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Clinical outcome of PRP (Platelet rich Plasma) injection in shoulder pain due to rotator cuff disorders

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Abstract
Among causes of shoulder pain, rotator cuff disorders *viz* tendinitis, tears, impingement are very common. In this study we evaluate the efficacy of new treatment of PRP (Platelet Rich Plasma) injection in selected patients.
This study was conducted in twenty patients having rotator cuff pathology allocated for intra articular injection of PRP in shoulder joint through posterior approach under local anaesthesia. All patients assessed pre-operative and post-operative period by using Constant Shoulder Scores.
In our study a single injection of PRP resulted in a safe, significant, sustained improvement in pain and functional outcomes for patients with refractory partial Rotator Cuff Tear (RCT) that is statistically significant.

Keywords: PRP Platelet Rich Plasma, RCT Rotator Cuff Tear, FT RCT Full-Thickness Rotator Cuff Tear, PT RCT Partial-Thickness Rotator Cuff Tear

Introduction
In the community as many as 20% of adult populations experience shoulder pain symptoms at any one time, many of whom do not consult their doctors, and these complaints seem to be increasing in incidence. It is important to investigate shoulder pain in the community to understand the full impact such complaints have on general population.
The causes may stem from degeneration, impingement or overload. It is thought to be a combination of intrinsic and extrinsic factors that cause joint injury [1]. Extrinsic factors include repetitive microtrauma and impingement. Intrinsic factors include hypovascularity of tendons, as well as age related changes including decreased cellular activity and changes in the composition of the matrix of the tendon.
Once injured, it is likely that there is difficulty healing due to poor blood supply at the humeral insertion point. Diagnosis is made based on clinical suspicion with supporting radiographic evidence. The preferred imaging method is magnetic resonance imaging (MRI), which can show partial or small rotator cuff tears [2].
To improve outcomes, the relatively new technique of injection of PRP is under investigation. This technique uses platelet-rich plasma, which is a whole blood fraction containing high platelet concentration. The proposed benefit of including PRP in rotator cuff disorders is that it allows platelet derived factors to be locally available to the tissue throughout the healing process [3] [4].
This study, "clinical outcome of PRP (platelet rich plasma) injection in shoulder pain due to rotator cuff disorders'' has been taken to evaluate efficacy of PRP(Platelet Rich Plasma) injection in shoulder pain in selected patients.

Aims
Aims of study are to study the improvement in shoulder function in rotator cuff disorders by giving platelet rich plasma.
Objectives of study is to systematically evaluate the outcome of giving platelet rich plasma injection in shoulder pain in terms of pain, activities of daily living, range of movement and shoulder strength using Constant Shoulder Score [5-10].

Material and Methods

The study is a prospective and observational study conducted in the department of Orthopaedics, Tata Main Hospital, Jamshedpur, between 10th October 2015 to 9th October 2016 including the patients admitted at orthopaedics department with shoulder pain due to rotator cuff pathology. Approval by the ethics committee of Hospital, Jamshedpur had taken and written informed consent of patients obtained to conduct the study. Total study population was 25 out of that we are considering only 80% of that population. Taking the α at 0.05 and desired power of study is 80% the sample size needed is 20.

Inclusion Criteria

1. Age group : >18years
2. Gender : Male and female patients
3. Patients with shoulder pain due to rotator cuff disorders
4. Patients who are willing to participate in the study
5. Skeletally mature patient

Exclusion Criteria

1. Children and adolescent patients <18yrs
2. Patients with any previous history of Fracture of Shoulder
3. Patients not willing to participate.
4. Patients with history of shoulder dislocation
5. Patients with infections
6. Patients with haematological disorders (Coagulopathy).
7. Patients with severe Cardiovascular Diseases
8. Patients with Immunodeficiency
9. Patients who are using anticoagulants or anti-aggregants
10. Patients with platelet value less than 150,000 mm3

Methodology

All patients admitted for shoulder pain due to rotator cuff pathology in orthopaedics department in Tata Main Hospital, Jamshedpur, Jharkhand, were examined clinically, radiologically and patient will be taken for injection of PRP in shoulder joint according to inclusion and exclusion.

All patients examined clinically and radiologically using Constant Shoulder Score and MRI respectively.

Patient underwent intra-articular injection of PRP in shoulder joint through posterior approach under local anaesthesia. Post-injection physiotherapy was followed according to the protocol to evaluate the functional outcome.

Patients were followed up at 1st post-injection day, 1 month, 3 months and 6 months after the injection. Grading of results done using final Constant Shoulder Score.

Statistical Method

The collected data were organized, tabulated and statistically analysis using "MedCalc". The data will be analysed by appropriate statistical tools.

Numerical data were expressed as mean ± standard deviation, and categorical data were expressed as relative frequency and percentage.

The following statistical significance tests would be applied

1. T-test was used to compare two independent groups of continuous data.
2. Chi-square test was used to compare categorical data.

Results and Discussion

In this study, 20 cases of shoulder pain due to rotator cuff disorders of which 12 patients were of partial supraspinatous tear and 08 patients were of complete supraspinatous tear, confirmed with either USG or MRI were treated with Platelet Rich Plasma(PRP) injection in shoulder joint.

The study included patients with age ranging from 41 to 80 years with a mean age of 57.90 years. Mean age of male patients was 58.73 years and mean age of female patients was 56.89 years of total 11 male and 09 female patients.

In our study we have 10 (50%) patients having right shoulder pain and 10 (50%) patients having left shoulder suggesting equal incidence of shoulder pain in both shoulder.

None of the patients developed any complication in our study.

Evaluation of Results By Means Of Constant Shoulder Score

It comprises of the following components: (11-17)

1. Pain 0-15 Points
2. Activities of Daily Living 0-20 Points
3. Movements 0-40 Points
4. Strength 0-25 Points

The maximum possible points are 100 Units.

Table 1: Grading of Constant Shoulder Score (Difference between normal and abnormal Side)

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

Table 2: Pre-injection and final post-injection score after 6 months follow up

Criteria	Follow up	Partial tear	Full tear
Pain	Pre	2.92 ± 3.34	2.5 ± 2.67
	Post	10.42 ± 3.34	6.87 ± 4.58
Activity	Pre	6.83 ± 4.39	5 ± 1.51
	Post	12.17 ± 5.56	5.75 ± 1.67
Movements	Pre	14 ± 6.82	13.75 ± 5.06
	Post	28 ± 6.82	16 ± 5.01
Strength	Pre	3.83 ± 3.61	3.5 ± 2.27
	post	9.58 ± 3.63	4.25 ± 3.11

Constant score improvement seen in both the groups but it is more in partial tear patients compared to full tear patients.

Overall outcome of pain relief among patients

In partial tear 6 patients have severe pain initially and 5 have moderate pain and on follow up 7 patients have only mild pain and 3 have no pain at all and no one have severe pain.

In full tear 4 have severe and 4 have moderate pain and on follow up pain decreased to mild grade in 5 patients.

Patients showed significant improvements in pain relief.

Overall outcome of strength of abduction among patients

In partial tear initially 6 patients have strength in range 1-3 pounds and 4 patients have strength in 4-6 range and on final follow up 5 patients improved to range 7-9 pounds and 3 have >10 pounds strength of abduction.

In full tear there is not much significant improvement in strength of abduction.

Overall outcome of Activity of Daily Living among patients

In partial tear all 12 patients have unaffected sleep after follow up, 4 patients can do full sports activity without any discomfort and 4 can do full daily activity and 5 patients use

their hand to do over head activity without any problem.
In full tear patients out of 8 patients 6 have unaffected sleep, rest activity scores do not show significant improvements.

Overall outcome of movements among patients

Forward flexion

In partial tear initially, 5 have flexion in 31-60 degrees range and 4 have 61-90 degrees flexion and on final follow up, no patient is in 31-60 degrees range, 3 have 91-120 degrees, 3 have 121-150 degrees range and 3 improved to 151-180 degrees of flexion. In full tear only 1 improved to 121-150 and 2 improved to 91-120, rest have < 90 degrees of flexion.

Lateral elevation

In partial tear initially 3 have 31-60 degrees, 6 have 61-90 degrees 2 have 121-150 degrees and on follow up, 5 patients improved to 151-180 degrees and 5 patients have lateral elevations > 90 degrees and only 2 in 31-60 degrees, no patient have <60 lateral elevation.
Full tear patient do not shows much significant difference on follow up.

External rotation

In partial tear initially 8 patients have external rotation only up to hand behind head, elbow forward and on final follow up 2 patients do full external rotation, 3 have rotation with hand above head & elbow back, 5 have rotation with hand above head and elbow forward.
In full tear external rotation improved to mild degrees in few patients, not much significant.

Internal rotation

In partial tear initially 2 patients have internal rotation up to lateral thigh, 7 have up to buttock, 3 have up to lumbosacral region and after 6 months follow up 6 patient have rotation up to lumbosacral junction, 3 improved to rotation up to waist and 1 patient improved to internal rotation up to T12 and 1 patient improved to full internal rotation up to T7 vertebra.
In full tear no significant improvement seen on follow up.

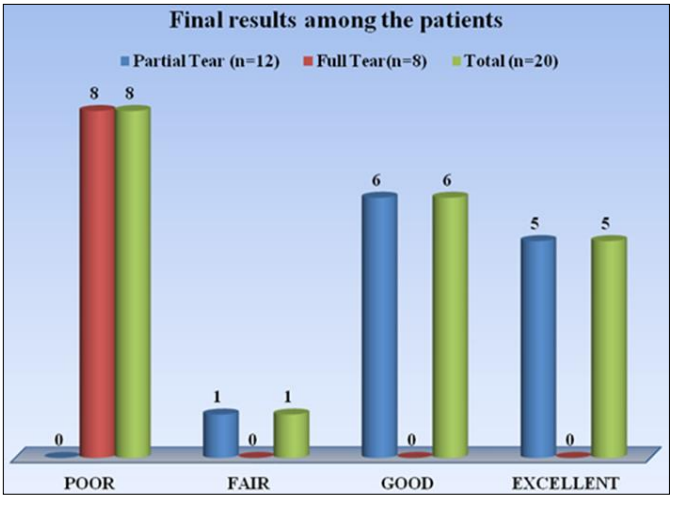

Fig 1: Overall outcome of Constant score among patients

Table 3: Overall outcome of Constant score among patients

Parameter	Partial Tear(n=12)	Full Tear(n=08)
Poor	0(0%)	8(100%)
Fair	1(8.33%)	0
Good	6(50%)	0
Excellent	5(41.67%)	0

In partial tear 5(41.67%) have excellent, 6(50%) have good and 1(8.33%) has fair outcome on 6 months follow up and in full tear all 8(100%) patients have poor outcome.

Table 4: Comparison among following studies

Study	Positive outcome
Ilhani *et al.* [20]	Yes
Scarpone *et al.* [19]	Yes
Randelli *et al.* [18]	Yes
Castricini *et al.* [21]	No
Our study	Yes (In partial tear patients)

Currently, there are few published studies that specifically investigate the safety and efficacy of PRP injections to the shoulder as a non-operative treatment option for Partial Tear RCTs. Even fewer studies seek to compare pre- and post-injection imaging to radiographically assess healing of the partially torn tendon and, at the same time, to determine a correlation between objective (i.e. image reporting) and subjective (i.e. patient report) outcome data. As PRP continues to evolve, more substantiated research is needed to understand its mechanism of action in addition to clinical data. It is also clear that large, multicentre clinical trials are needed to define the best type of PRP to be used and for what specific clinical application. The data supporting PRP use thus far are immature, but this biologic technology has the potential to transform the practice of musculoskeletal medicine and orthopaedic surgery.

Conclusion

The present study was conducted to assess the clinical outcome of Platelet Rich Plasma (PRP) injection in shoulder pain due to rotator cuff pathology. We conclude the following from our study –
A single injection of PRP resulted in a safe, significant, sustained improvement in pain and functional outcomes for patients with refractory partial Rotator Cuff Tear (RCT).
Single injections of PRP in patients having complete Rotator Cuff Tear do not have significant improvement in functional outcome.
This suggests that PRP may have the potential to heal the muscle-tendon unit of the rotator cuff at the level of degenerative tissue and may be a primary nonsurgical treatment for refractory partial RCT.
The rate of post injection complication is nil in this study probably due to autologous nature of PRP.
PRP preparation demands careful blood withdrawal, centrifugation and isolation under strict aseptic precautions and through pre injection planning.
PRP seems to be a well-tolerated therapeutic application which has shown encouraging clinical results in patients with chronic partial rotator cuff tears.

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