e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(6); 303-308

Original Research Article

Ultrasound Guided Platelet Rich Plasma or Corticosteroid for Supraspinatus Tendonosis or Partial Tear

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Received: 25-03-2024 / Revised: 23-04-2024 / Accepted: 26-05-2024

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Conflict of interest: Nil

Abstract:

Background and Aim: PRP is a viable option for treating rotator cuff disease, providing an alternative to corticosteroid injections. In this study, our main goal was to observe and evaluate the effectiveness of two different treatment methods in terms of providing relief from symptoms and improving range of motion. We also wanted to determine how long the patients remained symptom-free and how much their overall function improved during the follow-up period.

Material and Methods: A clinical outcome study was conducted in the orthopaedics department of a Tertiary Care Teaching Institute in India for duration of 1 year. In this study, 100 patients who tested positive for supraspinatus tendinitis and had MRI results suggesting the same condition were divided into two groups. The groups were determined based on whether the patients received intra-articular CS or PRP injection under ultrasonography guidance. Patients were monitored to evaluate their progress at 6 weeks, 3 months, and 6 months after the intervention.

Results: VAS scores for pain, activity, and satisfaction, as well as the OSS scores and CM scores, were similar before the injection. There was a notable contrast between the two groups in terms of patients with a history of overhead activity. In the PRP intervention arm, 64% of patients had this history, while in the CS intervention group, only 36% did. The PRP group showed significantly better scores for both OSS and CM compared to the other group, even though there were only slight differences in the scores at 6 weeks and 3 months.

Conclusion: Our study found that both the corticosteroids and PRP group showed improvement in all the parameters. However, the PRP group showed a significant reduction in pain at the 6-month follow-up, as evidenced by improved VAS score. Additionally, the PRP group also showed improvements in functional ability and quality of life, as indicated by the Oxford shoulder score and constant Murley score.

Keywords: Corticosteroids, Platelet-rich plasma, Rotator cuff, VAS.

Introduction

Shoulder area pain affects a significant portion of the population, with estimates ranging from 0.9% to 2.5%. As people get older, the prevalence of this type of pain increases dramatically, reaching as high as 6.7% to 66.7% over a lifetime. [1] Pain in the shoulder area can be quite intricate and may involve various changes in the structures of the shoulder.

Rotator cuff disease is a common condition that often results in shoulder pain and can have a significant impact on a person's ability to work and function. This disorder is quite common and tends to be more prevalent as people age or engage in occupations that require a lot of overhead activities. Rotator cuff disease involves the deterioration of the four muscles and tendons in the shoulder, often accompanied by the presence of calcific deposits. [2] Rotator cuff disease is a highly prevalent shoulder condition that affects a significant portion of the population, particularly those over the age of 80.1 RCD encompasses a range of pathologies, including tears of varying severity, cuff tear arthropathy, tendinopathy, subacromial impingement syndrome, and subacromial bursitis. [3,4]

According to general guidelines, it is recommended that the first line of treatment for rotator cuff tendinopathy is non-operative. [5,6] Typically, the first line of treatment involves physical rehabilitation, rest, and non-steroidal anti-inflammatory drugs. Additional techniques employed include extracorporeal shockwave

therapy and barbotage. CS, platelet-rich therapies (PRTs), hyaluronic acid, and botox injections have also been explored as potential treatments in these cases. [7,8] During the acute phase, corticosteroid injections can be quite beneficial. However, it's important to note that they do carry the risk of potentially causing a tear in the tendon. It's worth noting that corticosteroids can also impede collagen synthesis. According to a meta-analysis, there seems to be a potential for symptom improvement with short-term steroid injections.

According to recent research, it has been found that CS injections have been shown to reduce cell proliferation. [9] These substances also have an impact on collagen and the extracellular matrix, as well as the ability to suppress inflammation.

Additionally, they can influence the differentiation of adipocytes and promote cell death through apoptosis. In addition, these changes typically start within 24 hours and can last for 2 to 3 weeks, resulting in a decrease in the maximum load that can be sustained before failure. Using local anesthetics together with corticosteroids can lead to negative effects on the soft tissues. [10-12]

Orthobiologics such as PRP and PRF have gained significant popularity in recent times. [13] There are two types of platelet-rich therapies (PRTs): platelet-rich plasma (RPP) and platelet-rich fibrin (PRF). Both of these can be either low in white blood cells or high in white blood cells. Platelet rich plasma delivers concentrated levels of growth factors to the targeted area. [14] Autologous platelets have been found to be beneficial in promoting the revascularization of the affected area.

Additionally, they enhance the healing process of tendons by stimulating the growth of tendon cells and increasing the production of PDGF and TGF, which can lead to improved pain relief and overall function. Studies have shown that PRP injection therapies have great potential in treating rotator cuff tendinopathies and other musculoskeletal disorders. Unlike corticosteroids, PRP injections have not been found to have any significant adverse effects. PRP may offer numerous advantages in promoting soft tissue healing. [15]

This study aimed to observe and evaluate the effectiveness of two different treatment methods in terms of providing relief from symptoms and improving range of motion. Additionally, it sought to determine the duration of symptom-free periods and measure functional improvement during follow-up.

Material and Methods

A clinical outcome study was conducted in the orthopaedics department of a Tertiary Care Teaching Institute in India for a duration of 1 year. The study obtained ethical approval from the institutional ethical committee and ensured that all participants provided written informed consent. The patient and the treating team collaborated to determine the most suitable intervention. Individuals between the ages of 20 and 50 who exhibited symptoms of supraspinatus tendinopathy and had MRI results indicating supraspinatus tendinitis were selected for the study.

The study participants were carefully selected based on specific criteria. These criteria included factors such as previous shoulder fracture or surgery, a full-thickness rotator cuff tear, recent use of certain medications, bleeding disorders, low platelet count, diabetes, cervical spondylosis, long-term stiffness, involvement of other rotator cuff muscles, shoulder instability, frozen shoulder, and osteoarthritis of certain joints.

They thoroughly explained the patients about the treatment options (PRP and corticosteroid) and potential side effects after diagnosing them using clinical and radiological methods. Patients were either given CS or received 2.5 ml of PRP along with a local anesthetic (2.5 ml of 2% lidocaine) administered under USG guidance.

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Prepared under strict aseptic conditions, a single dose injection of 1 ml (40 mg) of methyl prednisolone acetate was combined with a local anesthetic (4 ml of 2% lidocaine) in a single-use syringe. The area was prepared and covered with a sterile glove to ensure a clean injection site. The USG guidance was given using a linear array transducer with a frequency range of 1.7 to 10 MHz. The injection was administered using a dorsolateral approach in both groups, with the guidance of ultrasound imaging. Infiltration was also performed.

Preparing PRP

The patient's blood was collected using a syringe that contained sodium citrate. After a 15-minute centrifugation at 3,000 rounds per minute, the sample was successfully separated into platelets poor and leucocyte rich plasma, as well as platelets rich and leucocyte poor plasma. The plasma containing low platelet count was discarded. Following another round of centrifugation, the PRP was extracted. The PRP was carefully transported from the blood bank to the procedure room (USG room) in a test tube stand, ensuring aseptic and thermal control conditions were maintained throughout the process.

Following the injection, all patients were closely monitored for a duration of 30 minutes. During this time, they were contacted about joining the trial by one of the primary authors. The patients were

provided with detailed explanations, and those who met the inclusion and exclusion criteria were divided into two groups. Group I received PRP intervention, while group II received CS intervention.

Patients were instructed to wear arm slings to immobilize their shoulders for the next three days. After that, they were given a gentle rehabilitation exercise program that involved both passive and active range of motion exercises. Avoided engaging in any sports activities for a period of 6 weeks. The pain was effectively addressed using acetaminophen or a combination of acetaminophen and tramadol (325/37.5 mg). A grand total of 160 individuals were recruited. Patients were monitored and assessed at 6 weeks, 3 months, and 6 months using various measures, including the VAS for shoulder pain, activity level, satisfaction, the Oxford shoulder (OS) score, and the constant Murley (CM) score.

Statistical analysis

The data was compiled and entered into a spreadsheet computer program (Microsoft Excel 2019) and then exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were reported using measures such as means and standard deviations or median and interquartile range, depending on their distribution. The qualitative variables were expressed as counts and percentages. Confidence level and level of significance were set at 95% and 5% respectively for all tests.

Results

There were no notable variations observed in terms of age group, gender distribution, residence, marital status, physical activity status, educational qualification, mean duration of symptoms, side affected, and history of hypertension. The demographic data can be found in Table 1 and 2. The shoulder contour of patients in both arms appeared to be similar. Both groups had a similar distribution in terms of mild joint line tenderness and clinical examination before the intervention. The VAS scores for pain, activity, and satisfaction, as well as the OSS scores and CM scores before injection, showed no significant differences. There was a notable contrast between the two groups: a much larger percentage of patients in the PRP intervention arm (64%) had a background of overhead activity, in comparison to the CS intervention group (36%).

After the intervention, it was found that there was no significant difference in the VAS pain scores between the CS and PRP groups at 6 weeks and 3 months. At the end of 6 months, the pain scores in the PRP group are significantly lower ($p<0.005$) compared to the CS group. The PRP group showed significantly better scores for both OSS and CM, with minimal differences observed in the 6-weeks and 3-months scores ($p<0.05$). (Table 3)

There was no notable disparity in the enhancement of range of motion between the two intervention groups at the beginning (pre-injection), 6 weeks, and 3 months. At 6 months, the PRP group showed an increased range of movements in flexion, abduction, and external rotation after the intervention. However, it is worth noting that only the variations in improvement in abduction were deemed statistically significant.

Table 1: Age distribution among groups

Age (Years)	Corticosteroid N (%)	Platelet rich plasma N (%)	P value
<30	3 (4.28)	3 (4.28)	0.84
30-45	27 (38.57)	20 (28.57)	
46 and Above	40 (57.14)	47 (67.14)	
Total	70 (100)	70 (100)	

Statistically significance at p≤0.05

Table 2: Comparison of gender between the intervention groups

Gender	Corticosteroid N (%)	Platelet rich plasma N (%)	P value
Male	30 (42.85)	26 (37.14)	0.12
Female	40 (57.14)	44 (62.85)	
Total	70 (100)	70 (100)	

Statistically significance at p≤0.05

Table 3: Comparison of mean CM score between the intervention groups

CM (mean±SD)	Corticosteroid	Platelet rich plasma	P value
Pre injection	22.4±0.9	22.88±1.45	**0.19**
6weeks	27.32±2.5	27.52±2.33	**0.7**
3 months	35.20±1.8	36.24±2.4	**0.32**
6 months	36.55±2.35	37.88±2.2	**0.005***

*** indicate statistically significance at p≤0.05**

Discussion

After carefully examining the existing literature, it became clear that PRP might offer some benefits in treating RC tendinopathy. However, the findings were not conclusive due to variations in study methodologies and the use of different PRP products.2.6 According to a study conducted by Dadgostar et al, significant pain improvement was observed in patients with rotator cuff tendinopathy who received PRP injections compared to those in the corticosteroid group after three months.16 In contrast, Shams et al found that PRP only yielded better results for up to 3 months. However, no significant differences were found in the results after 6 months. In a similar vein, von Wehren et al [17] discovered that PRP showed initial improvement, but after 6 months of follow-up, no significant difference was observed. [18]

Regardless of varying opinions on the timing of improvement, this study aimed to examine the clinical outcomes of both PRP and CS groups in a larger sample size at a tertiary care orthopedic center. The findings align with studies conducted by Shams et al and von Wehren et al, suggesting that PRP may be a more favorable choice compared to CS injections. [18] In a study conducted by Scapone et al, it was found that there was a notable reduction in pain, as well as an improvement in functionality and better MRI results. [19] In contrast, Kesikburun et al discovered that there was no discernible distinction between PRP or saline injections throughout a one-year follow-up period. [20]

In this study, the findings indicate that PRP injection yields comparable results to CS injections in the short term and superior results in the long term. This suggests that PRP could serve as a viable substitute for corticosteroid injections in individuals with supraspinatus tendinosis or partial supraspinatus tear. Repeated use of corticosteroid injections can increase the risk of both local and systemic complications in patients. [21] Applying corticosteroids locally can weaken the injected area of the tendon, which can potentially lead to failure or rupture. [22]

Studies have shown that corticosteroid injections have been found to be more effective in providing short-term functional recovery and pain relief for rotator cuff injuries compared to PRP injections. However, it's important to note that corticosteroid injections can have some potential negative side effects. These may include subcutaneous atrophy, recurrence, effusion, infection, systemic absorption, skin depigmentation, and subcutaneous tendon rupture. [23,24] Additional treatment options were necessary to advance the state of healthcare, considering the limited effectiveness and possible adverse consequences of current methods. Over the past few decades, experts have extensively discussed the causes of rotator cuff tendinopathy, focusing on the concept of damage caused by overuse. Tendons can only regenerate to a certain extent. There is a proposal suggesting that the main culprit behind chronic tendinopathy may be a deficiency in healing ability, rather than inflammation. Thus, the potential treatment for this condition could involve innovative biological therapeutics such as PRP. PRP contains growth factors, bioactive cytokines, and other chemokines that are believed to promote tissue repair and stimulate tissue regeneration. These substances enhance cellular proliferation, facilitate cellular migration, accelerate angiogenesis, and promote matrix deposition. [25,26] In their study, Shams et al. found that the group treated with PRP showed more favorable outcomes during the initial follow-up period of 3 months. However, no significant differences were observed in the long-term results at 6 months. The study they conducted involved a randomized selection of participants who had confirmed partial RC ruptures and had been experiencing shoulder pain for over 3 months. MRI scans were used to confirm the injuries. [17]

PRP contains growth factors that have been found to enhance the production of type I collagen and promote the growth of tenocytes. Research has shown that injecting PRP into areas of musculotendinous injury in animals can improve the recruitment of cells for tendon healing in the early stages. [27] These factors combined may account for the superior long-term outcomes observed in the PRP group, as they have a greater potential for healing compared to the CS group. As part of a study conducted by Kwong CA, Woodmass JM, et al., researchers compared the effectiveness of PRP and corticosteroid injection in patients with partial-thickness rotator cuff tears. The trial was double-blind and randomized, ensuring unbiased results. [17] PRP achieved significant improvements in pain and function during the short-term follow-up period. At longer-term follow-up, there was no lasting advantage of PRP compared to CS. Our study found that the group receiving corticosteroids experienced superior pain relief after 3 weeks. A study conducted by Wang C, Zhang Z, Ma Y et al. compared the effectiveness of Platelet-rich plasma (PRP) injection and corticosteroid injection for treating rotator cuff lesions. The study found that corticosteroid injection showed short-term efficacy, while there was no significant difference in the medium to long-term outcomes between corticosteroid and PRP injection for treating rotator cuff lesions. We also found similar results in our study. [4]

Aside from the intervention, there are various other factors that can impact the recovery of patients.

Two crucial factors to consider are engaging in regular exercise and taking pain-relieving medication. Given that the treatment groups were provided with comparable post-procedure instructions regarding physical therapy and medications, the impact of these variables on recovery was significantly minimized. One limitation of the study is that it was conducted in a single center, which may limit the generalization of the findings.

Conclusion

Both corticosteroids and PRP group showed improvement in all the parameters in our study however the PRP group on 6 month follow up had significant reduction of pain as evident by improved VAS score and functional improvement and quality of life improvement as evident by Oxford shoulder score and constant Murley score. There is significant improvement in abduction with PRP group on long term follow-up. In future, studies with prolonged follow-up periods, larger sample sizes, a homogenous treatment protocol, and MCID evaluating rotator cuff disease are required to further assess the clinical difference of CS versus PRP injection in the management of rotator cuff disease.

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