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Original Article

Effects of Compressive Myofascial Release of Vastus Lateralis on Lateral Patellar Tracking in Patients with Knee Osteoarthritis

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ABSTRACT

Knee osteoarthritis is highly prevalent around the world and 4th leading cause of disability. Lateral patellar tracking is a common complain of knee osteoarthritis. It causes Q-angle at knee joint to increase that further leads to gait abnormalities. **Objective:** To determine the effect of compressive myofascial release of vastus lateralis on lateral patellar tracking in terms of pain, range of motion, and functional disability in patients with knee OA. **Methods:** This Randomized controlled trial was conducted at the Ahad Medicare Clinic and Physiotherapy Centre, Rawalpindi, spanning from December 2020 to June 2021. In this study, 52 participants were carefully selected using the Open Epi software. These individuals were aged 50 years and above and had previously been diagnosed with Grade 2-3 knee osteoarthritis. Participants were then evaluated for the presence of lateral patellar tracking by measuring Q-angle. After meeting eligibility criteria participants were divided into two groups: the Experimental group (n=26) and the Control group (n=26). Numeric Pain Rating Scale (NPRS), Goniometer, and Western Ontario and McMaster Universities Arthrosis Index (WOMAC) were used to take measurements at baseline and at 15 days follow-up. **Results:** Statistical analysis revealed a significant difference ($p<0.05$) between the Experimental and Control groups in terms of pain reduction and knee extension range of motion (ROM). **Conclusions:** The study's findings revealed that the experimental group exhibited more significant improvements in pain reduction and knee extension compared to the conventional treatment group.

INTRODUCTION

Osteoarthritis (OA) is a degenerative condition that is highly prevailing around the world and 4th leading cause of disability worldwide [1, 2]. It can affect any synovial joint but most commonly affected joints are hip, knee hand, foot and spine [3]. Knee OA is commonly described as a condition including reduced joint space, subchondral bone sclerosis, the formation of bony spurs, cartilage degeneration, and predominant lateral patellar tracking [4]. Knee OA affects medial, lateral, and patellofemoral component of knee joint usually developing and causing symptoms over a period of 10-15 years. There are several modifiable and non-modifiable risk factors for OA. The more pronounced modifiable risk factor is being overweight [5]. The joint space narrowing correlates strongly with pain than any other radiographic features following Kallegren and Lawrence knee OA grading [6]. Patients with knee OA face an elevated risk of falling, primarily because they experience balance issues, particularly in the sagittal plane. Furthermore, individuals afflicted with medial knee OA are even more susceptible to falls [7]. Lateral patellar tracking is characterized by the movement of the patella shifting to the outer side in comparison to the femoral groove, occurring during both the flexion and extension phases [8, 9]. Physiologically when the knee is intact, patella moves 4mm laterally when the knee is moved into full extension, and fixed in trochlear groove and becomes

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more medial when the knee is moved beyond 20 degree of knee flexion [10]. If there is some injury to knee joint or some muscular imbalance, it leads to increase in Q-angle, the distance between trochlear groove and tibial tuberosity is increased, genu valgum and knock knees [11]. Compressive myofascial release (CMFR) is a contemporary soft tissue stretching method that encompasses the application of sustained compression and myofascial stretches to the specific area in order to induce a release. The treatment involves applying broad strokes using the clinician's knuckles initially to address surface restrictions, followed by focused strokes using the clinician's thumb on tense muscles. These strokes are applied at a 45-degree angle, with pressure moving from the far end to the closer end [12]. Numerous research studies have been undertaken to investigate the impact of myofascial release on the Quadriceps muscle, employing various techniques [13].

Existing evidence suggests that myofascial trigger points in the anterior thigh can increase muscle tension, potentially affecting connected structures. Notably, previous studies have not addressed lateral patellar tracking issues in knee osteoarthritis by targeting the vastus lateralis muscle. Instead, they have mainly focused on using the CMFR technique to enhance ankle dorsiflexion range. In this study, the primary objective was to investigate the impact of compressive myofascial release applied to the vastus lateralis on lateral patellar tracking in individuals with knee osteoarthritis. Additionally, the study assessed its effects on pain, range of motion (ROM), and functional disability in these patients.

METHODS

This randomized controlled trial (clinical trial no: NCT05052593 registered on Clinical Trials.gov PRS) took place at the Ahad Medicare Clinic and Physiotherapy Centre in Kallar Syedan, Rawalpindi, spanning from December 2020 to June 2021 after receiving ethical approval on 16-10-2020 from Riphah college of rehabilitation science, Islamabad (Ref: RIPHAH/RCRS/REC/Letter-00870). The sample size, determined using Open Epi software, consisted of 52 participants, chosen with a 95% confidence level and 80% statistical power [13]. Purposive sampling technique with sealed enveloped method of randomisation was used. The study involved individuals aged 50 years and older who had been diagnosed with Grade 2-3 knee osteoarthritis according to the Kellgren and Lawrence classification system. Subsequently, the presence of lateral patellar tracking was evaluated using a goniometer by measuring Q-angle [14]. Participants with a recent knee injury, a history of hip disease, prior knee surgery or arthroplasty, and those who had received intra-articular corticosteroid injections were excluded from the study. Out of a total of 68 participants initially screened for eligibility, 16 individuals did not meet the inclusion criteria. Consequently, 52 participants were enrolled in the study and subsequently divided into two groups: the Experimental group (n=26) and the Control group (n=26). Following the acquisition of demographic information and informed consent, each participant underwent a baseline assessment. During this assessment, pain intensity and ROM were measured using the Numeric Pain Rating Scale (NPRS) [15] and a goniometer [16] respectively. Functional disability was evaluated using the Western Ontario and McMaster Universities Arthrosis Index (WOMAC) [17]. Both the experimental and control group received standard treatment protocol that began with a 20-minute application of hot packs and Transcutaneous Electrical Nerve Stimulation (TENS). This was followed by a series of exercises, starting with ROM exercises and then proceeding to knee stretching and strengthening exercises. These exercises specifically targeted the Vastus Medialis Obliquus (VMO) and involved quadriceps strengthening through isometric exercises. These exercises were performed in three sets, with each set consisting of 10 repetitions, holding each stretch for 5 seconds. Subsequent to the conventional treatment, participants in experimental group received an additional session involving CMFR. This session entailed the shaking of the muscle belly of the Vastus Lateralis for a duration of 30 seconds [18]. Both the Experimental and Control groups followed this two-week treatment plan, which included a total of six sessions. These sessions were scheduled on alternate days, resulting in a total of six sessions throughout the treatment period. Assessments were conducted at the baseline and the sixth visit to evaluate the treatment's efficacy. Data analysis was conducted using SPSS version 21. Descriptive statistics, such as mean and standard deviation, were utilized to summarize the data. Independent T-test was used for between-group comparison.

RESULTS

The results were obtained through an analysis of quantitative data. A total of 68 individuals were enlisted to take part in this research, out of which 52 met eligibility criteria and they were assigned randomly to either a control group or an experimental group. The average age of the participants in the control group was 57.69 ± 6.03 years, while those in the experimental group had an average age of 58.19 ± 5.83 years. Table 1 shows between group analyses of baseline data by Independent T-test with statistically non-significant results for all the variables with a p-value of $p > 0.05$.

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Table 1: Between group analysis of baseline data by Independent t-test

Variable		Experimental group (n=26) Mean ± SD	Control group (n=26) Mean ± SD	
Age (year)		58.19 ± 5.83	57.69 ± 6.03	
NPRS		5.81± 1.26	6.12 ±1.45	p-value 0.419
Q-angle		21.32 ± 3.90	22.92 ± 4.20	0.169
WOMAC		53.85 ± 11.05	51.08 ± 12.47	0.401
Knee range of motion (degrees)	Flexion	107.19 ± 9.18	106.31 ± 11.90	0.765
	Extension	4.35 ± 2.85	5.31 ± 2.69	0.218

NPRS: Numeric Pain Rating Scale, WOMAC: Western Ontario and McMaster Universities Arthrosis Index

Table 2 shows Between group analysis of post treatment values by independent T test showed statistically significant difference in NPRS and knee extension with a [-value of 0.008, and 0.00 respectively (Level of significance p-value <0.05).

Table 2: Between group analysis of post treatment data

Variable		Experimental group (n=26) Mean ± SD	Control group (n=26) Mean ± SD	p-value
NPRS		2.96±1.34	3.58 ±1.17	0.008
Q-angle		18.85 ±3.20	20.88 ±3.98	0.215
WOMAC		38.31 ±9.20	35.69 ± 11.30	0.071
Knee range of motion (degrees)	Flexion	121.69±6.71	111.38±8.41	0.066
	Extension	1.77±2.20	3.31±1.56	0.00

NPRS: Numeric Pain Rating Scale, WOMAC: Western Ontario and McMaster Universities Arthrosis Index

DISCUSSION

This interventional study was conducted on 52 participants diagnosed with OA. After recruiting and allotting participants in both experimental (26) and control group (26), baseline data were obtained from participants. Control group received conventional knee osteoarthritis treatment for 2 week (3 sessions/week) and experimental group received CMFR treatment for 5 minutes in addition to conventional knee osteoarthritis treatment 3 sessions/week). This study aimed to investigate the effects of compressive myofascial release on lateral tilting of the patella in individuals diagnosed with knee osteoarthritis. Secondary objectives included investigating its effects on pain, range of motion (ROM), and functional disability in these patients. Results of this study proposed greater reduction in pain and ROM (especially knee extension ROM) in experimental group as compared to control group on independent T-test with p value <0.05. Qiangmin Huang, in 2020, set out a study to evaluate the effectiveness of applying pressure to myofascial trigger points (MTrPs) using a foam roller or ball, coupled with static stretching for knee muscles [19]. The objective was to assess the impact of this treatment on patients experiencing knee pain. The findings indicated an improvement in VAS scores and an increase in knee joint range of motion. These results align with another study, suggesting that compressive myofascial release of the vastus lateralis contributes to a reduction in knee joint pain and an improvement in range of motion. Another study by Mahmooda et al., in 2020 demonstrated consistent findings indicating that myofascial release proved more effective in relieving pain and enhancing range of motion for patients with knee osteoarthritis when compared to Mulligan's mobilization techniques [20]. The earlier study proposed that myofascial release of knee muscles improve overall knee function and functional abilities more effectively, which is in contrast to this study in which knee flexion range and functional abilities were not significant in comparison to control group. A study by Stanek et al., in 2018 found out the effect of compressive myofascial release in comparison with Graston tool [13]. The main outcome of this study was to find out impact of both techniques at ankle dorsiflexion ROM. CMFR improved ankle dorsiflexion range significantly after a single 5-minute treatment session which is consistent with this study that resulted in marked improvement in extension ROM at knee joint. This study showed remarkable improvement in Q angle in experimental group and these results are similar to the results of a study conducted by Lee et al., in 2018 [21].Similar results have been shown by a study conducted by Torrente et al., [22]. The study aimed to investigate how Self-Myofascial Release affects the Pennation Angle of the Vastus Medialis Oblique and Vastus Lateralis in athletic males. The results revealed a significant decrease in the Pennation angle after applying the self-myofascial release technique consistently for a period of 7 weeks.

CONCLUSIONS

The study concluded that both compressive myofascial release technique and conventional treatment for knee osteoarthritis were effective in improving lateral patellar tilting, pain, ROM, and functional disability through CMFR and conventional OA Treatment, but experimental group showed marked improvement in pain and knee extension range.

Authors Contribution

Conceptualization: RB, FA, LGK, SA, AA, KB
Methodology: RB, FA
Formal analysis: LGK
Writing-review and editing: RB, FA, LGK, SA, AA, KB
All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Fransen M, Bridgett L, March L, Hoy D, Penserga E, Brooks P. The epidemiology of osteoarthritis in Asia. International Journal of Rheumatic Diseases. 2011 May; 14(2): 113-21. doi: 10.1111/j.1756-185X.2011.01608 . x.

[2] Vina ER and Kwoh CK. Epidemiology of osteoarth ritis: literature update. Current Opinion in Rheuma tology. 2018 Mar; 30(2): 160. doi: 10.1097/ BOR.000000 0000000479.

[3] O'Neill TW, McCabe PS, McBeth J. Update on the epidemiology, risk factors and disease outcomes of osteoarthritis. Best Practice & Research Clinical Rheumatology. 2018 Apr; 32(2): 312-26. doi: 10.1016/j. berh.2018.10.007.

[4] Hunter DJ and Felson DT. Osteoarthritis. BMJ. 2006 Mar; 332(7542): 639-42. doi: 10.1136/bmj.332.7542.63 9.

[5] Lespasio MJ, Piuzzi NS, Husni ME, Muschler GF, Guarino AJ, Mont MA. Knee osteoarthritis: a primer. The Permanente Journal. 2017 Nov; 21: 16-183. doi: 10. 7812/TPP/16-183.

[6] Neogi T, Felson D, Niu J, Nevitt M, Lewis CE, Aliabadi P, et al. Association between radiographic features of knee osteoarthritis and pain: results from two cohort studies. BMJ. 2009 Aug; 339: b2844. doi: 10.1136/bmj. b2844.

[7] Lee PA, Wu KH, Lu HY, Su KW, Wang TM, Liu HC, et al. Compromised balance control in older people with bilateral medial knee osteoarthritis during level walking. Scientific Reports. 2021 Feb; 11(1): 3742. doi: 10.1038/s41598-021-83233-w.

[8] Douciette SA and Goble EM. The effect of exercise on patellar tracking in lateral patellar compression syndrome. The American Journal of Sports Medicine. 1992 Jul; 20(4): 434-40. doi: 10.1177/0363546592020 00412.

[9] Feller JA, Amis AA, Andrish JT, Arendt EA, Erasmus PJ, Powers CM. Surgical biomechanics of the patellofemoral joint. Arthroscopy: The Journal of Arthroscopic & Related Surgery. 2007 May; 23(5): 542 -53. doi: 10.1016/j.arthro.2007.03.006.

[10] Amis AA, Senavongse W, Bull AM. Patellofemoral kinematics during knee flexion-extension: An in vitro study. Journal of Orthopaedic Research. 2006 Dec; 24(12): 2201-11. doi: 10.1002/jor.20268.

[11] Frosch KH and Schmeling A. A new classification system of patellar instability and patellar maltracking. Archives of Orthopaedic and Trauma Surgery. 2016 Apr; 136(4): 485-97.doi: 10.1007/s00402 -015-2381-9.

[12] Manheim C. Introduction to myofascial release. The myofascial release manual. Slack Incorporated; 2008: 1-36.

[13] Stanek J, Sullivan T, Davis S. Comparison of compres sive myofascial release and the graston technique for improving ankle-dorsiflexion range of motion. Journal of Athletic Training. 2018 Feb; 53(2): 160-7. do i: 10.4085/1062-6050-386-16.

[14] Weiss L, DeForest B, Hammond K, Schilling B, Ferreira L. Reliability of goniometry-based Q-angle. PM&R. 2013 Sep; 5(9): 763-8. doi: 10.1016/j.pmrj.2013. 03.023.

[15] Alghadir AH, Anwer S, Iqbal A, Iqbal ZA. Test–retest reliability, validity, and minimum detectable change of visual analog, numerical rating, and verbal rating scales for measurement of osteoarthritic knee pain. Journal of Pain Research. 2018 Apr; 11: 851-6. doi: 10.2147/JPR.S158847.

[16] Shamsi M, Mirzaei M, Khabiri SS. Universal goniometer and electro-goniometer intra-examiner reliability in measuring the knee range of motion during active knee extension test in patients with chronic low back pain with short hamstring muscle. BMC Sports Science, Medicine and Rehabilitation. 2019 Dec; 11(1): 1-5. doi: 10.1186/s13102-019-0116-x.

[17] Ackerman I. Western ontario and mcMaster universities osteoarthritis index (WOMAC). Australian Journal of Physiotherapy. 2009 Jan; 55(3): 213. doi: 10.1016/s0004-9514(09)70088-1.

[18] Manheim CJ and Lavett DK. The Myofascial Release Manual. SLACK. Inc; 2008.

[19] Qiangmin Huang MD. Compression of myofascial trigger points with a foam roller or ball for exercise-induced anterior knee pain: a randomized controlled trial. Alternative Therapies in Health and Medicine. 2020 May; 26(3): 16-23.

[20] Mahmooda S, Ishaq I, Safdar M, Sabir M, Tahir A, Irshad S. Effects of Mulligan's mobilization with movements versus myofascial release in addition to usual care on pain and range in knee osteoarthritis. Rawal Medical Journal. 2020 Apr; 45(2): 353-7.

[21] Lee HI and Lim BO. Effects of self myofascial release, elastic band, and stretching exercises on lower extremity alignment and gait in female genu varum. Korea Kinesiology Association. 2018 Dec; 28(4): 207-11.

[22] Torrente QM, Killingback A, Adds PJ, Robertson C. The effect of self-myofascial release on the pennation angle of the vastus medialis oblique and the vastus lateralis in athletic male individuals: an ultrasound investigation. International Journal of Sports Physical Therapy. 2022 Jun; 17(4): 636. doi: 10.26603/001c.35591.