A comparative study to analyze the efficacy of platelet rich plasma versus corticosteroids in treatment of chronic plantar fasciitis

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Abstract

Plantar Fasciitis is responsible for 15% of all foot problems. Over ten percent of the population will be affected at some point in their lives. It is caused by inflammation of a broad band of tissue that links your heel bone to your toes and runs across the bottom of your foot (plantar fascia). Plantar fasciitis is a type of plantar fasciitis that causes stabbing pain when you take your first steps in the morning. The discomfort usually goes away as you get up and move around, but it may come back after long periods of standing or when you stand up after sitting. Runners are more likely to get plantar fasciitis. The plantar fascia is made up of white-coloured fibers that run longitudinally from the calcaneum to the toes. The attachments include the following: Proximal - Affixed to the calcaneum's medial tubercle. The fascia fanning out into five slips against the metatarsophalangeal joints and attaches to the base of the appropriate toes' proximal phalanges. Chronic heel pain is a difficult condition to treat and takes a long time to resolve. This study outlines both PRP and steroid are effective and safe modalities in the treatment of plantar fasciitis. But statistical data suggest that steroid injection is effective for immediate pain relief. And PRP injection is better for long term pain relief in plantar fasciitis with no side effects.

Keywords: Platelet rich plasma, corticosteroids, chronic plantar fasciitis

Introduction

Plantar Fasciitis is responsible for 15% of all foot problems. Over ten percent of the population will be affected at some point in their lives. It is caused by inflammation of a broad band of tissue that links your heel bone to your toes and runs across the bottom of your foot (plantar fascia). Plantar fasciitis is a type of plantar fasciitis that causes stabbing pain when you take your first steps in the morning [1,2]. The discomfort usually goes away as you get up and move around, but it may come back after long periods of standing or when you stand up after sitting. Runners are more likely to get plantar fasciitis. Plantar fasciitis is more common in those who are overweight or who use shoes with insufficient support [3]. Plantar Fasciitis is caused by degenerative irritation of the plantar origin at the medical calcaneal tuberosity of the heel. It is made up of three segments, all of which originate from the calcaneous origin. The fascia plays a crucial role in supporting the arch and providing shock absorption. Despite the fact that the diagnosis includes segmentis, this illness is distinguished by the absence of inflammatory cells. Plantar Fasciitis is a highly widespread condition in India, with millions of people suffering from heel discomfort each year. Plantar fasciitis can be caused by a variety of factors, but the majority of instances are caused by overuse or stress [4,5]. The most common symptom is intense, localised pain in the heel. A heel spur may be discovered in some circumstances. Plantar Fasciitis is difficult to treat, and most therapies result in dissatisfaction. The majority of cases are treated without surgery, however discomfort recurrence is frustrating.
This is typically an overuse injury caused by repetitive strain generating micro-tears in the plantar fascia, although it can also be caused by trauma or other multifactorial factors. Pes planus, pescavus, limited ankle dorsiflexion, and severe pronation or supination are all predisposing factors. Pes planus can produce higher tension at the plantar fascia's origin. Because the foot does not adequately evert or absorb shock, pescavus can generate undue strain on the heel. Patients with this illness frequently have tight gastrocnemius, soleus, and/or other posterior leg muscles. These tense muscles are hypothesised to affect the usual biomechanics of ambulation. Heel spurs are present in almost half of all individuals with this illness, but they are not the cause. Obesity, heel pad atrophy, ageing, employment requiring prolonged standing, and weight-bearing are some of the additional risk factors. Although plantar fasciitis has been linked to a variety of seronegatives pondyloarthropathies, there are no known systemic causes in about 85% of patients [6].

**Anatomy of foot**
The plantar fascia is made up of white-coloured fibers that run longitudinally from the calcaneum to the toes. The attachments include the following: Proximal- Affixed to the calcaneum's medial tubercle. The fascia fanning out into five slips against the metatarsophalangeal joints and attaches to the base of the appropriate toes' proximal phalanges.  
1. The central band is the most important portion.  
2. The middle band  
3. Band on the side

**Heel Spur**
A heel spur is an osseous elongation of the plantar calcaneal tuberosity in the form of an exostosis found at the medial process.

**Treatment includes**
In case of Conservative therapy treatment include: ICE therapy, Laser therapy, stretching exercises, orthotics, night splints, ultrasound therapy In case of invasive therapy: Corticosteroids, nerve therapy, Plantar Fascia release, excision of heel, autologous blood, PRP Platelet rich plasma (PRP) is an autologous biological blood-derived substance that is given to various tissues where it releases high quantities of PDGF to aid wound, bone, and tendon repair. PRP also has antibacterial properties that aid in the prevention of infections. The growth factors in the alpha-granules are crucial to the basic science of PRP [8, 9].

**Growth Factors**

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**Fig 1**: Showing the location of plantar fascia in foot

**Fig 2**: Showing the heel spur in patient with plantar fasciitis

**Fig 3**: Showing growth factors
Corticosteroids
Corticosteroids have been shown to suppress fibroblast growth and reduce the synthesis of ground substances. The aforementioned action of steroid injection, rather than its anti-inflammatory activity, may be responsible for its positive effect [10, 11, 12].

Methodology
Study Site: The study was conducted at RMMCH, Annamalai University, between May 2020 to December May 2020.

Study Design: Prospective Comparative study

Study Population: Total Number of Patients - 30
- PRP-15 was given to an unknown number of patients.
- The total majority of patients who got steroid treatment was reduced by 15%.
- Male patients - 15; Female patients - 16

The following include the types of groups
- Patients were divided into two categories at random.
- Patients in Category 1 had a single 3 ml PRP injection regionally.
- Patients in Category 2 received a single injection of 3 cc [40 mg methyl prednisolone acetate] regionally.

Inclusion criterion
1. Heel irritation on one side > 6 weeks
2. Has been on conservative therapy for more than four weeks and has not seen any symptomatic improvements.
3. Have you had any past local injections in your heel?
4. Are you willing to follow up?
5. Patients with normal blood pressure and glucose levels

Exclusion Criterion
1. Heel soreness on both sides
2. Has had prior injections in the nearby area
3. Doesn't want to be followed up on
4. Patients suffering from various medical conditions
5. Pathology of the Achilles tendon and foot deformity
6. Patients with a history of foot surgery

PRP Preparation
Under strict aseptic precautions, 20 milliliters of the patient's blood were taken from the antecubital vein and placed in pre-sterilized centrifuge vials.Anticoagulant acid citrate dextrose was pre-loaded into these centrifuge vials. After that, the blood was centrifuged for 15 minutes at 3200 rpm. Platelet-poor plasma and platelet-rich plasma are isolated from the blood. The former is taken out and thrown away. When compared to reference entire blood, the platelet concentrate comprises 6-8 percent the amount of platelets [13, 14].

Ultrasound Evaluation of Plantar Fascia Thickness
- The researchers utilized a diagnostic ultrasound apparatus with a 4 cm broad transducer tip and an 8 MHz probes.
- The thickest part of the plantar fascia was evaluated from the base of the medial calcaneal tubercle, where a strong echogenic line could readily be seen. A thickness of greater than 4mm in the plantar fascia was deemed unusual.

Injection Protocol
- The technique was performed as an outpatient under strict aseptic circumstances.
- Maximum sensitivity sites have been found. After that, the patient was given 3 cc of PRP injection. With a single skin gateway and 4 to 5 rounds through the fascia itself, a peppering method, i.e. distributing in a clockwise way, was employed to produce a more broad zone of administration [15].

Post Injection Protocol
- The patients were observed for 20 minutes to see whether they had any negative responses.
- To confine their usage of their foot and narcotic painkillers for 48 hours.
- Patients were given conventional stretching routines to practice for two weeks after 48 hours.
- Patients were permitted to resume normal athletic or leisure activities as appropriate after 4 weeks.
- Any sort of foot, including those, was not recommended.

Aim and Objective
- To analyze the effectiveness of platelet rich plasma versus corticosteroids in the treatment of chronic plantar fasciitis
- To assess the relief of symptoms of heel pain and patient satisfaction using VAS [Visual Analog Score] and FAAM [Foot and Ankle Ability Measure]
- To assess the plantar fascia thickness [pre injection and post injection] using ultrasound
PF Thickness 0.46cms
Asymptomatic Heel LFT PF Thickness 0.30cms
Symptomatic Heel RT
PF Thickness 0.70 cms
Asymptomatic Heel Left PF Thickness 0.30 cms
Symptomatic Heel RT
Clinical pictures of case of 50/F

Figure showing the symptomatic an asymptomatic PF thickness in patient with Plantar Fasciitis

Follow up
- Follow up was done at 2, 4, 8, 12, and 24 weeks
- For discomfort and operational result, we utilized the VAS [VISUAL ANALOG SCORE] and FAAM [FOOT AND ANKLE ABILITY Measurement] scores.
- Patients were also observed for complications, if any at the injection site.
Patient Name: __________________  Date: __________________

Foot and Ankle Ability Measure (FAAM)

Please answer every question with one response that most closely describes your condition within the past week. If the activity in question is limited by something other than your foot or ankle mark not applicable (N/A).

<table>
<thead>
<tr>
<th>Activity</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>N/A</th>
</tr>
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<tbody>
<tr>
<td>Standing</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Walking on even ground</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Walking on even ground without shoes</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Walking up hills</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Walking down hills</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Going up stairs</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Going down stairs</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Walking on uneven ground</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Stepping up and down curbs</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Squatting</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Coming up on your toes</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Walking initially</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Walking 5 minutes or less</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>Walking approximately 10 minutes</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Walking 15 minutes or greater</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

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Page 1 Score: __________________

Patient Signature: __________________ Date: __________________
Therapist Signature: __________________ Date: __________________

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Patient Name: __________________  Date: __________________

Foot and Ankle Ability Measure

Because of your foot and ankle how much difficulty do you have with:

<table>
<thead>
<tr>
<th>Activity</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>N/A</th>
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</thead>
<tbody>
<tr>
<td>Home Responsibilities</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Activities of daily living</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Personal care</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Light to moderate work (standing, walking)</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Heavy work (push/pulling, climbing, carrying)</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Recreational activities</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

How would you rate your current level of function during your usual activities of daily living from 0 to 100 with 100 being your level of function prior to your foot or ankle problem and 0 being the inability to perform any of your usual daily activities?

□□□□□.0 %

Page 2 Score: __________________

Total Page 1 & 2 Scores: __________________

---

Scoring:

\[
\text{total patient score} \times 100 = \text{% physical function}
\]

\[
\text{total number complete} \times 4
\]

MEDICARE PATIENTS ONLY

100% __________ % Function = __________ % impairment

Patient Signature: __________________ Date: __________________
Therapist Signature: __________________ Date: __________________

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Results and Discussion

Fig 3: Showing distribution of Plantar Fasciitis among male and Females

The above figure shows that 53% of male were found to be affected with Plantar Fasciitis while female was found to be 47%.

Fig 4: Showing the side distribution among general Population

The above figure shows that 86% of right foot is more effected than that of left 14%

Table 1: Showing VAAS Score

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS base score</td>
<td>1</td>
<td>15</td>
<td>8.38</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>8.44</td>
</tr>
<tr>
<td>VAS score 4 weeks</td>
<td>1</td>
<td>15</td>
<td>7.74</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>4.07</td>
</tr>
<tr>
<td>VAS score 8 weeks</td>
<td>1</td>
<td>15</td>
<td>6.26</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>2.60</td>
</tr>
<tr>
<td>VAS score 12 weeks</td>
<td>1</td>
<td>15</td>
<td>3.43</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>1.18</td>
</tr>
<tr>
<td>VAS score 24 weeks</td>
<td>1</td>
<td>15</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>3.02</td>
</tr>
</tbody>
</table>

Fig 5: Showing Group 1 PRP, Group 2 Steriods

The above figure shows that in our study, we found a significant reduction in VAS score at 4, 8, 12 weeks with steroid groups whereas at 6 months, there was a drastic reduction in VAS [1.45] in PRP Group in comparison with steroid groups [3.02].

Table 2: Showing FAAM Score

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FAAM base score</td>
<td>1</td>
<td>15</td>
<td>29.97</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>31.68</td>
</tr>
<tr>
<td>FAAM score 4 weeks</td>
<td>1</td>
<td>15</td>
<td>37.97</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>52.50</td>
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<tr>
<td>FAAM score 8 weeks</td>
<td>1</td>
<td>15</td>
<td>54.00</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>72.36</td>
</tr>
<tr>
<td>FAAM score 12 weeks</td>
<td>1</td>
<td>15</td>
<td>72.97</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>81.08</td>
</tr>
<tr>
<td>FAAM score 24 weeks</td>
<td>1</td>
<td>15</td>
<td>83.43</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>69.12</td>
</tr>
</tbody>
</table>

Fig 6: Showing FAAM SCORE

In our study, we found a significant reduction in VAS score at 4, 8, 12 weeks with steroid groups whereas at 6 months, there was a drastic reduction in VAS [1.45] in PRP Group in comparison with steroid groups [3.02].

Table 3: Showing the Ultrasound Evaluation

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean Plantar Fascia Thickness Pre-Treatment</th>
<th>Mean Plantar Fascia Thickness Post treatment [After 24 Weeks]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRP Group</td>
<td>6.10 mm</td>
<td>3.91 mm</td>
</tr>
<tr>
<td>Steroids Group</td>
<td>5.83 mm</td>
<td>4.15 mm</td>
</tr>
</tbody>
</table>
The above figure shows the plantar fascia thickness measured using ultrasound shows more reduction in PF thickness in PRP group [35.90%] than in steroid group [28.67%].

**Discussion**

- Augustus D. Marzocco et al., 2012 did studies on the technique of PRP injection (peppering) and found this method to be very effective in the sample application.
- Raymond Rocco Monto et al. [AOFAS] 2014 PRP was shown to be more efficacious and long-lasting than cortisone injection in the treatment of severe intractable plantar fasciitis.
- Nishanth Shetty et al. [Int journal of foot and ankle] 2018 concluded that Both PRP and corticosteroid injections give symptomatic alleviation in the therapy of plantar fasciitis, both operationally and subjectively. Outcomes at 6 months show that PRP injections produced greater aggregate functions.
- Scholars such as Matthew V. Smith, MD, Sandra E. Klein, MD, John C, and others have determined that the FAAM rating is the most thoroughly established foot and ankle actual result instrument known; it is sensitive to general health and comorbidities. As a result, we used FAAM rating as one of our methods for assessing the functional status of the foot.
- Ultrasonography has a number of benefits over MRI, including being noninvasive, radiation-free, a cost-effective technique, and being well accepted by patients. It is also ideal for serial close (Fabrikant and Park). So we did USG evaluation to measure the thickness of plantar fascia.
- Gnasher et al. [JFAS] 2017 did study on 80 patients and concluded that treatment of plantar fasciitis with PRP reduces pain and significantly increases function, exceeding the effect of steroid on long-term follow-up.
- In his research on plantar fasciitis using Platelet Rich Plasma and Steroids, Akashic et al., 2012 observed that PRP was similarly efficient as steroid injection and was preferable since problems such as fat necrosis could be prevented.

**Conclusion**

Chronic heel pain is a tough to treat illness that takes a long time to heal. Both PRP and steroid are efficient and safe treatments for plantar fasciitis, according to this study. However, statistical evidence suggests that steroid injections are beneficial for pain alleviation right away. Furthermore, PRP injection is more effective for long-term pain alleviation in plantar fasciitis and has no negative side effects.

**Conflict of Interest**

Not available

**Financial Support**

Not available

**References**


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