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RESEARCH PAPER

Comparison of the Effect of Intralesional Injection of Corticosteroid and Platelet-rich Plasma in Patients with de Quervain's Tenosynovitis

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Abstract

Background: De Querveins' tenosynovitis affects the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons in the first dorsal compartment of the wrist. Corticosteroid injection is the mainstay of treatment for those patients who do not respond to conservative management. Platelet-rich plasma (PRP) is a currently used strategy in the clinical practice to provide a regenerative stimulus for tendon healing.

Objective: To evaluate the effects of Platelet-rich plasma in the treatment of DQVD in comparison with corticosteroid (CS) injection.

Materials and Methods: The present randomized clinical trial had been conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka. A total of 100 patients with pain and swelling over the radial aspect of the wrist with positive Finkelstein test were randomly allocated into three groups: group A (received platelet-rich plasma injection), group B (received corticosteroid injection) and group C (received conservative management). The severity of pain and functional status of the wrist joint were recorded according to VAS and Mayo's wrist score both pre-procedurally on day 0 and post-procedurally at the end of 1st, 3rd and 6th month.

Results: The mean age of the participants in group A, B and C were 45.6 (±10.4), 46.9 (±11.3) and 42.4 (±6.3) years respectively. In all groups, majority of the study participants were female and housewives. No significant statistical difference was observed among the groups regarding VAS scores and Mayo's Wrist Scores at baseline. At the end of 6 months, the reduction of pain in group A was significantly lower than group B ($p<0.001$). Again, at the end of 6 months, the improvement of Mayo's Wrist Scores in group A group was significantly higher than group B ($p<0.001$). In group A, 77.8% reduction of pain score was achieved while in group B, 68.4% reduction of pain score was achieved after 6 month of treatment ($p<0.001$).

Conclusions: Platelet-rich plasma provides better functional outcome than corticosteroid in the treatment of de Quervain tenosynovitis.

Key words: de Quervain's Tenosynovitis, Corticosteroid injection, Platelet-rich Plasma

Introduction

de Quervain's tenosynovitis is a repetitive stress condition located at the first dorsal compartment of the wrist at the radial styloid.[1] It is classically defined as a stenosing tenosynovitis of the synovial sheath of tendons of the abductor pollicis longus and extensor pollicis brevis muscles in the first compartment of the wrist due to repetitive use.[2] It is characterized by pain on the radial aspect of the wrist at the first dorsal compartment.[3] Persons with de Quervain's disease are typically women in their 30s and 40s, although the condition can develop in men and women at any age. de Quervain's disease is the most common tendinopathy to develop in postpartum women because of the specific hand and wrist position requirements in the care of an infant. Any activity requiring repeated thumb abduction and extension in combination with wrist radial and ulnar deviation can aggravate this problem.[4] Diagnosis is usually clinical using either the Finkelstein's test, Eichhoff's test, and/or the wrist hyperflexion and abduction of the thumb

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(WHAT) test. If required, the single most useful and accurate investigation is a high-resolution ultrasound scan. Plain X-Ray of the affected wrist (to exclude other diseases) and MRI (where ultrasound may be equivocal), and shear wave elastography (SWE) can also be done.[1]

Activity modification is often the most important consideration in conservative treatment. Elimination of highly repetitive activities that include pinching or gripping is beneficial. Heat modalities, stretching of the first dorsal compartment muscles, and ice may offer relief of symptoms.[3] Corticosteroid injections is the mainstay of treatment for those patients who do not respond to the above and thishas been shown to be of benefit.[5]

Platelet rich plasma (PRP) is autologous blood derivative with enhanced platelet concentration which basically has properties of biologically enhancing the healing process naturally.[6] A variety of potentially therapeutic growth factors are detected and released from the platelets in significant levels in platelet-rich plasma preparations. These factors after secretion are involved in key process of tissue repair and cell proliferation, cellular differentiation and extracellular matrix synthesis.[7] The first clinical study assessing the effect of Platelet Rich Plasma on de Quervain‘s tenosynovitis was published by Peck and Ely.[8] They suggest that US-guided Percutanous needle tenotomy (PNT) and platelet rich plasma injection may be a reasonable option to consider before surgery. The retrospective study of Bender & Elder[9] reported that the average VAS scores decreased an average of 87% after ultrasound guided platelet-rich-plasma injections for the treatment of De Quervain’s Tenosynovitis. The prospective study of AL-Ardi[10] reported that VAS score reduced significantly after single platelet rich plasmainjection. The prospective cohort study of Ramesh et al.[11] found that percutaneous needling with autologous platelet rich plasma injection is the most superior modality for de Quervain’s stenosing tenosynovitis which minimise the pain and improve the functional quality of life.

Due to availability from patients’ whole blood and thus it’s autologous source, makes it theoretically and potentially safe, without risks of disease transmission or immunogenic reaction.[12] Therefore, the present study was conducted to evaluate the effect of platelet rich plasmain the treatment of De Quervain’s tenosynovitis in comparison to corticosteroid local injection.

Materials and Methods

The study was a randomized clinical trial conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka. Considering an alpha error of 0.05, 90% power,69.5% patients in corticosteroid group and 95.5% patients in platelet rich plasma group had recovered from disease at the end of 6th month follow up[13] the minimum sample size was 30 for each group. Considering a possible drop out of 10%, a total of 100 patients were required. Patients with pain and swelling over the radial aspect of the wrist with positive Finkelstein test and had taken conservative treatment but had shown no improvement from past 6 months were included in the study. Patients with haemoglobin< 10 gm/dL and platelet count <105 / ìL, with usage of analgesics prior to 72 hours of platelet rich plasma therapy, with corticosteroid injection at treatment site within 1 month, who underwent surgical treatment for de Quervain’s tenosynovitis were excluded from the study. Patients with rheumatoid arthritis, gouty arthritis, seronegative arthropathies and reactive arthritis, with local infection at the site of the procedure, HIV, Hepatitis B or C, coagulation and bleeding disorders, septicaemia and other systemic disorders were also excluded from the study.

All patients were subjected for thorough clinical examination and to investigate the duration of the disease and the nature of management taken prior to the study. The baseline investigations and radiographic analysis such as plain x ray and ultrasound examination of the affected wrists were analysed.

Group selection was done randomly by the way of lottery and patients were divided into three groups: group A, group B and group C. In group A, 33 patients were treated with 3-4 ml of autologous platelet rich plasma injection along the inflamed tendon sheath of APL and EPB tendons. The sterile dressing and crepe bandage were applied at the injection site. In group B, 33 patients were treated with single dose of 40 mg of triamcinolone infiltration around the inflamed tendon sheath of APL and EPB tendons. Immediately after the injection, the patient was kept in a supine position without moving the arm for 15 minutes. Patient was sent home with instructions to limit their use of the wrist for approximately 24 hours and use cold compression or acetaminophen for pain. A formal strengthening program was initiated after stretching.

At 4 weeks after the procedure, patients were allowed to proceed with normal regular activities as tolerated. In group C, 33 patients were given conventional therapy in the form of rest, ice pack application, analgesics and anti-edema measures for 2 weeks and physical therapy in the form of soft tissue massage.

The severity of pain around the wrist joint and functional status were recorded according to VAS and Mayo's wrist score both pre-procedurally on day 0 and post-procedurally at the end of 1st, 3rd and 6th month. Within the six month follow up, two patients in group B and three patients in group C dropped out the study. Finally, 94 patients (group A: 33 patients, group B: 31 patients; group C: 30 patients) completed the study.

Data processing and analysis: The statistical analysis was conducted using SPSS (statistical package for social science) version 26 statistical software. Associations of categorical data were assessed using Chi-square test and Fisher Exact test. Continuous data were assessed using Independent Sample t-test and one way ANOVA test. Here, $p<0.05$ was considered significant. Here, all p-values were two sided.

Ethical implication: The protocol of the study was approved by the Institutional Review Board (IRB) of BSMMU. The IRB no. was BSMMU/2017/9932. Informed and understood written consent was taken from every patient before enrollment.

Results

The mean age of the participants in group A, B and C were 45.6 (±10.4), 46.9 (±11.3) and 42.4 (±6.3) years respectively. In all groups, majority of the study participants were female and housewives. No significant statistical difference among the groups regarding age, sex, side involvement and occupational status ($p>0.05$) (table I).

No significant statistical difference among the groups regarding VAS scores at baseline as $p>0.05$. After one month, no significant difference was observed in the VAS score between group A and B. at 1st month, VAS score was significantly lower in group A when compared to group C ($p=0.034$) and VAS score was also significantly lower in group B when compared to group C ($p<0.001$). At 3rd month, VAS score was significantly lower in group A when compared to group B ($p=0.001$) and group C ($p<0.001$). At 6th month, VAS score was also significantly lower in group A when compared to group B ($p<0.001$) and group C ($p<0.001$) (table II).

No significant statistical difference among the groups regarding Mayo's Wrist scores at baseline as $p>0.05$. From 1st month to 6th month, Mayo's Wrist scores was significantly higher in group A when compared to group B ($p<0.001$) and group C ($p<0.001$). Moreover, the Mayo's Wrist scores was significantly higher in group B when compared to group C ($p<0.05$).

Table I: Baseline characteristics of the study participants in three groups

Baseline characteristics (n=33)	Group A (n=31)	Group B (n=30)	Group C	*p* value
Age (in years) (Mean ±SD)	45.6 ±10.4	46.9 ±11.3	42.4 ±6.3	0.171[a]
Sex				
Female	21 (63.6%)	22 (71.0%)	23 (76.7%)	0.517[b]
Male	12 (36.4 %)	9 (29.0%)	7 (23.3%)	
Side involvement				
Right	20 (60.6%)	24 (77.4%)	18 (60.0%)	0.258[b]
Left	13 (39.4%)	7 (22.6%)	12 (40.0%)	
Occupational status				
House wife	17 (51.5)	19 (61.3)	19 (63.3)	0.216[c]
Service holder	11 (33.3)	5 (16.1)	2 (6.7)	
Businessman	3 (9.1)	4 (12.9)	4 (13.3)	
Others	2 (6.1)	3 (9.7)	5 (16.7)	

Footnote: a=Independent Sample t test, b=Chi-square test, c= Fisher Exact test

Table II: Comparison of VAS scores among the groups

VAS scores	Group A (n=33)	Group B (n=31)	Group C (n=30)	*p* value AvsB	AvsC	BvsC	All group
At baseline	7.8±0.8	7.9±0.6	7.7±0.7	0.646[a]	0.666[a]	0.308[a]	0.657[b]
At one month	5.6±0.7	5.3±0.5	5.9±0.6	0.097[a]	0.034[a]	<0.001[a]	0.001[b]
At three month	3.5±0.7	3.9±0.5	4.4±0.7	0.001[a]	<0.001[a]	0.005[a]	<0.001[b]
At six month	1.7±0.7	2.5±0.6	2.9±0.5	<0.001[a]	<0.001[a]	0.001[a]	<0.001[b]

Footnote: a=Independent Sample t test, b=One way ANOVA

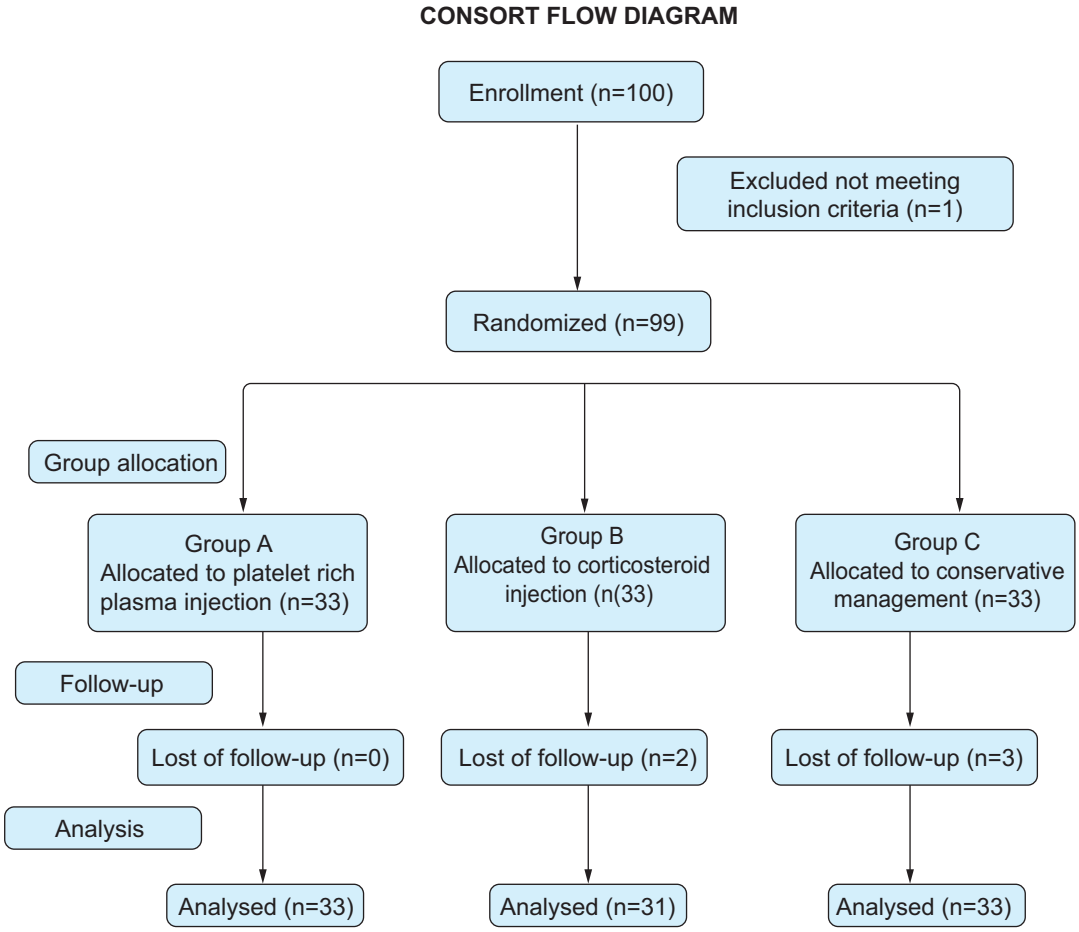

Table III: Comparison of Mayo's Wrist scores among the groups

Mayo's Wrist scores	Group A (n=33)	Group B (n=31)	Group C (n=30)	*p* value AvsB	AvsC	BvsC	All group
At baseline	40.7±5.0	39.2±3.7	40.0±4.3	0.158	0.527	0.308	0.437
At one month	66.7±4.8	56.8±5.8	52.2±7.3	<0.001	<0.001	<0.001	0.008
At three month	75.3±4.7	65.8±4.5	59.3±6.8	<0.001	<0.001	0.005	<0.001
At six month	87.9±3.7	73.7±4.8	65.2±7.2	<0.001	<0.001	0.001	<0.001

In group A, 77.8% reduction of pain score was achieved while in group B, 68.4% reduction of pain score was achieved after 6 month of treatment (p<0.001) (Figure 1).

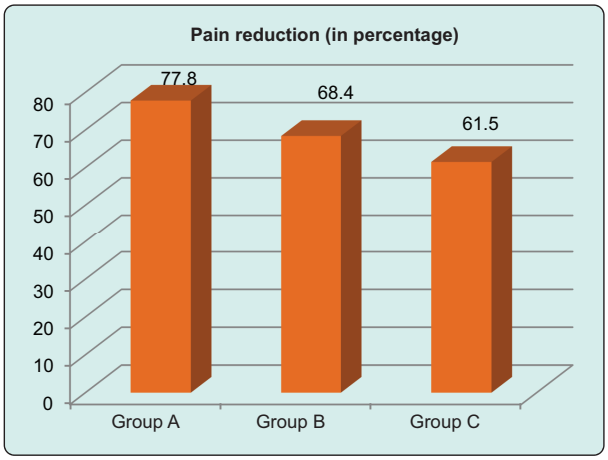

Figure 1: Reduction of pain (in percentage) of study participants in VAS score (n=94)

Discussion

The present randomized controlled trial had been conducted to assess the effectiveness of intralesional platelet rich plasma therapy for the treatment of de Quervain's tenosynovitis. Patients were randomly allocated into three groups: Group A (received platelet rich plasma injection), group B (received corticosteroid injection) and group c (received conservative management). The present study found that at the end of 6 months, the reduction of pain in patients who received platelet rich plasma injection was significantly lower than patients who received corticosteroid injection while the improvement of Mayo's Wrist Scores was significantly higher in patients who received platelet rich plasma injection.

The results of the present study showed that the mean age of the participants in group A, B and C were 45.6 (±10.4), 46.9 (±11.3) and 42.4 (±6.3) years respectively. The typical age of occurrence of de Quervain's disease are within 30 to 50 years.[4] Studies conducted among Bangladeshi patients with de Quervain's disease also found that the mean age of patients was around 40 years.[14,15]

Most of the patients in all groups were female. It is thought to occur more frequently in women between the ages of 20 and 40[16], including the variant that occurs during pregnancy and the postpartum period.[17] Other studies also found higher proportion of female patients compared to male.[10,14,15]

Majority of the study participants in all groups were housewives. As most of the patients in both groups were female, the proportion of housewives was higher than other professions. Similar finding was presented in the studies of Hassanet al.[14] and Haque et al.[15]

There is no predilection for right versus left side for de Quervain's disease.[2] However, majority of the patients of the current study had de Quervain's disease on right side which was consistent with the study of Haqueet al.[15]

Before treatment, there was no significant difference among the groups regarding VAS scores. Though, at one month, no significant difference was observed between group A and group B regarding the VAS score, it became significantly lower in group A after 6 months. In group A, 77.8% reduction of pain score was achieved while in group B, 68.4% reduction of pain score was achieved after 6 month of treatment. The case report of Peck & Ely[8] reported 63% reduction in pain from her pre-procedure level at 6 months after the receiving platelet rich plasma. Bender & Elder[9] retrospectively reviewed the charts of 8 patients who received at least one injection of platelet rich plasmaand observed that average VAS scores decreased an average of 87%. The case series of Sikkandar & Sha[18] also found that the VAS score decreased in all three patients. The prospective study of AL-Ardi[10] found that at six month follow up, the VAS score significantly improve from 5.9 to 2.0 after injection with platelet-rich –plasma.Ramesh et al.[11] reported that from 1st month, there was highly significant statistical difference among the groups regarding VAS scores which persisted up to 12 months (p<0.001).

In this study, pain reduction was significantly lower in group B when compared to group C which was consistent with the systematic review and meta-analysiswhere the authors reported that there was a significant reduction in pain withcorticosteroid injection when compared to the control group.[5]

At 1st month, the VAS score was significantly lower in group Bcompared to group A.At the end of 6 months, the reduction of pain in group A was significantly lower than group B. This finding denoted that though corticosteroid provide faster pain relief than platelet rich plasma, in the long run, platelet rich plasma was more beneficial than corticosteroid. Other studies also supported this finding.[13,19,20]

In all groups, the Mayo's Wrist Scores increased after intervention. Moreover, at the end of 6 months, the improvement of Mayo's Wrist Scores in group A group was significantly higher than group B ($p<0.001$).The study of Ramesh, et al.[11] also assessedseverity of pain and functional status according to VAS and Mayo's wrist score and found that percutaneous needling with autologous platelet-rich plasma injection is the superior modality compared to corticosteroid for de Quervain's stenosing tenosynovitis which minimize the pain and improve the functional quality of life. The study of Deb et al.[13]also found more improvement in Mayo's wrist score in platelet rich plasma group than corticosteroid group.

No serious adverse effect was observed in any patient except minor bleeding in one patient in group A which resolved spontaneously. Platelet rich plasma is prepared from autologous blood, so any concerns of allergic reactions or disease transfer are eliminated. Platelet rich plasma does not promote hyperplasia, carcinogenesis, or tumor growth.[21]

Conclusions

It can be concluded from the present study that Platelet-rich plasma provides better functional outcome than corticosteroid in the treatment of de Quervain tenosynovitis. Pain management is also superior in platelet rich plasma group than corticosteroid. Further studies are required to evaluate the long-term outcomes of this modality.

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Conflict of Interest: None

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Ethical approval: The protocol of the study was approved by the Institutional Review Board (IRB) of BSMMU, Shahbag, Dhaka, Bangladesh.

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