



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2018; 4(5): 27-35
www.allresearchjournal.com
Received: 14-03-2018
Accepted: 18-04-2018

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The effect of Cyriax (Transverse frictional massage) on pain and function in patients with plantar fasciitis randomized controlled trial study

Trupti Chandrakant Rasal and Dr. Kiran Jeswani

Abstract

Objective: The effect of Cyriax (Transverse friction massage) on pain and functions in patients with plantar fasciitis.

Background: There is limited study available which support that Cyriax's (transverse friction massage) can be used as intervention in management of plantar fasciitis.

Study design: Experimental Study.

Methods: The ethical clearance was taken from 30 diagnosed patients of plantar fasciitis and then selected by simple random sampling into 2 equal groups naming group A and group B. Pre and post outcome measures were taken from the patients Numerating Pain Rating Sacle ;other one is Foot and Ankle Ability Measure scale (FAAM) Activities of Daily Living Subscale. Subjects in group A underwent treatment Cyriax (transverse friction massage) along with Conventional therapy. Subjects in group B underwent only conventional therapy which includes stretching of plantar fascia, soleus, gastroceimus; toe raise, heel raise, towel curling, thera band exercise for plantar flexors and dorsi flexors along with the ultrasound.

Results: The intra-group mean differences in pre and post values for group A 46.6 ± 6.0 , 78.5 ± 7.8 ; 8.24 ± 1.2 , 3.5 ± 0.7 of FAAM and NPRS respectively; where as in group B are 51.9 ± 10.5 , 94.7 ± 2.2 ; 7.5 ± 1.1 , 4.1 ± 0.6 FAAM, NPRS respectively.

Conclusion: The present study it was found that the additional Cyriax (transverse friction massage) is more significantly effective on pain as compared to Conventional therapy while Conventional therapy is more significantly effective on function as compared to Cyriax(transverse frictional massage) in patients of Plantar fasciitis.

Keywords: plantar fasciitis, Cyriax (transverse friction massage), Conventional therapy, FAAM, NPRS

1. Introduction

- Plantar fascia is a thickened fibrous sheet of connective tissue that originates from the medial tubercle of the calcaneus and attachés to the plantar surface of the metatarsophalangeal joints ^[1].
- It acts as static and dynamic stabilizer of the longitudinal arch of the foot and acts as a dynamic shock absorber ^[1].
- The condition is prevalent in both active and sedentary population ^[3].
- The plantar fasciitis is the most common cause of heel pain with a lifetime prevalence of ten percent, accounting for all foot symptoms ^[4, 9].
- It is more likely to occur in persons who are obese, who spend their most of the day on their feet, who have limited ankle flexion ^[3].

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Image 1: Inflammation of plantar fascia

- Conventional therapy includes stretching and strengthening exercises.
- Ultrasound is method of applying deep heat to connective tissue [8].
- Ultrasound: The ultrasonic waves of frequencies in between 1 MHz or 3MHz [12].
- As ultrasonic waves are absorbed by tissues they are converted to heat due to which there rise in temperature could be used to accelerate the healing and increase extensibility of the collagen so stretching of the scars or adhesions is easier following the ultrasound [12].



Image 2: Therapeutic ultrasound

- Cyriax originated from therapeutic friction massage, prominently advocated by
- James Cyriax [6].
- Cyriax's deep friction massage is theorized to make scar tissue more mobile, to facilitate healing through controlled micro trauma, and to aid the alignment of the soft tissue fibers to normal [6].
- Strengthening exercises improve; restore the muscle strength, power and endurance [11].
- Strengthening exercises increases the strength of connective tissues; tendons, ligaments intramuscular connective tissues [11].
- Stretching exercises effective to restore or increase the extensibility of the muscle tendon unit and therefore, regain and achieve the flexibility and range of motion required for necessary or desired functional activities [11].

Need of the study

- Increase in the incidence of plantar fasciitis.
- Plantar fasciitis interferes with the work performance of the people.
- There are also many studies available that convectional therapy is effective in plantar fasciitis [9].

- There are few studies available that Cyriax is effective in plantar fasciitis [6, 9].
- Therefore this study is an effort to find the effect of Cyriax (transverse frictional massage) on pain and function in patients with plantar fasciitis.

Aim

- To find the effect of Cyriax (transverse frictional massage) on pain and function in patients with plantar fasciitis.

Objectives

- To find the effect of Cyriax (transverse friction massage) on pain and function in patients with plantar fasciitis.

Hypothesis

- Null hypothesis: There is no effect of Cyriax (transverse friction massage) on pain and functions in patients with plantar fasciitis.

Alternate hypothesis

- Cyriax (transverse frictional massage) is more effective on pain and function in patients with plantar fasciitis.

Materials

- Pen.
- Consent form.
- Visual analogue scale (VAS).
- Foot and Ankle Ability Measure scale (FAAM) Activities of Daily Living Subscale.
- Ultrasound.
- Tissuepaper.
- Theraband.
- Towel. and weight cuffs

Methodology

- Study Design-Experimental Study.
- Study Population-Patients diagnosed with Plantar Fasciitis.
- Place-Hospitals and clinics in and around Pune.
- Sample Size-30.
- Sampling Method-Simple random sampling.

Inclusion criteria

- Gender-both males and females [2].
- Age-30 to 50 years.
- Diagnosed cases of plantar fasciitis [1, 3, 4].
- Patients having complaints more than four weeks [2].

Exclusion criteria

- Conditions associated with plantar fasciitis in the previous 6 months and during the study period.
- History of fracture in ankle or foot [2].
- Congenital deformity of the foot, ankle [17].
- Spasticity throughout the lower extremity [17].

Procedure

Ethical clearance was taken from the PES Modern College of the Physiotherapy.

According to inclusion and exclusion criteria the subject were selected in clinics and hospitals; in and around Pune.

The consent form was taken from the all subjects.

The subjects were divided into two equal groups by simple random sampling namely group A and group B.

Subjects in group A underwent treatment Cyriax (transverse friction massage) along with conventional therapy. Subjects in group B underwent only conventional therapy which includes stretching of plantar fascia, soleus, gastrocnemius; toe raise, heel raise, towel curling, theranaband exercise for plantar flexors and dorsi flexors along with the ultrasound. The treatment for 3 alternate days in a week for 4 weeks for both the groups. Pre and post treatment measures were taken FAAM and NPRS the score was recorded of each subject in both the groups.

- The patient must be in a comfortable position [7].
- The transverse friction massage is given vigorously [14].
- Some discomfort may be caused for few minutes; it can be reduced by gentle start [14].



Image 3: Cyriax (transverse friction massage)

Plantar fascia stretching

Plantar specific stretch perform with patient cross leg sitting and affected leg over contra lateral leg. While placing the fingers at the base of the toes the patient pull the toes back toward the shin until they feel stretch in the arch or plantar fascia. The other hand to palpate the tension in the plantar fascia to confirm the stretch [5].



Image 4: Plantar fascia stretching

Group A	Group B
<ul style="list-style-type: none"> • Deep friction massage:- The treatment session was given for 20 minutes 3 alternate days in a week for 4 weeks [14]. 	
<ul style="list-style-type: none"> • Conventional therapy: The stretching was done for 20 seconds hold; 3 times repeat [11]; for 3 alternative days in a week for 4 weeks. Strengthening exercises 10 repetitions; 3 days in a week for 4 weeks. 	<ul style="list-style-type: none"> • Conventional therapy: The stretching was done for 20 seconds hold; 3 times repeat [11]; for 3 alternative days in a week for 4 weeks. Strengthening exercises 10 repetitions; 3 days in a week for 4 weeks.
<ul style="list-style-type: none"> • Therapeutic Ultrasound- 0.8W/cm² for 4 minutes continuous mode [12] 3 alternate days in a week for 4 weeks. 	<ul style="list-style-type: none"> • Therapeutic Ultrasound- 0.8W/cm² for 4 minutes continuous mode [12] 3 alternate days in a week for 4 weeks.



Pre and post measure were obtained-Numerating pain rating scale; Foot and Ankle Ability Measure scale

Flow chart 1: Procedure

Before the friction massage can perform successfully, the correct structure must be found through proper evaluation procedures [7].

- The massage involves pressure from the therapist fingers applied transversely to the involved tissue⁶.
- In addition to finding the right spot, the massage must also be given the most effective way by following these basic principles [7].
- The proper location must be found through proper evaluation procedures and palpation of the specific tendon, ligament, or muscle [7].
- Friction massage must be given across the affected fibers [7].
- The therapist's finger and patient's skin must move as one [7].
- The friction massage must have sufficient sweep and be deep enough [7].

Standing self-stretching of calf muscle [10].

- A-Soleus muscle- the knee is bent, the patient leans forward while heel keeping on the ground.
- B-Gastrocnemius muscle-same as the A but keep the knee straight.



Image 5A: Soleus muscle



Image 5B: Gastrocnemius muscle

Therapeutic ultrasound



Image 6: Ultrasound

Strengthening exercises:-strengthening of plantar flexors [1].



Image 7: Strengthening of plantar flexors

Strengthening of dorsiflexors [1].



Image 8: Strengthening of the dorsi flexors

Heel raise, toes raise-first bilateral then unilaterally in standing [1]



Image 9: Heel raise bilaterally

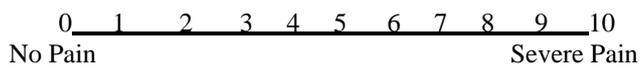
Intrinsic muscle strengthening exercises: towel curling first without weight on towel latter by keeping weight on towel ^[11].



Image 10: Intrinsic muscle strengthening exercises

Outcome measures

1. Foot and Ankle Ability Measure (FAAM) Activities of Daily Living Subscale:-
Reliability and Validity:-Reliability-0.89 points ^[15]
Validity <0.05 ^[15]
2. Numerating Pain Rating Scale



Reliability and Validity of Numerating Pain Rating Scale:
Reliability = 0.96 and 0.95 ^[16].
Validity = 0.86to0.95 ^[16].

Literature review

- Mohamad Ali Mohesh- Bandpei, Masoomah Nakhaee, *et al.* Ultrasound in Med. & Biol. Vol. 40, No.8, pp 1737-1754, 2014-The purpose of this study was to systematically review published studies from 2000 to 2012 concerning the application of US in the assessment of PF in the patients with PFS. There were wide variations in methodology, US equipment, sample size and other factors the results indicate that US is an accurate, reliable and non-invasive imaging technique for assessing PF thickness, monitoring effects of different interventions and guiding therapeutic interventions in patients with PFS.
- Shaswat Prakashn, Anand Misra, Effect of Manual Therapy verses conventional therapy in plantar fasciitis- A comparative study, International Journal of Physiotherapy and Research, 2014, vol 2(1):378-82. ISSN 2321-1822-the present study concludes that the manual therapy approach is superior to conventional therapy in improving pain and disabilities in patient of plantar fasciitis.
- Michael Skovdal Rathleff, Ulrich Fredberg, *et al.* High Load Strength Training Improves Outcome in Patients with Plantar Fasciitis: A randomized controlled trial with 12-month follow up: HL strength training and plantar fasciitis, Scandivian Journal of Medicine and Science in Sports. September 2014-In conclusion a simple progressive exercise protocol consisting high load strength training performed every second day, resulted in the superior outcome at 3 months compared with plantar-specific stretching aid in a quicker reduction in pain and

improvements in function.

- Romulo Renan-Ordine, PT, DO ^[1], Francis Alburquerque-Send PT, PhD ^[2], *et al.* Effectiveness Of Myofascial trigger point manual therapy combined with A Self-Stretching Protocol for Heel Pain A Randomized Controlled Trial, Journal Of Orthopedic & Sport Physical Therapy, Vol 4, No 2, Feb 2011, 43-50-overall, findings suggest that wearing a TCFO for 2 weeks followed by stretching program, decrease overall pain and increases foot and ankle function in participants with PF.
- Annemarijke Boonstra, Roy Stewart *et al.* Int Reliability and validity of the visual analogue scalefor disability in patients with chronic musculoskeletal pain, International Journal of Rehabilitation Research, July 2008:-concludes that visual analogue scale can be used to measure musculoskeletal pain intensity.
- Rob Roy L Martin, PT. Ph.D. C.S.C.S. *et al.* Evidence of validity and reliability for Foot and Ankle Ability Measure, (FAAM), Foot & Ankle International/ Vol.26,No.11/November2005 Pg No.968-983:-concludes that FAAM is reliable and valid.
- Kent Stuber, BSc, DC*, Kevyn Kristmanson, BSc, DC**Conservative therapy for plantar fasciitis: a narrative review of randomized controlled trials,0008-3194/2006/118-133-further high/quality research randomized controlled trails in particular, into the conservative management of plantar fasciitis with any all of the modalities clearly needed.
- Charles Cole, M.D. and Craig Seto, M.D. *et al.* Plantar Fasciitis: Evidence-Based Review of Diagnosis and Therapy Am Fam Physician 2005; 72:2237-42, 2247-8:-conclude that plantar fasciitis causes heel pain in active as well as sedentary adult of all ages. Condition is more likely to occur in obese and long standing workers.
- Claudia A Knight, Carrie R Rutledge, *et al.* Effectiveness of Superficial Heat, and Active Exercise Warm-up on the Extensibility of the Plantar Flexors, Journal of the American Physical Therapy Association, 2001; 81:1206-1214.-All experimental groups in this study produced increases in the extensibility of the plantar flexors, resulting in increases in AROM and PROM when the compare with the control group.
- Clayton's Electrotherapy, Theory and Practice, 9th Edition Ultrasonic Therapy, Pg No. 165-179: Concludes that ultrasound is indicated for inflammation with appropriate dosage.
- Orthopedic Physical Assessment David J. Magee, Phd, BPT, C. M, 6th Edition, 1st Chapter Principles and Concept pg no.1-76;13th Chapter, Lower leg, Ankle and Foot Pg No.888-955. concludes pain measuring scales Visual Analogue Scale, Foot and Ankle Ability Measures (FAAM).
- Cyriax's Illustrated Manual of Orthopedic Medicine, P.J. Cyriax, volum2nd, Part 1- Principles of Diagnosis, Pg No.3-19, Part 2- Principles of Treatment, Pg No. 119-142. Concludes the procedure, treatment sessions of Cyriax's Deep Massage for plantar fasciitis it is effective in plantar fasciitis.
- Kisser Colby, Therapeutic Exercise, Foundations and Techniques, 6th Edition Chapter 22 The Ankle and Foot, Pg No.849-889:- concludes therapeutic exercises of plantar fasciitis, stretching, strengthening.

Discussion

In the present study there are 30 samples were selected for according to inclusion and exclusion criteria.

The selected samples were divided into 2 groups by simple random sampling method.

Group A received Cyriax (Transverse friction massage) along with the conventional therapy; while group B received only conventional therapy which includes conventional exercises and Ultrasound.

The conventional exercises includes stretching of plantar fascia, stretching of soleus, stretching of gastrocnemius, heel raise, toe raise, towel curling, theraband exercises for plantar flexors and dorsiflexors.

The stretching reduces tightness of the fascia, muscles; helps to improve the mobility reduce pain. The toe raise heel raise, towel curling exercises maintain mobility, improves strength of the intrinsic muscles of the foot, theraband exercises improves the strength of the ankle dorsi flexors and plantar flexors. Due to this the Conventional therapy has significantly improved the FAAM score.

Ultrasound is the therapeutic frequencies being in region of 1MHz or 3MHz; works on principle of piezoelectric effect. Ultrasound is used in soft tissue injury, inflammation to reduce pain and promote healing

Cyriax (transverse friction massage) is soft tissue manipulation employed by Cyriax and Russell to reach the musculoskeletal structures, ligaments, tendons, muscles. The purpose of friction massage is to maintain the mobility within the soft tissue structure of ligaments, tendons, muscles; and prevent adherent scar from forming.

Cyriax's goals are 2 folded: to provide the movement to the tissue itself and to produce traumatic hyperemia. The movement encourages realignment and lengthening of these fibers.

Second goal is-traumatic hyperemia, results in enhancement of blood supply to the area; the hyperemia appears to diminish the pain by increasing the speed of destruction of Lewis' P substance. Probably due to the release of histamine Lewis' P factor is an irritative metabolite which produces ischemia when it accumulates. This mechanism of the Cyriax's (transverse friction massage) might be help to reduce pain in patients of plantar fasciitis.

Both of these protocols given on 3alternative days in week for 4weeks.

The outcome measures were used Numerating pain rating scale (NPRS) and Foot and Ankle Ability Measures Activities of Daily Living subscale. Both the outcome measures were selected based on their reliability and validity.

Pre and post treatment score of both the outcome measures were recorded.

The acquired data was statistically analyzed and compared.

There was no statistical significant difference when the baseline demographic characteristic gender and age were compared. So the chances of these factors influencing the results in our study are minimized.

The paired t test is used for intra group pre and post outcome measures values while unpaired t test is done for intergroup values of outcome measures.

Pre and post treatment values of NPRS of group A: Cyriax(transverse friction massage); group A found to be more effective on pain the NPRS decreased from 8.24±1.2 pre-treatment to 3.5±0.7 post treatment with p value <0.001.

Pre and post treatment values of FAAM of group A: Cyriax(transverse friction massage)groupA the FAAM increased from 46.6±6.0 pre-treatment to 78.5±7.8 post treatment with p value <0.0001.

Pre and post treatment values of NPRS of group B: Conventional therapy, the NPRS decreased from 7.5±1.1 pre-treatment to 4.1±0.6 post treatment with p value <0.001.

Pre and post treatment values of FAAM of group B: Conventional therapy group B found to be more effective on function; the FAAM increased from 51.9±10.5 pre-treatment to 94.7±2.2 post treatment with p value < 0.0001

The post treatment values of FAAM of group A and group B: Group A post FAAM is 78.5±7.8 while; group B post FAAM is 94.7±2.2 with p value <0.0001.

The post treatment values of NPRS of group A and group B: Group a post NPRS is 3.5±0.7 while group B post NPRS is 4.1±0.6 with p value 0.0196.

The result shows that the Cyriax (transverse friction massage) is more effective on pain as compared to Conventional therapy while Conventional therapy more effective on function as compared to Cyriax (transverse frictional massage) in patients of plantar fasciitis.

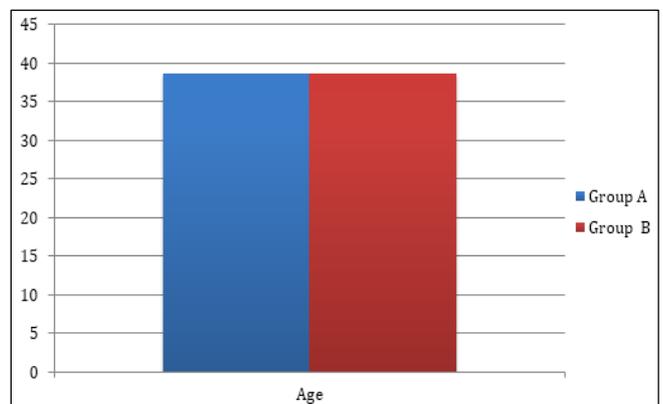
Conclusion

The present study it was found that that the additional Cyriax (transverse friction massage) is more significantly effective on pain as compared to Conventional therapy while Conventional therapy is more significantly effective on function as compared to Cyriax (transverse friction massage) in patients of Plantar fasciitis.

Statistical analysis

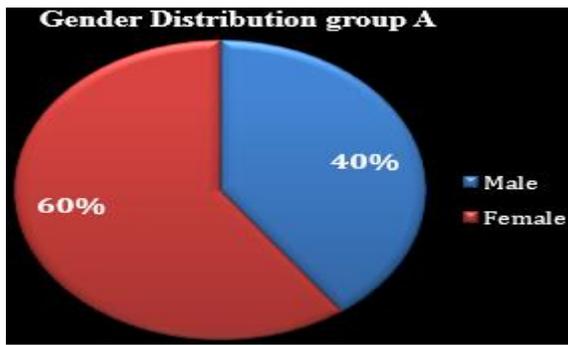
Table 1: Age distribution of group A and group B

Age Distribution	Group A	Group B
Mean±SD	38.53±7.726	38.53±8.114



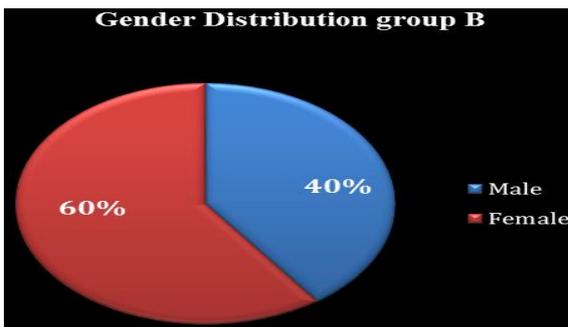
Graph 1: Age distribution of group A and group B

Gender distribution group A



Pie chart 1: Gender distribution group A

Gender distribution group B



Pie chart 2: Gender distribution group B

Table 2: Gender distribution group A

Gender	No of participants
Male	06
Female	09

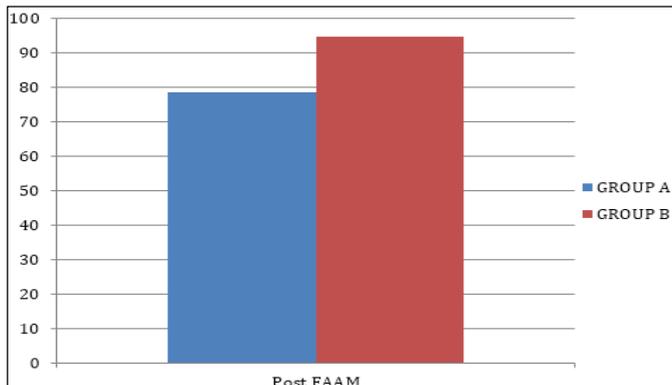
Table 3: Gender distribution group B

Gender	No of participants
Male	06
Female	09

Graph is showing values of post treatment FAAM score of group A and group B

Table 4: Values of Post Treatment Faam Score of Group A and Group B

Post treatment FAAM values	Group A	Group B	t value	p value	Result
MEAN±SD	78.5±7.8	94.7±2.2	7.703	<0.0001	Extremely significant

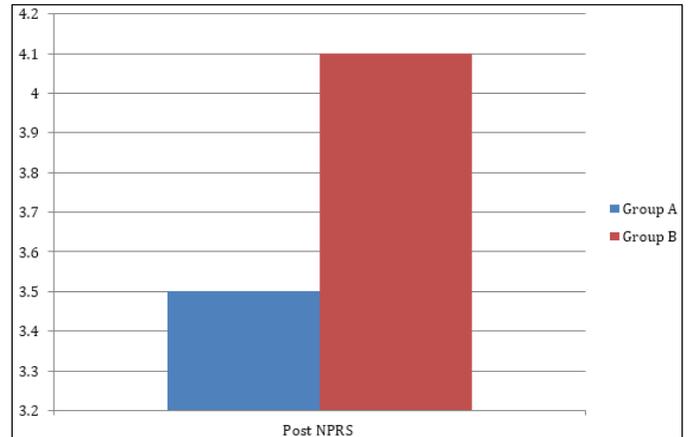


Graph 2: Values of post treatment FAAM score of group A and group B

Graph is showing values of post treatment NPRS of group A and group B

Table 5: Values of post treatment NPRS of group A and group B

Post treatment NPRS	Group A	Group B	t value	p value	Result
MEAN±SD	3.5±0.7	4.1±0.6	2.476	0.0196	Significant

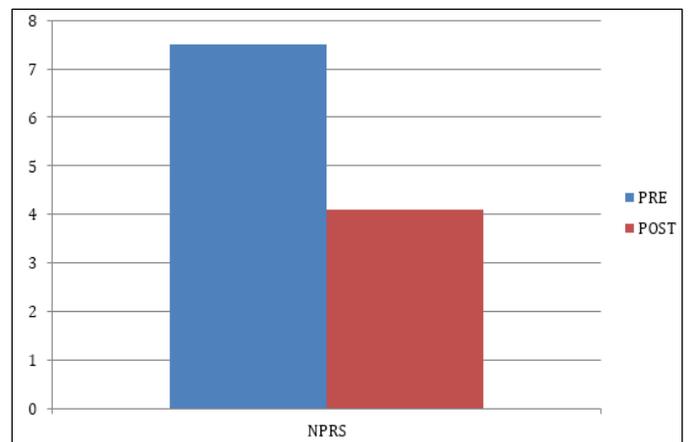


Graph 3: Graph is showing values of post treatment NPRS of group A and group B

Graph is representing pre & post values of NPRS of group B (Conventional therapy)

Table 6: Pre & Post values of NPRS of group B (Conventional therapy)

Group B	Pre	Post	t value	p value	Result
MEAN±SD	7.5±1.1	4.1±0.6	13.77	<0.0001	Extremely significant

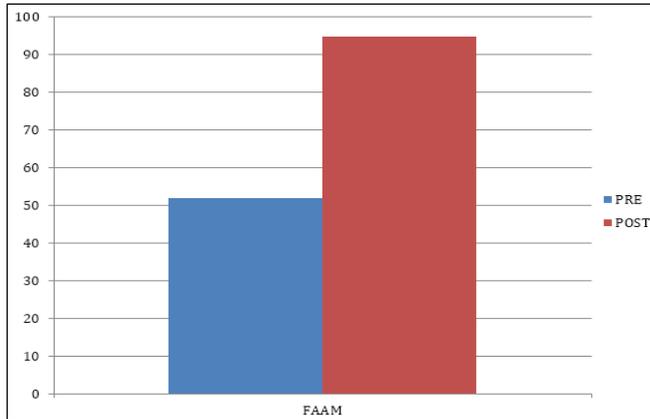


Graph 4: Graph is representing pre & post values of NPRS of group B (Conventional therapy)

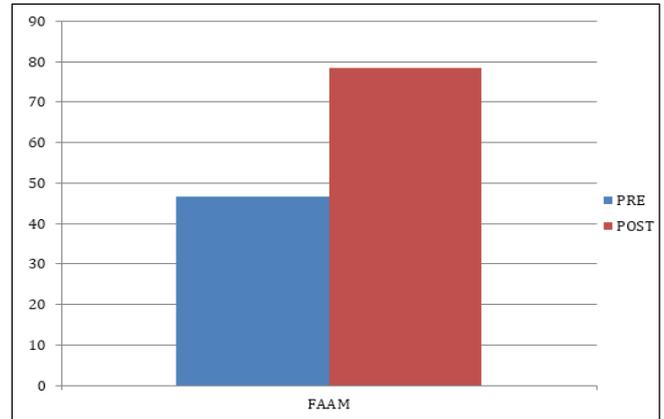
Graph is representing pre & post values of FAAM of group B (Conventional therapy)

Table 7: Pre & Post values of FAAM of group B (Conventional therapy)

Group B	PRE	POST	t value	p value	Result
MEAN±SD	51.9±10.5	94±2.2	14.63	<0.0001	Extremely Significant



Graph 5: Graph is representing pre & post values of FAAM of group B (Conventional therapy)



Graph 6: Graph showing the pre & post values of FAAM of group A (Cyriax transverse friction massage)

Graph showing the pre & post values of FAAM of group A (Cyriax transverse friction massage)

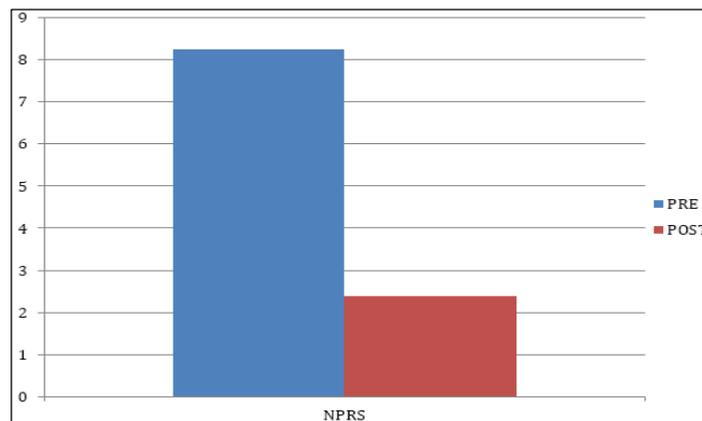
Table 8: Pre & Post values of FAAM of group A (Cyriax transverse friction massage)

Group A	Per	Post	T value	p value	Result
NPRS MEAN±SD	46.6±6.0	78.5±7.8	17.072	<0.0001	Extremely significant

Graph showing the pre & post values of NPRS of group A (Cyriax transverse friction massage)

Table 9: showing the Pre & Post values of NPRS of group A (Cyriax transverse friction massage)

Group A	Pre	Post	t value	p value	Result
NPRS MEAN±SD	8.24±1.2	3.5±0.7	20.76	<0.0001	Extremely significant



Graph 7: Graph showing the pre & post values of NPRS of group A (Cyriax transverse friction massage)

Result

The present study was conducted to compare the effect of Cyriax (transverse friction massage) on pain and function in patients of plantar fasciitis.

The statistical analysis was done using in stat software. Inter group analysis was done by unpaired t test while intra group comparison was done using paired t-test. The average pretreatment FAAM was 46.6±6.0 in group A and 51.9±10.5 in group B.

In group A, the FAAM increased from 46.6±6.0 pretreatment to 78.5±7.8 post treatment with P value <0.0001.

There was significant difference in the PRE and POST FAAM in group A.

In group B, the FAAM increased from 51.9±10.5 pretreatment to 94.7±2.2 post treatment with p value < 0.0001.

There was significant difference in the PRE and POST FAAM in group B.

Post treatment FAAM for Group A and Group B was analyzed; using unpaired t test.

Difference between the groups were statistically significant with t=7.703 and p= <0.001.

The average pretreatment NPRS was in group A 8.24±1.2 and 7.5±1.1 in group B.

In group A, the NPRS decreased from 8.24±1.2 pretreatment to 3.5±0.7 post treatment with P value <0.001.

There was significant difference in the PRE and POST NPRS in group A.

In group B, the NPRS decreased from 7.5±1.1 pretreatment to 4.1±0.6 post treatment with p value <0.001.

There was significant difference in the PRE and POST NPRS in group B.

Post treatment NPRS for Group A and Group B was analyzed using unpaired t test.

Difference between the groups were statistically significant with t= 2.47 and p = 0.0196.

Limitations

- Ankle ROM were not taken into the consideration.
- Study has small sample size.

Future scope of the study

- The study can be done separately in males and females.
- Study can be conducted in particular profession.

The study can be conducted in other town, villages or any specific area.

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