



## Clinical Effects Of Local Infiltration Of Autologous Platelet Supernatant In Supraspinatus Tendinopathies

**Dr Nandan Kumar Mishra\***

MS, DNB, Specialty Medical Officer, Department of Orthopaedics, KEM Hospital  
\*Corresponding Author

**Dr Roshan Wade**

MS, DNB, D.Ortho, FCPS, Department of orthopaedics, KEM Hospital

### ABSTRACT

**Introduction:** Tendon injuries are a common presentation to the orthopaedic OPD. Supraspinatus tendinopathy is a common occurrence and commonly occurs at the "critical area" located between 1.25 - 2.5 cms proximal to site of insertion<sup>1</sup>. There is increasing interest in the use of autologous platelet concentrate or platelet rich plasma<sup>4</sup>. PRP is exogenously applied to soft tissues to promote wound healing and tissue sealing (4,5).

**Materials and Methods:** The study was a prospective study conducted at tertiary care hospital catering to both urban and rural population. The freshly prepared PRP was taken in syringe with needle no. 24 and around 2-3ml of PRP was injected at the site of tendon. At baseline, 1 month, 3 months and 6 months the patients were assessed for pain and movement on the affected side with the help of Constant Murley score.

**Result:** Grade wise 63.3% cases had poor and 36.6% had fair shoulder function as baseline. This gradually improved at 1 month with 63.3% patients having fair function and 3.34% patients having good function at affected shoulder. At 3 months there was further improvement and 33.33% patients had good function, and 56.67% patients with fair function of shoulder. At 6 months. 9.09% had poor function whereas percentage of those with fair function increased marginally (59.09%) compared to 3 months.

**Conclusion:** We found significant improvement in shoulder function as the Constant-Murley score reduced significantly at 1 month ( $P < 0.0001$ ) and at 3 months ( $P < 0.0001$ ) from the baseline.

### KEYWORDS :

#### Introduction

Tendon injuries are a common presentation to the orthopaedic OPD. They may occur at mid-portion or at the site of attachment of the tendon. Commonly affected tendons include the Achilles tendon, patellar tendon, and Rotator cuff involvement. Supraspinatus tendinopathy is a common occurrence and commonly occurs at the "critical area" located between 1.25 - 2.5 cms proximal to site of insertion<sup>1</sup>.

Supraspinatus tendon strain is a common cause of pain in the shoulder. Various activities that may injure the tendon include swimming, lifting heavy objects, carrying heavy weights etc. Individuals involved in athletic or sporting activities may be more prone to develop supraspinatus tendinopathy.

Tendon injuries occur in a continuum that consists of reactive tendinopathy, Tendon disrepair or failed healing and degenerative tendinopathy. Characteristic changes occur in the structure of the tendon that weakens the tendon causing failure on repeated tensile loading<sup>2</sup>. Repeated such episodes are associated with chronic overload.

The mainstay of treatment of such tendon injuries remains conservative management. These comprise of eccentric exercises, shock wave therapy, corticosteroid injection etc<sup>3</sup>. Aprotinin, a serine protease inhibitor maybe used off-label for treatment of tendinopathy. Similarly there is increasing interest in the use of autologous platelet concentrate or platelet rich plasma<sup>4</sup>.

Platelet Rich Plasma (PRP) is derived from whole blood by centrifugation. Autologous PRP is safe and effective in promoting natural process of wound healing soft tissue reconstruction and sometimes even bony healing<sup>4</sup>. The mechanism is based on the high concentrate of platelet-derived growth factors such as fibrin. PRP is exogenously applied to soft tissues to promote wound healing and tissue sealing<sup>(4,5)</sup>.

Our study aimed to evaluate the short-term efficacy of PRP in supraspinatus tendinitis.

#### Materials and Methods

The study was a prospective study conducted at tertiary care

hospital catering to both urban and rural population. The study includes both outpatient visitors and in-patient admissions. The study was conducted from April 2015 to April 2016. After obtaining informed consent an MRI or a local ultrasonography was done to diagnose the supraspinatus tendinopathy. The patients who were excluded were those with associated fractures of shoulder joint or scapula, those with shoulder dislocation and patients with any local infection.

After briefing the patients about the procedure the following steps were done

1. 30 cc of blood was withdrawn from the patient's antecubital vein under all aseptic precautions. Citrate dextrose was used as an anti-coagulant.
2. Initial centrifugation was done at 3000 RPM for 12 minutes to separate red blood cells.
3. Supernatant plasma containing platelets was transferred to another tube.
4. Again centrifugation was carried out at 3500 RPM for 10 minutes to concentrate the platelets.
5. Lower 1/3rd contained PRP and upper 1/3rd was removed, as it was platelet poor.
6. Platelet plug was formed at the bottom of the tube. Platelet plug was suspended with minimum quantity with gentle shaking of the tube.

For each patient the lateral edge of the acromion on the affected side was located by thumb. The thumb was passed along the edge anteriorly where the bony prominence was felt. The thumb was slid downwards in front for a quarter inch. The groove is felt where the distal end of the tendon lies.

The freshly prepared PRP was taken in syringe with needle no. 24 and around 2-3ml of PRP was injected at the site of tendon. The patients were followed up for a minimum of 3 months till maximum of 18 months. At baseline, 1 month, 3 months and 6 months the patients were assessed for pain and movement on the affected side with the help of Constant Murley score.

The Constant Murley score assesses subjective and objective shoulder function with respect to following parameters

- A. Pain
- B. Activities of daily living
- C. Range of Motion
- D. Strength

The European Society for Shoulder and Elbow (ESSSE) and the Journal of Shoulder and Elbow surgery recommend the use of CMS for use in research on shoulder disorders.

Based on the score the grading of the shoulder function was done as follows.

- Score >30: Poor function
- Score 21-30: Fair
- Score 11-20: Good
- Score <11: Excellent

The sampling method adopted was simple random sampling. The data analysis was performed using statistical software SPSS version 15.0 Statistical test used were Chi square test for comparing qualitative variables, t test for quantitative variable. P value at <0.05 was considered significant at 95% confidence interval.

**Results**

In total 30 patients included in the study, age ranged from 30 to 78 years with mean 46.6 years. Most patients were in the age group of 31 to 40 years (36.7%) followed by 41 to 50 years (26.7%).

Gender distribution was as depicted in the table.

**Table 1**

Gender	n	%
Male	23	76.7
Female	7	23.3

The Male: Female ratio was 3.28:1

The occupation of the patients were as follows

**Table 2**

Occupation	n	%
Farmer	12	40.0
Household	7	23.3
Wage worker	3	10.0
Barber	2	6.7
Carpenter	1	3.3
Construction Worker	1	3.3
Industrial worker	1	3.3
School teacher	1	3.3
Shopkeeper	1	3.3
Student	1	3.3
Total	30	100

Majority of patients were farmers (40.0%), followed by household activities in 23.3% and wageworker being 10% patients.

**Table 3**

Clinical presentation	n	%
<b>Pain Severity</b>		
Mild	2	6.7
Moderate	21	70.0
Severe	7	23.3
<b>Movements</b>		
Restricted	29	96.7
Not restricted	1	3.3
<b>Shoulder affected</b>		
Right	16	53.3
Left	14	46.7
<b>Dominant side</b>		
Right	27	90.0
Left	3	10.0

	Etiology	Etiology
Traumatic	7	23.3
Non-traumatic	23	76.7
Past history of complaints	2	6.7
<b>Duration of pain</b>	<b>Range : 15 days to 18.3months</b>	
2 weeks	4	13.3
>2 to 4 weeks	14	46.7
>4 to 8 weeks	6	20.0
>8 weeks	6	20.0

Pain was of moderate intensity in most of the patients (70%) and was severe in 23.3%. 96.7 % patients had restricted movements. Right shoulder was affected in 53.3% whereas left in 46.7% cases. Two patients had past history of similar complaints. Shoulder pain was of 2 to 4 weeks duration in 46.7% cases. 20% patients had over 8-week duration of pain.

**Investigation for diagnosis in study population**

**Table 4**

Investigation	n	%
USG	27	90.0
MRI	3	10
Additional MRI required in cases of USG diagnosis	3	10

The accuracy for diagnosis of supraspinatus tear was 80%

**Table 5**

Visits	N	CMS SCORE GRADE >30 (Poor)	CMS SCORE GRADE 21-30 (Fair)	CMS SCORE GRADE 11-20 (Good)	CMS SCORE GRADE <11 (Excellent)
Baseline	30	19(63.33)	11(36.67)	-	-
1 month	30	10(33.33)	19(63.33)	1(3.34)	
3 months	30	2(6.67)	17(56.67)	10(33.33)	
6months	22	2(9.09)	13(59.09)	7(31.82)	-

Grade wise 63.3% cases had poor and 36.6% had fair shoulder function as baseline. This gradually improved at 1 month with 63.3% patients having fair function and 3.34% patients having good function at affected shoulder. At 3 months there was further improvement ad 33.33% patients had good function, and 56.67% patients with fair function of shoulder. One patient had excellent functional recovery at 3months. At 6 months, only 22 patients were evaluated on follow-up. 9.09% had poor function whereas percentage of those with fair function increased marginally (59.09%) compared to 3 months.

**Discussion**

Rotator cuff tendinopathy (RCT) is an important condition of the upper extremity affecting 1 in 50 adults; incidence increases with age, making shoulder pain a common musculo-skeletal complaint in adults over 65 years of age 6. Platelet-rich plasma (PRP) is increasingly used in sports medicine because it enhances the process of healing, tissue regeneration and return to play, particularly in elite athletes and professional athletes.

The first use of PRP was done in 1980s to promote physiological wound healing of cutaneous ulcers; PRP has potential regenerative and healing effects in dental procedures 7.

In this study 30 patients of rotator cuff tendinopathy proved by USG were included. In addition to USG 3 patients had MRI done as other patients refused to undergo MRI study.

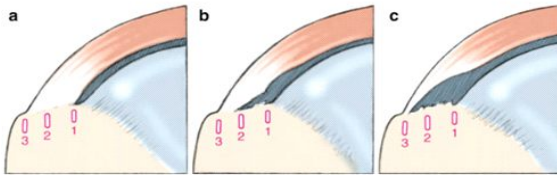
**Rotator cuff classification**

Elman was the first to popularize a system to classify partial-thickness tears based on intra-operative findings. In the Elman system, a grade I tear is 3mm deep, a grade II tear is 3-6 mm deep, but does not exceed one-half of the tendon thickness and a Grade III tear is 6 mm deep.

**Habermayer classification (figure 1)**

The tear classification in coronal and sagittal plane of shoulder was as follows Longitudinal extension of articular sided supraspinatus tears in coronal plane

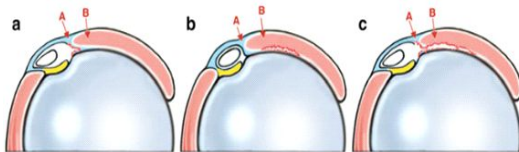
- A. Type 1 tear: small tear within transition zone from cartilage to bone
- B. Type 2 tear: extension of tear to center of footprint
- C. Type 3 tear: Extension of tear up to greater tuberosity



**Figure 1**

Sagittal extension of articular sided supraspinatus tear in transverse plane (figure 2)

- A. Type A: tear of coraco-humeral ligament continuing into medial border of supraspinatus tendon
- B. Type B: Isolated tear within crescent zone
- C. Type C: tear extending from the lateral border of pulley system over the medial border of supraspinatus tendon up to the area of crescent zone



**Figure 2**

**Full thickness tear classification**

Many factors are felt to be important in describing full thickness tears. These include size of tear, number of tendons involved, tear shape, soft tissue quality, and CT/MRI assessment of fatty infiltration and atrophy of the muscles attached to the torn tendons. In a review of commonly used systems, not one included all of these systems.

Tear size was classified by Cofield as Small if tear was less than 1cm, medium if tear was 1-3 cms, large if 3-5cms, and massive if the tear was greater than 5 cm in length.

Harryman developed classification based on the number of compromised tendons

Stage 1a is partial thickness tear

Stage 1b is full thickness tear isolated to the supraspinatus

Stage 2 includes the supraspinatus and a portion of the Infraspinatus

Stage 3 includes the entire Supraspinatus, the Infraspinatus and Subscapularis tendons

Stage 4 is Rotator cuff arthropathy

**Patte classification incorporated several factor (figure 3)**

Stage 1: Proximal stump close to bony insertion

Stage 2: Proximal stump at level of humeral head

Stage 3: Proximal stump at the level of glenoid



**figure 3**

**Management**

The goals of the physical therapy are to relieve pain and inflammation, prevent muscle atrophy without exacerbating the pain, re-establish non-painful ROM. This includes period of active rest, eliminating any activity that may cause increase in symptoms. Neuromuscular exercises are started.

Injections: Steroid injections are often used. Bursa sided RCT's should receive sub-acromial injection while intra-articular injections provide greater pain relief for articular sided RCT's3

Platelet Rich Plasma (PRP) has also been used for treatment of supraspinatus tears(6). It is based on the presence of the multitude of Platelet derived growth factors.

Ehrenfest 7 classified PRP into 4 types:-

Pure Platelet rich plasma (P-PRP)

Leucocyte and PRP

Pure platelet-rich Fibrin (P-PRF)

Leucocyte and Platelet -rich fibrin

There are many commercially available kits for preparation of PRP. The various factors that influence the yield of PRP are draw of blood, speed, time and temperature of centrifugation and the use of anti-coagulants.

**Conclusion**

We found significant improvement in shoulder function as the Constant-Murley score reduced significantly at 1 month (P<0.0001) and at 3 months (P<0.0001) from the baseline. Also categorically more patient reached good score of improved overall function at 3months. No side effects were noted in this study.

Hence in conclusion, PRP can be considered as a treatment modality for the management of supraspinatus tear. This finding would need to be substantiated in a large long term placebo controlled randomized clinical trial.

**References:**

- 1) Chansky HA, lannott JP The vascularity of rotator cuff; Clin sports med 1991 Oct 10(4):807-822
- 2) Clement et al: Management of degenerative rotator cuff tears: a review of treatment strategy. Sports medicine, arthroscopy, rehabilitation, therapy and technology 2012 4:48
- 3) Eiji Itoi et al: Rotator cuff tear :physical examination and conservative treatment; journal of orthopaedics science 2013 18(2) 197-204
- 4) Mei- Dan O et al: The Role of platelet rich plasma in rotator cuff repair; Sports med arthrosc. 2011 Sep;19 (3):244-50
- 5) Barber FA et al: Platelet rich plasma for rotator cuff repair: Sports med Arthrosc.2013 Dec;21(4):199-205.
- 6) Senthil Nathan Sambandam: Rotator cuff tears: An elective based approach; World journal orthopaedics. 2015 Dec 18; 6(11):902-918
- 7) David M et al: Classification of platelet concentrates ( Platelet rich plasma- PRP, Platelet rich fibrin- PRF) for topical and infiltrative use in orthopaedic and sports medicine: current consensus, clinical implication and perspectives: Muscles, Ligaments and tendon journal 2014 Jan- Mar; 4(1) 3-9.