

ORIGINAL ARTICLE

STRETCHING EXERCISES VERSUS DEEP FRICTION MASSAGE FOR THE MANAGEMENT OF PIRIFORMIS SYNDROME

1. Assistant Professor (visiting). Department of Physiotherapy, University of Hail Riyadh Saudi Arabia
2. Physical Therapist. Department of Rehabilitation, Fouji Foundation Hospital, Rawalpindi. Pakistan.
3. Director. Department of Physical Therapy & Rehabilitation. Benazir Bhutto Hospital Rawalpindi (BBH), Rawalpindi
4. Associate Professor. Isra Institute of Rehabilitation Sciences, Isra University Islamabad. Pakistan
5. Department of Physical Therapy, PAF School For Special Education

Correspondence

Dr Rabnawaz Khan
 Director. Department of Physical Therapy & Rehabilitation. Benazir Bhutto Hospital Rawalpindi (BBH), Rawalpindi
 E-mail: dr.khanktk@gmail.com

Received on: 13-06-2018

Revision on: 10-09-2018

Published on: 31-12-2018

Citation

Kanwal R, Khan J, Khan Rn, Awan WA, Malik S. Stretching exercises versus deep friction massage for the management of piriformis syndrome. T Rehabil. J. 2018;02(02): 65-69
 doi: [21-2017/re-trjvol02iss02p65](https://doi.org/10.212017/re-trjvol02iss02p65)

Raheela Kanwal¹: Analysis & interpretation of data, writing; Revised and Accountable for all aspects
 Javeria Khan²: Analysis & interpretation of data, writing; Revised and Accountable for all aspects
 Waqar Ahmed Awan³: Analysis & interpretation of data, writing; Revised and Accountable for all aspects
 Rabnawaz Khan⁴: Writing; Revised and Accountable for all aspects
 Shomaila Malik⁵: Writing; Revised and Accountable for all aspects

ABSTRACT

Objective: to compare cross friction massage (CFM) and stretching exercise (SE) in decreasing pain and disability in patients with piriformis syndrome. **Methods:** A randomized controlled trial was conducted at Benazir Bhutto Hospital Rawalpindi for duration of 1 year (June 2017-18). Non probability convenience sampling technique was used for data collection. A total of n=47 participants between 20-60 years with +ve FAIR test with mild to moderate level of disability on Oswestry disability index (ODI) were included in the study. A total of n=47 were divided into two groups, CFM group (n=23) and SE group (n=24). The demographic data was collected in term of age, gender, height, weight, BMI, sitting and standing duration. Each participant was evaluated for symptoms of piriformis syndrome on Oswestry Disability Index (ODI). Paired samples t-test was used to analyze with-in group changes in both groups and independent t-test was use to compare the effects of both rehabilitation protocols. **Results:** The mean age of study participants in both groups was 37.62±8.97. Between-group changes showed significant difference in overall ODI of CFM group & SE group (7.08±2.74 ver. 13.27, $p<0.001$). But individual item of ODI including lifting (1.13±0.91 ver. 1.58±0.97, $p=0.10$), standing (1.08±1.23 ver. 1.50±1.31, $p=0.27$) and sleeping 0.65±0.93 ver. 1.20±1.21, $p=0.08$) did not showed significant difference in both groups. **Conclusion:** it is concluded that cross friction massage is more effective in reducing pain and improving functional abilities in patients with piriformis syndrome as compare to stretching exercises

Keywords: friction massage, physical therapy, piriformis syndrome, stretching exercises, sciatica

INTRODUCTION

Piriformis syndrome is the compression or irritation of sciatic nerve causing pain in low back, hip region, back of thigh radiating to leg and side of foot along with the root of sciatic nerve.¹ Patient experiences pain, numbness, burning sensation, painful bowel movements, trouble with walking and performing other functional activities. If untreated it causes problems with prolonged sitting, walking and long standing.² Magnetic resonance imaging, X-rays of hip, electromyography, freiberg and beatty test are considered for diagnosis of piriformis syndrome.³ Treatment for piriformis syndrome includes NSAIDs, painkillers, muscle relaxant, steroids, physical therapy, and psychiatric therapy.⁴ Physical therapy management includes number of treatment options such as hot packs, ultrasound, shockwave therapy, soft tissue mobilization, cold packs, stretching exercises. Muscle stretches, Gebauer's spray and stretch technique, and soft tissue, myofascial, muscle energy, and thrust techniques can relieve all somatic dysfunctions in the patient with piriformis syndrome.^{5,6,7} Surgical

treatment is done in severe cases when symptoms become severe and stubborn and syndrome is causing disability.⁸

Soft tissue mobilization techniques are effective than electrotherapy for the management of symptoms related to piriformis syndrome.⁷ Cross friction massage helps to release scar tissue and break adhesions in muscles.⁹ The stretching exercise improves the elasticity and flexibility of muscles thus reducing pressure on sciatic nerve.¹⁰ Some studies showed that cross friction massage and stretching exercise are effective in relieving pain and reducing disability in patients.^{7,9,10}

But in past no study have been conducted to find out the effects produced by these techniques separately. Most of the studies have reported effectiveness of different physical therapy techniques on symptoms of piriformis syndrome; no study investigated the effects on disability level. For this reason, randomized controlled trial was focused on the comparison of the results produced by cross friction massage and stretching exercise separately in

decreasing pain and disability in patients with piriformis syndrome.

MATERIAL & METHODS

A randomized controlled trial was conducted at Benazir Bhutto Hospital Rawalpindi for duration of 1 year. Non probability convenience sampling technique was used for data collection. Physiotherapist performed FAIR test (sensitivity=0.881 & specificity=0.832) to evaluate each participant for piriformis syndrome. A total of

n=56 participants between 20-60 years with +ve FAIR test with mild to moderate level of disability on Oswestry disability index (ODI) were included in the study. A total of n=53 were divided into two groups, cross friction massage (CFM) group (n=23) and stretching exercises (SE) group (n=24) and n=47 participants received intervention. (Figure 1) Participants with diagnosis of lumbar sacral disk herniations, hip and sacroiliac osteoarthritis were excluded from the study.

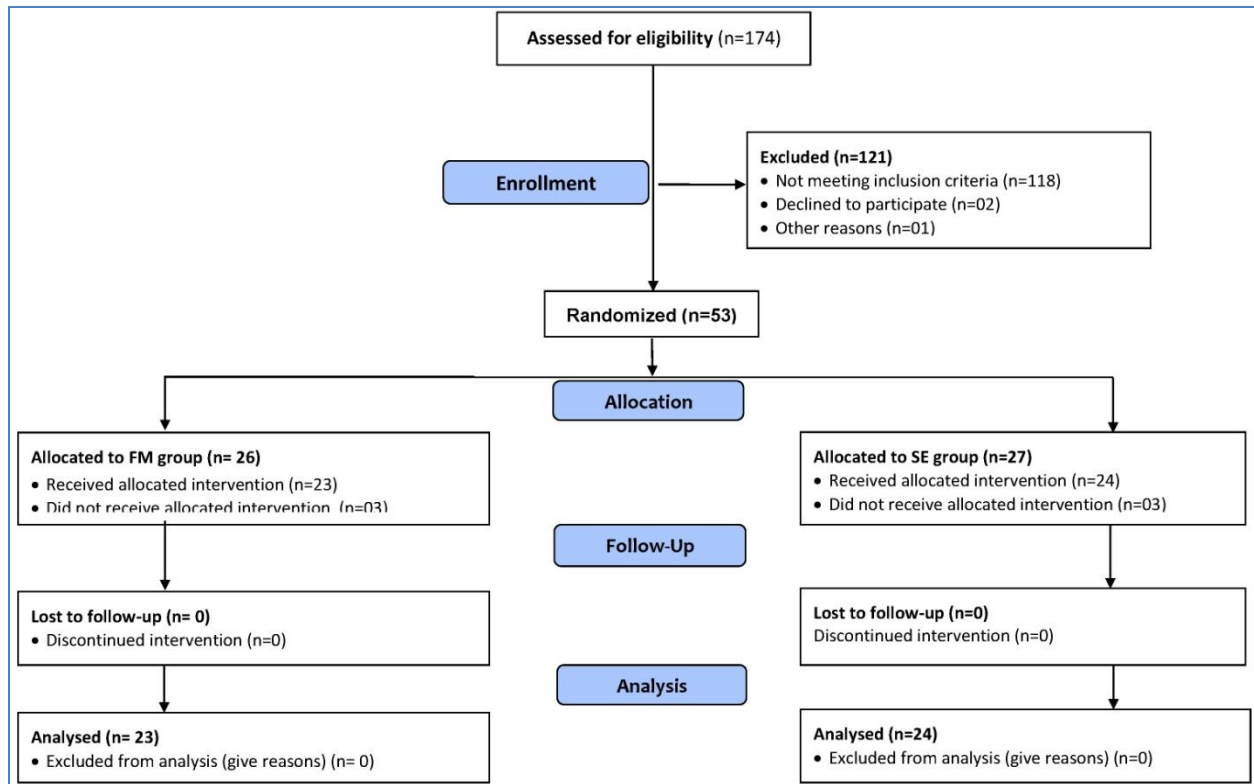


Figure 1: CONSORT diagram

Patients of both groups were given physiotherapy sessions in outpatient department and they were guided for regular follow up visits. After taking informed consent from the study participant’s demographic data was collected in term of age, gender, height, weight, BMI, sitting and standing duration. Each participant was evaluated for symptoms of piriformis syndrome on Oswestry

Disability Index (ODI). The both CFM and SE groups received hot pack at gluteal region for 15 minutes along with stretching of hamstring muscle for 10 seconds and 10 repetitions per session. Additional detail of treatment protocol is given in table 1. After the completion of 3 weeks of management final data was obtain by ODI.

Table 1: Intervention Protocol

	CFM Group	SE Group
Frequency of sessions	3 days/week for 3 weeks	3 days/week for 3 weeks
Repetitions of technique in each session	10 Repetition/per session	10 Repetition/per session
Duration of each technique	10 sec	30 sec

The data was normally distributed on the basis of Shapiro–Wilk test. Paired samples t-test was used to analyze with-in group changes in both groups and independent t-test was use to compare the effects of both rehabilitation protocols on the symptoms of piriformis syndrome. The data was analyzed through SPSS 20 and level of significance was set at $p \leq 0.05$.

RESULTS

The mean age of study participants in both groups was 37.62 ± 8.97 . A total of $n=26$ females and remaining $n=21$ were male divided in friction massage (CFM) group ($n=14$ females & $n=9$ males) and stretching exercises (SE) group ($n=12$ female & $n=12$ male). It was found that $n=18$ were obese ($n=10$ CFM & $n=8$ SE), $n=17$ were overweight ($n=8$ CFM & $n=9$ SE) and $n=12$ were normal ($n=5$ CFM & $n=7$ SE).

Table 2: Demographic characteristics - (CFM Group $n=23$, SE Group $n=24$)

	Groups	Mean	SD	p-value
Age	CFM	39.65	6.54	0.12
	SE	35.67	10.58	
Height (Feet)	CFM	5.47	0.29	0.61
	SE	5.52	0.27	
Weight (Kg)	CFM	77.60	9.02	0.60
	SE	76.04	11.61	
BMI	CFM	27.95	3.85	0.45
	SE	27.10	3.85	
Sitting (hr/day)	CFM	5.69	2.49	0.30
	SE	5.00	2.08	
Standing (hr/day)	CFM	3.52	2.21	0.86
	SE	3.62	1.92	

Within the group changes showed that overall pre & post changes of CFM GROUP showed significant improvement (25.34 ± 4.55 ver. 7.08 ± 2.74 , $p < 0.001$) in overall mean score of ODI. The SE group also showed significant improvement (28.62 ± 6.90 ver. 13.29 ± 7.66 , $p < 0.001$) in the overall mean score of ODI. The detail with-in group changes in individual items of ODI were presented in table 3.

After completion of rehabilitation of piriformis syndrome, between-group changes showed significant difference in overall ODI of CFM group & SE group (7.08 ± 2.74 ver. 13.27 , $p < 0.001$). But individual item of ODI including lifting (1.13 ± 0.91 ver. 1.58 ± 0.97 , $p = 0.10$), standing (1.08 ± 1.23 ver. 1.50 ± 1.31 , $p = 0.27$) and sleeping 0.65 ± 0.93 ver. 1.20 ± 1.21 , $p = 0.08$) did not showed significant

difference in both groups (table 4). The results showed that mostly study participant were improved from moderate to mild disability on ODI. (Figure 2)

Table 3: Within –Group Changes (CFM Group $n=23$, SE Group $n=24$)

		CFM Group			SE Group		
		Mean	SD	p-value	Mean	SD	p-value
Pain Intensity	Pre	2.91	1.20	<0.001	2.96	1.51	<0.001
	Post	0.91	0.59		1.46	0.77	
Personal Care	Pre	2.26	1.00	<0.001	2.66	1.09	<0.001
	Post	0.52	0.59		1.16	1.00	
Lifting	Pre	3.21	1.24	<0.001	3.33	1.20	<0.001
	Post	1.13	0.91		1.58	0.97	
Walking	Pre	2.60	0.72	<0.001	2.95	0.90	<0.001
	Post	0.65	0.64		1.25	0.94	
Sitting	Pre	2.52	1.08	<0.001	2.79	0.88	<0.001
	Post	0.60	0.65		1.29	0.85	
Standing	Pre	2.56	1.34	<0.001	2.83	1.37	<0.001
	Post	1.08	1.23		1.50	1.31	
Sleep	Pre	2.17	1.26	<0.001	2.79	1.50	<0.001
	Post	0.65	0.93		1.20	1.21	
Social	Pre	2.39	0.49	<0.001	2.75	0.89	<0.001
	Post	0.39	0.58		1.33	0.81	
Travelling	Pre	2.30	0.63	<0.001	2.70	1.26	<0.001
	Post	0.52	0.59		1.08	1.13	
Employment	Pre	2.39	0.94	<0.001	2.83	1.12	<0.001
	Post	0.60	0.58		1.41	1.01	
Total Score	Pre	25.34	4.55	<0.001	28.62	6.90	<0.001
	Post	7.08	2.74		13.29	7.66	

Table 4: Between Group Comparison (CFM Group $n=23$, SE Group $n=24$)

		CFM Group			SE Group		
		Mean	SD	p-value	Mean	SD	p-value
Pain Intensity	Pre	2.91	1.20	<0.001	2.96	1.51	<0.001
	Post	0.91	0.59		1.46	0.77	
Personal Care	Pre	2.26	1.00	<0.001	2.66	1.09	<0.001
	Post	0.52	0.59		1.16	1.00	
Lifting	Pre	3.21	1.24	<0.001	3.33	1.20	<0.001
	Post	1.13	0.91		1.58	0.97	
Walking	Pre	2.60	0.72	<0.001	2.95	0.90	<0.001
	Post	0.65	0.64		1.25	0.94	
Sitting	Pre	2.52	1.08	<0.001	2.79	0.88	<0.001
	Post	0.60	0.65		1.29	0.85	
Standing	Pre	2.56	1.34	<0.001	2.83	1.37	<0.001
	Post	1.08	1.23		1.50	1.31	
Sleep	Pre	2.17	1.26	<0.001	2.79	1.50	<0.001
	Post	0.65	0.93		1.20	1.21	
Social	Pre	2.39	0.49	<0.001	2.75	0.89	<0.001
	Post	0.39	0.58		1.33	0.81	
Travelling	Pre	2.30	0.63	<0.001	2.70	1.26	<0.001
	Post	0.52	0.59		1.08	1.13	
Employment	Pre	2.39	0.94	<0.001	2.83	1.12	<0.001
	Post	0.60	0.58		1.41	1.01	
Total Score	Pre	25.34	4.55	<0.001	28.62	6.90	<0.001
	Post	7.08	2.74		13.29	7.66	

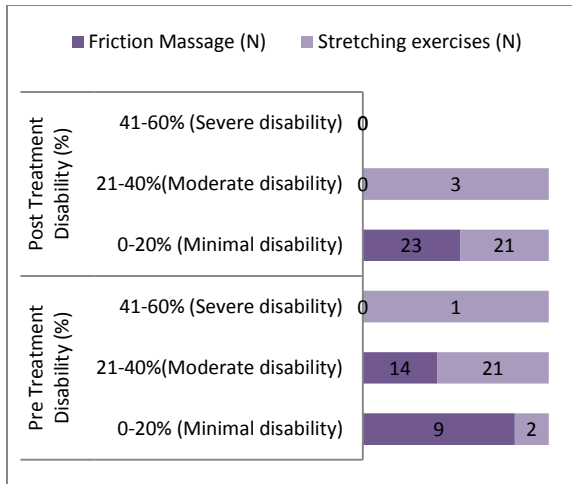


Figure 2: Frequency distribution of change in Pre & Post disability level of study participants

DISCUSSION

The objective of the study was to compare the effects of stretching exercises and friction massage in relieving symptoms associated with piriformis syndrome. The results of the study showed that stretching exercises and friction massage both showed significant effects on symptoms of piriformis syndrome but friction massage is more effective than stretching.

Treatment options for piriformis syndrome focus around the subjective and objective findings of the assessment. A manual medicine approach have also supported the use of muscle stretches and soft tissue, techniques for somatic dysfunctions in the patient with piriformis syndrome.^{5,6}

Indirect osteopathic manipulative techniques like counter-strain and facilitated positional release also remove tension from the piriformis and relieve the symptoms.⁵ The muscle energy technique can also be applied in the management of piriformis spasm. In another study diverse stretching methods were used to reduce piriformis thickness and increase in coxal articulation and all methods were effective to reduce symptoms.¹¹

Cross friction massage helps in reducing inflammation, releasing scar tissue, reduces muscle spasm and enhances flow of blood.⁹ Cross fiber friction provides movement to the tissue itself and produces traumatic hyperemia. The gentle passive movements move the structure but do not detach

the healing fibrils. The transverse movement maintains normal mobility by broadening but not stretching or tearing the healing fibers thus movement encourages realignment and lengthening. Traumatic hyperemia, results in the increased blood supply to the area and decrease pain by increasing the speed of destruction of Lewis' P substance.¹² According to Kirschner et al. piriformis stretching relaxes the tight piriformis muscle, thereby relieving sciatic nerve compression and improving the symptoms.¹³

Stretching improves physical performance ability, prevents injury, reduces muscle pain, and increases flexibility.^{10,13} Stretching generally focuses on increasing the length of a musculotendinous unit and muscle tension is usually inversely related to length: decreased muscular tension is related to increased muscle length, while increased muscular tension is related to decreased muscle length. Inevitably, stretching of muscle applies tension to other structures such as the joint capsule and fascia, which are made up of different tissue than muscle with different biomechanical properties. Thus by increase in length and decrease in tension of piriformis muscle it relieved pressure on sciatic nerve and symptoms improved.¹⁴

Piriformis syndrome causes disability related to daily activities. In present study 9 patients were in crippling pain and 13 in severe disability according to Oswestry disability index and by treatment disability level reduced in both groups but more in Group A according to the mean difference of total disability score pre and post treatment. Overall disability level changed from moderate disability to minimal disability.

A case study done by Awan et al. reported that deep soft tissue mobilization techniques improved the symptoms of piriformis syndrome by reducing compression of the sciatic nerve by surrounding muscles. Transfer fibre frictions were applied for several minutes at the tenoperiosteal junctions and sacrum attachments of the piriformis, as well as the gluteus maximus and minimus attachments. In the same study In conjunction with deep soft tissue mobilization techniques, stretching exercises of

the involved muscle and postural awareness were also effective for reducing pain frequency.¹⁵

Choi and Yoo¹⁰ applied muscle energy technique (MET) to women in their twenties who complained about buttock and lower extremity pain due to piriform muscle syndrome and reported that pain decreased from 4 points to 2 points and the passive flexion angle of the coxal articulation increased from 90° to 120°. In one study Hashemirad et al. applied taping to the trigger point of the piriformis muscle in a stretched position and reported that pain decreased from 6.5 points to 3.9 points and the medial rotation angle increased from 39.5° to 46.2°.¹⁶

Although Improvement by massage is more due to the fact that it improves healing process along with realignment and lengthening of fibres and also by increase in blood supply which directly relieve the pain rather than stretching which focuses only on lengthening the muscle and indirectly decreasing the tension of muscle.

It is evident that demographic data must be noted properly i.e age, gender, BMI, weight, occupation. No of standing and sitting hours because according to the results and literature review they affect the results.

CONCLUSION

The study indicated that cross friction massage (CFM) and stretching exercises (SE) both are significantly improved symptoms of piriformis syndrome. But cross friction massage is more effective in reducing pain and improving functional abilities in patients with piriformis syndrome as compare to stretching exercises.

REFERENCES

1. Cass SP. Piriformis syndrome: a cause of nondiscogenic sciatica. *Curr Sports Med Rep.* 2015;14(1):41-4.
2. Rossi P, Cardinali P, Serrao M, Parisi L, Bianco F, De Bac S, et al. Magnetic resonance imaging findings in piriformis syndrome: A case report. *Arch Phys Med Rehabil.* 2001;82:519-21
3. Vassalou EE, Katonis P, Karantanas AH. Piriformis muscle syndrome: A cross-sectional imaging study in 116 patients and evaluation of therapeutic outcome. *Eur Radiol.* 2018;28(2):447-458.
4. Fishman LM, Dombi GW, Michaelsen C, Ringel S, Rozbruch J, Rosner B, et al. Piriformis syndrome: diagnosis, treatment, and outcome—a 10-year study. *Arch Phys Med Rehabil.* 2002;83(3):295-301
5. Boyajian-O'Neill LA, McClain RL, Coleman MK, Thomas PP. Diagnosis and management of piriformis syndrome: an osteopathic approach. *J Am Osteopath Assoc.* 2008;108(11):657-64.
6. Papadopoulos EC, Khan SN. Piriformis syndrome and low back pain: a new classification and review of the literature. *Orthop Clin North Am.* 2004;35(1):65-71.
7. Awan WA, Naveed M, Babur SA, Janjua U. The effectiveness of electrotherapy with manual therapy in the treatment of piriformis syndrome. *Int. J Rehabil. Sci.* 2012;01(01): 16-19
8. Han SK, Kim YS, Kim TH, Kang SH. Surgical treatment of piriformis syndrome. *Clin Orthop Surg.* 2017;9(2):136-144.
9. Chaves P, Simões D, Paço M, Pinho F, Duarte JA, Ribeiro F. Cyriax's deep friction massage application parameters: Evidence from a cross-sectional study with physiotherapists. *Musculoskelet Sci Pract.* 2017;32:92-97.
10. Choi JH, Yoo KT, An HJ, Choi WS, Koo JP, Kim JI, et al. The effects of taping, stretching, and joint exercise on hip joint flexibility and range of motion. *J Phys Ther Sci.* 2016;28(5):1665-8.
11. Park JC, Shim JH, Chung SH. The effects of three types of piriformis muscle stretching on muscle thickness and the medial rotation angle of the coxal articulation. *J Phys Ther Sci.* 2017; 29(10): 1811-1814
12. Hammer WI. Friction Massage. In: Hammer WI, ed. *Functional Soft Tissue Examination and Treatment by Manual Methods.* 2nd ed. New York: Aspen Publishers;1999: 463-464
13. Kirschner JS, Foye PM, Cole JL. Piriformis syndrome, diagnosis and treatment. *Muscle Nerve.* 2009;40(1):10-8.
14. Page P. Current concepts in muscle stretching for exercise and rehabilitation. *Int J Sports Phys Ther.* 2012;7(1):109-19.
15. Awan WA, Babur MN. Effectiveness of deep friction massage & stretching exercises in piriformis syndrome. *IJCRB.* 2011; 03(03): 378-383
16. Hashemirad F, Karimi N, Keshavarz R. The effect of Kinesio taping technique on trigger points of the piriformis muscle. *J Bodyw Mov Ther.* 2016;20(4):807-814.

Disclaimer: None to declare.

Conflict of Interest: None to declare.

Funding Sources: None to declare.