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A Clinical Evaluation of Platelet-Rich Plasma Therapy in Treatment of Frozen Shoulder

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Abstract **Original Research Article**

***Background*:** Frozen shoulder is a common reason for shoulder pain and impairment. Several treatments are used to relieve pain and enhance range of motion (ROM) in patients. Recent study has focused on the injection of platelet-rich plasma (PRP). ***Aim of the Study*:** The goal of this study is to find out the impact and possible outcome of PRP treatment in frozen shoulder management. ***Methods*:** This study was conducted in TMSS Medical College and Rafatullah Community Hospital, Bogura, Bangladesh, from January 2019 to December 2019. In the study, 65 patients in stages I or II with frozen shoulder were treated with PRP. All acquired data was entered into a Microsoft Excel work sheet and evaluated with descriptive statistics in SPSS 11.5. ***Results*:** The majority of the participants (84.62%) were female, with 15.38% being male. The average age of the participants was 57.45 years. The investigation comprised participants who received PRP injections for frozen shoulder (62.4% right limb, 37.6% left limb). Before therapy, the average flexion was around 61°, abduction was 70°, and external rotation was 21°. Furthermore, the baseline scores for VAS, DASH, and the SF-12 Health Survey questionnaire were 9.41, 64.86, and 24 correspondingly. All patients demonstrated significant improvement in shoulder ROM, discomfort, and function ($p < 0.001$). ***Conclusion*:** This case series study found a significant improvement in pain and disability outcomes for individuals after PRP injection. These findings support PRP as a safe therapy protocol that reduces pain and improves upper limb function. It can also increase shoulder range of motion.

Keywords: Platelet-rich plasma, PRP injection, Adhesive capsulitis Frozen shoulder.

INTRODUCTION

Adhesive capsulitis, often known as frozen shoulder, is a common cause of shoulder pain and impairment, affecting 2 to 5% of the general population, with peaks between the ages of 40 and 70 [1, 2]. The condition causes pain and stiffness in the glenohumeral joint due to adhesion and fibrosis in the capsule. This can impede gross function, particularly external rotation. The reasons of this condition are not entirely understood. Medical conditions linked to frozen shoulder include diabetes, hypothyroidism, hyperthyroidism, Parkinson's disease, and heart disease [1, 3, 4]. Adhesive capsulitis usually arises in three phases: Phase I is the 'freezing' painful phase, which lasts around 2-9 months; Phase II is the 'frozen' or stiff (or adhesive) phase, which lasts 4-12 months. Muscles surrounding the shoulder may waste during this phase since they are not used; Phase III is the 'thawing' or recuperation phase, which lasts one to three years. Following this phase, the discomfort and stiffness progressively subside, and movement recovers to normal, or near-normal [5, 6]. Symptoms persist for years in a minority of individuals; up to 40% of patients have permanent symptoms after three years [7, 8]. Various therapies are used to alleviate discomfort and enhance range of motion (ROM). Treatment options include intra-articular injections, nerve block, shoulder manipulation under anesthesia, mobilization and passive stretching exercises, oral NSAIDs and analgesics, and open or arthroscopic surgery for synovectomy and glenohumeral capsular releases [6, 9]. Platelet-rich plasma (PRP) injection, a concentrated dose of autologous platelets in blood plasma including growth factors and cytokines, has been shown to promote soft tissue healing [10, 11]. PRP therapy is a safe and effective treatment for dermatology, orthopedics, and dentistry. Platelet-rich plasma can produce collagen, growth factors, and stem cells, promoting healing by

delivering biologically active molecules like vascular endothelial growth factor and transforming growth factor-β to areas of soft tissue damage [3, 12-14]. PRP therapy effectively treats lesions in tendons, muscles, ligaments, and fractures, with no reported problems [12, 13, 15]. The purpose of this study is to determine the impact and potential outcomes of PRP treatment in frozen shoulder management.

METHODOLOGY

This study was conducted in TMSS Medical College and Rafatullah Community Hospital, Bogura, Bangladesh, from January 2019 to December 2019. The study included 65 patients in stages I or II with frozen shoulder who were treated with PRP.

During the first session, two syringes of PRP were injected into the subacromial bursa and intra-articular region; the procedure was repeated after four weeks. In the second stage, PRP was injected directly into the glenohumeral joint. A p-value less than 0.05 was judged statistically significant. The Kolmogorov-Smirnov test was used to determine data normality, while the paired sample t-test (for normal data) and Wilcoxon rank sum test (for non-parametric data) were employed to evaluate mean differences before and after injection administration. All acquired data was entered into a Microsoft Excel Work Sheet and analyzed descriptively with SPSS 11.5.

RESULT

The majority of the participants (84.62%) were female, with 15.38% being male (Table-1). The average age of the participants was 57.45 years (Table-2). The investigation comprised participants who received PRP injections for frozen shoulder (62.4% right limb, 37.6% left limb) (Table-3). Table-4 summarizes the mean and standard deviation of each outcome before and after injection. Before therapy, the average flexion was around 61°, abduction was 70°, and external rotation was 21°. Furthermore, the baseline scores for VAS, DASH, and the SF-12 Health Survey questionnaire were 9.41, 64.86, and 24 correspondingly. All patients demonstrated significant improvement in shoulder ROM, discomfort, and function ($p < 0.001$) (Table-4). Participants experienced 65.7% improvement in pain, 52.6% in DASH score, and 100% in SF-12 Health Survey. They were also 66% pleased with the therapy approach.

Table-1: Sex of the participants (N=65)

Sex	Frequency	Percent
Female	55	84.62
Male	10	15.38
Total	65	100

Table -2: Age of the participants (N=65)

Age in years	Frequency	Percent
39-67	65	100
Total	65	100
Mean ± SD	57.45 ± 7.8	

Table-3: Characteristics of the participants (N=65)

Frozen shoulder stage (I/II)	Side of effect (L/R)
52.5% / 47.5%	37.6% / 62.4%

Table-4: Summary of participants outcomes before and after PRP injections (N=65)

Variables	Before Injection		After Injection		P Value
	Mean	Std. Deviation	Mean	Std. Deviation	
Abduction ROM(º)	70.34	36.15	137.75	9.99	.00
Flexion ROM(º)	61.05	9.56	146.98	12.38	.00
External rotation ROM	20.89	4.71	45.05	10.56	.00
VAS	9.41	1.09	2.79	1.21	.00
DASH	64.86	5.17	31.86	8.31	.00
SF12	24.00	5.86	69.16	12.76	.00

DISCUSSION

Frozen shoulder syndrome, also known as adhesive capsulitis, is a painful and burdensome illness characterized by fibrosis of the glenohumeral joint capsule and chronic inflammation [17, 18]. Patients typically have pain, reduced range of motion, and impairment for 1-24 months [18]. This disease is still an unclear clinical issue. No current therapy regimens are particularly spectacular, and there is a significant need for additional study and development of more effective treatment protocols. This condition has both individual and social costs, and if not treated and managed properly, it can cause long-term disability [17, 19]. Conservative

treatment options for adhesive capsulitis include corticosteroid and hyaluronic acid injections, as well as physical therapy, as recommended by some doctors [20]. In individuals with adhesive capsulitis, intra-articular corticosteroid injections may offer greater short-term pain alleviation and range of motion compared to oral glucocorticoid therapy [21, 22]. Physical treatment may be more effective than hyaluronic acid and corticosteroid injections, according to studies [9, 23]. One trial found that hyaluronic acid injections did not significantly improve patients with frozen shoulder who were undergoing physiotherapy [24]. Systematic reviews have not yet demonstrated the superiority of physiotherapy over other therapies [25, 26]. Research suggests that combining occupational therapy with corticosteroid injections can improve pain management and impairment. The treatment strategy proved more beneficial than physical therapy alone [2]. A study found no significant difference between corticosteroids alone and in conjunction with hyaluronic acid in individuals with frozen shoulder after 6 months of follow-up. Additionally, individuals receiving traditional treatment should be assessed for any side effects [26, 27]. Platelet concentrates have been used as topical therapy for chronic leg ulcers since the late 1980s. They are now also used to treat chronic elbow tendinopathy, chronic Achilles tendinopathy, and rotator cuff tendon tears to control inflammation and improve tissue healing [28, 29]. PRP's mechanisms for initiating cellular and tissue changes are currently being researched. PRP promotes cell proliferation and the recruitment of reparative cells. Connective tissue heals through three phases: inflammation, proliferation, and remodeling. The particular composition and concentration of bioactive chemicals found in PRP have a significant impact on the inflammatory, proliferative, and remodeling stages of tissue repair [3, 15]. This explains why PRP injections can have long-term effects on the healing process. PRP's interaction with macrophages can reduce inflammation, promoting tissue repair and regeneration [14, 29]. This experiment found that combining PRP injection with home stretching exercises effectively treats adhesive capsulitis of the shoulder. Corticosteroid and hyaluronic injections or physiotherapy are commonly recommended by physicians for treating frozen shoulder. However, these treatments can have adverse effects and physiotherapy has not been shown to be more effective [1, 26]. This case series study introduces a new method for improvement that appears to have no negative effects.

Limitation of the Study:

This study had a single focal point and small sample sizes. Therefore, it's possible that the study's findings don't accurately capture the overall situation.

CONCLUSION & RECOMMENDATION

This case series of 65 frozen shoulder patients in phase I or II showed considerable improvement in pain and disability outcomes with PRP injection, compared to appropriate conservative therapy. These findings suggest PRP as a safe and effective treatment for reducing pain and improving upper limb function. Additionally, it helps enhance shoulder range of motion. Longer follow-up randomized controlled trials evaluating the efficacy of corticosteroids, hyaluronic acid, and physiotherapy with PRP injection are needed to further understand its impact on treating frozen shoulder.

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