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Research Article

Clinical Evaluation of Tendon Infiltration of Platelet-Rich and Leukocyte-Rich Plasma PRP-L as Treatment of Partial Rotator Cuff Tear

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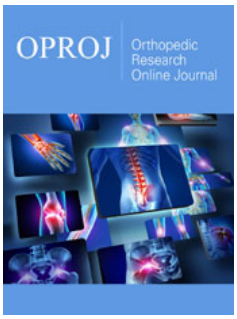

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Abstract

From January 2021 to March 2024, 36 patients with partial supraspinatus tendon injury who underwent platelet-rich plasma therapy were studied. The preparation protocol used was recommended by Vendramini in 2009, with two centrifugations, the first for 10 minutes at 400G and the second for 10 minutes at 800G. Each patient received 3 applications of PRP-L with a 15-day interval between each application. After each application, patients were instructed to start specific physiotherapy, but without the use of local cryotherapy. The rehabilitation guidance for all patients was for analgesia and assisted range of motion gain. Results There was a predominance of injuries in females and in the age group of the fifth and sixth decades of life, an improvement in UCLA scores in all patients, but the criteria pain and clinical satisfaction were the most relevant factors in the overall improvement of patients. The general function and pain scores did not show significant changes directly related to the use of PRP-L, and at the end of the clinical evaluation at 12 months, a statistically significant progression was observed, by the student's t test with a P value of 0.005, of the mean UCLA scores from 12.9 to 18.9. Conclusion: The use of PRP-L was relevant and effective in the treatment of partial supraspinatus lesions.

Keywords: PRP; Rotator cuff; Orthobiologicals

Introduction

Partial rotator cuff tears commonly affect people in their 50s and 60s and are a leading cause of shoulder pain and disability [1,2]. Although they may initially present with minimal symptoms, associated conditions such as scapular instability, dyskinesia, or stiffness may contribute to pain and muscle weakness [3]. Surgical treatment is effective but always carries risks, such as infections, delayed healing, and difficulty in rehabilitation. Conservative treatments include sodium hyaluronate, corticosteroids, lidocaine, and physical therapy [4,5]. Given the limited healing capacity of the tendon, Platelet-Rich Plasma (PRP) has gained interest as a potential treatment modality, but existing studies adopt different preparation and implementation protocols, which makes its standardized reproduction difficult [6].

The regenerative properties of PRP as an orthobiological can be attributed to the growth factors it contains [7]. Platelet-derived growth factors stimulate cell proliferation and tissue regeneration, while transforming growth factor β-1 plays a crucial role in modulating the inflammatory response and promoting collagen synthesis [8,9]. Hepatocyte growth factor aids in tissue regeneration and angiogenesis, insulin-like growth factor promotes cell growth and differentiation, and vascular endothelial growth factor stimulates the formation of new blood vessels, facilitating tissue repair [10]. Despite the potential benefits of PRP, its clinical effects may vary due to several factors. The composition of PRP may differ depending on individual patients and the specific preparation method employed. This may lead to variations in the

concentration of growth factors and other bioactive substances, which may influence treatment outcomes.

The lack of standardized protocols for PRP preparation and administration hinders the ability to accurately compare and replicate studies. Furthermore, the clinical evidence supporting the use of PRP is still evolving, and optimal treatment protocols for specific musculoskeletal conditions have yet to be fully determined. The aim of this study was to evaluate the efficacy of PRP use in patients with partial rotator cuff tears using a quantitative and replicable protocol.

Material and Method

From January 2021 to March 2024, 36 patients with partial injury to the supraspinatus tendon who underwent platelet-rich plasma therapy at the Orthopedics outpatient clinic of the Gaffree and Guinle University Hospital HUGG, Federal University of the State of Rio de Janeiro UNIRIO were studied.

Exclusion factors were: A total number of platelets less than 150,000 in the blood count, patients with coagulopathies, smokers, treatment with immunosuppressants, anticoagulants, acetylsalicylic acid, warfarin, chronic inflammatory processes, and active infectious diseases. The preparation protocol used was recommended by Vendramini in 2006, with two centrifugations, the first for 10 minutes at 400G and the second for 10 minutes at 800G.

The volume of venous blood punctured was 60ml and distributed in 6 bottles of 10ml containing sodium citrate. After the first 10-minute centrifugation at 400G, the upper 75% of the platelet-poor plasma PPP were discarded and the lower 25% of the platelet-rich plasma precipitate PRP was punctured together with the cloud zone, where the leukocytes are found, forming the so-called leukocyte-rich platelet-rich plasma PRP-L.

This material punctured in each vial corresponded to 2ml and was distributed in 2 new 10ml vials without citrate or any other reagent, containing 6ml of PRP and were centrifuged again for 10 minutes at 800G Figure 1. After centrifugation, the bottom 2ml of each vial were punctured, including the leukocyte platelet residue at the bottom of the vial, totaling 4ml of PRP-L. Using a GE Vision ultrasound device with a 9MHz linear transducer, the supraspinatus lesion was visualized, and PRP-L was injected into the lesion with a long needle number 18.

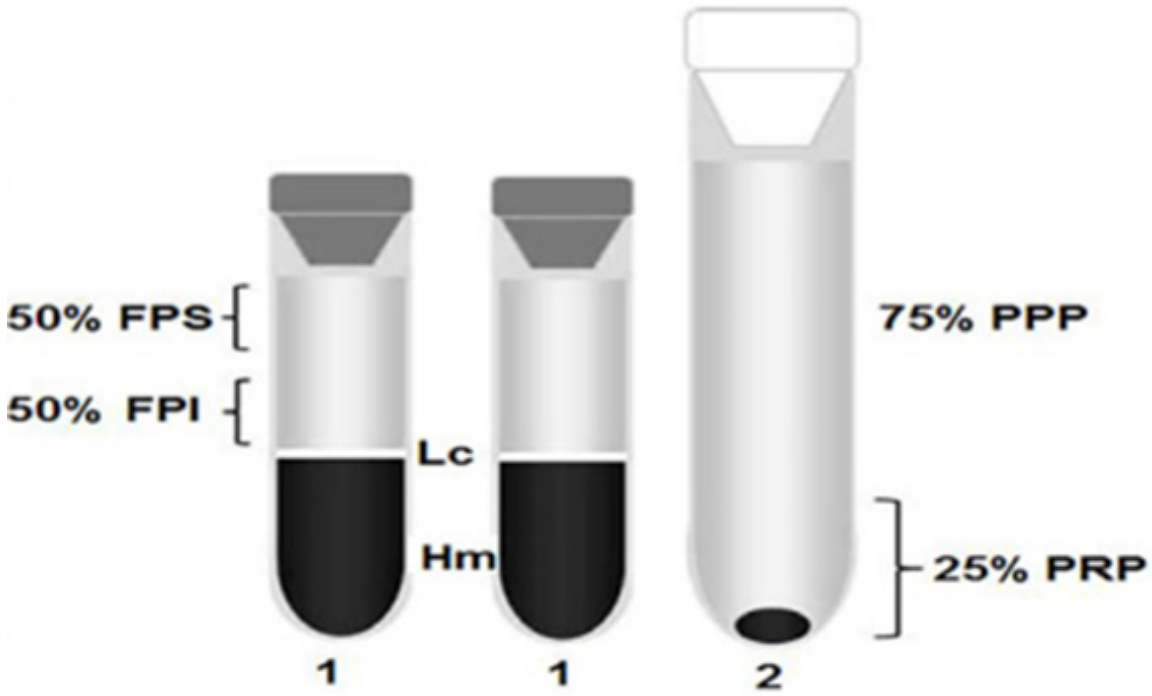

Figure 1: Proportionality scheme in the acquisition of PRP.

Each patient received 3 applications of PRP-L with a 15-day interval between each application. After each application, patients were instructed to begin specific physiotherapy, but without the use of local cryotherapy. Rehabilitation guidance for all patients was for analgesia and assisted range of motion gain. Patients were evaluated initially and 12 months after the application of PRP-L in a blind manner by two different evaluators who were unaware of the previous result using the University of California – Los Angeles UCLA scale.

Results

There was a predominance of lesions in females and in the fifth and sixth decade of life, as observed in Table 1. There was an improvement in UCLA scores in all patients, but the pain and clinical satisfaction criteria were the most relevant factors in the overall improvement of patients, as shown in Table 2. General function and pain did not show significant changes directly related to the use of PRP-L, corroborating the researched literature. At the

end of the clinical evaluation at 12 months, a statistically significant progression was observed, by Student's T test with a P value of 0.005, of the mean UCLA scores from 12.9 to 18.9.

Table 1: UCLA scale before PRP-L application.

Sex	Age	Pain	Function	Active Flexion	Degree of Strength	Satisfaction	Total
F	64	3	4	5	4	0	16
F	53	4	2	4	4	0	14
F	52	3	1	5	4	0	13
F	60	3	1	3	5	0	12
M	51	4	4	3	3	0	14
F	49	3	3	5	3	0	14
M	53	3	2	3	3	0	11
F	52	3	3	2	4	0	12
M	57	3	2	2	4	0	11
M	52	4	2	3	4	0	13
M	48	3	4	3	3	0	13
F	51	3	4	3	4	0	14
F	50	2	4	3	5	0	14
F	53	3	3	4	4	0	14
F	57	4	4	3	3	0	14
M	56	4	2	3	3	0	12
F	52	4	4	3	4	0	15
F	49	4	4	3	3	0	14
M	47	3	3	2	4	0	12
F	55	4	3	4	4	0	15
M	56	2	3	3	3	0	11
F	49	3	2	3	3	0	11
F	62	3	3	2	5	0	13
M	58	4	1	2	4	0	11
M	59	4	1	4	5	0	14
F	56	4	2	3	3	0	13
F	55	3	2	2	5	0	12
F	50	3	1	2	4	0	10
F	52	3	3	4	4	0	14
M	49	4	2	4	3	0	13
M	52	3	3	5	3	0	14
F	52	3	2	4	3	0	12
F	49	3	2	3	4	0	12
F	58	3	2	4	5	0	14
F	58	3	3	3	4	0	13
F	51	4	1	3	4	0	12

Source: HUGG orthopedics outpatient clinic.

Table 2: UCLA scale after PRP-L application (12 months).

Sex	Age	Pain	Function	Active Flexion	Degree of Strength	Satisfaction	Total
F	64	3	4	5	4	3	19
F	53	3	4	4	4	3	18
F	52	5	3	5	4	4	21
F	60	3	4	4	4	3	18

M	51	3	4	5	5	4	21
F	49	4	4	5	4	4	21
M	53	4	3	4	4	3	18
F	52	2	3	5	4	3	17
M	57	3	4	4	4	3	18
M	52	3	4	4	4	4	19
M	48	4	4	5	4	4	21
F	51	4	4	4	4	4	20
F	50	4	4	4	5	4	21
F	53	3	4	4	4	4	19
F	57	5	4	4	4	3	20
M	56	4	3	3	3	4	17
F	52	3	4	4	4	4	19
F	49	4	4	4	4	4	20
M	47	5	4	4	4	4	21
F	55	5	4	4	4	4	21
M	56	4	4	4	4	3	19
F	49	3	4	4	4	3	18
F	62	4	4	4	5	4	21
M	58	4	4	3	4	3	18
M	59	5	3	4	4	4	20
F	56	4	4	4	4	3	19
F	55	4	4	4	4	4	20
F	50	3	3	3	3	3	15
F	52	3	4	4	4	4	19
M	49	4	5	4	4	4	21
M	52	4	4	5	4	4	21
F	52	5	4	4	4	4	21
F	49	3	4	3	4	4	18
F	58	5	4	5	5	4	23
F	58	4	4	4	4	4	20
F	51	3	3	4	4	3	17

Source: HUGG orthopedics outpatient clinic.

Discussion

In the present study, we observed a small variation in results among the patients studied and correlated this with the small sample of patients, since this is a biological study of regenerative medinin and obeying strict standards, with larger samples, we will be able to present a prospective and reliable analysis of the indication of PRP-L in the treatment of partial rotator cuff injuries.

Kesikburun [1] At 1-year follow-up, they reported that a PRP injection was no more effective in improving quality of life, pain, disability, and shoulder range of motion than placebo in patients with chronic RCT who were treated with an exercise program. In the present study, we observed a significant improvement in the quality of life of the patients treated, disagreeing with the methodology applied and the application of only 1 PRP injection.

Kim [2] subdivided his groups into applications of 1ml and 2ml of PRP only in the hypoechoic zone using ultrasound and presented better results in patients where he applied a single application of 2ml. We agree that larger volumes determine better results, however we disagree with the volume applied and the single application, we believe that more applications are necessary for a better final result.

Bhan [3] presents a series of questions in his systematic review that we agree with and tried to help and elucidate in the present study. He reports having found many difficulties and variability in the volume applied, preparation technique and number of applications between studies. In the present study we tried to format an evidence-based protocol so that new studies can replicate the technique and compare its results.

Prodromos [4] concluded that PRP injection is a safe and effective treatment for rotator cuff injury in patients who failed conservative treatment of activity modification and physical therapy without deterioration of results two years after treatment.

Better results were obtained with greater structural damage of the tendon than in shoulders with inflammation without structural damage. We do not agree with this statement because in the present study the best results were obtained in smaller injuries and with better structural quality of the tendon.

According to Kwong [5] Patients with partial rotator cuff tears showed clinical improvement in pain and patient-reported outcome scores after ultrasound-guided PRP injections. Patients who received PRP had superior improvement in pain and function at short-term follow-up (3 months). There was no sustained benefit of PRP over local corticosteroid application at long-term follow-up (12 months). In the present study, we observed the opposite, with significantly better improvement in patients between 6 and 12 months, possibly due to the initial inflammatory process caused by the presence of leukocytes associated with the PRP-L used.

In agreement with our study, we observed that of Thepsopam [7] concluding that an injection using a corticosteroid or LP-PRP resulted in a similar reduction in pain and improvement in function at 1 month in patients with partial supraspinatus rupture. However, PRP showed superior benefits over corticosteroid at the 6-month follow-up. This fact corroborates the prolonged regenerative activity of the application of growth factors on the cellular homeostasis of the degenerated tendon.

Tanpowpong [8] observed that intralesional PRP injection can reduce tear size in partial-thickness supraspinatus tendon tears, whereas subacromial steroid injection did not significantly affect tear size. While corticosteroid injection only improved functional scores compared to baseline, PRP resulted in greater improvement 6 months after injection, supporting the theory that growth factors are regenerative and not just for treating symptoms.

We absolutely agree with Chen [10] when he states that Long-term re-tear rates were significantly reduced in patients with rotator cuff-related abnormalities who received PRP. Significant improvements in PRP-treated patients were observed for multiple functional outcomes, but none achieved their respective minimum clinically important differences. Overall, our results suggest that PRP may positively affect clinical outcomes, but limited data, study heterogeneity, and low methodological quality make firm conclusions difficult.

We note that all authors question the lack of standardization of studies on the applicability of PRP and we believe that the present study can effectively cooperate with this standardization and help new studies to be carried out, using the same proposed methodology, enabling more consistent and realistic analyses of the use of PRP in the most diverse types of tendinopathies and connective tissue injuries.

Conclusion

The use of PRP-L was relevant and effective in the treatment of partial lesions of the supraspinatus tendon, with the pain criterion being the most prominent score in the 12-month clinical follow-up.

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