

Comparative effects of post isometric relaxation and active release technique of calf muscles in young females; Randomized Clinical Trial

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Abstract

Objective: To compare the effects of post-isometric relaxation and active release techniques in terms of pain, range of motion and functional disability on calf muscles in young females.

Method: The randomised clinical trial was conducted from February to May, 2024, at the Allied Hospital, Faisalabad, Pakistan, and comprised females aged 20-40 years who presented with functional disability due to calf tightness. The patients were randomised using the lottery method into groups A and B. Both the groups received a moist hot pack at baseline, and calf strengthening exercises at the end of treatment. Group A received post-isometric relaxation by adding 20% effort of the patient in a supine lying position. Group B received active release technique on calf muscles in a prone position. There were two sessions per week for four weeks. Pain was measured using the visual analogue scale, and range of motion was measured with a universal goniometer. The secondary outcome was functional disability due to calf tightness, which was assessed using the Lower Extremity Functional Scale. Data was analysed using SPSS 27.

Results: Out of the 40 patients initially screened, 30(75%) were randomised into the two groups. However, the study was completed by 27(90%); 13(48.15%) in group A with mean age 29.15 ± 4.59 years, and 14(51.85%) in group B with mean age 29.35 ± 4.41 years. Three variables pain, range and functional disability were measured. When data were interpreted, there were significant improvement in both groups compared to baseline values within groups but there was no significant difference between the groups with respect to outcome measures ($p > 0.05$).

Conclusion: The post-isometric relaxation and active release techniques were found to be equally effective in terms of pain, range of motion and functional disability related to calf muscles in young females.

Key Words: Females, Range of motion, Visual analogue scale.

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Introduction

Calf muscles are the posterior muscles of the leg. Gastrocnemius and soleus are the two great muscles of that region. Gastrocnemius has two heads and superficial muscles of the calf; the two heads being lateral and medial.¹ The gastrocnemius expands with the flexion of the leg. Rather than flexion, these muscles stretch out under pressure as they work to move back the powers following up on the knee, and flexion and extension at the ankle joint. The quadriceps stretch the knee as the gastrocnemius steps in to prevent the tibia from translating forward. The soleus muscles are larger muscles compared to the plantaris muscle. Calf muscles are supplied by the tibial nerve.² Calf muscles help in plantar flexion of ankle joint. The plantaris muscle is a short muscle and is missing in 10% of the population. Calf

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muscles help in jumping, walking and running.³

In females, calf pain occurs due to exercises because there is foot pronation during exercise, resulting in stress on the back of the leg. Cystic adventitial degeneration of the popliteal artery in females also causes calf tightness. In the third trimester of pregnancy, females report calf muscle pain. Aged females also report calf muscle weakness and pain due to weak muscles and bones. Decrease in lubrication with increasing age causes resistance and pain in the muscles during activity.³ Women who wear high heels also suffer calf tightness.⁴ Runners often have tight calf muscles. Occupations requiring long-term standing also cause back and lower leg pain because of physiological fatigue of the calf muscles.⁵

Muscle Energy Techniques (METs) are components of mild tissue osteopathic control techniques that integrate coordination and control with isometric or isotonic compressions that work on outer muscle capability, and thereby reduce pain. There are two types of METs⁶; post-isometric relaxation and reciprocal inhibition. METs have a wide application⁷, including massage therapy, physical

therapy and athletic training. When applied to a muscle with hyper tonicity and joint dysfunction, METs are effective.⁸ METs can be utilised to unwind and stretch muscles, and to work on range of motion (ROM). METs help in restoring tone of muscle, strengthening weak muscles, preparing muscle for subsequent muscles, and improving joint mobility.⁹

The Active Release Technique (ART) is a combination of both skin restriction and movement. It normalise the strength, flexibility and normal functions of soft tissues. ART is a hands-on treatment that can help improve physical performance and alleviate pain caused by muscle overuse, strain and injuries.¹⁰ ART is not a massage therapy. It releases muscle stiffness and muscle strain with the help of patients' active participation.¹¹

ART helps in treating medical conditions, like arthritis, Achilles tendinitis, ankle injuries, foot pain and injury, frozen shoulder, headaches, gait imbalance, hip pain, knee and leg pain, and dequervains tenosynovitis.¹² ART deals not only with nerves, but also muscles, ligaments, trigger points and soft tissue dysfunction. ART removes dysfunction and restores normal ROM. ART is a diagnostic and treatment tool.¹³

The current study aimed to compare the effects of Post-Isometric Relaxation and Active Release Technique in terms of pain, ROM and functional disability on calf muscles in young females.

Patients and Methods

The Randomised Clinical Trial (RCT) (IRCT20240508061706N1) was conducted from February to May, 2024, at the Allied Hospital, Faisalabad, Pakistan. After approval from the Institutional Review Board (IRB) of The University of Faisalabad, adult females having calf muscle pain were enrolled using purposive sampling technique. After taking written and verbal informed consent, the subjects were randomised into two groups using the lottery method.¹⁴ The study had a single-blind design as the patients were kept blinded to group randomisation. The sample size was calculated using Open Epi tool¹⁵ in the light of literature.

Those included were female patients aged 20-40 years¹⁶, patients without any injury of ankle, hip and lower extremity, patients with symptoms of pain, tightness and functional loss, and patients with functional disability due to calf tightness as per the Lower Extremity Functional Scale (LEFS).¹⁷ Also, the weight-bearing wall lunge test had to be positive in the patients to be included in the study. Those with compartment syndrome, structural deformity, like club foot deformity, medications, like

cholesterol-lowering drugs, and those having peripheral vascular disease, ankle fracture, neurological issues and sports-related injuries were excluded.¹⁸

The outcome measures were pain, ankle ROM and functional disability, which were measured by Visual Analogue Scale (VAS)¹⁸, a universal goniometer, and the (LEFS)¹⁷, respectively.

Patients in group A received post-isometric relaxation for 10 repetitions. The patients were asked to lie in supine position and to plantar flex the foot for 10 seconds by adding 20% effort while inhaling. The therapist resisted the dorsiflexion of the foot and then asked the patients to inhale and relax. The therapist then did dorsiflexion of the foot for 10 seconds. Patient felt minimal pain along with hotpacks for 10 minutes at baseline and strengthening exercise for 5 minutes at the end of session. In group B, ART of calf muscles was applied for 7-10 minutes. The patients were asked to lie in prone position on the plinth. By squeezing the calf muscles with one hand, the patients were asked to actively plantar flex the foot, and the therapist did dorsiflexion of the patients' foot by applying force with the other hand. Strengthening exercise (single calf raises with 10 repetitions and 3 sets) was also performed after ART. During this treatment, the patients felt stretch on calf muscles and felt pain due to calf tightness. But after the treatment, the patients felt less pain.

The intervention in both groups lasted two sessions per week for four weeks. Measurements were recorded at baseline and after 8th session. Data was analysed using SPSS 27¹⁹. Based on Shapiro-Wilk test for data normality, nonparametric tests were applied. Mann Whitney U test was used for comparison between the groups for pain, ROM, ankle plantar flexion and dorsiflexion, and functional disability. Wilcoxon test was applied for intragroup comparisons. Friedman test was used for intergroup analysis for pain. $P < 0.05$ was considered significant.

Results

Out of the 40 patients initially screened, 30(75%) were randomised into the two groups (Figure-1). However, the study was completed by 27(90%) patients; 13(48.15%) in group A with mean age 29.15 ± 4.59 years, and 14(51.85%) in group B with mean age 29.35 ± 4.41 years (Table 1). Three variables was measured pain, range and functional disability by visual analogue scale, goniometer and by lower extremity functional scale. Data were interpreted and showed great improvement in both groups there was no significant difference between the groups with respect to outcome measures ($p > 0.05$) (Tables 2-3).

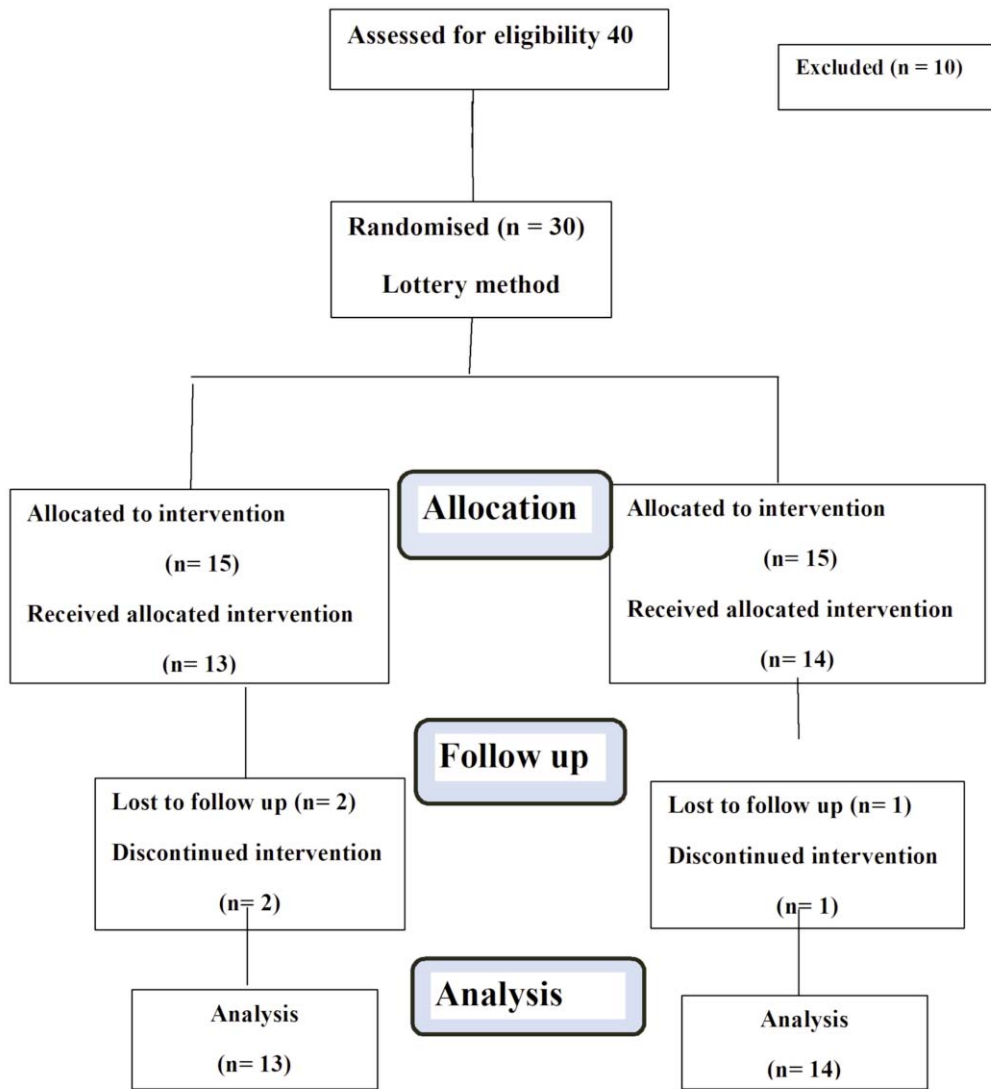


Figure: The study flowchart.

Table-1: Data related to age and the side of limb in the two groups.

Age of the patient	N	Minimum	Maximum	Mean	Std. Deviation
Group A	13	21	35	29.15	4.59
Group B	14	23.00	38.00	29.35	4.41

Side of Pain					
Side of pain		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Group A	left	3	23.1	23.1	23.1
	Right	10	76.9	76.9	100.0
	Total	13	100.0	100.0	
Group B	left	8	57.1	57.1	57.1
	Right	6	42.9	42.9	100.0
	Total	14	100.0	100.0	

Table-2: Intergroup comparison related to pain and functional disability.

Group of treatment		N	Mean ± S.D	Mean Rank	Median	P value
Pain at Baseline	Post Isometric Relaxation	13	7.29± 2.14	10.46	7.00	0.23
	Active Release Technique	14		17.29		
	Total	27				
PainAfter 8 th Session	Post Isometric Relaxation	13	3.00±1.03	16.69	3.00	0.69
	Active Release Technique	14		11.50		
	Total	27				
Between the group Functional Disability						
Functional disability at Baseline	Post Isometric Relaxation	13	49.70±9.70	12.92	50	0.49
	Active Release Technique	14		15.00		
	Total	27				
Functional disabilityAfter 8 th Session	Post Isometric Relaxation	13	61.55±8.67	11.81	60	0.148
	Active Release Technique	14		16.04		
	Total	27				

*SD: Standard deviation.

Table-3: Intergroup comparison related to ankle plantar and dorsiflexion.

Group of treatment		N	Mean ± S.D	Mean Rank	Median	P value
Ankle DorsiflexionAt Baseline	Post Isometric Relaxation	13	7.22±3.50	13.92	5	0.958
	Active Release Technique	14		14.07		
	Total	27				
Ankle DorsiflexionAfter 8 th Session	Post Isometric Relaxation	13	15.00±4.16	11.92	15	0.165
	Active Release Technique	14		15.93		
	Total	27				
Between the group ankle plantar flexion						
Ankle Plantar flexionAt Baseline	Post Isometric Relaxation	13	19.14±9.024	16.23	20	0.147
	Active Release Technique	14		11.93		
	Total	27				
Ankle Plantar flexionAfter 8 th Session	Post Isometric Relaxation	13	37.59±8.010	13.46	40	0.714
	Active Release Technique	14		14.50		
	Total	27				

*SD: Standard deviation.

Discussion

The current study compared the effects of post-isometric relaxation and ART of calf muscles in young females, finding no significant differences between the two techniques with respect to outcome measures. A similar study on short-term effects on hamstring muscles, and reported no significant difference between the techniques.²⁰

An RCT compared the effects of ART and mulligan technique on gluteal muscles, and reported that both the

techniques had similar effects on pain and functional disability.²¹

A study on footballer players in the context of internal and external rotation of the hip also reported that MET an ART had similar effect with respect to ROM and pain.²²

A study assessed the efficacy of MET in the management of pain compared to a control Group, and found that MET was significantly more effective.²³

The current study has limitations as the sample was

restricted to females aged 20-40 years. Also, pain was measured on separate days and joint ROM may have been affected by variations related to delayed onset muscle soreness of calf muscles on the measurement day.

Conclusion

The Post-Isometric Relaxation and ART were found to be equally effective in terms of pain, ROM and functional disability related to calf muscles in young females.

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ZJ & MS: Concept, design, data acquisition, analysis, interpretation, drafting, revision, final approval and agreement to be accountable for all aspects of the work.