Effects of Instrument Assisted Soft Tissue Mobilization and Myofascial Release Technique among patients with Chronic Heel Pain

Muhammad Umer Arshad [1], Muhammad Salman Bashir[2], Wajeeha Zia[3], Dr. Sarfraz Ahmad[4]

[1] Student, Faculty of Health Sciences, Riphah International university QIE campus, Lahore Pakistan.

[2] Professor, Faculty of Health Sciences, Riphah International university QIE campus, Lahore Pakistan.

[3] Assistant professor, RCR &AHS, Riphah International university QIE campus Lahore Pakistan.

[4] Registrar, Gulab Devi Educational Complex Hospital, Lahore Pakistan.

Abstract-

Objective: The purpose of the study was to compare the effects of both techniques, assisted soft tissue mobilization (IASTM) and myofascial release technique (MFR), to improve pain and mobility among patients with chronic heel pain.

Methodology: It was a quasi-experimental study with a sample size of 70 with 5% margin of error and 95% confidence interval. Participants were recruited from outpatient department of physiotherapy of private hospital through convenient sampling technique. IASTM and MFR interventions were received by 33 participants in each allocated group. Both groups were treated for three sessions per week for four weeks. Pre and post treatment readings were measured on NPRS and FADI.

Results: Both groups were similar at baseline on (age, weight, height, and BMI) and clinical characteristics NPRS, and FADI. To compare mean changes between groups, independent t-test was used. The mean difference of NPRS between groups in IASTM was 7.90 (1.01) to 1.60 (0.55) and in MFR group was 7.75 (1.0) to 2.87 (1.02) with p=0.001. The functional mobility on FADI was changed from 32.87 (14.21) to 95.81 (3.11) in IASTM and in MFR was changed from 32.33 (9.42) to 64.03 (9.23) with p=0.001.

Conclusion: The current study concluded that Instrument Assisted Soft Tissue Mobilization is more effective than Myofascial Release Technique in reducing pain and improving functional mobility of foot and ankle in chronic pain of heel.

Index Terms- Gastrocnemius muscle, Instrument Assisted, Mayo fascial release, Plantar fasciitis, Soft tissue technique,

I. INTRODUCTION

Heel pain is one of common complaint in musculoskeletal clinics although it is a very extensive term. It is the pain and soreness in heel and difficulty in weight bearing. Planter fasciitis is one most common cause of it. More precisely, it is pain in medial side of the heel that extents to medial longitudinal arch of the foot and often associated with pain at weight bearing at early morning. Discomfort in the proximal plantar fascia can be elicited by passive ankle/first toe dorsiflexion. (1, 2) It is of unknown etiology that could be due to micro-trauma to planter fascia, collagen degeneration, changes in the planter Aponeurosis, but biomechanical fault is always present in all cases.(3) Any factor which is responsible for mechanical overloading of planter fascia can be addressed as risk factors obesity, foot arch, decrease dorsiflexion ROM and tightness in calf muscles. (4, 5) It is mostly reported after long standing or running with the prevalence of heel pain 3-7% in general population with greater rate in women as compared to men. (4, 6, 7)

While during differential diagnosis, there is limited role of x-ray, however in some cases heel pain may be due to heel spur, in few younger patients there is calcaneal apophysitis in lateral view of x-rays. But there is not a strong relationship between planter fascities and heel spur has not been established. It is mostly diagnosed with pattern of pain and muscular tightness. (8, 9) Mostly corticosteroid injections are considered as common choice of management of about 75% American podiatrists and orthopedic surgeons**.** (10) In small proportion of patients, surgical release of planter fascia is also considered but does give satisfactory results. New techniques such as endoscopic plantar

release and extracorporeal shockwave therapy may have a role but the limited availability of equipment and skills means that most patients will continue to be treated by more traditional techniques. In physiotherapy, there are many approaches like stretching of calf muscles, dry cupping, trigger point release, soft tissue mobilization, mayofascial release, and instrument assisted techniques. (11, 12)

Clinical physiotherapists also considered mayofascial restrictions as source of pain and decrease ROM and different techniques are available for release of soft tissue restrictions. Mayofascial release (MFR) is a used to apply compression and sustained stretching of the targeted muscle that not only release the restriction and improve ROM but also reduce the pain and improve mobility. It is one of the conventional techniques used for soft tissue restriction release.(7) On the other hand, there are few modified techniques which are instrument assisted that not only release the restriction but also save the efforts of physiotherapists.

Instrument-Assisted Soft Tissue Mobilization (IASTM) is uses specifically designed instruments to identify and treat myofascial restrictions. It is based off the principles of deep transverse friction massage, which was made popular by James Cyriax, M.D. It is also known as Graston Technique. There are 6 stainless steel instruments which are specific for different regions and types of muscles which need to be targeted.(13)

Both techniques are based on the same principles, but one is further assisted by an instrument. It is designed to reduce fatigue of the clinician's hands and to detect lesions by amplifying the resonance felt through the instrument. The purpose of the study was to compare the effects of both techniques, assisted soft tissue mobilization (IASTM) and myofascial release technique (MFR), to improve pain and mobility among patients with chronic heel pain.

II. MATERIAL AND METHODS

Study design and participants characteristics

It was a Quasi experimental study with a sample size of 70 which was measured by using G-power Analysis Software calculator (Version 3.1.9.2) by assuming 9% attrition rate with 0.80 power of study, with 5% margin of error and 95% confidence interval.(14, 15) It was conducted after getting approval from ethical committee. Participants were recruited from outpatient department of physiotherapy of private hospital. Participants were recruited between the age group of 22 years to 40 years, having tight Achilles tendon and heel pain from last 3 months without any radicular symptom. Exclusion criteria was any history of recent fracture or trauma, two or more positive neurologic signs consistent with nerve root compression or having foot drop, any metabolic diseases, rheumatoid arthritis and osteoporosis etc. (14)

Outcome measure variables

Pain was measured by Numeric Pain Rating Scale (NPRS), Ankle foot disability index AFDI for Functional mobility was taken. NPRS is self-reported single dimensional 11point scale between 0 and 10 with test–retest reliability of r = 0.96 and validity correlations of 0.86 to 0.95. (16) The foot and ankle index (FADI) is used for the measurement of pain and disability in foot and ankle. It is of 26 item with liker scale. The total score is 104 and maximum score indicate absence of pain and difficult is of 26 item with liker scale. The total score is 104 and maximum score indicate absence of pain and difficulty in daily activities. (17, 18)

Recruitment and allocation to groups

An assessor physiotherapist assessed all the participants by physical examination as per the eligibility criteria. All the participants were informed about their participation in the study, oral explanation was given to them. Written informed consent was filled by all the participants along with basic socio-demographic details i.e., age, weight, height, and BMI.

After completion of thorough case history, physical assessment, and examination by as Assessor physiotherapist. Participants were allocated to parallel group with ratio of 1:1 (35 participants in each group). Assessment and examination of participants was done before and after the application of interventions by assessor physiotherapist. As per calculated sample size 70 participants were recruited into the trail. Out of 70 participants, only 2 participants were excluded because they could not meet the inclusion criteria and 2 were not willing for further treatment. All selected participants were divided into two groups. IASTM and

MFR interventions were received by 33 participants in each allocated group. Both groups were treated for three sessions per week for four weeks. After that post treatment readings were measured.

Intervention:

Both groups were treated with cold pack for 7-10 minutes to reduce the pain of fascia. Both groups were treated with cold pack for 7-10 minutes to reduce the pain of fascia. In home plan, both groups were advised to apply ice cubes at heel with moderate pressure for five to ten minutes. (3)

IASTM

This group was treated with IASTM for seven to ten minutes. The GT 4 instrument was used for this study. It has a single bevel with smaller convex treatment edges at each end. It was used to scan the large muscle areas. Small amount of lubricant was applied and the treated the medial and lateral part of gastrocnemius and both side of Achilles tendon with GT-4. Feedback regarding pain was asked from patient before termination of session. (19)

MFR

MFR was applied to medial and lateral sides of gastrocnemius muscle and the sides of the Achilles tendon with the knuckles of dominant hand of the physiotherapists consisted of broad strokes to release superficial restrictions. Strokes were applied at 45° of hand in relation of calf muscle. After that small restrictions were located and the release with the deep thumb massage. Feedback regarding pain was asked from patient and then muscle belly was shaken for 30 seconds. (14, 20, 21)

Data analysis

Data was checked for normality by Shapiro–Wilk's test with the help of SPSS version 25 for Windows software. Both groups were similar at baseline measurement of demographic (age, weight, height and BMI) and clinical characteristics NPRS, and FADI with p>0.05. Table-1. As the data was normally distributed parametric test were applied to determine the pre-treatment and post treatment changes within the groups and between the groups. To compare mean changes between groups, independent t-test was used. Significance level was set at p=0.05.

III. RESULTS

Both groups were similar at baseline measurements as shown in Table-1 The mean difference of pain on NPRS between groups in IASTM was 7.90 (1.01) to 1.60 (0.55) and in MFR group was 7.75 (1.0) to 2.87 (1.02) with p=0.001 with statistical and clinical significance. The functional mobility on FADI was changed from 32.87 (14.21) to 95.81 (3.11) in IASTM and in MFR was changed from 32.33 (9.42) to 64.03 (9.23) with p=0.001. As Shown the differences within group in Table-2. In the clustered bar chart, it is shown that improvement in pain was greater (IASTM) group as compared to (MFR).

Table 1: Baseline Characteristics of Participants

Characteristic	Randomized (n = 66)		p value
	(IASTM) (n = 33)	(MFR) (n = 33)	
Age (yr), mean (SD)	30.21 (6.42)	31.53 (5.82)	0.83
Height (m), mean (SD)	1.65 (0.12)	1.61 (0.10)	0.74
Weight (kg), mean (SD)	78.18 (9.10)	75.64 (9.10)	0.47
BMI (kg/m), mean (SD)	32.04 (4.99)	32.05 (5.43)	0.92
NPRS, mean (SD)	7.90 (1.01)	7.75 (1.06)	0.66
FADI, mean (SD)	32.87 (12.17)	32.33 (9.42)	0.14

IASTM = Instrument Assisted Soft Tissue Mobilization, MFR= Myofascial Release Technique
NPRS= Numeric Pain Rating Scale, FADI= Foot Ankle Disability Index.

Table-2: Within Group Outcome Variable Differences

Variables		(IASTM)	(MFR)	p-value
		Mean ± SD	Mean ± SD	
NPRS	Pre-treatment	7.90 (1.01)	7.75 (1.0)	0.66
	Post-treatment	1.60 (0.55)	2.87 (1.02)	0.000
FADI	Pre-treatment	32.87 (14.21)	32.33±9.42	0.14
	Post-treatment	95.81 (3.11)	64.03 (9.23)	0.000

IV. DISCUSSION

The purpose of the study was to compare the effects of IASTM and MFR on chronic heel pain, the results of the study showed

that there was marked improvement in pain on NPRS and functional mobility on FADI with statistically significant difference with p value <0.05. The findings of this study are comparable with the study done of IASTM and myofascial release. In that study, there was immediate changes in ROM with mysofasical release as compared with IASTM. But in this study, there was marked change in IASTM in pain and mobility after the session of 4 weeks. Although the MFR group also showed statistically significant results, but the mean difference was greater in IASTM as was 7.90 (1.01) to 1.60 (0.55) in IASTM and was 7.75 (1.0) to 2.87 (1.02) in MFR. (14)

A study was conducted by Heyer and Kathryn in 2011 on effects of IASTM on iliotibial band tightness, the results of that study showed 25% improvement in ROM from base line to 4th day of Garston session in decreasing pain and improving range of ankle dorsiflexion. The results are same as in this study, there was marked change in functional mobility from changed from 32.87 (14.21) to 95.81 (3.11) in IASTM and in MFR was changed from 32.33 (9.42) to 64.03 (9.23) on FADI (22) The results of this study contradict the study conducted by Christopher Yelverton et al. there were three groups, mobilization of manipulation to the ankle and foo, cross friction massage of calf muscles, and combination of both. There was greater improvement in range after mobilization and manipulation but FADI and pain was improved in group treated with combination. (23)

However, a systematic review on the effects of myofascial release of different muscles i.e., hamstrings muscles, shoulder mobility, TMJ mobility in dysfunction correction. In all these study there was marked improvement in range after soft tissue mobilization techniques. (24) More elaboration can be understood by a study conducted by Bialosky et al on comprehensive model of manual therapy approaches. This model by included a potential combined effect from biomechanical or neurologic mechanisms to explain the results of manual therapy. As per the results of this study, there is difference in mechanical and proprioceptive changes in terms of range and pain after the application of manual techniques or directly targeting the soft tissue muscles and immediately change the tissue tone. (24) (25) There are few study that showed human touch produced better results in soft tissue mobilization, which contrad icts this study. But several groups have reported that self-myofascial release achieved through foam rolling or other self-myofascial instruments routinely produced changes in ROM, which clearly support this study. (26, 27) Both IASTM and MFR use similar treatment guidelines and principles to reduce the pain and tone of targeted muscles and improve the mobility. Both are clinically effective treatment as per literature and clinicians point of views, but IASTM not only produce marked effects but also reduces the efforts of the physiotherapist's hand in application of these stokes. Immediate effects of both techniques were not measured which was the limitation of the study.

V. CONCLUSION

The current study concluded that Instrument Assisted Soft Tissue Mobilization is more effective than Myofascial Release Technique in reducing pain and improving functional mobility of foot and ankle in chronic pain of heel.

Acknowledgement: None

Disclaimer: It belongs to research thesis.

Conflict of interest: There is no conflict of interest.

Funding disclosure: There was no funding source.

REFERENCES

1. TU P, BYTOMSKI JR. DIAGNOSIS OF HEEL PAIN. AMERICAN FAMILY PHYSICIAN. 2011;84(8):909-16. EPUB 2011/10/21. PUBMED PMID: 22010770.

2. Goff JD, Crawford R. Diagnosis and treatment of plantar fasciitis. American family physician. 2011;84(6):676-82. Epub 2011/09/16. PubMed PMID: 21916393.

3. Lim AT, How CH, Tan B. Management of plantar fasciitis in the outpatient setting. Singapore medical journal. 2016;57(4):168-70; quiz 71. Epub 2016/04/15. doi: 10.11622/smedj.2016069. PubMed PMID: 27075037; PubMed Central PMCID: PMCPmc4853481.

4. Beeson P. Plantar fasciopathy: revisiting the risk factors. Foot and ankle surgery : official journal of the European Society of Foot and Ankle Surgeons. 2014;20(3):160-5. Epub 2014/08/12. doi: 10.1016/j.fas.2014.03.003. PubMed PMID: 25103701.

5. Riddle DL, Pulisic M, Pidcoe P, Johnson RE. Risk factors for plantar fasciitis: a matched case-control study. JBJS. 2003;85(5):872-7.

6. Scher DL, Belmont PJ, Jr., Bear R, Mountcastle SB, Orr JD, Owens BD. The incidence of plantar fasciitis in the United States military. The Journal of bone and joint surgery American volume. 2009;91(12):2867-72. Epub 2009/12/03. doi: 10.2106/jbjs.i.00257. PubMed PMID: 19952249.

7. AlKhadhrawi N, Alshami A. Effects of myofascial trigger point dry cupping on pain and function in patients with plantar heel pain: A randomized controlled trial. Journal of bodywork and movement therapies. 2019;23(3):532-8. Epub 2019/09/30. doi: 10.1016/j.jbmt.2019.05.016. PubMed PMID: 31563366.

8. Johal KS, Milner SA. Plantar fasciitis and the calcaneal spur: Fact or fiction? Foot and ankle surgery : official journal of the European Society of Foot and Ankle Surgeons. 2012;18(1):39-41. Epub 2012/02/14. doi: 10.1016/j.fas.2011.03.003. PubMed PMID: 22326003.

9. Moroney PJ, O'Neill BJ, Khan-Bhambro K, O'Flanagan SJ, Keogh P, Kenny PJ. The conundrum of calcaneal spurs: do they matter? Foot & ankle specialist. 2014;7(2):95-101. Epub 2014/01/01. doi: 10.1177/1938640013516792. PubMed PMID: 24379452.

10. McMillan AM, Landorf KB, Gilheany MF, Bird AR, Morrow AD, Menz HB. Ultrasound guided corticosteroid injection for plantar fasciitis: randomised controlled trial. BMJ (Clinical research ed). 2012;344:e3260. Epub 2012/05/24. doi: 10.1136/bmj.e3260. PubMed PMID: 22619193.

11. Pollack Y, Shashua A, Kalichman L. Manual therapy for plantar heel pain. Foot (Edinburgh, Scotland). 2018;34:11-6. Epub 2017/11/28. doi: 10.1016/j.foot.2017.08.001. PubMed PMID: 29175715.

12. Cutts S, Obi N, Pasapula C, Chan W. Plantar fasciitis. Annals of the Royal College of Surgeons of England. 2012;94(8):539-42. Epub 2012/11/08. doi: 10.1308/003588412x13171221592456. PubMed PMID: 23131221; PubMed Central PMCID: PMCPmc3954277.

13. Stow R. Instrument-assisted soft tissue mobilization. International journal of athletic therapy and training. 2011;16(3):5-8.

14. Stanek J, Sullivan T, Davis S. Comparison of Compressive Myofascial Release and the Graston Technique for Improving Ankle-Dorsiflexion Range of Motion. Journal of athletic training. 2018;53(2):160-7. Epub 2018/01/27. doi: 10.4085/1062-6050-386-16. PubMed PMID: 29373060; PubMed Central PMCID: PMCPmc5842906.

15. Bruin J. newtest: command to compute new test {@ONLINE}. 2020.

16. Ferreira-Valente MA, Pais-Ribeiro JL, Jensen MP. Validity of four pain intensity rating scales. Pain. 2011;152(10):2399-404. Epub 2011/08/23. doi: 10.1016/j.pain.2011.07.005. PubMed PMID: 21856077.

17. Leigheb M, Rava E, Vaiuso D, Samaila EM, Pogliacomi F, Bosetti M, et al. Translation, cross-cultural adaptation, reliability, and validation of the italian version of the Foot and Ankle Disability Index (FADI). Acta bio-medica : Atenei Parmensis. 2020;91(4-s):160-6. Epub 2020/06/20. doi: 10.23750/abm.v91i4-S.9544. PubMed PMID: 32555091; PubMed Central PMCID: PMCPMC7944815 stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

18. Hale SA, Hertel J. Reliability and Sensitivity of the Foot and Ankle Disability Index in Subjects With Chronic Ankle Instability. Journal of athletic training. 2005;40(1):35-40. Epub 2005/05/20. PubMed PMID: 15902322; PubMed Central PMCID: PMCPmc1088343.

19. Kim J, Sung DJ, Lee J. Therapeutic effectiveness of instrument-assisted soft tissue mobilization for soft tissue injury: mechanisms and practical application. Journal of exercise rehabilitation. 2017;13(1):12-22. Epub 2017/03/30. doi: 10.12965/jer.1732824.412. PubMed PMID: 28349028; PubMed Central PMCID: PMCPmc5331993.

20. Grieve R, Clark J, Pearson E, Bullock S, Boyer C, Jarrett A. The immediate effect of soleus trigger point pressure release on restricted ankle joint dorsiflexion: A pilot randomised controlled trial. Journal of bodywork and movement therapies. 2011;15(1):42-9. Epub 2010/12/15. doi: 10.1016/j.jbmt.2010.02.005. PubMed PMID: 21147417.

21. Grieve R, Cranston A, Henderson A, John R, Malone G, Mayall C. The immediate effect of triceps surae myofascial trigger point therapy on restricted active ankle joint dorsiflexion in recreational runners: a crossover randomised controlled trial. Journal of bodywork and movement therapies. 2013;17(4):453-61. Epub 2013/10/22. doi: 10.1016/j.jbmt.2013.02.001. PubMed PMID: 24139003.

22. Heyer K. Effect of implement assisted soft tissue mobilization on iliotibial band tightness 2011.

23. Yelverton C, Rama S, Zipfel B. Manual therapy interventions in the treatment of plantar fasciitis: A comparison of three approaches. Health SA = SA Gesondheid. 2019;24:1244. Epub 2020/01/15. doi: 10.4102/hsag.v24i0.1244. PubMed PMID: 31934436; PubMed Central PMCID: PMCPmc6917457.

24. Ajimsha MS, Al-Mudahka NR, Al-Madzhar JA. Effectiveness of myofascial release: systematic review of randomized controlled trials. Journal of bodywork and movement therapies. 2015;19(1):102-12. Epub 2015/01/22. doi: 10.1016/j.jbmt.2014.06.001. PubMed PMID: 25603749.

25. Bialosky JE, Bishop MD, Price DD, Robinson ME, George SZ. The mechanisms of manual therapy in the treatment of musculoskeletal pain: a comprehensive model. Manual therapy. 2009;14(5):531-8. Epub 2008/11/26. doi: 10.1016/j.math.2008.09.001. PubMed PMID: 19027342; PubMed Central PMCID: PMCPmc2775050.

26. MacDonald GZ, Penney MD, Mullaley ME, Cuconato AL, Drake CD, Behm DG, et al. An acute bout of self-myofascial release increases range of motion without a subsequent decrease in muscle activation or force. Journal of strength and conditioning research. 2013;27(3):812-21. Epub 2012/05/15. doi: 10.1519/JSC.0b013e31825c2bc1. PubMed PMID: 22580977.

27. Halperin I, Aboodarda SJ, Button DC, Andersen LL, Behm DG. Roller massager improves range of motion of plantar flexor muscles without subsequent decreases in force parameters. International journal of sports physical therapy. 2014;9(1):92-102. Epub 2014/02/26. PubMed PMID: 24567860; PubMed Central PMCID: PMCPmc3924613.

AUTHORS

First Author – **,** Student, , Riphah international university QIE campus, Lahore**.** Pakistan

Second Author – Muhammad Salman Bashir, Professor, Riphah College of Rehabilitation & Allied Health Sciences, Riphah International University, Lahore, Pakistan.

Third Author – Wajeeha Zia, Assistant professor**,** RCR &AHS, Riphah international university QIE campus, Lahore, Pakistan.

Fourth Author – Dr. Sarfraz Ahmad Registrar, Gulab Devi Educational Complex Hospital, Lahore , Pakistan.