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Effectiveness of Ultrasound-Guided Platelet-Rich Plasma Injection Compared with Triamcinolone Hexacetonide in Improving Pain and Function in Patients with De Quervain's Tenosynovitis: A Randomized Controlled Trial

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Abstract: ***Background*: De Quervain's tenosynovitis is a stenosing tendinopathy of the first dorsal compartment tendons, commonly affecting women and individuals performing repetitive wrist and thumb movements. Corticosteroid injections provide rapid symptom relief but carry risks of recurrence and local adverse effects. Platelet-rich plasma (PRP), rich in growth factors, has emerged as a potential regenerative therapy. This study aimed to compare the efficacy of ultrasound-guided PRP injection versus triamcinolone hexacetonide in improving pain and function in patients with De Quervain's tenosynovitis. *Methods*: A randomized controlled trial was conducted in the Department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences, Imphal. Fifty-two patients aged 20–60 years with clinically diagnosed De Quervain's tenosynovitis were randomized to receive either ultrasound-guided PRP (n=26) or triamcinolone hexacetonide (n=26) injection. Pain and upper limb function were assessed using the Visual Analogue Scale (VAS) and Quick Disabilities of Arm, Shoulder, and Hand (Quick DASH) scores at baseline, 1 week, 4 weeks, 12 weeks, and 24 weeks post-injection. Data were analyzed using repeated measures ANOVA and independent t-test. *Results*: Baseline characteristics were comparable between groups. Both groups showed significant improvement in VAS and Quick DASH scores at all follow-up intervals. The steroid group demonstrated greater improvement at 4 weeks (VAS: p=0.047), whereas the PRP group showed superior long-term outcomes at 12 and 24 weeks (VAS: p=0.000; Quick DASH: p=0.000). At 24 weeks, mean VAS improved from 9.16±0.74 to 1.04±0.80 in the PRP group and from 9.08±0.74 to 3.67±1.34 in the steroid group. *Conclusion*: Both ultrasound-guided PRP and triamcinolone hexacetonide injections effectively reduced pain and improved function in De Quervain's tenosynovitis. While steroids provided faster short-term relief, PRP demonstrated superior and sustained improvement over 24 weeks, suggesting its potential as a regenerative alternative, particularly in patients contraindicated for steroid use.***

Keywords: Platelet-rich plasma (PRP), Visual analogue scale (VAS), Quick DASH -Quick disabilities of arm shoulder and hand

1. Introduction

De Quervain's tenosynovitis is a common cause of radial-sided wrist pain resulting from stenosing tendinopathy of the abductor pollicis longus and extensor pollicis brevis tendons. It predominantly affects women aged 30–55 years and individuals performing repetitive wrist/thumb movements. The condition often affects postpartum mothers due to hormonal and mechanical factors.

Conservative management includes rest, splinting, NSAIDs, and physical therapy. Corticosteroid injection is widely used and provides rapid relief. However, recurrence rates and steroid adverse effects (hypopigmentation, skin atrophy, tendon weakening) limit long-term utility.

Platelet-rich plasma (PRP) contains concentrated autologous platelets delivering growth factors that promote tendon healing, cellular proliferation, and anti-inflammatory properties. PRP may offer durable symptom improvement without steroid-related adverse effects.

Evidence comparing PRP and triamcinolone for de Quervain's is limited and inconsistent. This study evaluates comparative efficacy under ultrasound guidance for precise delivery.

The objective of this study was to determine the effectiveness of Ultrasound-Guided Platelet-Rich Plasma Injection Compared with Triamcinolone Hexacetonide in Improving Pain and Function in Patients with De Quervain's Tenosynovitis

2. Materials and Methods

Study Design
A randomized controlled trial was conducted in the Department of Physical Medicine and Rehabilitation (PMR), Regional institute of Medical Sciences (RIMS), Imphal, Manipur. The study comprised patients with De Quervain's tenosynovitis who attended the PMR OPD from April 2023 till March 2024.

Inclusion criteria
Eligible patients, both males and females aged between 20 and 60 years, with De Quervain's tenosynovitis described as stenosing tenosynovitis of the abductor pollicis longus and extensor pollicis brevis of the first Extensor compartment of the wrist[2], who were willing to participate in the study, signed the informed consent prior to enrolment of the trial and comply with treatment and follow up were included in the study.

Exclusion criteria
Patients with uncontrolled diabetes, congenital deformity of hand, rheumatoid arthritis, pregnancy, local infection, thrombocytopenia, impaired cognition were excluded from the study.

Study population
Sample size was calculated by taking into consideration the study conducted by Kothari SY et al[28] with 80% power, 5% significance level. Assuming a dropout rate of 10%, the final calculated sample obtained was 32 participants per group, giving a total sample size of 64. Participants meeting the inclusion and exclusion criteria attending Tuesday and Friday PMR OPD of RIMS were recruited until sample size was met.

All the participants were informed about the nature of the study, and those who agreed to participate were asked to sign the informed consent form. The approval of the Institutional Ethics Committee, RIMS, Imphal, was taken before starting the study. Privacy and confidentiality of participants was maintained by identifying patients using the unique identification number/MRD number and limiting access to collected data. The study was approved by the Research Ethics Board (REB), RIMS, Imphal on 30 September 2023 and registered in Clinical Trials Registry of India and the registration number was CTRI/2024/08/072131.

Patients were randomized into the intervention and control groups by block randomization. It was decided prior to intervention that the group A would be the intervention (PRP) group and group B would be the control (steroid) group. A block size of four was used and the possible combinations were numbered 1 to 6. A computer-generated list was then generated to select 13 blocks and the sequence of interventions was then generated according to the sequence in each of the selected block. Opaque envelopes containing the group to which each patient would belong were sequentially numbered and closed by an individual not involved in the study. Assessment of outcomes was done by a Senior Resident who was not aware of the treatment allocation.

Study participants were assessed at baseline, 1 week, 4 weeks, 12 and 24 weeks after the injections for pain and function using Visual analogue scale (VAS) and Quick disabilities of arm shoulder and hand (DASH). Paracetamol 650 mg tablet was given as rescue medication after injection. Range of motion and stretching were advised in both groups following injection.

Outcome measures
The treatment outcome was assessed with VAS for pain and Quick DASH for function. Using a 10 cm line, VAS for pain was assessed with two endpoints representing no pain and worst pain imaginable. Quick DASH uses 11 items to measure physical function and symptoms on people with any or multiple musculoskeletal disorder of upper limb. The Quick DASH tool uses a 5point Likert scale from which the patient can select an appropriate number corresponding to his/her severity level/ function level.

3. Statistical Analysis

Statistical analysis was done using IBM-SPSS version 21. Data were analyzed by using descriptive statistics like mean, standard deviation and percentages. Independent t-test for continuous variables and Chi-square test for categorical variables were used to test for significance. For comparison between the groups, independent t- test was used and repeated measures ANOVA was used to compare the means obtained on repeated measurements within each group. When statistical significance was observed in repeated measures ANOVA, the analysis was followed by post hoc analysis (Bonferroni) to establish differences between groups. A p value<0.05 was considered as statistically significant.

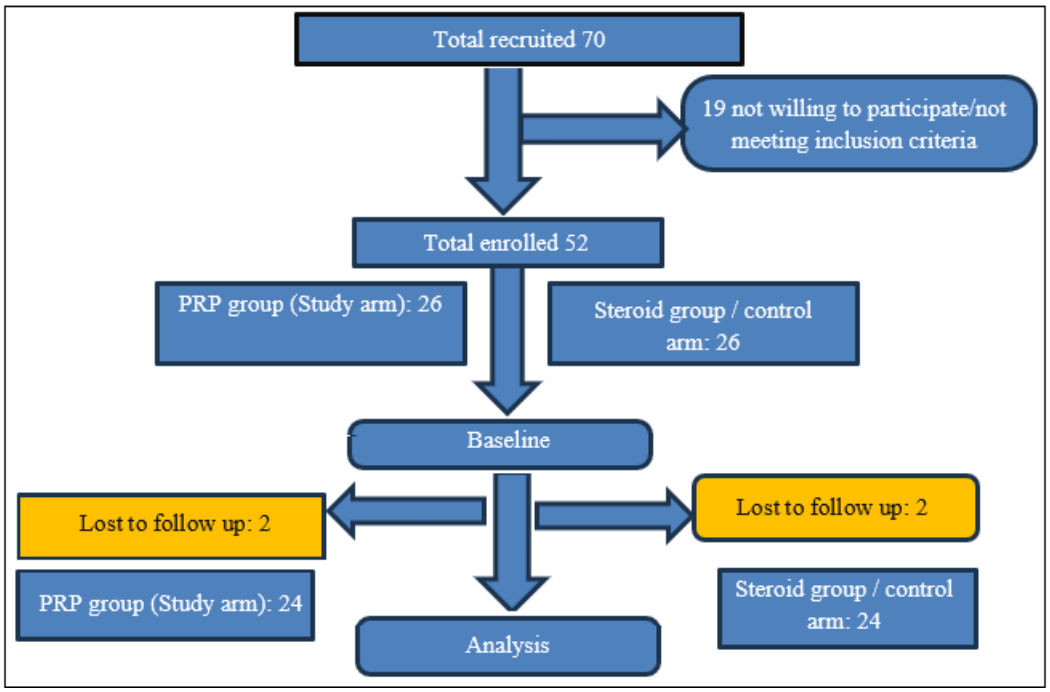

Figure 1: Consort flow chart of the study

4. Results

The baseline characteristic of the patients in both groups was comparable (Table 1). There was no statistically significant difference between the study and the control group in the baseline characteristics. The mean age for males was 41.3 years, while for females it was 35.6 years. In contrast, in the Steroid group, the mean age for females (41.4 years) was slightly higher than that of males (39.7 years). Females (53.85%) were affected more than males (46.15%) in both the study and control groups. Right side was affected more in the both the study (53.49%) and control 20 (46.51%) population. The duration of symptoms in study group was 3.23±1.36 weeks and control group was 2.96±1.156 weeks. Majority of the patients constituted of moderately heavy working patients. There were no statistically significant differences in the outcome measures i.e VAS and Quick DASH at baseline.

Table 1: Comparison of baseline characteristics and outcome measures between study and control group

Parameter	PRP n (%)	Steroid n (%)	p- value
Mean Age ± SD	38.80 ± 9.48	40.50 ± 9.75	0.531#
Gender			
Male	11 (46.2%)	12 (53.8%)	0.550*
Female	15 (44.0%)	14 (56.0%)	
Side of affection			
Left	6 (66.67%)	3 (33.33%)	0.151*
Right	20 (46.51%)	23 (53.49%)	
Duration in weeks (Mean ± SD)	3.23±1.36	2.96±1.156	0.501#
Occupation			
Light	7 (58.3%)	5 (41.7%%)	0.939*
Moderate	13(50.0%)	13(50.0%)	
Heavy	5 (45.4%)	6 (54.6%)	
Very heavy	1 (33.1%)	2 (66.7%)	
VAS (mean±SD)	9.16 ± .74	9.08 ± .74	0.692#
Quick DASH (mean±SD)	91.04 ± 5.99	92.04 ± 5.73	0.547#

Independent t test, *Chi-square test

Table 2: Comparison of mean changes of VAS and Quick DASH from the baseline between the two groups

Follow	Mean changes from baseline of VAS score		P value	Mean changes from baseline of Quick DASH		P value
	Steroid	PRP		Steroid	PRP	
Baseline	9.08 ± 0.74	9.16 ± 0.74	0.692	92.04 ± 5.73	91.04 ± 5.99	0.547
1 week	7.85 ± 0.88	8.28 ± 0.61	0.047	81.65 ± 6.40	77.56 ± 8.61	0.059
4 week	6.42 ± 0.85	7.32 ± 0.85	0.000	70.19 ± 7.51	63.36 ± 10.79	0.011
12 week	5.14 ± 0.96	4.21 ± 0.93	0.001	52.42 ± 12.90	35.13 ± 12.00	0.000
24 week	3.67 ± 1.34	1.04 ± 0.80	0.000	34.96 ± 16.74	11.92 ± 7.15	0.000

Table 3: Comparison of mean changes in outcome measures within the groups from baseline to 1 week, 4 weeks, 12 week and 24 weeks

Parameter	Group	Baseline Mean±SD	1 week Mean±SD	4 weeks Mean±SD	12 weeks Mean±SD	24 weeks Mean±SD	p-value*
VAS	PRP injection (Study)	9.16±0.74	8.28±0.61	7.32±0.85	4.21±0.93	1.04±0.80	0.00
	Steroid (Control)	9.08±0.74	.85±0.88	6.42±0.85	5.14±0.96	3.67±1.34	0.005
Quick DASH	PRP injection (Study)	91.04±5.99	77.56±8.61	63.36±10.79	35.13±12.00	11.92±7.15	0.000
	Steroid (Control)	92.04±5.73	81.65±6.40	70.19±7.51	52.42±12.90	34.96±16.74	0.015

*Repeated measures ANOVA test p-value < 0.05 is taken as significant

Table 4: Post hoc analysis of VAS and Quick DASH between study and control group

Steroid group						PRP group			
		VAS		Quick DASH		VAS		Quick DASH	
		Mean difference	p-value*	Mean difference	p-value*	Mean difference	p-value*	Mean difference	p-value*
Baseline	1week	0.880	0.000	13.480	0.000	0.880	0.000	13.480	0.000
	4week	1.840	0.000	27.680	0.000	1.840	0.000	27.680	0.000
	12weeks	4.917	0.000	55.875	0.000	4.917	0.000	55.875	0.000
	24weeks	8.083	0.000	79.083	0.000	8.083	0.000	79.083	0.000
1 week	4 weeks	0.960	0.000	14.200	0.000	0.960	0.000	14.200	0.000
	12weeks	4.042	0.000	42.333	0.000	4.042	0.000	42.333	0.000
	24weeks	7.208	0.000	65.542	0.000	7.208	0.000	65.542	0.000
4 weeks	12 weeks	3.042	0.000	27.708	0.000	3.042	0.000	27.708	0.000
	24 weeks	6.208	0.000	50.917	0.000	6.208	0.000	50.917	0.000
12 weeks	24 weeks	3.167	0.000	23.208	0.000	3.167	0.000	23.208	0.000

* Post hoc analysis using Bonferroni p-value < 0.05 is taken as significant

5. Discussion

The present study was initiated to see the effectiveness of platelet-rich plasma (PRP) in comparison with triamcinolone hexacetonide in improving pain and function in patients with de Quervain's tenosynovitis.

Known as stenosing tenosynovitis of the Abductor pollicis longus and Extensor pollicis brevis of the first Extensor compartment of the wrist.[2] This occurs when the tendons are constricted by the sheath which run through to get from the wrist to the hand. This condition can cause pain and tenderness along the thumb side of the wrist. Pathophysiology includes myxoid degeneration, fibrocartilaginous metaplasia, mucopolysaccharide deposition, neovascularization and neoinnervation are observed which explains pain and nociceptive transmission.[4]

Although many studies have shown corticosteroid to be effective for the condition, very limited literature is available to support the use of PRP in de Quervain's disease and their comparison in treating this disease.[26,27] Furthermore comparison has been done with other formulation such as methylprednisolone, Triamcinolone acetonide etc.[26,27,28,29] Only few studies are present with the Triamcinolone hexacetnoide. Due to its least soluble property it has longer duration of action and greater potency.[37]

Platelet-rich plasma (PRP) is a blood product with a higher platelet concentration than whole blood. It contains bioactive compounds that offer analgesic and anti-inflammatory benefits, as well as growth factors that aid in cellular regeneration. PRP is created by centrifuging whole blood to concentrate autologous platelets, which are then re-injected into the injured joint as part of the therapeutic process.[33,34] The study was conducted after confirming the safety and accuracy of ultrasound-guided injections of both steroid and PRP around the tendon sheath.

The present study was conducted on 52 patients with de Quervain's disease. 24 patients in study group and 24 patients in control group finished 6 months of follow up. There were 2 lost to follow up in study group and 2 in control group. Baseline characteristics such as occupation, gender, side of affection was assessed using chi-Square test. Independent t test was used for duration of illness in weeks, age, duration of disease, baseline VAS and Quick DASH. There was no significant difference in baseline characteristics in both groups. Randomization was followed in the present study. Outcome assessor was blinded in the study.

Study revealed that among the participants, the mean age was 39.67 ± 9.56 years. A similar study finding was noted by Adhishwar K et al[27] where mean age of participants was 37 years. For gender distribution both males (n=24, 46.15%) and females (n=28, 53.85%) were in the study group. Females were having more preponderance than males, similar finding was noted in study by Eman S et al[26]. The condition being more common among females.[6]

In case of handedness, both the groups had greater right sided involvement than left, in the control group the right side accounted for 53.49% while in the PRP group it was 46.21% involved whereas left hand in control group accounted for 53.49% and PRP was 46.51%. Similar findings were noted in previous studies. [26,27] Reason being right hand dominance more common than left.

The participants were followed up to 24 weeks from the date of intervention. We wanted to see both short and long term effect of both Platelet rich plasma and Triamcinolone hexacetonide. Both between and within the group difference at 1,4,12,24 weeks follow up in VAS and Quick DASH were measured using repeated measure ANOVA.

The study findings demonstrated that initially, triamcinolone hexacetonide (corticosteroid) injection reduces the pain intensity (VAS score) up to 4 weeks significantly but in the long run cases of de Quervain's tenosynovitis responded better with injectable PRP as observed by reduced pain (VAS score) at 12 and 24 weeks significantly. In the steroid group, the VAS score at baseline was 9.08 and it reduced to 3.67 after 24 weeks of follow-up; but in the PRP group, it reduced significantly from 9.16 to 1.04. Similar findings were noted in previous study by Chetan G et al[28], The mean VAS also decreased from 7.8 to 2.1 in corticosteroid group and 7.5 to 1.4 in PRP injection. Similar reduction was seen in other studies.[26,28,29,30] Both steroid and PRP have anti-inflammatory property which explains the immediate reduction in VAS score. Long term effect for PRP was attributed to its regenerative effect due to release of multiple growth factors such as insulin like growth factors, tendon progenitor cells contributing to tendon repair as well.[31]

The present study also analyzed Quick DASH scores between the groups. Both groups had improved outcomes. It was

significant from week 4 onwards till 24 weeks of treatment. In the steroid group, the DASH score improved from 92.04 to 34.96 but in the PRP group, better improvement was noted i.e 91.04 to 11.92. Statistical better improvement was noted in PRP group(p-value=.000). Similar findings were recorded by previous studies[28], where DASH reduced from 76.8 to 23.5 in PRP group and 73.5 to 39.7 in the control group. It can explained by the fact that reduction pain led to improvement in the hand function on subsequent follow up. Comparing the two groups, there was no different initially but statistically significant findings were noted in pain relief and functional improvement in the subsequent follow up. In a study conducted by Eman S et al[26] they used Jebsen Hand Function Test for assessing hand function and Quick DASH both the parameters showed improvement from baseline to 6 months post intervention follow up. The present study used ultrasound guided injection for accurate localization and hence improvement and better outcomes in both primary and secondary outcomes.

The post-hoc analysis of VAS and DASH scores within and between the groups revealed significant improvements at all time points for both the control (steroid injection) and study (PRP injection) groups. In the control group, VAS scores showed consistent improvement, with the largest mean difference of 5.417 at 24 weeks, and DASH scores increased significantly, reaching a mean difference of 57.125 at 24 weeks. Within the PRP group, VAS scores showed the most substantial change, reaching a mean difference of 8.083 at 24 weeks, while DASH scores demonstrated the greatest improvement of 79.083 at 24 weeks. These results indicate that both treatments led to continuous improvement over time within each group, but PRP injections resulted in more marked and sustained improvements, particularly in functional outcomes as measured by the DASH score, when compared to the steroid injection group.

6. Limitations

There are some limitations in the study such small sample size, short follow up. No reassessment was done for any recurrence. Use of paracetamol as a rescue analgesic might be a confounding factor. In support of the present study, further multicentric study with larger sample size needs to be conducted in the future.

7. Conclusion

This study demonstrates that injection of both Platelet rich plasma and Triamcinolone hexacetonide improved pain and function. However, with longer follow up time, more significant improvement was noted in the platelet rich plasma injection group due to its additional regenerative property. To conclude, both therapies are effective in the management of de Quervain tenosynovitis. PRP can be another option for patients contraindicated to steroid therapy.

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