International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 05 | May - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Efficacy Of Gluteal Loading Exercise and Motor Control Exercise Combined with Patient Education in Women with Greater Trochanteric Pain Syndrome

Monika Tamil Selvan[1][0009-0009-1063-4174], Buvanesh Annadurai[2][0000-0002-9851-2973], Surya Vishnuram[3][0000-0002-7381-967X]

[1]Undergraduate, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India.
[2]Tutor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India.
[3]Tutor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India.
monikats1442003@gmail.com
buvanesh21896@gmail.com
suryavishnuram@gmail.com

ABSTRACT

BACKGROUND AND PURPOSE: Localized lateral hip pain with focal point tenderness over the greater trochanter of the femur is a prevalent manifestation of a condition known as greater trochanteric pain syndrome. Women between the ages of 43 and 65 were the most prevalent individuals with greater trochanteric pain syndrome. When estrogen levels drop in Women, the body produces less collagen, which thins the tendon. The study aimed to determine the effects of gluteal loading exercise and motor control exercise on greater trochanteric pain syndrome among Women.

METHODS: This was a randomized controlled trial involving women aged 40–55 years with lateral hip pain. The participants were recruited and screened based on inclusion and exclusion criteria, and after obtaining informed consent, 24 women randomly assigned to either the Gluteal Loading Exercise Group (n=12) or the Motor Control Exercise Group (n=12). Each group performed exercises three times a week for 6 weeks, with sessions lasting 45 minutes, Including patient education in the initial session for both groups . Pre-intervention and post-intervention assessments were collected, tabulated and analyzed using the Victorian institute of sport assessment- gluteal questionnaire and hand-held dynamometer.

RESULTS: The post-test value shows p value less than 0.0001.So, the gluteal loading exercise group shows the final results in improving in functional activities and muscle strength compared with the motor control exercise group.

CONCLUSION : From the results obtained in the study it is concluded that gluteal loading exercise shows significant effect in improving functional activities and muscle strength on greater trochanteric pain syndrome among women analyzed in relation to the motor control exercise.

Key words: Greater Trochanteric Pain Syndrome, Women, Gluteal loading exercise, Motor control exercise, Functional activity,

1 **INTRODUCTION**Greater trochanteric pain syndrome (GTPS) commonly presents as localized lateral hip pain accompanied by tenderness directly over the greater trochanter of the femur [1]. Current evidence identifies the primary source of GTPS as tendinopathy of the gluteus medius and gluteus minimus at their insertion points, rather than

inflammation of the bursae, which is now considered a secondary effect despite its contribution to pain symptoms [2]. The greater trochanter serves as the attachment site for the gluteal tendons and can undergo microtrauma due to repeated friction from the iliotibial band (ITB), contributing to symptom development [3].

Patients typically report increased pain over the lateral hip, especially when lying on the affected side, palpating the greater trochanter, or performing activities such as walking, prolonged standing on one leg, sitting with legs crossed, and rising from a seated position. This discomfort can significantly limit their participation in daily physical activities [4]. Hip movements involving flexion, abduction, or a combination of both can place further stress on the gluteal tendons, worsening symptoms. As a result, individuals with GTPS often demonstrate reduced functional performance [5].

GTPS is increasingly recognized in both active and sedentary populations, with a higher prevalence observed in women over 40 years of age [6]. Studies suggest that up to 25% of middle-aged women experience hip abductor tendon injuries, with approximately 15% showing symptoms of unilateral GTPS. The condition is particularly common in women between 40 and 60 years of age, with prevalence rising in those over 50 [7].

Women appear to be especially susceptible to GTPS, with reported rates of 8.5% for bilateral and 15% for unilateral presentations among women aged 50 to 79 years [8]. One contributing factor may be the anatomical structure of the female pelvis. Additionally, hormonal changes—especially reduced estrogen levels after menopause—have been linked to tendon health. Lower estrogen can lead to decreased production of type I collagen and increased type III collagen within gluteal tendons, resulting in weaker fiber linkages and reduced mechanical strength [9].

Gluteal loading exercises focus on activating and strengthening the gluteus maximus, medius, and minimus muscles, which are essential for maintaining hip stability and lower limb function. These exercises, whether isolated or compound, help improve muscular strength, endurance, and activation, and they also enhance joint mechanics, reduce stress on surrounding structures, and support better physical performance [10,11].

Motor control exercises (MCE) are a specialized form of therapeutic training that emphasizes precise regulation of movement and muscle activation. The goal is to enhance proprioception, neuromuscular control, and coordination, which helps alleviate pain and improve functional movement patterns. Through improved muscular control and recruitment, MCE can ultimately enhance overall physical performance and work capacity [12,13,14].

2 METHODS

2.1 **STUDY DESIGN**- It was a randomized control trial conducted with a concealed randomization involving 24 women aged between 40-55 years with greater trochanteric pain syndrome. The study was approved by ISRB 01/018/2023/ISRB/SR/SCPT. Written informed consent was obtained from all participants prior to their participation.

2.2 **SUBJECTS**

Inclusion Criteria:

- Female participants aged between 40 and 55 years
- Experiencing lateral hip pain persisting for a minimum duration of six weeks
- Presence of pain and tenderness over the greater trochanter upon manual palpation
- Discomfort reported when lying on the affected side during sleep
- Pain elicited during the 30-second single-leg stance test
- Positive result on the resisted external de-rotation test

Exclusion Criteria:

- History of spinal or hip surgery
- Received corticosteroid injections for lateral hip pain within the last three months

- Underwent physical therapy for hip pain within the previous 12 weeks
- Morning hip stiffness lasting 60 minutes or less
- Clinically diagnosed with hip osteoarthritis
- Currently taking vitamin supplements
- Presence of any neuromuscular disorders, infectious diseases, or malignancies

2.3 **PROCEDURE**- Before beginning of the treatment procedures,The individuals were comprehensively briefed on the patient education protocols, the intervention strategies and the pre-test measurement of Victorian Institute of Sport Assessment-Gluteal Questionnaire and quantitative assessment of force Maximal isometric hip abductor strength tests are conducted three times, with a 5-second contraction period and a 30-second break in between using hand-held dynamometer was reported. After 6 weeks of training, post-test measurement of Victorian Institute of Sport Assessment-Gluteal Questionnaire and isometric hip abductor strength tests using hand-held dynamometer was reported. The results, as well as the data gathered are tailed and examined. The pre-test and post-test values are compared and evaluated statistically.

PATIENT EDUCATION

Each participant was instructed to avoid activities such as walking uphill, climbing stairs, and crossing the legs past the body's midline to help minimize stress on the tendons. They were also guided on maintaining proper posture, including sitting with the hips higher than the knees, not crossing the legs, standing with equal weight distribution on both legs, sleep modification and avoiding side-lying positions. These instructions were introduced during the initial physiotherapy session and consistently reinforced throughout the intervention, with participants encouraged to apply them in all daily and recreational activities.

2.3.1 EXERCISE PROGRAM

Gluteal loading exercise group

Gluteal loading exercise was carried out over the course of 6 weeks, 3 days a week. Each lasting between 45 minutes. The study involved participants in exercise program that consists of four stages, including isometric gluteus medius and minimus loading, and kinetic chain strengthening exercises for quadriceps and calf muscle. The program began with a hip hitch isometric hold, followed by dynamic movement progressions. The most advanced exercise was a single leg wall squat. Participants were guided to perform the prescribed exercises for 2-4 sets of 5-15 repetitions. There is 2 minutes of pause in between each exercise. STAGE 1: WEEK 1&2-Hip Hitch, Double Leg Wall Squats, Bilateral Calf Raise. STAGE 2: WEEK 3&4-Hip Hitch with Toe Taps, sit to stand off a standard chair, Calf Raises with Toe Taps STAGE 3: WEEK 5&6-Hip Hitch with Hip Swing, sit to stand with split stance, Single Leg Calf Raise, Single Leg Wall Squat, Step Up, Single Leg Calf Raise.

Motor control exercise group

The motor control program was carried out for the course of 6 weeks with 3 individual face-to-face consultations each week each lasting between 45 minutes. In order to enhance the dynamic motor control of the lower extremity, the regimen is included with isotonic and isometric strengthening activities that target the hip abductor muscles. Elastic bands (thera band) are be used in exercises while also adding harder workouts. For each exercise in the first week, no load or elastic band is used, and the elastic band is placed above the knee joint. Participants were guided to perform the prescribed exercises for 3 sets of 8 repetitions to hold a contraction for 15 seconds. There is a minute of pause in between each workout .WEEK 1&2- Bilateral Bridge, Bridge with Feet Together, Clamshell, Hip Abduction with Lower Limbs Flexed, Double Leg Squat. WEEK 3&4-Single Leg Bridge, Hip Abduction with Lower Limbs Extended, Hip and Knee Extension, Hip Abduction, Double Leg Squat. WEEK 5&6-Single Leg Bridge with Hip Abduction, Hip Abduction, Hip Abduction and Extension, Side Walking, Side Walking, Single Seg Stance with Hip Flexion, Abduction, And Extension, Hip Hike, Walk.

3 OUTCOME MEASURES

Victorian Institute of Sport Assessment (VISA) Gluteal Questionnaire- It is a self-reported tool used to assess the function of the gluteal muscles and their potential contribution to various musculoskeletal conditions. The VAS rating for Question 1 ranges from 0 to 10. (Optimal health is 10) It is possible to score the five categories on questions 2 through 6 as 0, 2, 5, 7, or 10. The four options on question 7 can receive a score of 0, 4, 7, or 10. According to how long the patient remains active despite their present degree of pain, Question 8 is rated. The theoretically lowest possible score is 0, while the highest score for an asymptomatic person is 100.[15]

Hand held dynamometry- It offers a quantitative assessment of force Maximal hip abductors isometric strength tests are conducted three times, with a 5-second contraction period and a 30-second break in between.[16]

RESULT

The gathered information was analyzed and examined. For each parameter, the mean and standard deviation were calculated. The Paired t-test was utilized to analyse the statistically significant variations between the pre-test and post-test measurements. The difference between the post-test values was determined using unpaired t test. The pre-test scores of Victorian Institute of Sport Assessment-Gluteal Questionnaire and hand-held dynamometer for isometric hip abductor strength were assessed before the initiation of intervention and measured after 6 weeks of intervention and taken as post values. It made it possible for us to clearly see patterns in the functional activity and muscle strength among the research groups by displaying the results in tables. There was a statistically significant distinction in outcomes among the Gluteal loading exercise group and the motor control group according to a statistical analysis of the data.

Table 1. Pre and post-test values of Gluteal Loading Exercise group and Motor Control Exercise Group for VISA Gluteal Questionnaire

Visa-G Questionnaire	Values	Mean	SD	T value	P value
Gluteal Loading Exercise Group	Pre-test	54.67	11.71	25.8362	<0.0001
	Post-test	72.4	9.37		
Motor Control Exercise Group	Pre-test	49.40	6.79	19.0788	<0.0001
	Post-test	58.07	6.68		

Table 2. Pre and post-test values of Gluteal Loading Exercise group and Motor Control Exercise Group for Hand-held dynamometer

Hand Held Dynamometry	Values (kg)	Mean	SD	T value	P value
Gluteal Loading Exercise Group	Pre-test	7.608	0.805	40.800	<0.0001
	Post-test	12.826	1.216		
Motor Control Exercise Group	Pre-test	7.561	0.886	28.581	<0.0001
	Post-test	9.783	0.915		

Table 3.Comparison between the post-test values of Gluteal Loading Exercise group and Motor Control Exercise group for VISA-G Questionnaire and Hand-held dynamometer

5 DISCUSSION

This study aimed to assess the effectiveness of gluteal loading exercises and motor control training in alleviating pain, improving function, and increasing muscle strength in women diagnosed with greater trochanteric pain syndrome (GTPS). The purpose was to determine whether individuals with GTPS who engage in a targeted exercise program—emphasizing gluteal loading and motor control—experience measurable differences in pain levels, physical function, and muscular strength.

Outcome	Group	Mean	SD	T value	P value
VISA-G Questionnaire	Gluteal Loading Exercise Group	72.4	9.37	4.8230	<0.0001
	Motor Control Exercise Group	58.07	6.68		
Hand Held Dynamometry	Gluteal Loading Exercise Group	12.826	1.216	7.7375	<0.0001
	Motor Control Exercise Group	9.783	0.915		

Ganderton et al. evaluated the outcomes of a 12-week gluteal loading and education (GLoBE) exercise program compared to a sham regimen in managing GTPS. Participants were also instructed on how to avoid tendon compression. Outcome measures, including VISA-G, AQoL-8D, HOOS, OHS, and Lateral Hip Pain questionnaires, were recorded at the beginning, at 12 weeks, and again at 52 weeks. Statistical analyses, including covariance and protocol-based assessments, revealed that the GLoBE group experienced significantly greater improvements in pain and function, indicating the program's therapeutic value [17].

In a separate study, Mellor et al. compared the effectiveness of corticosteroid injections versus an exercise and education program in treating GTPS. Results over an initial 8-week period showed that participants in the exercise-education group had better outcomes in both pain relief and functional performance, highlighting the benefits of non-pharmacological management for GTPS [18].

Clifford et al. conducted a systematic review and meta-analysis focusing on exercise-based interventions for GTPS. Their findings confirmed that both isometric and isotonic exercises effectively reduced pain and improved function. The study recommends integrating these types of training into GTPS rehabilitation programs and stresses the importance of tailoring exercise regimens to individual patient needs, as responses can vary widely [19].

Aquino Nava et al. (2022) compared motor control exercises (MCG) with general exercise programs (GEG) for GTPS management. Their findings showed that MCG, which prioritizes neuromuscular control, yielded better pain outcomes than general exercise, supporting the use of targeted neuromuscular training to correct specific muscle dysfunctions [20].

Finally, Suh (2023) reported that both general and targeted training protocols enhanced gluteus medius strength in postmenopausal women. However, targeted functional training was especially effective, suggesting its value in improving hip stability and guiding exercise prescriptions for this population [21].

6 CONCLUSION

According to the study's findings, gluteal loading exercises were found to be more effective than motor control exercises in enhancing functional activity and muscle strength in women with greater trochanteric pain syndrome.

REFERENCES

1. 1 Reid D. The Management of Greater Trochanteric Pain Syndrome: A Systematic Literature Review. J Orthop. 2016;13(1):15-28.
2. Grimaldi A, Mellor R, Hodges P, Bennell K, Wajswelner H, Vicenzino B. Gluteal Tendinopathy: A Review of Mechanisms, Assessment and Management. Sports Med. 2015;45(7):1107-1119.
3. Reid D. The Management of Greater Trochanteric Pain Syndrome: A Systematic Literature Review. J Orthopaed. 2016;13(1):15-28.
4. Redmond JM, Chen AW, Domb BG. Greater Trochanteric Pain Syndrome. J Am Acad Orthop Surg. 2016;24(4):231-240.
5. Grumet RC, Frank RM, Slabaugh MA, Virkus WW, Bush-Joseph CA, Nho SJ. Lateral Hip Pain in an Athletic Population: Differential Diagnosis and Treatment Options. Sports Health. 2010;2(3):191-196.
6. Segal NA, Felson DT, Torner JC, Zhu Y, Curtis JR, Niu J, Nevitt, et al. Greater Trochanteric Pain Syndrome: Epidemiology and Associated Factors. Arch Phys Med Rehabil. 2007;88(8):988-992.
7. Moalli PA, Talarico LC, Sung VW, Klingensmith WL, Shand SH, Meyn LA, et al. Impact of Menopause on Collagen Subtypes in the Arcus Tendineous Fasciae Pelvis. Am J Obstet Gynecol. 2004;190(3):620-627.

8. Barratt PA, Brookes N, Newson A. Conservative Treatments for Greater Trochanteric Pain Syndrome: A Systematic Review. Br J Sports Med. 2017;51(2):97-104.
9. Ganderton C, Pizzari T, Harle T, Cook J, Semciw A. A Comparison of Gluteus Medius, Gluteus Minimus and Tensor Fascia Latae Muscle Activation During Gait in Post-Menopausal Women with and without Greater Trochanteric Pain Syndrome. J Electromyogr Kinesiol. 2017;33:39-47.

10. Mellor R, Grimaldi A, Wajswelner H, Hodges P, Abbott JH, Bennell K, et al. Exercise and Load Modification versus Corticosteroid Injection versus 'Wait and See' for Persistent Gluteus Medius/Minimus Tendinopathy (The LEAP Trial): A Protocol for a Randomized Clinical Trial. BMC Musculoskelet Disord. 2016;17(1):1-7.
11. Bagwell JJ, Reynolds N, Walaszek M, Runez H, Lam K, Smith JA, et al. Lower Extremity Kinetics and Muscle Activation during Gait Are Significantly Different during and after Pregnancy Compared to Nulliparous Females. Gait Posture. 2020;81:33-40.
12. Levin MF, Piscitelli D. Motor Control: A Conceptual Framework for Rehabilitation. Motor Control. 2022;26(4):497-517.
13. Feldman AG, Levin MF, Garofolini A, Piscitelli D, Zhang L. Central Pattern Generator and Human Locomotion in the Context of Referent Control of Motor Actions. Clin Neurophysiol. 2021;132(11):2870-2889.
14. Latash ML. On Primitives in Motor Control. Motor Control. 2020;24(2):318-346.
15. Fearon AM, Ganderton C, Scarvell JM, Smith PN, Neeman T, Nash C, Cook JL. Development and validation of a VISA tendinopathy questionnaire for greater trochanteric pain syndrome, the VISA-G. Manual therapy. 2015;20(6):805-13.
16. Stark T, Walker B, Phillips JK, Fejer R, Beck R. Hand-held dynamometry correlation with the gold standard isokinetic dynamometry: a systematic review. PM&R. 2011;3(5):472-9.
17. 15. Ganderton C, Semciw A, Cook J, Moreira E, Pizzari T. Gluteal Loading versus Sham Exercises to Improve Pain and Dysfunction in Postmenopausal Women with Greater Trochanteric Pain Syndrome: A Randomized Controlled Trial. J Women's Health. 2018;27(6):815-829.
18. 16. Mellor R, Bennell K, Grimaldi A, Nicolson P, Kasza J, Hodges P, et al. Education Plus Exercise versus Corticosteroid Injection Use versus a Wait and See Approach on Global Outcome and Pain from Gluteal Tendinopathy: Prospective, Single Blinded, Randomised Clinical Trial. BMJ. 2018;361:k2828.
19. 17. Clifford C, Paul L, Syme G, Millar NL. Isometric versus isotonic exercise for Greater Trochanteric Pain Syndrome: a randomised controlled pilot study. BMJ Open Sport Exerc Med. 2019;5(1):e000558.
20. 18. Thomaz de Aquino Nava G, Baldini Prudencio C, Krasic Alaiti R, Mendes Tozim B, Mellor R, et al. Motor Control Exercises versus General Exercises for Greater Trochanteric Pain Syndrome: A Protocol of a Randomized Controlled Trial. PLOS ONE. 2022;17(6):e0269230.
21. 19. Suh KS, Baek WY. Effects of Functional Exercise Program on Improving Gluteus Medius Muscle Strength in Postmenopausal Women. Iran J Public Health. 2023;52(9):2014.