These observations were noted to be contradicting the results in the study of Mishra and Pavelko (Mishra, pavlko 2006) and Kenneth Mautner et al. (Kenneth et al., 2013) which could be because of the occupation difference in the rural and urban population and lifestyle (Ragab EM, Othman AM 2012). In their study found 60 % patients had no functional limitations post-injection, 32 % had minimal functional limitations whereas two patients (8 %) had moderate functional limitations post-injection.

In our study we found out that 88% of the patients had complete healing i.e. no functional limitation after 6<sup>th</sup> week of PRP injection and 12% patients had mild or moderate limitation at the end of 6<sup>th</sup> week. (Kenneth et al., 2013) in their study showed that 82% of patients indicated moderate to complete improvement in symptoms which is similar to the findings in our study. In addition,

at follow-up, 95% of patients reported having no pain at rest that disrupted their activities of daily living and 68% reported no pain during activities. A total of 85% of patients were satisfied with the procedure. The complication of local infiltration of the platelet rich plasma has been discussed sparsely in the literature. However we did not encounter any complication in our study. (Sampson et al., 2008) found that some of the patient who had undergone PRP therapy complained about an acute ache or soreness at the site of the injection. Sometimes this pain is even felt deep inside the area, whether in the muscle or bone. While a tremendous amount of precaution is taken when injecting a patient with a PRP serum—intense sterilization procedures are, in fact, followed closely for each treatment—sometimes an infection can break out in the injured area. Allergic reaction has also been seen in some of the study. Blood clot formation, skin discoloration has also been reported in the literature (Everts P et al., 2006)

## 5. CONCLUSION

The current investigation represents clinically based outcome study to evaluate and compare the effectiveness of treating partial supraspinatous tears with USG guided PRP infiltration. Our observation and results suggest that this treatment may be an effective and safe treatment option for patients presenting with partial supraspinatous tears. The patients showed better improvement in terms of relief from pain, restoration of mobility and duration of time required for clinical improvement with local infiltration of platelet rich plasma. However, it can also be concluded that the platelet rich plasma can be a good treatment option for the patients with partial supraspinatous tears.

### Conflicts of Interest:

The authors declare no conflict of interest.

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## REFERENCE

- Biberthaler P, Wiedemann E, Nerlich A, Kettler M, Mussack T, Deckelmann S, Mutschler W. Microcirculation associated with degenerative rotator cuff lesions. In vivo assessment with orthogonal polarization spectral imaging during arthroscopy of the shoulder. *J Bone Joint Surg Am* 2003; 85-A: 475-480
- Bunker T. Rotator cuff disease. *Curr Orthop* 2002; 16: 223-233
- Burke WS, Vangsness CT, Powers CM. Strengthening the supraspinatus: a clinical and biomechanical review. *Clin Orthop Relat Res* 2002; (402): 292-298
- Camargo PR, Haik MN, Ludewig PM, Filho RB, Mattiello-Rosa SM, Salvini TF. Effects of strengthening and stretching exercises applied during working hours on pain and physical impairment in workers with subacromial impingement syndrome. *Physiother Theory Pract* 2009; 25: 463-475
- Carr A, Harvie P. Rotator cuff tendinopathy. In: Maffulli N, Renström P, Leadbetter WB. Tendon injuries: Basic science and clinical medicine. London: Springer, 2005: 101-118
- Cools AM, Declercq G, Cagnie B, Cambier D, Witvrouw E. Internal impingement in the tennis player: rehabilitation guidelines. *Br J Sports Med* 2008; 42: 165-171
- Culav EM, Clark CH, Merrilees MJ. Connective tissues: matrix composition and its relevance to physical therapy. *Phys Ther* 1999; 79: 308-319
- Eppley B, Woodell JE, Higgins J. Platelet quantification and growth factor analysis from platelet-rich plasma: Implications for wound healing. *Plast Reconstr Surg* 2004;114:1502-1508.
- Everts P, Knape J, Weirich G, Schonberger J, Hoffman J, Overvest E, et al. Platelet-rich plasma and platelet gel: a review. *JECT*. 2006;38:174-87.
- Hughes PJ, Bolton-Maggs B. Calcifying tendonitis. *Curr Orthop* 2002; 16: 389-394.
- Kenneth Mautner, Ricardo E. Colberg, Gerard Malanga, Joanne P. Borg-Stein, MD, Kimberly G. Harmon, Aisha S. Dharamsi, Samuel Chu, Paul Homer Outcomes After Ultrasound-Guided Platelet-Rich Plasma Injections for Chronic Tendinopathy: A Multicenter, Retrospective Review *PM R* 2013;5:169-175.
- Khan K, Cook J. The painful nonruptured tendon: clinical aspects. *Clin Sports Med* 2003; 22: 711-725
- Kraushaar B, Nirschl RP. Current concepts review: Tendinosis of the elbow (tennis elbow). Clinical features and findings of histological, immunohistochemical, and electron microscopy studies. *J Bone Joint Surg Am* 1999;81:259-278.
- Marcondes FB, de Jesus JF, Bryk FF, de Vasconcelos RA, Fukuda TY. Posterior shoulder tightness and rotator cuff strength assessments in painful shoulders of amateur tennis players. *Braz J Phys Ther* 2013; 17: 185-194
- Martins LV, Marziale MH. Assessment of proprioceptive exercises in the treatment of rotator cuff disorders in nursing professionals: a randomized controlled clinical trial. *Rev Bras Fisioter* 2012; 16: 502-509

16. Mishra and Pavelko. Treatment of chronic elbow tendinosis with buffered platelet-rich plasma. *Am J Sports Med.* 2006 10(10):1–5.
17. Peter G. Hamilton, MRCGP: The prevalence of humeral epicondylitis: a survey in general practice *Journal of the Royal College of General Practitioners*, 1986, 36,464-465.
18. Ragab EM, Othman AM Platelets rich plasma for treatment of chronic plantar fasciitis. *Arch Orthop Trauma Surg.* 2012 Aug;132(8):1065-70.
19. Randelli PS, Arrigoni P, Cabitza P, et al: Autologous platelet rich plasma for arthroscopic rotator cuff repair. A pilot study. *Disabil Rehabil* 2008 30: 1584-1589.
20. Steven Sampson, Michael Gerhardt, Bert Mandelbaum. Platelet rich plasma injection grafts for musculoskeletal injuries: a review. *Curr Rev Musculoskelet Med* 2008 1:165–174.
21. Tuoheti Y, Itoi E, Pradhan RL, Wakabayashi I, Takahashi S, Minagawa H, Kobayashi M, Okada K, Shimada Y. Apoptosis in the supraspinatus tendon with stage II subacromial impingement. *J Shoulder Elbow Surg* 2005; 14: 535-541
22. Wang JH, Iosifidis MI, Fu FH. Biomechanical basis for tendinopathy. *Clin Orthop Relat Res* 2006; 443: 320-332