Original Article

Comparative Study of Efficacy of UST *versus* Local Corticosteroid Injection in the Treatment of Plantar Fasciitis

Sen Mausumi[1], Pramanik Rajesh[2], Ghosal Vasundhara[3], Biswas MM[4]

Abstract

Objective: To compare the efficacy between ultrasound therapy (UST) and local corticosteroid injection (INJ) in the management of plantar fasciitis.

Methodology: This prospective randomised analytical study was done at the Dept of PMR, Sambhunath Pandit Hospital, Kolkata for a period September2007- August 2009. Patients suffering from plantar fasciitis with duration more than 4 weeks were included in our study. Patients unable to give consent, congenital heel deformity, active infection, conditions where local corticosteroid injection and ultrasound therapy are contra-indicated, referred pain from other places and peripheral vascular disease were excluded from our study. After randomisation patients were divided into two treatment groups for comparative study (UST *versus* local corticosteroid injection) for treatment of plantar fasciitis. Group A patients receive UST at a dose of 0.5 W/Cm2 pulsed (1:4) locally for 8 minutes, 6 days /week for 2 weeks at initial period. Group B patients received two doses of injection corticosteroid (triamcinolone-20 mg) given at O and 2 weeks. Both of the groups received some basic management which included shoe modification and exercise therapy and NSAIDs when needed.

Assessment scales: VAS (Pain), FFI (foot function index).

Results: Both UST and local corticosteroid injection were effective mode of treatment for plantar fasciitis but effects of corticosteroid injection were prolonged as compared to UST.

Key words: **Corticosteroid injection, ultrasound therapy, plantar fasciitis.**

Introduction:

Heel pain is a common clinical problem of the patients attending Physical Medicine and Rehabilitation OPD. According to 'Heel pain guide line 2010' Plantar heel pain is the most prevalent complaint presenting to foot and ankle specialist and may be seen in up to 11-15% in adult[1]. Plantar fasciitis is the most common cause of heel pain[2,3]. It is not only significantly uncomfortable but sometimes it may be so distressing that it can interfere with activities of daily life. A major part of these patients ignore their problems at early stage, often self medicate with the idea that pharmacotherapy alone would cure their ailments. However management of heel pain embraces an understanding of anatomy and biomechanics of the foot and the ailments are needed to be addressed with different mode of treatment other than pharmacotherapy alone. There are lots of modalities available in the physiatrist's armamentorium to counteract the condition but there is scarcity of specific recommendations regarding treatment protocols of plantar fasciitis. Though there are many treatment options like different physical modalities, exercise therapy, shoe modification, local corticosteroid injection, orthosis, etc are available for plantar fasciitis but only a few supportive literature for comparative studies of different mode of treatment are available. This project is a humble attempt to find out the demographic distributions of plantar fasciitis and to compare the role of UST and local infiltration of steroid injection in heel pain.

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Materials and Methods:

Place of Study:

The study was conducted in the department of Physical

Medicine and Rehabilitation, Sambhunath Pandit Hospital, Kolkata.

Period of Study: September 2007– August 2009.

Inclusion Criteria: Patients presenting with heel pain diagnosed as plantar fasciitis with duration more than 4 weeks.

Exclusion Criteria:

1. Unable to give consent.
2 Acute heel pain less than 4 weeks.
3. Congenital heel deformity.
4. Active infection and inflammatory conditions.
5. Contra-indications of local corticosteroid injection (infection, diabetes mellitus, osteoporosis, etc).
6. Contra-indications of ultrasound therapy (eg. insensitivity, neoplasm. diabetes mellitus, bleeding diatheses, etc).
8. Referred pain and peripheral vascular diseases.

Study Design: Prospective randomised analytical study.

Randomisation : Patients presenting with heel pain, diagnosed as plantar fasciitis primarily by history and clinical examination and supportive investigation like straight x-ray of heel . Study was carried out according to the stipulated proforma after taking permission from institutional ethical committee. Patient's consent has also taken beforehand. Total number of patients of our study was 94. They were randomly divided into two treatment groups–group A and group B, 47 patients in each group for comparative study of different modalities and total number of visit for each patient was 3 [one initial visit(visit-1),two follow-up visits at 6 weeks (visit-2) and 12 weeks (visit-3) after the initial visit].

Intervention:

Patients with plantar fasciitis were given following treatment –

Group A----- Local ultrasound therapy (UST)

Group B---- Local corticosteroid injection (INJ)

Patients of both these groups got some basic management which included exercise therapy, shoe modification, NSAID when needed and patient education like avoidance of bare foot walking ,wearing of proper shoes, weight reduction on the basis of BMI .

UST was advised at a dose of 0.5 W/Cm2 pulsed (1:4) locally for 8 minutes, 6 days /week for 2 weeks at initial period.

Two doses of injection corticosteroid (triamcinolone-20 mg) with local anaesthetic agent (0.5 ml of 2 % lignocaine) were given at 0 and 2 weeks.

Shoe modification—Shoe modification used for plantar fasciitis is heel cushion or resilient heel and excavated insole filled with soft rubber (MCR)

Assessment:

- Demographics and medical history were taken at visit 1.
- Vital signs were recorded at all visits.
- Physical examinations were done at visit 1,visit 2,visit 3.
- Investigations done-

  HB, TC, DC, ESR, blood sugar (PP) at initial visit.

  Straight X ray of foot – Lateral view at initial visit.
- Patients were assessed on a visual analogue scale (VAS) and foot function index (FFI) at each visit.
- Clinically also looked after at each visit regarding adverse effect and those detected or complained of, were recorded and treated promptly.
- VAS –Assessment of heel pain was done by VAS (0 to 10) where 0 is no pain and 10 is maximum pain.
- The foot function index (FFI) is a widely used self-reported measure of health-related foot function. A foot function index was developed to measure the impact of foot pathology on function in terms of pain, disability and limitation of activities. The FFI is a self-administered index consisting of validated self reported of questionnaires.

Outcome Measures : After completion of study all the available data were analysed to reach the objective of the study. Software used STATISTICA version 6 [Tulsa, Oklahoma: StatSoft, Inc.; 2001] and Graph Pad Prism version 4 [San Diego, California: GraphPad Software Inc.; 2005] were used.

Results and Analysis :

Data collected in our study were analysed using appropriate statistical tests and results obtained. Helps of statistical charts and diagrame was also taken to represent statistical data.

Sample size: Total number of patients included in our study was 94, 47 patients in each group.

The youngest patient was 22 years and the oldest was aged 70 years(average age group 44.12). Maximum

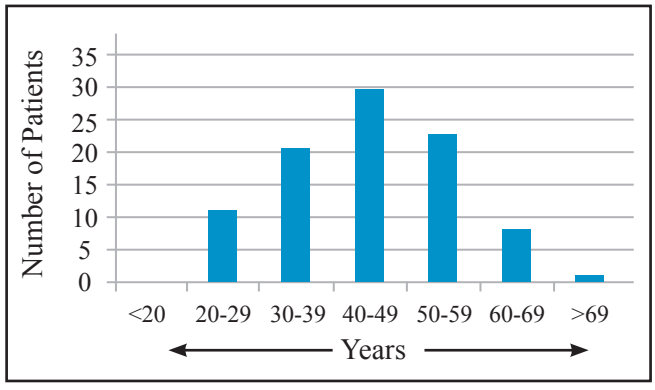

Fig 1 - Age Distribution of Patients

number of patients were between 40 and 49 years, followed by 50-59 years age group (Fig1).

In our study number of male patients were 36 (38.29%) and 58 patients (61.71%) were female with a male to female ratio is 1:1.6 (Fig 2).

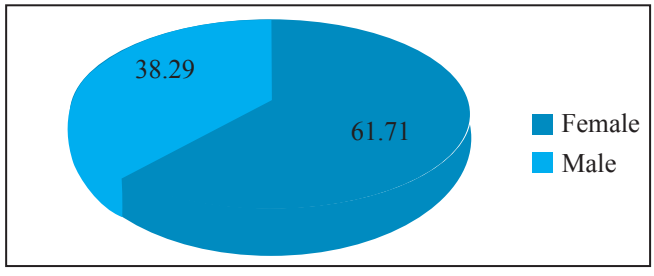

Fig 2 - Sex Distribution

Most patients were involved in house hold work (HHW), followed by people whose works demand prolonged standing(PS). Patients working at offices(OFC), doing agricultural work (AGW) were also involved in a good number. Retired person (RTD) with sedentary life, students were also suffering from plantar fasciitis (Fig3).

Distribution of BMI - Mean BMI was 26.34 (range 21.9- 33.2).

Table 1 and Fig 4 show the improvement of VAS and

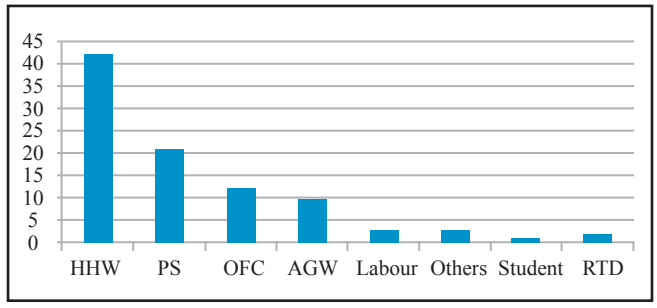

Fig 3 - Occupation Distribution

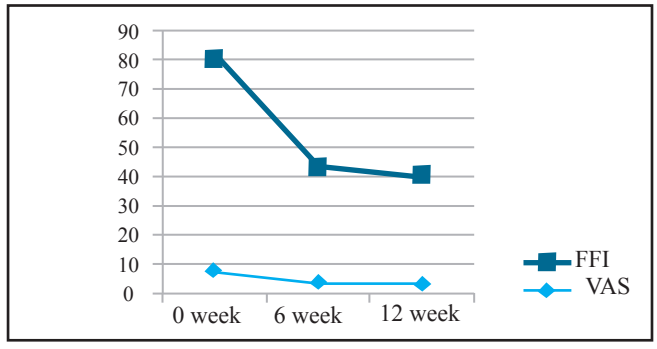

Fig 4 - Group A Managed by UST

FFI score occur in UST group (group A) throughout the follow -up period of 12 weeks. But improvement is more in first 6 weeks of follow-up.

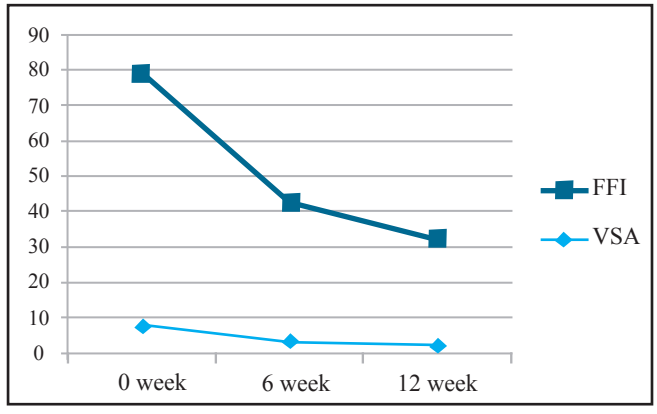

Fig 5 - Group B Managed by INJ

Table 1 : *Group A – Managed by UST*

	Valid N	Mean	Median	Minimum	Maximum	Std. Dev.	Standard Error
AGE	47	46.27660	45.00000	22.00000	69.00000	11.26306	1.642887
BMI	47	27.21277	27.10000	21.90000	33.20000	2.83339	0.413292
VAS1	47	8.40426	8.00000	6.00000	10.00000	0.97042	0.141551
VAS 2	44	3.86364	4.00000	2.00000	6.00000	0.85156	0.128378
VAS 3	44	3.38636	3.00000	2.00000	5.00000	0.89484	0.134902
FFI 1	47	72.28511	72.30000	64.10000	78.20000	2.95392	0.430874
FFI 2	44	40.00227	40.00000	26.40000	50.10000	5.75360	0.867388
FFI 3	44	36.98250	37.60000	26.00000	48.80000	4.76562	0.718444

Table 2: *Group B –Managed by INJ*

	Valid N	Mean	Median	Minimum	Maximum	Std.Dev.	Standard Error
AGE	47	41.95745	41.00000	25.00000	70.00000	10.03463	1.463701
BMI	47	25.46809	25.20000	22.80000	31.30000	1.64662	0.240184
VAS 1	47	8.00000	8.00000	6.00000	10.00000	0.97802	0.142659
VAS 2	46	3.82609	4.00000	2.00000	6.00000	0.94996	0.140063
VAS 3	45	2.15556	2.00000	1.00000	4.00000	0.82450	0.122909
FFI 1	47	70.84468	71.10000	64.10000	78.20000	3.15428	0.460099
FFI 2	46	39.03478	38.20000	28.40000	58.80000	5.90455	0.870578
FFI 3	45	29.99556	28.80000	23.50000	42.30000	4.57309	0.681716

Table 2 and Fig 5 show improvement of VAS and FFI in patients treated with local corticosteroid injection throughout the follow-up period of 12 weeks.

Comparison of VAS score and FFI in group A and group B:

It is seen that VAS score of both INJ and UST group are same at 6 weeks but improvement of VAS score was more in INJ group at 12 weeks (Fig 6). FFI score of both INJ and UST group are at par at 0 and 6 weeks but improvement of FFI is more in INJ group at 12 weeks (Fig 7).

Change OF VAS and FFI within each group (Tables 3&4) :

By repeated measures ANOVA followed by Tukey's test was clearly seen that VAS score improved consistently by UST at 6 weeks and 12 weeks with statistical significance (VAS1 *versus* VAS 2, p value<0.001 and VAS2 *versus* VAS 3, p value <0.05). On the contrary improvement of FFI was consistent up to 6 weeks (FFI 1 *versus* FFI 2, p value<0.001) of treatment period. Thereafter FFI fails to improve significantly until the end of the study period (FFI 2 *versus* FFI 3, p value>0.05). Local infiltration of injection is effective to improve both VAS score (p value<0.001) throughout the follow-up period up to 12 weeks. In our prospective analytical study improvement of FFI score (p value<0.001) also occured significantly throughout the follow-up period up to 12 weeks.

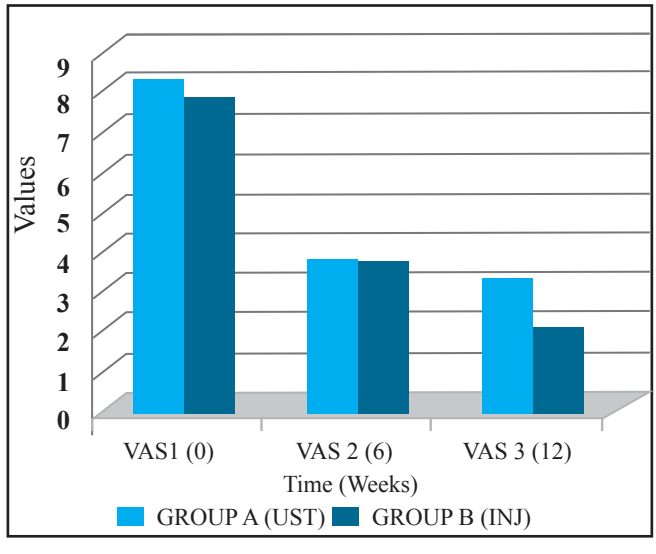

Fig 6 - Comparison of VAS score between group A (UST) and B (INJ)

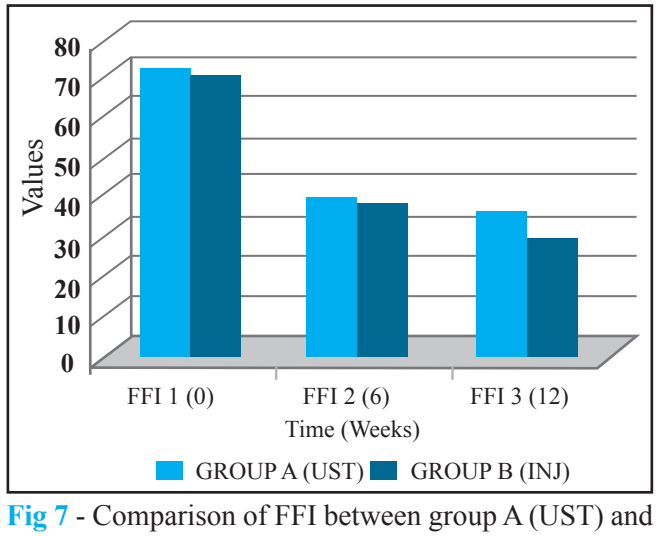

Fig 7 - Comparison of FFI between group A (UST) and B (INJ)

Discussion:

Our study included 94 patients with mean age 44.12 years (range 22-70 years) It included 36 males and 58 females with a male to female ratio 1:1.6 which is compatible with Chigwanda series[4] where mean age of plantar fasciitis is 48.5 years and majority were females.

Obesity is not only a risk factor for plantar fasciitis[5,6], even relapse is common in obese patients[7]. In our study the mean BMI of 94 patients was 26.34 (range21.9-33.2) which suggests a correlation between plantar

Table 3 : *Changes of VAS within Group A (UST) and Group B (INJ)*

	Tukey's Multiple Comparison Test	Mean Diff.	Q	P value	95% CI of diff
Group A (UST)	VAS 1 vs VAS 2	4.2766	32.514	P < 0.001	3.8325 to 4.7207
	VAS 1 vs VAS 3	4.7234	35.911	P < 0.001	4.2793 to 5.1675
	VAS 2 vs VAS 3	0.44681	3.3969	P < 0.05	0.0027464 to 0.89087
GROUP B (INJ)	VAS 1 vs VAS 2	4.1277	35.045	P < 0.001	3.7300 to 4.5253
	VAS 1 vs VAS 3	5.7234	48.593	P < 0.001	5.3258 to 6.1210
	VAS 2 vs VAS 3	1.5957	13.548	P < 0.001	1.1981 to 1.9934

Table 4 : *Changes of FFI within Group A (UST) and Group B (INJ)*

	Tukey's Multiple Comparison Test	Mean Diff.	Q	P value	95% CI of diff
GROUP A (UST)	FFI 1 vs FFI 2	30.483	35.958	P < 0.001	27.621 to 33.345
	FFI 1 vs FFI 3	33.31	39.293	P < 0.001	30.448 to 36.172
	FFI 2 vs FFI 3	2.827	3.3348	P > 0.05	-0.034998 to 5.6890
GROUP B (INJ)	FFI 1 vs FFI 2	31.277	46.685	P < 0.001	29.015 to 33.538
	FFI 1 vs FFI 3	40.157	59.941	P < 0.001	37.896 to 42.419
	FFI 2 vs FFI 3	8.8809	13.256	P < 0.001	6.6191 to 11.143

fasciitis with increased body weight.

In our study highest incidence of plantar fasciitis was found to occur in subjects with occupation of house hold work (44.68 %). Next comes the patients whose occupation needs prolonged standing (22.34%). Most of the patients in our study were housewives and many of them were barefooted particularly at home. Many people involved in agricultural work were also barefooted. As per literature review barefoot walking and prolonged standing are some of the risk factors for plantar fasciitis[5]. It is also supported by plantar pressure studies by Cavanagh *et al*[8] of subjects standing barefoot have determined that the distribution of load in the heel 2.6 times greater than forefoot when the subject stands barefooted. The shoe wear reduces peak heel pressure producing a more even distribution of pressure under heel.

Another interesting finding was noted about the role of much discussed radiological calcaneal spur as a causative factor of plantar fasciitis. In our 94 patients only 39 patients (41.49%) had calcaneal spur , compatible with Chigwanda series[4], where 60% have no spur. As per literature review calcaneal spur sometimes seen on x-ray is not a cause but as a type of traction lesion in the plantar ligament or flexor digitorum brevis muscle[9]. Spur is also found in normal asymptomatic patients[10]. The symptomatic loss of elasticity of plantar fascia with the onset of middle age suggests that this subset of patients would be expected to show an increased incidence of spur noted on radiography[11].

According to the study by Crawford and Snaith[12] with objective to evaluate the therapeutic effect from ultrasound in the treatment of plantar heel pain, a reduction in pain without any statistical significance noticed due to UST [the improvement was 30% in the treated group and 25% in the placebo group (p = 0.5)]. They concluded that therapeutic ultrasound at a dosage of 0.5 w/cm2, 3 MHz, pulsed 1:4, for eight minutes is no more effective than placebo in the treatment of plantar heel pain.

In our present study comprising 94 patients of plantar fasciitis, comparable as par age, BMI and VAS and FFI at initial visit, a definite role of UST and injection corticosteroid was established by statistical evidences. It is seen that improvement of pain and function occur both 6 weeks and 12 weeks.

In group A patients of our study it was clearly seen that VAS score was improved by UST at 6weeks and12

weeks with statistical significance (p value<0.05). On the contrary improvement of FFI was consistent up to 6 weeks of treatment period(p value <0.05). Thereafter FFI fails to improve until the end of the study period (p value >0.05). Hence we may conclude that effect of UST in management of plantar fasciitis is possibly not long lasting.

In group B of our study local infiltration of injection is effective to improve both VAS score (p value<0.001) and FFI (p value<0.001) throughout the follow-up period up to 12 weeks. Although the improvement in terms of pain (VAS) and function (FFI) is more in first 6 weeks after starting of treatment, effect of local steroid is long lasting also. But unfortunately 5 patients (2 from INJ group and 3 from UST group) dropped out from our study.

Our observation was not supported by the finding of Frawford *et al*[13] who while evaluating the effectiveness of steroid injection for heel pain of 106 patients found that statistical difference in favour of treatment with inj. steroid at 1 month. No statistically significant difference in pain reduction could be detected between 3 months and 6 months (p value 0.9, 0.8) respectively. At the end of their study they concluded that a single steroid injection does not offer a therapeutic benefit in long term.

But our observation is supported by Genc *et al*[14] while evaluating the long-term efficacy of steroid injection for plantar fasciitis using clinical parameters and high-resolution ultrasonography. Palpation-guided steroid injection was applied to the 47 heels of 30 plantar fasciitis patients. Strong correlation was found between the changes of plantar fascia thickness and VAS values 1 month after ($p < 0.001$, r: 0.61) and 6 months after ($p < 0.001$, r: 0.49) steroid injection. They concluded that steroid injection could be used in plantar fasciitis treatment for its positive long-term effects.

At the end of the study it is seen both UST and local corticosteroid injections are effective mode of treatment in plantar fasciitis. UST shows improvement of VAS score throughout the study duration (p value<0.05) but failed to show improvement of FFI in the 2nd follow-up (p value>0.05).But local infiltration of corticosteroid injection is effective to improve VAS score and FFI throughout the study duration with statistical significance (p value<0.001).

Conclusions:

Female with the mean age group 44.12 years are the commonest victim of plantar fasciitis. Maximum number of patients are involved in household work. Both UST and local corticosteroid injections will effective (statistically significant with p-valve <0.05 at the end of the study) mode of treatment in plantar fasciitis. But the overall improvement is more with local corticosteroid injection as compared to UST in terms of pain relief and function as assessed by VAS and FFI respectively. But a larger sample with longer duration is needed to observe the long term effect of different modes of treatment.

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