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COMPARATIVE EFFICACY OF LOCAL PLATELET RICH PLASMA INJECTION AND CORTICOSTEROID INJECTION IN THE TREATMENT OF PERIARTHRITIS SHOULDER

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ABSTRACT Periarthritis shoulder (PA) is characterised by insidious onset, progressive pain and loss of active and passive range of motion in the glenohumeral joint. The objective of the study was to compare the outcome of local autologous Platelet rich Plasma injection and local triamcinolone injection in patients with Periarthritis shoulder in terms of pain and range of motion. This was a prospective study conducted in patients with USG confirmed Periarthritis shoulder who attended Department of Physical Medicine and Rehabilitation, Government Medical College Kottayam. 30 subjects were allotted in each group. Both groups were followed up at 1st week, 3rd week and 6th week. At each of these follow up visits Visual Analogue Scale (VAS) and Range Of Motion (ROM) were measured. Even though the improvement in ROM and decrease in VAS was more in PRP group as compared to the triamcinolone group, the data was not statistically significant. Thus in this study it was found that in all followup visits in either group, ROM significantly improved and pain significantly reduced. So both triamcinolone injection and PRP injection are equally effective in the pain reduction and improving shoulder function.

KEYWORDS : Periarthritis shoulder, Platelet rich Plasma injection, local triamcinolone injection

INTRODUCTION

Periarthritis shoulder (PA) is characterised by insidious onset, progressive pain and loss of active and passive range of motion in the glenohumeral joint. The annual incidence of PA is between 3%-5% in the general population and as high as 20% among individuals with diabetes. It usually develops between the ages of 40 to 70 years[1].

It is a self limiting disorder[2]. The current hypothesis suggests pathology as inflammation in the joint capsule [3] followed by development of adhesions and fibrosis in the synovial lining[4]. Patients present with insidious onset of progressive pain and gradual decrease in active and passive Range Of Motion[5].

Periarthritis shoulder is divided into four stages[6]. Stage 1 involves pain with shoulder movements but no significant glenohumeral ROM restriction when examined under anaesthesia. In stage 2, freezing stage, is characterised by pain with shoulder motion and progressive glenohumeral joint ROM restriction in forward flexion, abduction and internal and external rotation. During stage 3 or the frozen stage, there is significant reduction in pain but maintenance of the restricted glenohumeral joint ROM. In stage 4, frequently referred to as the thawing stage, the ROM gradually improves.

Periarthritis shoulder is a clinical diagnosis. Laboratory and imaging studies can be used to rule out other conditions and to confirm the likelihood of the correct diagnosis.

Treatment goals are to relieve pain and restore movement and shoulder function. Physiotherapy and home exercise are first-line treatments. These are often combined with anti-inflammatory medications and corticosteroid injection[7]. Platelet Rich Plasma (PRP) has a platelet concentration higher than that of whole blood, and is thought to stimulate a natural healing process.[8] Aslani et al evaluated the efficacy of the PRP injection in patients with PA and showed improvement in the ROM and functional improvement.[9] Surgery has not been shown to improve outcomes and hydrodilatation has a small, clinically insignificant effect.

Though both local corticosteroid injection and local PRP injection can be used as treatment,the efficacy of one over other has not studied yet. So we attempted here to study the comparative efficacy of PRP injection and corticosteroid injection in the treatment of PA.

Methods

The study design was prospective study. Study population included patients with USG confirmed Periarthritis shoulder attending Department of Physical Medicine and Rehabilitation, Government, Medical College Kottayam. The study was approved by the Institutional Review Board of our institution. All subjects had signed an informed consent form (available in local language also) to participate in the study.

We included patients with age 40 - 70 years, who had shoulder pain for atleast one month and associated with more than one-third loss of active shoulder flexion, abduction, internal rotation and external rotation, with normal anteroposterior radiographs of the glenohumeral joint in neutral rotation and diagnosis confirmed with USG (to rule out rotatorcuff tendinitis ,tear etc)

We excluded patients with intrinsic glenohumeral pathology and tendon rupture, history of shoulder trauma or surgery, clinical evidence of complex regional pain syndrome, history of injection in the involved shoulder joint during the preceeding 6 months, patients with haematological disorders or on antiplatelet or anticoagulant therapy, patients having significant cardiovascular, renal or hepatic diseases, pregnancy and lactation, local malignancy, severe anaemia (Hb<5gm%) and diabetics with FBS >110 and PPBS >140.

According to study on comparative efficacy of Platelet Rich Plasma and Corticosteroid injection in treatment of Periarthritis shoulder by Shashank Yeshwant Kothari, VenkataramanSrikumara and Neha Singh[1], it was observed that a single injection of PRP resulted in significant improvement in shoulder range of motion, pain and function than Corticosteroid injection.

Hence calculating sample size using the formula,
$[(Z\ 1\text{-}\alpha/2 + Z\ 1\text{-}\beta)*2*\sigma*\sigma] \div (Meu1 - Meu2)$
Where $\sigma = S1(n1-1) + S2(n2-1)$
$n1 + n2 - 2$
N = Sample size
$Z\ 1\text{-}\alpha/2 = 1.96$
$Z\ 1\text{-}\beta = 0.84$
Sample size = (2*406.347*7.84)/234.09 = 30.
Hence sample size for this study is taken as 30 in each group.

General details of the patients including name, age, sex, address, occupational status, type of occupation, diabetic status were collected. A written informed consent was obtained from all patients. Short history and clinical examinations were carried out. Basic investigations were carried out. All the information collected from each patient was recorded in the pre-prepared proforma .Tools used to compare the effectiveness of the treatments were the Visual Analogue Scale[10] for pain (VAS) and the Range Of Motion for functional status. At first, the patient's pain status was determined using the Visual Analogue Scale for pain. The VAS is applied by drawing a horizontal line, 10 centimeters in length, anchored by word descriptors at each end like 0 which represents no pain and 10 which represents maximum pain. The patient was asked to mark on the line, the point that he/she felt represented the pain perception at that time. The VAS score was determined by taking the measurement in centimeters from the left hand end of the line to the point marked by the patient. Secondly, patient's functional status was determined using Range Of Motion especially, Flexion, Abduction, Internal rotation and External rotation

and are assessed using a device called Goniometer.

Two groups were formed with group A receiving local triamcinolone injection and group B receiving autologous Platelet Rich Plasma injection. The patients were allocated to each groups on alternate basis. The patient was prepared in a standard aseptic fashion over a large area enough to allow palpation of landmarks and sterile technique was used throughout the procedure. A 24 G 1 ½ inch needle was inserted medial to the head of humerus, lateral to the coracoid process by 1cm and was directed posteriorly at a slight superior and lateral angle. The needle should slip into the joint completely and the injection have no resistance. After negative aspiration a 2ml mixture of 40 mg of triamcinolone acetonide and local anaesthetic 2% lignocaine is injected.

PRP Preparation And Injection

The American Association of Blood Banks technical manual, states that "platelet-rich plasma is separated from whole blood by 'light-spin' centrifugation and subsequently the platelets are concentrated by 'heavy-spin' centrifugation with removal of the supernatant plasma." The basic principle behind the PRP separation procedure is as follows. The centrifugation process separates blood components owing to their different specific gravities, i.e., RBCs being the heaviest, followed by WBCs, whereas platelets are the lightest. The first centrifugation is slow to avoid spinning down platelets and to isolate plasma. Platelets are mostly concentrated right on top of the buffy coat layer. Subsequent centrifugation is faster, so that platelets are spun down and separate as a pellet at the bottom of the tube from platelet-poor plasma (PPP) above. The final platelet concentration depends on the volume reduction of PPP. Approximately 3/4 of the supernatant is discarded and the platelet-rich pellet is re-suspended in remaining amount of plasma. The resulting suspension is used as PRP.

Under aseptic precautions, 18ml of blood is drawn from subjects belonging to group B via venepuncture using a 22 gauge needle and mixed with 2ml of anticoagulant Citrate Phosphate Dextrose in a sterile test tube. It is centrifuged at 160G (1500rpm) for 10mins in a table top. Aspirate plasma and buffycoat and is transferred to another sterile test tube. It is then centrifuged at 400G (2500rpm) for 10mins. Approximately ¾ of the supernatant is discarded and the platelet rich pellet is resuspended in remaining amount of plasma. This PRP sample is injected into the affected shoulder by anterior approach which was then dressed.

Both groups were followed up at 1st week, 3rd week and 6th week. At each of these follow up visits VAS and Range Of Motion were applied as assessment tools. The results were then analyzed statistically.

Data analysis was performed by SPSS (version 17) for windows. Alpha value was set as 0.05. Descriptive statistics was performed to find out mean, standard deviation for the demographic variable and outcome variables. Chi square test was performed to find out gender, diabetes, side, occupation and age distribution. Unpaired t test was used to find out significant differences among demographic variable such as age and outcome variables such as ROM. Mann Whitney U test was used to find out difference in scores between group for demographic variables such as VAS. Unpaired t test was used to find out difference between groups for ROM such as flexion, abduction and external & internal rotation. A repeated measure of ANOVA was used to find out significant difference with in groups for flexion, abduction and external & internal rotation. Friedman's test was used to find out significant difference with in groups for VAS. Microsoft excel, word was used to generate graph and tables.

ANALYSIS AND RESULTS

Total subjects included in the study was sixty. 30 in steroid group and 30 in PRP group. The data related to each group, before starting treatment, and at first, third and sixth weeks of treatment were collected and analysed statistically.

Among the triamcinolone group 17/30 (57%) were females and 13/30 (43%) were males & among the PRP group 14/30 (47%) were females and 16/30 (53%) were males which was not statistically significant ($p > 0.438$). 23 (77%) patients were having diabetes as comorbidity in triamcinolone group and 21 (70%) patients were having diabetes as comorbidity in PRP group which was not statistically significant ($p > 0.559$). 17/30 (57%) patients had right shoulder involvement and 13/30 (43%) patients had left shoulder involvement in Group A, whereas 15/30 (50%) patients had right shoulder involvement and 15/30 (50%) patients had left shoulder involvement in Group B which was also not statistically significant ($p > 0.605$). In summary, the data was homogenous among both groups.

Among Group A, majority (11) belonged to age group between (40-50), few (10) were between agegroup (61-70) and the remaining (9) were between age group (51-60) and among Group B, majority (12) belonged to age group between (40-50), few (11) were between agegroup (51-60) and the remaining (7) were between age group (61-70), which was not statistically significant ($p > 0.679$).Among Group A, majority were sedentary (11), few were heavy manual labourers (10) and the remaining were manual labourers whereas, among Group B, majority included both sedentary and manual labourers (both 11) and few were heavy manual labourers (8), which was also not statistically significant ($p > 0.810$). In summary, the data was homogenous between groups at baseline.

The mean pre-injection Range of motion in Group A were flexion 90.17 with a standard deviation 15.84 , abduction 89.03 with a standard deviation 15.17 , internal rotation 72.83 with a standard deviation 8.48 and external rotation 24.83 with a standard deviation 14.59 and those in Group B were flexion 91.33 with a standard deviation 16.34, abduction 88.07 with a standard deviation 17.22, internal rotation 73 with a standard deviation 8.26 and external rotation 24.5 with a standard deviation 14.64, all being not statistically significant ($p > 0.05$). In summary, the data was homogenous between groups at baseline.

1 week after triamcinolone injection in Group A, the mean Range of motion has improved to flexion 101 with a standard deviation 18.07 , abduction 98.5 with a standard deviation 16.46 , internal rotation 80.33 with a standard deviation 7.06 and external rotation 33.67 with a standard deviation 14.50 and 1 week after PRP injection in Group B, the mean Range of motion has improved to flexion 101.6 with a standard deviation 16.69, abduction 99.83 with a standard deviation 15.67, internal rotation 79.9 with a standard deviation 7.04 and external rotation 34.83 with a standard deviation 14.29, all being not statistically significant ($p > 0.05$). In summary, both groups were equally effective in improving the ROM after 1 week.

3 week after triamcinolone injection in Group A, the mean Range of motion has improved to flexion 110.83 with a standard deviation 21.76, abduction 106.93 with a standard deviation 18.80, internal rotation 84.83 with a standard deviation 7.13 and external rotation 40.5 with a standard deviation 16.10, and 3 week after PRP injection in Group B, the mean Range of motion has improved to flexion 111.5 with a standard deviation 17.62, abduction 108 with a standard deviation 15.40, internal rotation 84.67 with a standard deviation 6.42 and external rotation 41.83 with a standard deviation 16.05, all being not statistically significant ($p > 0.05$). In summary, both groups were equally effective in improving the ROM after 3 weeks.

6 week after triamcinolone injection in Group A, the mean Range of motion has improved to flexion 121 with a standard deviation 24.92, abduction 116.9 with a standard deviation 20.97, internal rotation 87.67 with a standard deviation 4.87 and external rotation 46.5 with a standard deviation 17.67, and 6 week after PRP injection in Group B, the mean Range of motion has improved to flexion 123.4 with a standard deviation 20.88, abduction 119.83 with a standard deviation 20.15, internal rotation 87.17 with a standard deviation 4.86 and external rotation 49.67 with a standard deviation 18.89, all being not statistically significant ($p > 0.05$). In summary, both groups were equally effective in improving the ROM after 6 weeks.

After triamcinolone injection, there was significant reduction in pain ($p<0.001$) as measured by VAS in all followup visits. Also there was significant reduction in pain ($p<0.001$) as measured by VAS score in PRP group in each of the post injection followup visits. In summary, at 1 week, 3 weeks and 6 weeks the pain reduction was equally effective at both groups.

In triamcinolone group, there was increase in range of motion (flexion, abduction, internal rotation and external rotation) in each of the followup visits and all were significant ($p<0.001$).Similarly, PRP group also showed increase in functionality as measured by range of motion (flexion, abduction, internal rotation and external rotation) in each of the followup visits and all were significant ($p<0.001$).

In summary, the repeated measurements taken for ROM and VAS at 1

week, 3 week and 6 week were improved significantly in both groups.

DISCUSSION

Periarthritis shoulder is one of the commonest causes of shoulder pain. It is usually debilitating and influences every aspect of a patient's life. There are both invasive and non invasive treatment options available for this condition. Oral medications includes NSAIDs and Glucocorticoids[7].

Oral glucocorticosteroids can be prescribed in lieu of NSAIDs, as they provide a stronger anti-inflammatory effect, however they should not be given routinely due to their potential adverse effects[11,12,13]. Cataract, glaucoma, osteoporosis, peptic ulcer, Cushing's syndrome, limb muscle atrophy, growth retardation are some of the adverse effects.

The overall effect of intraarticular corticosteroid is reduction in pro-inflammatory derivatives such as bradykinin, histamine, prostaglandins, and leukotrienes, but is associated with adverse effects such as post injection flare[14,15], skin depigmentation, tissue atrophy, fat necrosis[16], tendon rupture [17,18,19,20,21], avascular necrosis[22] etc.

Platelet Rich Plasma (PRP) derived by centrifuging whole blood, has a platelet concentration higher than that of whole blood, and is thought to stimulate the natural healing process through growth factors contained in the platelets such as platelet derived growth factor, transforming growth factor beta, fibroblast growth factor and insulin like growth factor, initiating and accelerating the natural physiological tissue healing process[8].

The objective of this study is to compare the clinical outcomes of platelet rich plasma injection with local steroid injection, in patients with Periarthritis shoulder visiting the Department of Physical Medicine & Rehabilitation, Government Medical College, Kottayam. In the present study, the majority of patients belonged to the age group greater than 40 years. The mean age of patients in the steroid group was 55.7 , and in the PRP group 53.4 years. The range of participant's age reflects that Periarthritis shoulder affects the adults especially middle to later age of life.

Females formed the majority of patients in the study (31/60), with rest being males (29/60). Data showed that 57% in steroid group, 47% in PRP group were females.44/60 patients were having diabetes as a comorbidity. 77% in Group A and 70% in Group B were diabetic.

Among the study population, majority were sedentary (22/60), few were manual labourers (20/60) and remaining were heavy manual labourers.In the present study, 32 (57% in Group A and 50% in Group B) patients had right shoulder involvement and 28 (43% in Group A and 50% in Group B) had left shoulder involvement.

In this study, PRP injection resulted in better pain relief compared to triamcinolone injection, as measured by the Visual Analogue Scale at the followup visits, results being statistically significant.

With regard to functional outcome, those who received PRP injection showed more improvement as measured by range of motion shoulder (flexion, abduction, internal rotation and external rotation) when compared with that following triamcinolone injection, at all the followup visits, each difference being statistically significant.

Many studies were done demonstrating the efficacy of PRP in musculoskeletal conditions. Shashank Yeshwant Kothari et al studied 195 subjects with shoulder pain and demonstrated that single injection of PRP is effective and better than corticosteroid injection or ultrasonic therapy in treatment of Periarthritis Shoulder[1].

Zhang et al. reported widespread application of PRP for a myriad of musculoskeltal injuries[23]. Giotis et al. studied effectiveness of PRP and other biologicals in shoulder disorders including periarthritis shoulder and found that they are promising approaches for biological repair in the management of shoulder disorders[126].

The limitations of our study are the outcome measures used in the study were more of a subjective than objective nature a they were used to measure pain which is a subjective symptom. The VAS score is not specific for Periarthritis shoulder. Similar study can be done by including a functional outcome measure such as SPADI and DASH. Effectiveness of PRP at different stages of Periarthritis shoulder is not studied. For complete assessment of efficacy of treatments, patients have to be followed up over a longer time. A large, double blind controlled clinical trial would be desirable.

CONCLUSION

The objective of the study was to compare the outcome of local autologous Platelet rich Plasma injection and local triamcinolone injection in patients with Periarthritis shoulder in terms of pain and range of motion.

Even though the improvement in range of motion and decrease in VAS was more in PRP group as compared to the triamcinolone group, the data was not statistically significant.

Thus in this study it was found that in all followup visits in either group, ROM significantly improved and pain significantly reduced. So both triamcinolone injection and PRP injection are equally effective in improving the pain reduction and shoulder function.

Considering various side effects of corticosteroids it is safe to use PRP over corticosteroids.

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FIGURES AND TABLES

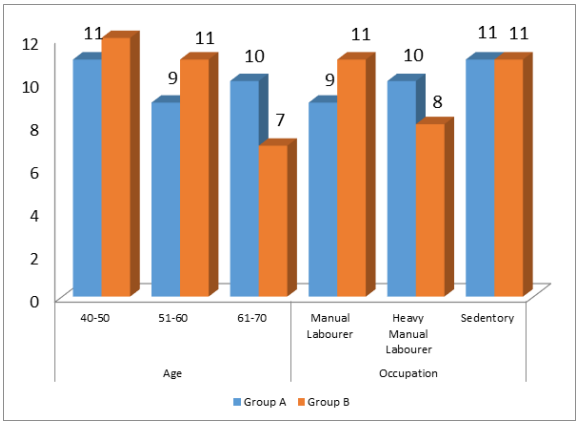

Figure 1: Distribution Of Age And Occupation Among Both Groups

Table 1: ROM Measurements At Baseline

Sl.No:	ROM-pre	Group A	Group B	Þ-value
1	Flexion	90.17±15.84	91.33±16.34	>0.780
2	Abduction	89.03±15.17	88.07±17.22	>0.818
3	Internal Rotation	72.83±8.48	73.00±8.26	>0.939
4	External Rotation	24.83±14.59	24.50±14.64	>0.930

Table 2: ROM Measurements At 1 Week Between Groups

Sl.No:	ROM1	Group A	Group B	Þ-value
1	Flexion	101.00±18.07	101.60±16.69	>0.894
2	Abduction	98.50±16.46	99.83±15.67	>0.749
3	Internal Rotation	80.33±7.06	79.90±7.04	>0.813
4	External Rotation	33.67±14.50	34.83±14.29	>0.755

Table 3: ROM Measurements At 3 Week Between Groups

Sl.No:	ROM3	Group A	Group B	Þ-value
1	Flexion	110.83±21.76	111.50±17.62	>0.897
2	Abduction	106.93±18.80	108.00±15.40	>0.811
3	Internal Rotation	84.83±7.13	84.67±6.42	>0.925
4	External Rotation	40.50±16.10	41.83±16.05	>0.749

Table 4: ROM Measurements At 6 Week Between Groups

Sl.No:	ROM6	Group A	Group B	Þ-value
1	Flexion	121.00±24.92	123.40±20.88	>0.687
2	Abduction	116.90±20.97	119.83±20.15	>0.583
3	Internal Rotation	87.67±4.87	87.17±4.86	>0.692
4	External Rotation	46.50±17.67	49.67±18.89	>0.505

Table 5: VAS Measurements At Pre, 1 Week, Three Week And 6 Week Between Groups

Sl.No:	Variables	Group A	Group B	Þ-value
1	Vas pre	8.75±1.20	8.72±1.54	>0.893
2	Vas1wk	6.75±1.54	6.56±1.45	>0.454
3	Vas3wk	5.71±1.37	5.45±1.28	>0.410
4	Vas6wk	4.58±1.39	4.29±1.42	>0.374

Table 6: ROM and VAS Comparison Within Group A

Sl.No:	Variables	Pre	Post 1 wk	Post 3 wk	Post 6 wk	p-value
1	Flexion	90.17± 15.84	101.00± 18.07	110.83± 21.76	121.00± 24.92	<0.0001
2	Abduction	89.03± 15.17	98.50± 16.46	106.93± 18.80	116.90± 20.97	<0.0001
3	Internal Rotation	72.83± 8.48	80.33± 7.06	84.83± 7.13	87.67± 4.87	<0.0001
4	External Rotation	24.83± 14.59	33.67± 14.50	40.50± 16.10	46.50± 17.67	<0.0001
5	Vas	8.75± 1.20	6.75± 1.54	5.71± 1.37	4.58± 1.39	<0.0001

Table 7: ROM and VAS Comparison Within Group B

Sl.No:	Variables	Pre	Post 1 wk	Post 3 wk	Post 6 wk	p-value
1	Flexion	91.34± 16.34	101.60± 16.69	111.50± 17.62	123.40± 20.88	<0.0001
2	Abduction	88.07± 17.22	99.83± 15.67	108.00± 15.40	119.83± 20.15	<0.0001
3	Internal Rotation	73.00± 8.26	79.90± 7.04	84.67± 6.42	87.17± 4.86	<0.0001
4	External Rotation	24.50± 14.64	34.83± 14.29	41.83± 16.05	49.67± 18.89	<0.0001
5	VAS	8.72± 1.54	6.56± 1.45	5.45± 1.28	4.29± 1.42	<0.0001

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