

Original Research Article

Comparison between platelet rich plasma injection, corticosteroid injection and short-wave diathermy in the management of pain and the improvement of functional outcome in the patients suffering from adhesive capsulitis of the shoulder: a randomized controlled trial

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Received: 23 July 2020

Accepted: 03 September 2020

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ABSTRACT

Background: Adhesive capsulitis of shoulder is characterized by pain and restricted range of motion and has a wide variety of treatment options without any substantial evidence. Platelet rich plasma (PRP) is one of the newer treatment modalities and its efficacy needs to be compared with other routine treatment modalities.

Method: A randomized controlled trial was conducted in the Department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences (RIMS), Imphal for a period of 1-year February 2019 to January 2020. One hundred ninety-five patients with adhesive capsulitis recruited and randomized, patients received single PRP injection (2 ml) or corticosteroid (80 mg methyl prednisolone) or shortwave diathermy (10 settings continuous mode using 27.12 MHz).

Results: The primary outcome measure was active range of motion of the shoulder and the secondary outcome measures included Visual analogue scale (VAS) for pain and a shortened version of Disabilities of the Arm, Shoulder and Hand (Quick DASH) for function. Patients were evaluated at 0, 3, 6 and 12 weeks. Chi-square test and ANOVA were used to determine significant differences. PRP treatment resulted in statistically significant improvement over corticosteroid at 12 weeks and over short-wave diathermy therapy at 6 weeks.

Conclusion: This study demonstrates that single injection of PRP is more effective than corticosteroid or short-wave diathermy in the treatment of adhesive capsulitis of shoulder.

Keywords: Adhesive capsulitis, PRP, Short-wave diathermy, Corticosteroid

INTRODUCTION

Adhesive capsulitis of shoulder is characterized by insidious onset of pain and progressive loss of both active and passive range of motion of the shoulder joint. The incidence in general population is 3-5% and about 20% in patients with diabetes. It usually develops between 40-70 years of age. The underlying pathology is soft tissue fibrosis and inflammation of rotator interval, capsules and ligament. Various treatment options like intra-articular

injection of corticosteroid, hyaluronic acid, deep heat modalities, manipulation under anesthesia, hydro dilation, arthroscopic release has been tried but none of them proved to superior in managing the condition successfully.^{1,2} Platelet rich plasma (PRP) is a sample of autologous blood with concentration of platelets above baseline, has emerged as a new treatment modality and it stimulates the revascularization of soft tissues and increases concentration of growth factors to improve and accelerate tendon healing.³ Based on this background of

lack of enough evidence regarding the treatment modalities there is need to check the efficacy of PRP and compare it with corticosteroid and short-wave diathermy as a safe treatment modality.

METHODS

A randomized controlled trial was done in the Department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences (RIMS), Imphal from February 2019 to January 2020. One ninety-five patients diagnosed with adhesive capsulitis of shoulder were recruited for the study from the Outpatient department (OPD) patients. Informed consent was taken from all participants before starting the study.

The inclusion criteria were age over 18 years, shoulder pain for at least 1 month with restriction of >1/3rd of the shoulder range of motion, normal anterior-posterior radiograph of shoulder joint and willingness to participate in the study. The exclusion criteria were unwillingness to participate in the study, intrinsic glenohumeral pathology, history of shoulder trauma/surgery, history of injection in the involved shoulder in last six months or non-steroidal anti-inflammatory drug intake in last seven days, patients with hematological disorder or on anti-platelet or anticoagulation therapy and pregnancy or breastfeeding.

A total of 195 patients were randomized into three groups (A, B, C) using computer generated random number table. Subjects in group A and B received one intra-articular injection of 2 ml PRP and 2 ml of 80 mg methylprednisolone acetate respectively via anterior approach under strict aseptic condition. After injections

patients were advised to limit shoulder movement for at least 24 hours and to use cold compress and paracetamol for pain. Patients with group C received 15 minutes of short-wave diathermy (27.12 MHz, continuous mode) daily for 10 days. All participants (group A, B, C) were taught a 10 minutes exercise therapy comprising of pendulum exercises, stretching exercises and were instructed to perform the exercises twice daily at home. After baseline evaluation and intervention all subjects were followed up at 3, 6 and 12 weeks. Primary outcome measure used was improvement in the active range of motion (assessed using clinical goniometer) and secondary outcome measures were Visual analogue scale (VAS) for pain and a shortened version of disabilities of the arm, shoulder and hand (Quick DASH) for function.

Statistical analysis

Data were entered and analyzed by using Statistical package for the social sciences (SPSS) version 21. Chi-square test was used for the comparison of binomial variance. All continuous data were assessed and expressed as mean and standard deviation of mean. Within each group change in the mean values of continuous variable was compared using analysis of variance (ANOVA) test. P-value <0.05 was taken as significant. 3 patients in group A, 5 patients in group B and 7 patients in group C were lost to follow-up. So, analysis was done on 180 patients.

RESULTS

For Gender and side involved chi-square test and for other parameters one-way ANOVA with Bonferroni correction.

Table 1: Baseline characteristics of the participants showing no significant differences between the groups.

Baseline characteristics	PRP (n=62)	Steroid (n=60)	Short-wave diathermy (n=58)	P value
Gender, n (%)				
Male	28 (45.2)	31 (51.7)	23 (39.7)	0.248
Female	34 (54.8)	29 (48.3)	35 (60.3)	
Age, years				
Mean (SD)	52.7 (8.6)	51.9 (10.1)	51.2 (11.7)	0.724
Range	(37-72)	(30-72)	(27-75)	
Side involved, n (%)				
Nondominant	26 (41.9)	26 (43.3)	22 (37.9)	0.825
Dominant	36 (58.1)	34 (56.7)	36 (62.1)	
Duration of symptoms, months				
Mean (SD)	4.1 (2.5)	5.2 (2.8)	4.7 (2.1)	0.059
Abduction, mean (SD)				
Active	90.1 (19.0)	90.6 (17.6)	88.5 (14.9)	0.800
Passive	95.9 (19.5)	96.2 (17.1)	95.2 (12.1)	0.943
Flexion, mean (SD)				
Active	94.9 (21.0)	96.7 (19.7)	97.2 (16.7)	0.876
Passive	102.3 (19.7)	102.6 (18.6)	102.5 (17.4)	0.994
External rotation, mean (SD)				
Active	34.5 (19.0)	34.4 (15.9)	33.9 (15.6)	0.982
Passive	38.2 (18.9)	38.0 (16.1)	38.0 (16.3)	0.997

Continued.

Baseline characteristics	PRP (n=62)	Steroid (n=60)	Short-wave diathermy (n=58)	P value
Internal rotation, mean (SD)				
Active	21.9 (14.1)	21.8 (12.8)	21.3 (10.2)	0.832
Passive	26.5 (14.4)	26.7 (15.4)	28.0 (15.9)	0.800
Extension, mean (SD)				
Active	35.8 (8.9)	32 (10.4)	28.6 (9.6)	<0.001
Passive	41.2 (9.5)	37 (11.4)	32.6 (9.7)	<0.001

Table 2: Active range of motion of shoulder in degrees [mean (SD)] in the three study groups at baseline, 3 weeks, 6 weeks and 12 weeks.

Active range of motion	Study groups	PRP (n=62)	Steroid (n=60)	Short-wave diathermy (n=58)	P value
Abduction	Baseline	90.1(19.0)	90.6(17.6)	88.5(14.9)	0.800
	3 weeks	107.1(18.6)	104.8(16.9)	103.6(13.1)	0.499
	6 weeks	124.1(20.8)	121.6(17.0)	117.6(15.8)	0.141
	12 weeks	142.3(22.9)	129.7(21.8)	117.3(16.0)	<0.001
Flexion	Baseline	95.5(21.0)	96.7(19.7)	97.2(16.7)	0.878
	3 weeks	111.3(13.9)	112.0(16.9)	112.2(15.3)	0.939
	6 weeks	128.7(12.5)	126.3(16.0)	124.7(15.8)	0.322
	12 weeks	145.5(13.5)	133.1(18.5)	124.8(15.2)	<0.001
External rotation	Baseline	34.5(19.0)	34.4(15.9)	33.9(15.6)	0.982
	3 weeks	49.4(16.1)	48.1(17.1)	47.6(16.7)	0.834
	6 weeks	65.2(14.3)	61.8(15.7)	60.6(15.9)	0.236
	12 weeks	80.2(13.8)	71.4(18.3)	65.0(18.6)	<0.001
Internal rotation	Baseline	21.9(14.1)	21.8(12.8)	21.4(10.2)	0.973
	3 weeks	33.8(14.3)	34.1(13.5)	33.5(10.1)	0.973
	6 weeks	46.4(12.3)	45.3(12.3)	43.9(11.5)	0.549
	12 weeks	57.5(10.7)	50.2(13.4)	45.6(13.8)	<0.001

Table 3: Passive range of motion of shoulder in degrees [mean (SD)] in the three study groups at baseline, 3 weeks, 6 weeks and 12 weeks.

Active range of motion	Study groups	PRP (n=62)	Steroid (n=60)	Short-wave diathermy (n=58)	P value
Abduction	Baseline	95.9(19.5)	96.2(17.1)	95.2(12.1)	0.943
	3 weeks	112.8(18.4)	110.7(16.2)	109.4(12.8)	0.498
	6 weeks	130.6(19.9)	127.3(16.7)	123.5(16.2)	0.098
	12 weeks	148.3(21.5)	135.9(21.1)	123.9(16.2)	<0.001
Flexion	Baseline	102.3(19.7)	102.6(18.6)	102.5(17.4)	0.995
	3 weeks	117.6 (13.1)	118.0(16.9)	118.9(15.9)	0.881
	6 weeks	134.8(11.6)	131.4(15.4)	129.7(15.6)	0.141
	12 weeks	151.2 (12.2)	138.0(17.5)	129.3(14.7)	<0.001
External rotation	Baseline	38.2(18.9)	38.0 (16.1)	38.0(16.3)	0.997
	3 weeks	53.9(15.7)	52.3(16.6)	52.8(16.6)	0.865
	6 weeks	69.7(14.1)	66.3(15.4)	65.6(16.3)	0.295
	12 weeks	85.9(12.8)	76.5(17.8)	69.7(18.4)	<0.001
Internal rotation	Baseline	26.5(14.4)	26.7(15.4)	28.0(15.9)	0.832
	3 weeks	38.9(14.1)	38.9(12.5)	38.7(10.1)	0.995
	6 weeks	50.8(11.2)	49.3(11.5)	48.4(11.3)	0.489
	12 weeks	60.4(8.5)	53.9(12.6)	49.1(13.4)	<0.001

One-way ANOVA with Bonferroni correction between groups and repeated ANOVA within the group.

Table 3 shows improvement in passive range of motion similar to active motion with significant improvement seen at 12 weeks.

Table 4: Visual analogue scale and quick DASH values [mean (SD)] in the three study groups at baseline, 3 weeks, 6 weeks and 12 weeks.

PRP (n=62)	VAS	Quick DASH	P value
Baseline	8.4±1.4	83.5±14.3	0.144
3 Weeks	6.4±1.6	63.7±16.4	0.723
6 Weeks	4.2±1.9	41.6±18.7	0.045
12 Weeks	1.9±1.8	18.7±18.2	<0.001
Steroid (n=60)			
Baseline	8.6±1.4	85.7±14.3	0.144
3 weeks	6.4±1.5	64.3±14.8	0.723
6 weeks	4.6±1.5	45.7±15.4	0.045
12 weeks	3.4±1.2	34±22.0	<0.001
Short-wave diathermy			
Baseline	8.9±1.4	88.6±13.6	0.144
3 weeks	6.6±1.4	65.9±14.0	0.723
6 weeks	4.9±1.4	48.9±13.6	0.045
12 weeks	4.5±2.0	45.2±20.0	<0.001

One-way ANOVA with Bonferroni correction between groups and repeated ANOVA within the group.

Table 4 shows that VAS and Quick DASH scores showed significant improvement at each follow up interval in all the groups when compared to baseline and significant difference between three groups at 12 weeks follow up.

DISCUSSION

The uniqueness of this study was that the group receiving PRP which was prepared by a simple technique. Total number of platelets in PRP preparation was 6.6±1.6 times higher than whole blood values. Our study demonstrates that PRP can be prepared by a simple technique and is better than steroid and short-wave diathermy in relieving pain, improving range of motion, pain and function. Evidence for the use of PRP in clinical conditions is growing and this study adds to the pool of this growing literature.⁴ Systematic review by Griesser et al showed significant but transient improvement in abduction and forward elevation and significant short as

well as long term diminution of pain measured by VAS and Shoulder pain and disability index (SPADI).⁵

CONCLUSION

Single injection of PRP is significantly more effective in reducing pain and improving functional outcome at 12 weeks compared to single dose of corticosteroid injection and short-wave diathermy.

ACKNOWLEDGEMENTS

Authors would like to give special thanks to Physiotherapy unit and Department of Sports medicine, RIMS Imphal.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Deb D, Nandabirsingh, Singh NB, Das R, Meethal SA. Comparison between platelet rich plasma injection, corticosteroid injection and short-wave diathermy in the management of pain and the improvement of functional outcome in the patients suffering from adhesive capsulitis of the shoulder: a randomized controlled trial. *Int J Adv Med* 2020;7:1546-9.