

To Measure the Thickness of Plantar Fascia by Ultrasonogram Before and After Botulinum Toxin-A versus Methyl Prednisolone Acetate Injection in Plantar Fasciitis

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Abstract:

Background: Plantar fascia acts as dynamic shock absorber and it also give support to the longitudinal arch of the foot. Plantar fasciitis occurs due to repetitive trauma to plantar fascia leading to degenerative changes at its calcaneal origin leading to pain and dysfunction. This study is done to assess the thickness of plantar fascia by ultrasonogram before and after intervention with Botulinum toxin-A injection versus Methyl prednisolone acetate injection.

Methodology: Hundred Participants with plantar fasciitis was selected in PMR-OPD in Government Institute of Rehabilitation Medicine Hospital and divided into two groups by simplified Randomized control study. Group 1 received Botulinum toxin-A injection and Group 2 received Methyl Prednisolone acetate injection. Thickness of Plantar fascia using ultrasonogram and Visual analog scale (VAS) for pain was assessed before and after treatment at 6 months

Conclusion: This study shows that there was significant reduction in thickness of Plantar fascia after intervention in both the groups after 6 months and it correlates with decrease in pain measured by VAS score.

Keywords: Botulinum Toxin-A(BTX-A), Visual analogue pain scale(VAS), ultrasonogram(USG).

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Introduction

Plantar fasciitis is the most common cause of chronic heel pain in adults affecting 7 to 10% of population [3]. Plantar fasciitis usually occurs between age group 45 to 64 yrs. Plantar fasciitis is more common in middle aged females[4], overweight and obese persons, young sports person, person with occupation requiring prolonged standing and doing sedentary work[5].

Usually patient will present with early morning heel pain with difficulty in walking and aggravated by weight bearing activities. Heel pain occurs mostly over medial calcaneal tuberosity, but may also present in posterior plantar heel, central arch, lateral heel.

The plantar fascia which has thick central part and weaker medial and lateral parts originating from medial tuberosity of calcaneum and inserted into ball of foot. The plantar fascia holds the parts of the foot together, protect the sole from injury and helps to support the longitudinal arches of the foot [6]. Ultrasonography is found to be non-invasive tool in

diagnosis of plantar fasciitis. Thickness of plantar fasciitis is easily measured by Ultrasonography.

Some previous studies shows that thickness of Plantar fascia correlates with severity of pain[7]. Normal thickness of plantar fascia measured at site of calcaneal insertion is 2-3mm.

Normal USG findings in plantar fascia are hyperechoic fibrillar pattern due to type 1 collagen fibre within hypoechoic matrix. USG findings of plantar fasciitis is thickness of plantar fascia more than 4mm at site of insertion of calcaneal tuberosity, hypoechoic with loss of fibrillar pattern, hyperemia, perifascial fluid collections[8].

Materials and Methodology

This study was done in Government Institute of Rehabilitation Medicine, K.K Nagar, and Madras Medical College as a prospective assessor, participant and physiotherapist blinded simplified Randomized control study. 100 Participants were

selected according to inclusion and exclusion criteria from individuals attending PMR-OPD and the study period was 10 months. Patient with age 20-60 yrs, symptomatic heel pain of any side for 3 months, both sex, no improvement of heel pain after physical modalities were included in the study. Patients with any systemic disease with foot pain like rheumatoid arthritis etc, allergic to botulinum toxin, cellulitis foot, pregnancy, received steroids within 4months were excluded from the study.

Proposed Treatment Groups:

- Group 1: will receive Botulinum toxin-A injection and scheduled exercise therapy.
- Group 2: will receive Methyl Prednisolone acetate injection and same scheduled exercise as group 1.

Sample Size: 50+50.

Methodology: After routine general examination, the participants were asked to lie prone with foot hanging from edge of the bed and their ankle in dorsiflexion to measure the thickness of plantar

fascia by ultrasonogram (USG) using linear 17-5 MHz probe. Participants will be administered test dose of 2% lignocaine and after confirming there are no adverse reactions, participants were taken to operation theatre and involved foot with ankle will be cleaned with surgical spirit followed by povidone iodine and then covered around by sterile towel. Under strict aseptic precautions, the injection site is anaesthetized with 2ml of 2% lignocaine.

- Group 1 will receive 50 units of Botulinum toxin-A mixed with 1ml of normal saline, injected into most tender point on medial aspect of heel.
- Group 2 will receive 40 mg of Methyl prednisolone acetate injection into most tender spot on medial aspect of heel.

Data Collection and Methods: Participants were assessed before and after 6 months of intervention the following parameters like thickness of plantar fascia by ultrasonogram (USG) and pain score by Visual Analogue Scale (VAS).



Figure 1: Botox injection

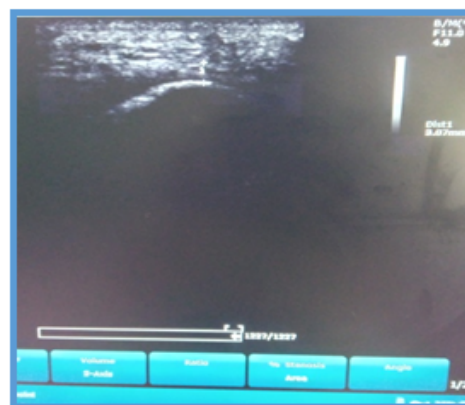


Figure 2: PF thickness by USG

Statistical Analysis: Analysis was done using standard software.

Ethical Issues: Prior to the commencement, the study was approved by the Ethical and Research Committee, Madras Medical College.

Informed Consent: Participants selected according to the protocol were briefed about the nature of the study. A written informed consent was obtained from them.

Table 1: Disease Demography

Sl. No	Features	Treatment groups 100 participants(50+50)		Mean	Standard deviation
1.	Age in years	Botulinum		44.6	9.66
		steroid		44.8	9.75
2.	Duration of symptoms in months	Botulinum		6.8	4.02
		steroid		7.3	4.23
				Frequency	Percent
3.	SEX	Botulinum	Male	19	38
		steroid	Female	31	62
4.	BMI	Botulinum	Normal	24	48
			overweight	20	40

			obese	6	12
		steroid	Normal	27	54
			overweight	19	38
			obese	4	8
5.	Laterality	Botulinum	Right	21	42
			Left	19	38
			Bilateral	10	20
		steroid	Right	23	46
			Left	18	36
			Bilateral	9	18

Study Parameters in the Groups: The outcome scale used in our study are thickness of plantar fascia by ultrasonogram (USG) and visual analogue scale(VAS).

Table 2: VAS Score

Group	Statistics	PAIN-VAS SCORE				
		Pre inter	1 month	2 month	4 month	6 month
1. Botulinum toxin	Mean	9.58	4.8	3.14	3.18	2.74
	S.D	0.702	0.755	0.534	1.043	1.293
	Median	10	5	3	3	3
2. steroid	Mean	9.4	6.3	3.9	4.9	5.4
	S.D	0.788	0.707	0.707	1.326	1.293
	Median	10	6	4	5	5

Table 3: Plantar fascia thickness by USG

Group	Statistics	PF thickness by USG in mm	
		Pre intervention	Post intervention(6 months)
1. Botulinum toxin	Mean	4.42	3.59
	S.D	0.586	0.384
	Median	4.4	3.7
2. steroid	Mean	4.59	3.78
	S.D	0.493	0.347
	Median	4.6	3.8

Table 4: Literature comparison of the mean thickness of plantar fascia

Study Author	Mean Age Years	No of Participants	No of Feet	Mean Thickness of Plantar Fascia
Vohra et al[9]	47.6	109	211	5.4mm
Hammer et al[10]	51.6	22	22	5.2mm
Sabir et al[11]	Not reported	77	144	4.9mm
Akfirat et al[12]	Not reported	23	25	4.8mm
This study	44.6	100	100	4.59mm

Discussion

In this study 100 participants were included with 50 participants in each group (Group1:Group2) selected by randomized controlled trials. Most of the participants were between 31 to 40 yrs and between 41 to 50 yrs in our study. The mean age years affected by PF is 44.6yrs in groups 1 and 44.8yrs in group 2 which is also correlated with previous studies which says PF is more common in middle aged persons.

In group 1 there was 19 males (38%) and 31 females (62%). In group 2 there was 18 males (36%) and 32 females (64%). Females are involved more than males in both groups in our study, but still there is no clear evidence in previous studies whether it is more common in males or females. Right sided heel pain is common in both groups in

this study. Average duration of symptoms is 6-7 months in this study. Risk factors like BMI also included in this study. Body mass index results of this study proves that overweight and obesity is one of the risk factor of PF. In this study, the mean thickness of plantar fascia in Botulinum toxin group before intervention is 4.42mm and after intervention is 3.59mm. The mean thickness of plantar fascia in Steroid Group before intervention is 4.59mm and after intervention is 3.78mm. VAS pain score in Botulinum toxin group before intervention is 9.58 and after intervention is 2.7. VAS pain score in steroid group before intervention is 9.4 and after intervention is 5.4. Parameters and scales in both group were analysed by paired t test within group and unpaired t test between two groups. VAS score and plantar fascia thickness by USG values was stastically significant

with p value >0.00001 in group 1 after 1 month of post intervention and with p value >0.0001 maintained at 6 months after intervention. Whereas in group 2 it was >0.0001 at 1month and >0.001 at 6 months after intervention.

Both groups shows significant reduction in pain upto 12-14 weeks of intervention, but after 16 weeks group1 BTX-A shows reduction and maintenance of VAS score. The Plantar fascia thickness is significantly reduced in BTX-A group compared to steroid group after 6 month of intervention. Complications like mild numbness of foot is noted in 2 participants in group2 and 1 in group 1 and heel pad thickness reduced in 3 persons in group 2 noted by USG when compared to other side No allergic reactions were noted during intervention. Only 3 patients in group1(Botulinum Toxin-A) has no significant improvement in VAS.

Conclusion

Ultrasonography was found to be highly specific and sensitive in diagnosing plantar fasciitis. Also it was low cost and easily available and aids in anatomic visualisation of structures, accurate USG guided intervention and also helps in monitoring the effects of intervention thereby choosing best intervention. In this study the Plantar fascia thickness is significantly reduced in BTX-A group and steroid group after 6 month of intervention, But the thickness reduction is more marked in BTX-A group and it also correlates with significant reduction in pain scale as shown by VAS.

Limitations

- Large sample is needed.
- Other USG findings like hyperemia, perifascial fluid collection are not taken as findings in this study.
- No long term follow up done in this study.
- Outcomes based on Subjective assessment only.
- Double blinded control study not done.

References

1. Karabay N, Toros t, Hurel C. Ultrasonaraphic evaluation in plantar fasciitis. J Foot Ankle Surg. 2007; 46(6):442-446.
2. Mark W. Cornwell, Thomas G, Mcpoil. Plan- tar fasciitis-Etiology & treatment. JOSPT 1999; 29(12):756-760.
3. Liselotte Hansen, Thoger Persson krogh, Torkell Ellingsen, Lars Bolvig, Ulrich Fred- berg, Long term prognosis of plantar fasciit- is,OJSM, Mar 6, 2018; 6(3).
4. Lourdes RK, Ram GG. Incidence of calcaneal spurs in Indian population with heel chain. Int J Res Orthop 2016; 2:174-6.
5. John V Thompson, Sundeep S Saini, OMS IV, Christopher W. Reb & Joseph N. Daniel, Di- agnosis & Management of plantar fasciitis, JAM Osteopath Asso. 2014;114(12)900-906.
6. Richard L. Drake, Wayne Vogl A, Adam W.M. Mitchell, gray's anatomy, Arches of foot and plantar aponeurosis, third edition, chapter 6, 2010:648-649.
7. Karabay N, Toros t, Hurel C. Ultrasonaraphic evaluation in plantar fasciitis. J Foot Ankle Surg. 2007; 46(6):442-446.
8. Ferdinando Derghi, salvatore gitto, chandra Bertolotto, Anna Guja Draghi and Gioia om Belometti. Imaging of plantar fascia disorders, PMID: PMC 5265197/PMID 2016 Dec.
9. Ultrasonographic Evaluation of Plantar Fascia Bands, A Retrospective Study of 211 Symp- tomatic Feet, Praveen K. Vohra. Brian R. Kin- caid.
10. D.S. Hammer, F. Adam, A. Kreutz, S. Rupp, D. Kohn, R. Seil, Ultrasonographic evaluation at 6-mo follow-up of plantar fasciitis after ex- tracorporeal shock wave therapy, Arch Orthop Trauma Surg, 2005;125: 6-9.
11. N. Sabir, S. Demirlenk, B. Yagci, N. Kara- bulut, S. Cubukcu, Clinical utility of sonogra- phy in diagnosing plantar fasciitis, J Ultra- sound Med, 2005;24: 1041-1048.
12. M. Akfirat, C. Sen, T. Günes, Ultrasonograph- ic appearance of the plantar fasciitis, Clin Im- aging, 2003;27: 353-357.