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**Varun Gautam**  
Senior Resident, Department of  
Orthopedics, Kalpana Chawla  
Govt. Medical College, Karnal,  
Haryana, India

**Prateek Girotra**  
Senior Resident, Department of  
Orthopedics, Hindu Rao  
Hospital, Delhi, India

**Anu Nagpal**  
Private Practice, Consultant  
Obstetrics and gynaecology  
Nagpal Nursing Home  
Gurgaon, Haryana, India

## A comparative prospective study of platelet rich plasma vs. corticosteroid injection in plantar fasciitis

Varun Gautam, Prateek Girotra and Anu Nagpal

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### Abstract

**Objective:** To compare the relative effectiveness of intralesional Steroid versus Platelet- Rich Plasma injection among 80 patients in plantar fasciitis.

**Methods:** A total number of 80 patients with plantar fasciitis were divided into 2 groups (Group A and B). Group A with 30 patients received intralesional Platelet Rich Plasma (PRP) and Group B received intralesional methyl prednisolone acetate injection. Pre and post intervention Visual Analogue Score (VAS), Foot and Ankle Ability Measure (FAAM) score and PF (plantar fascia) thickness for assessment of pain relief in two groups were recorded at 6 months.

**Results:** The mean VAS scores for heel pain measured after 6 months of treatment were  $1.460 \pm 0.691$  in PRP group and  $3.024 \pm 0.957$  in steroid group. The decrease in mean VAS score in both the groups was statistically significant when compared with pre-treatment values ( $8.38 \pm 0.682$  in PRP group and  $8.44 \pm 0.602$  in steroid group). The mean FAAM score measured after 6 months of treatment increased in both the groups ( $83.43 \pm 5.66$  in PRP group and  $69.12 \pm 5.795$  in steroid group) when compared with pre-treatment value ( $29.97 \pm 5.997$  in PRP group and  $31.68 \pm 6.297$  in steroid group) and it was statistically significant.

There was 35.90% reduction in mean plantar fascia thickness in PRP group and 28.67% reduction in Steroid group as compared to baseline values after 6 month of injection.

**Conclusion:** Intralesional injection of both the PRP and steroid are effective and safe modalities of treatment for plantar fasciitis. Steroid is better for short term treatment of plantar fasciitis but in long term follow up platelet rich plasma therapy is better than steroid. Both the treatment methods have caused significant reduction in PF (Plantar fascia) thickness.

**Keywords:** Plantar fasciitis, platelet rich plasma, steroid

### Introduction

Plantar fasciitis is a common cause of heel pain. It occurs due to degenerative process resulting to acute and chronic inflammation of plantar fascia. It may also cause calcification at the origin of the plantar fascia and bony traction spur formation. Approximately 10 percent of the population experience plantar heel pain at some point during their lifetime<sup>[1]</sup>,

The etiology of plantar fasciitis is somewhat controversial, but many factors that may precipitate the condition include poor foot mechanics due to pes planus or cavus foot type, obesity, inappropriate footwear, nerve entrapment, tight triceps surae, fat-pad atrophy, and repetitive microtrauma<sup>[2]</sup>.

Patient with plantar fasciitis present as heel pain which is characterised by 'first-step pain'. This pain occurs after a period of rest, such as in the morning when arising from bed. This acute pain usually subsides after the first couple of steps, either disappearing completely or remaining as a constant ache that worsens again after a period of rest<sup>[2, 3]</sup>.

Diagnosis of plantar fasciitis is clinical and done by taking detailed history and physical examination. Although imaging studies are done to confirm the diagnosis or rule out other causes of heel pain. Plain radiographs can rule out bony lesions or stress fractures whereas ultrasound is another relatively inexpensive diagnostic tool that can rule out certain causes of heel pain such as plantar fibromatosis, foreign body, plantar xanthomas and can aid in diagnosis by establishing plantar fascial thickness and the presence of fascial tears<sup>[4, 5]</sup>. Other investigations that are not routinely done are Technetium bone scintigraphy, Electromyography and Magnetic resonance imaging.

**Corresponding Author:**  
**Prateek Girotra**  
Senior Resident, Department of  
Orthopedics Hindu Rao  
Hospital, Delhi, India

Depending on the overall clinical picture, blood tests such as a white cell count, human leucocyte antigen B27, antinuclear antibodies and uric acid may also be performed in younger patients or patients who have bilateral heel pain [6].

The initial treatment of plantar fasciitis is conservative that include rest, activity modification and medication therapy with nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen or corticosteroids. Other therapy includes stretching, Orthotics and night splints, corticosteroid injections, platelet-rich plasma injections, autologous blood injections, botulinum toxin injections, extracorporeal shock wave therapy (ESWT) and radiation therapy. Surgical options include partial or complete plantar fascia release and gastrocnemius release, if the patient has continued pain even after 6 to 12 months of nonsurgical management [4, 6].

We conducted a simple randomized prospective comparative study to compare the relative effectiveness of intralesional steroid versus Platelet-Rich Plasma (PRP) injection in plantar fasciitis.

### Material and methods

After obtaining written informed consent, a randomized prospective trial was conducted. 80 patients of plantar fasciitis, in the age group 18-60 years were taken for intralesional steroid and platelet rich plasma injection locally. 30 patients in group-A for PRP injection and 50 patients in group-B for steroid injection were taken by Simple random sampling. The study was conducted at BPS Government Medical College, Khanpur Kalan between 2017 to 2018.

Patients included were those with age group between 18-60 years presenting with complaints of plantar heel pain, worse with rising in morning and/or after periods of rest with maximal tenderness at the attachment of the plantar fascia on the medial tubercle of the calcaneus for a duration of 4 weeks or more and willingness to forgo any other concomitant conservative treatment modality; NSAIDs and orthotic devices during the study period.

Patients excluded were those with inflammatory or degenerative polyarthritis, diabetes mellitus, local or systemic infection, peripheral vascular diseases, metabolic disease such as gout, clotting disorder, anticoagulation therapy, neuropathic symptoms, complex regional pain syndrome, metastatic cancer, previous surgery, pregnancy or breastfeeding female patients and previous treatment with corticosteroid injection in the last 6 months or NSAIDs treatment within the last 7 day.

The patients were divided into 2 groups:

1. Group A: Intralesional 3 ml autologous platelet rich plasma injection locally.
2. Group B: Intralesional single injection of 2 cc. i.e. 80 mg methyl prednisolone acetate locally.

After 48 hours of treatment, patients were given a standardized stretching protocol to follow for 2 weeks. Ultrasonographic evaluation of thickness of plantar fascia was done pre- treatment and 6 months after treatment in patients of both the group.

Patient biography, detailed history, clinical evaluation was done along with ultrasonic evaluation of plantar fascia thickness of both foot. Diagnosis was made on clinical and radiological ground. All the fresh cases were initially treated with contrast bath foot stretching exercise and silicon heel pad for 4 wks.

Follow up of patients after treatment was done at 4 weeks, 8 weeks, 12 weeks and after 24 weeks. We used visual analogue scale (VAS) and Foot and Ankle Ability Measure (FAAM) for assessment of pain relief and functional improvement in two groups. Ultrasonographic evaluation of thickness of plantar fascia was done pre-treatment and after 6 months of treatment in all the patients whereas thickness of more than 4mm was considered abnormal [7, 8, 9].

### PRP Preparation Method

27 ml of a patient's own venous blood was withdrawn from cubital vein under aseptic condition and collected in pre-sterilised centrifuge vials preloaded with anticoagulant sodium citrate in a ratio of 1:9. This blood was then centrifuged at 3200 rpm for 15 minutes. The blood was then separated into platelet poor plasma and platelet rich plasma. The platelet poor plasma was extracted and discarded. 3 ml of platelet rich plasma was harvested finally containing approximately 6-8 times the concentration of platelets compared to baseline whole blood [10].

### Injection technique

The procedure was done on an out-patient basis and under complete aseptic condition. Lidocaine sensitivity was done before starting the procedure. 2 cc of 2% Lidocaine was infiltrated prior to injection. Patients of Group A received 3 cc of autologous PRP injection into the origin of the plantar fascia and directly into site of maximum tenderness at the heel via 'peppering technique' i.e. single skin entry, partially with drawing the needle, redirecting and making multiple penetrations to the fascia.

Group B patients received 2 ml of methyl prednisolone acetate locally. The patients were monitored for 20 minutes for any adverse reactions [10].

### Statistical analysis

- The data was entered into a Microsoft Excel and analysed using statistical software SPSS(version 22).
- Categorical variables were analysed using Chi square test.
- Normally distributed variables were analysed using the student-t test.
- Analysis of variance (ANOVA) was used for demographic data.
- P value <0.05 was considered as statistically significant.

### Results

Out of 80 patients 30 were included in PRP group i.e. GROUP A and 50 were included in steroid group i.e. GROUP B.

**Table 1:** Age Distribution

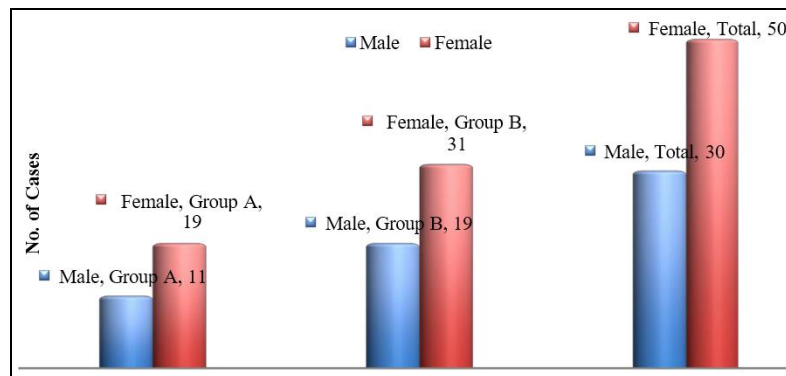
Group	N	Mean ± Std. Deviation	Std. Error Mean
Group A (PRP Group)	30	40.90 ± 9.632	1.759
Group B (Steroid Group)	50	37.82 ± 11.047	1.562

The mean patient age was 40.90 ± 9.632 years in PRP group and 37.82 ± 11.047 in steroid group. There was no statistical significance in the distribution of age categories.

**Table 2:** Group sex Cross tabulation

			Sex		Total
			Male	Female	
Group	Group A	No. of cases	11	19	30
		% percentage	36.6%	63.3%	100.0%
	Group B	No. Of cases	19	31	50
		% percentage	38.0%	62.0%	100.0%
Total		No. of cases	30	50	80
		% percentage	37.5%	62.5%	100.0%

In total, males comprised of 37.5% and females comprised of 62.5% of total 80 subjects. Out of 30 patients in PRP group 11(36.6%) were male and 19 (63.3%) were female. Out of 50 patients in steroid group 19(38.0%) were male and 31(62.0%) were female.



**Table 3:** Base Line Characteristics between PRP and Steroid Group

Group Statistics	Group	N	Mean	± Std. Deviation	Std. Error Mean
Age	Group A	30	40.90	+ 9.632	1.759
	Group B	50	37.82	+ 11.047	1.562
Fscr_base	Group A	30	29.97	+ 5.997	1.095
	Group B	50	31.68	+ 6.297	0.891
Vscr_base	Group A	30	8.380	+ 0.6820	0.1245
	Group B	50	8.444	+ 0.6021	0.0851
Pre_thick	Group A	30	6.100	+ 1.0980	0.2005
	Group B	50	5.830	+ 1.1795	0.1668

(fscr = FAAM i.e. Foot And Ankle Ability Measure Score) (vscr = VAS i.e. Visual Analogue Score) (Pre\_thick = PRE Treatment Plantar Fascia Thickness)

**Table 4:** Comparison of mean VAS score between baseline and vas score at frequent intervals in PRP group

	Mean difference in VAS score	P-value
Vscr_base – Vscr_4wks	0.633	<.001
Vscr_base – Vscr_8wks	2.12	<.001
Vscr_base – Vscr_12wks	4.94	<.001
Vscr_base – Vscr_24wks	6.92	<.001

Vscr\_base = VAS score base line

Within group comparison, in PRP group the result was statistically significant (P-value <0.001). The mean VAS score decreased from baseline continuously at 4weeks, 8 weeks, 12 weeks and 24 weeks which was statistically

significant. The difference in mean VAS score between pre-treatment period i.e. baseline and post-treatment period at 24 weeks was highest.

**Table 5:** Comparison of mean VAS score between baseline and VAS score at frequent intervals in steroid group

	Mean difference in VAS score	P-value
Vscr_base – Vscr_4wks	4.37	<.001
Vscr_base – Vscr_8wks	5.84	<.001
Vscr_base – Vscr_12wks	7.25	<.001
Vscr_base – Vscr_24wks	5.42	<.001

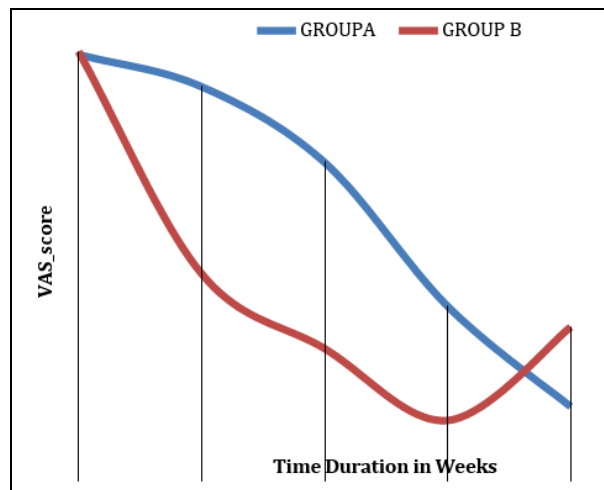
(Vscr\_base = VAS score base line)

Within group comparison, in steroid group the result was statistically significant (P-value <0.001). The mean VAS score decreased from baseline continuously at 4 weeks, 8

weeks and 12 weeks. But at the end of 24 weeks there was rise in mean VAS score when compared to mean VAS score at 12 weeks.

**Table 6:** Comparison of Effect of Treatment Methods (PRP and Steroid) on Visual Analogue Score

Group Statistics	Group	N	Mean	± Std. Deviation	Std. Error Mean
vscr_base	Group A	30	8.38	+ 0.6820	0.1245
	Group B	50	8.44	+ 0.6021	0.0851
vscr_4wk	Group A	30	7.747	+ 0.7514	0.1372
	Group B	50	4.074	+ 0.9762	0.1381
vscr_8wk	Group A	30	6.260	+ 0.8896	0.1624
	Group B	50	2.602	+ 0.8105	0.1146
vscr_12wk	Group A	30	3.433	+ 0.7875	0.1438
	Group B	50	1.188	+ 0.5189	0.0734
vscr_24wk	Group A	30	1.460	+ 0.6911	0.1262
	Group B	50	3.024	+ 0.9572	0.1354



When both treatment methods compared, mean VAS score was significantly lower at 4 weeks, 8 weeks and 12 weeks in steroid group as compared to PRP group. But at 24 weeks

mean VAS score was significantly lower in PRP group as compared to steroid group.

**Table 7:** Comparison of mean FAAM score from baseline and mean FAAM score at frequent intervals in PRP group

	Mean difference in FAAM Score	P- Value
fscr_base – fscr_4wks	8.00	<.001
fscr_base – fscr_8wks	24.03	<.001
fscr_base – fscr_12wks	43.00	<.001
fscr_base – fscr_24wks	53.46	<.001

(fscr\_base = foot and ankle ability measure score baseline)

Within group comparison, in PRP group the result was statistically significant (P-value <0.001). The mean FAAM score increased from baseline continuously at 4 weeks, 8 weeks, 12 weeks and 24 weeks which was statistically significant. The difference in mean FAAM score between pre-treatment period i.e. baseline and mean FAAM scores at 24 weeks of post-treatment was highest.

**Table 8:** Comparison of mean FAAM score at baseline and mean FAAM score at frequent intervals in Steroid group

	Mean difference in FAAM Score	P- Value
fscr_base – fscr_4wks	20.82	<.001
fscr_base – fscr_8wks	40.68	<.001
fscr_base – fscr_12wks	49.40	<.001
fscr_base – fscr_24wks	37.44	<.001

(fscr\_base = foot and ankle ability measure score baseline)

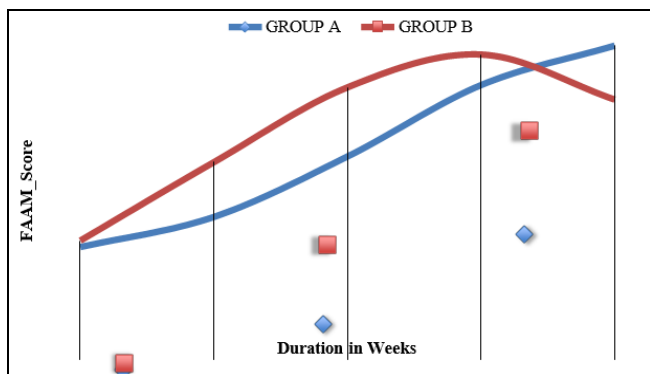
Within group comparison, in steroid group the result was statistically significant (P-value <0.001). The mean FAAM score increased from baseline continuously at 4 weeks, 8

weeks and 12 weeks. But at the end of 24 weeks there was decrease in mean FAAM score when compared to mean FAAM score at 12 weeks.

**Table 9:** Comparison of effect of treatment methods (PRP and STEROID) on Foot and Ankle Ability Measure Score

Group Statistics	Group	N	Mean±SD	Std. Error Mean
	fscr_base	Group A	30	29.97±5.997
Group B		50	31.68±6.297	0.891
fscr_4w	Group A	30	37.97±6.128	1.119
	Group B	50	52.50±5.953	.842
fscr_8w	Group A	30	54.00±6.052	1.105
	Group B	50	52.50±5.953	.842

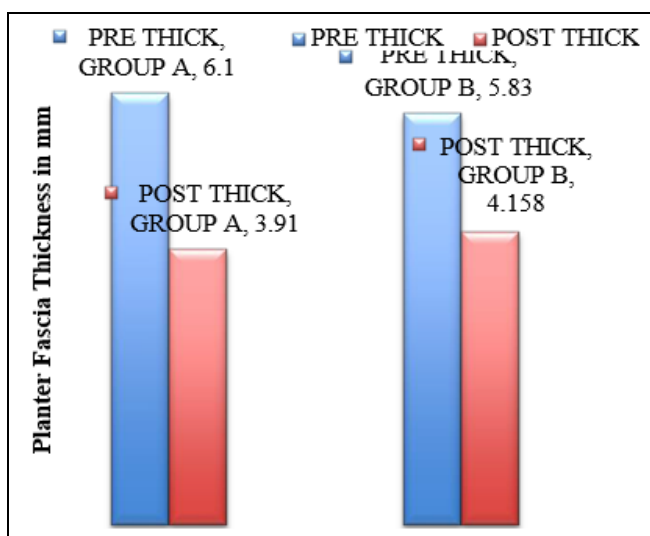
fscr_8w	Group B	50	72.36±5.989	.847
fscr_12w	Group A	30	72.97±6.128	1.119
	Group B	50	81.08±5.900	.834
fscr_24w	Group A	30	83.43±5.661	1.034
	Group B	50	69.12±5.795	.819



When both treatment methods compared, mean FAAM score was significantly higher at 4 weeks, 8 weeks and 12 weeks in steroid group as compared to PRP group. But at 24 weeks mean FAAM score was significantly higher in PRP group as compared to steroid group.

**Table 10:** Test of Significance of Plantar Fascia Thickness in PRP Group and Steroid Group

Group	Mean plantar fascia thickness pretreatment	Mean plantar fascia thickness post treatment
PRP	6.100	3.910
Steroid	5.830	4.158



There was significant decrease in mean plantar fascia thickness in both modalities of treatment at 24 weeks of post-treatment as compared to baseline values. There was 35.90% reduction in mean plantar fascia thickness in PRP group and 28.67% reduction in Steroid group.

**Discussion**

Plantar fasciitis is one of the most common cause of heel pain in adults. However, the true etiology of plantar fasciitis is still unknown and many different etiological factors have been attributed. The etiology and treatment are still not fully understood. In general, plantar fasciitis is self-limiting disease. Unfortunately, the time until resolution is often 6–18 months, which can lead to frustration for patients and physicians. Diagnosis of planter fasciitis is done by taking

detailed history and physical examination. Although imaging studies are done to confirm the diagnosis or rule out other causes of heel pain [6, 11].

There are many available treatment methods, but in chronic debilitating condition conservative treatment may fail. In such a condition the patient is often interested in treatment options other than surgery. Already various other injectable agents has been researched in the past including simple solutions such as hyperosmolar dextrose to complex orthobiologic agents such as bone morphogenic protein, but none achieved uniform success. Platelet rich plasma (PRP) injection has emerged as a treatment alternative for many musculoskeletal conditions. Steroid injections are often effective in the short term although they have been shown to cause fat pad atrophy and very occasionally, they may precipitate rupture of the plantar fascia [6, 21].

In our study, all patients were in the age group between 18-60 years. The mean patient age was 40.90±9.632years in PRP group and 37.82±11.047 years in steroid group. There was no statistical significance in the distribution of age categories (P-value=0.4). In total, males comprised of 37.5% and females comprised of 62.5% of total 80 subjects. Out of 30 patients in PRP group 11 (36.6%) were male and 19 (63.3%) were female. Out of 50 patients in steroid group 19 (38%) were male and 31 (62%) were female.

We followed every subject for period of 6 months after giving injection and used VAS score, FAAM score and plantar fascia thickness to evaluate the effect of both modalities of treatment [7, 8, 9].

Within group comparison in PRP group the result was statistically significant (P-value <0.001). The mean VAS score at 4 weeks (7.747±0.7514), 8 weeks (6.260±0.8896), 12 weeks (3.433±0.7875) and 24 weeks(1.460±0.6911)decreased continuously from baseline which was statistically significant. The difference in mean VAS score between pre-treatment period i.e. baseline and post-treatment period at 4 weeks, 8 weeks, 12 weeks and 24 weeks was 0.633, 2.12, 4.94, and 6.92. The difference in mean VAS score between pre-treatment and 24 weeks of post-treatment was highest. The mean FAAM score at 4 weeks (37.97±6.128), 8 weeks (54.00±6.052), 12 weeks (72.97±6.128) and 24 weeks (83.43±5.661) increased continuously from baseline which was statistically significant (P-value <0.001). The difference in mean FAAM score between pre-treatment period i.e. baseline and at 4 weeks, 8 weeks, 12 weeks and 24 weeks of post-treatment was 8, 24.03, 43 and 53.46. The difference in mean FAAM score between pre-treatment and 24 weeks of post-treatment was highest. This shows that maximum effect of PRP on VAS score and FAAM score was at 24 weeks. The above results are comparable with the studies conducted by Martinelli N *et al.* [12]

Within group comparison for steroid group the result was statistically significant (P-value<0.001). The mean VAS score decreased from baseline continuously at 4 weeks (4.074±0.9762), 8 weeks (2.602±0.8105) and 12 weeks (1.188±0.5189). But at the end of 24 weeks there was rise in mean VAS score (3.024±0.9572) when compared to mean VAS score at 12 weeks (1.188±0.5189). The difference in mean VAS score between pre-treatment period i.e. aseline and

post-treatment period at 4 weeks, 8 weeks, 12 weeks and 24 weeks was 4.37, 5.84, 7.25 and 5.42. The difference in mean VAS score between pre-treatment and 12 weeks of post-treatment was highest. The mean FAAM score increased from baseline continuously at 4 weeks ( $52.50 \pm 5.953$ ), 8 weeks ( $72.36 \pm 5.989$ ) and 12 weeks ( $81.08 \pm 5.900$ ). But at the end of 24 weeks there was decrease in mean FAAM score ( $69.12 \pm 5.795$ ) when compared to mean FAAM score at 12 weeks ( $81.08 \pm 5.900$ ). The difference in mean FAAM score between pre-treatment period i.e. baseline and post-treatment period at 4 weeks, 8 weeks, 12 weeks and 24 weeks was 20.82, 40.68, 49.40 and 37.44. The difference in mean FAAM score between pre-treatment and 12 weeks of post-treatment was highest. This shows that maximum effect of Steroid on VAS score and FAAM score was at 12 weeks. The above results are comparable with the studies conducted by Johannsen FE *et al.* [13] and Schneider HP *et al.* [14]

When both treatment methods compared with respect to pain and function, we observed that in PRP group there was steady decline in mean VAS score till 24 weeks of post-treatment. In steroid group the decline in mean VAS score was much faster during initial period of post-treatment upto 12 weeks after that there was rise in mean VAS score between 12 to 24 weeks of post-treatment. The mean VAS score was significantly lower at 4 weeks, 8 weeks and 12 weeks in steroid group as compared to PRP group but at 24 weeks mean VAS score was significantly lower in PRP group as compared to steroid group. Similarly mean FAAM score was significantly higher at 4 weeks, 8 weeks and 12 weeks in steroid group as compared to PRP group but at 24 weeks mean FAAM score was significantly higher in PRP group as compared to steroid group. The results of our study are comparable with the studies conducted by Shetty SH *et al.* [15], Mahindra P *et al.* [16], Ling Y *et al.* [17] and Soraganvi P *et al.* [18]

In the current study, reduction in plantar fascia thickness measured by ultrasonography after 24 weeks of treatment in both the groups was statistically significant ( $p$ -value  $< 0.001$ ). Although, the reduction in the thickness was more in PRP group (35.90%) than steroid group (28.67%), yet did not reach significant value. There was no significant correlation between baseline VAS score and pre-treatment plantar fascia thickness [19, 20].

So this study outlines that intralesional injection of both the PRP and steroid are effective and safe modalities of treatment for plantar fasciitis. Additionally, with respect to pain and function steroid is better for short term treatment but in long term follow up platelet rich plasma therapy is better than steroid.

In our study, 3 cases in steroid group showed no improvement in symptoms, VAS score and FAAM score and they were treated with some other modality.

With respect to complications, heel fat pad atrophy and plantar fascia rupture are two most feared complications associated with corticosteroid injections. 21 We found no serious ones (local or systemic) in our study with either Steroid or PRP therapy. Limitation of this study is the variability of platelet concentration among different patients, short duration of study and small sample size. However, Future studies with a larger patient population and a longer follow-up may provide a better insight into the efficacy of the 2 treatment modalities.

## Conclusion

On conclusion, our study is a randomised prospective comparative study which showed that intralesional injection

of both the PRP and steroid are effective and safe modalities of treatment for plantar fasciitis. However, steroid is better for short term treatment but in long term follow up platelet rich plasma therapy is better than steroid.

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