

ORIGINAL ARTICLE

IJPHY

EFFECTIVENESS OF MULLIGAN'S SQUEEZE TECHNIQUE AS AN ADJUNCT TO CONVENTIONAL THERAPY TO DECREASE PAIN AND IMPROVE RANGE OF MOTION IN MENISCAL TEAR-A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: Serious, major meniscal fractures are the most common knee injuries. In the management of meniscal tears, physical therapy has shown positive results, and additional medication is required to reduce the effects of meniscal tears. This study aimed to evaluate the feasibility of the mulligan squeeze procedure in combination with conventional pain relief therapy and to increase the range of movement and functional ability of meniscal tear patients. The study aims at reviving pain, increasing ROM and stability, and improving the quality of their lives.

Methods: In this randomized controlled trial, 40 patients were chosen and randomly assigned to two groups, A and B, clinically diagnosed with a meniscal tear. The Numeric Pain Rating Scale (NPRS), the Patient-Specific Functional Scale (PSFS), and knee range of motion were reported to determine the pain level and functional capability of the patients.

Results: During the 4th and 6th week, all classes showed a significant gap ($P < 0.05$). At the end of the 6th week, the standard variance and the overall analysis team t-test values were higher than the control group.

Conclusion: The two teams showed significant progress for NRPS, ROM, and PSFS, but the experimental group showed more significant improvement in all the parameters.

Keywords: Meniscal tear, knee pain, NPRS, PSFS, ROM.

Received 15th November 2019, accepted 23rd January 2020, published 09th February 2020



www.ijphy.org

10.15621/ijphy/2020/v7i1/193669

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INTRODUCTION

One of humanity's most common injuries during sports is an injury to the knee joint meniscus. This injury has been observed in various populations, and it could be due to traumatic out of which intense traumatic occur more often in youth[1] frequently during game competition and practice [2] The incidence of meniscal tears, with a prevalence of 2 can be as high as 6 per 1000 population 2.5 to 4 times in males[3]. The most typical indication of a meniscal tear is joint line tenderness, loss of motion range, and a sense of knee joint locking and instability [4]. Different methods are used to diagnose meniscal tears, the most commonly employed being magnetic resonance imaging (MRI) with 76 percent precision, 96 percent specificity, and 88 percent predictive performance. However, the clinical diagnosis of meniscal tears is also indicative of a number of particular tests. It needs that of McMurray (precision 95%, responsiveness 21%) [5], Apley's (Specificity 90%, Sensitivity 13%) [6] and Thessaly's test (Specificity 97.7%, Sensitivity 90.3%) [7]. Lowery et al. (2006) [5] Developed a regular clinical research battery capable of generating superior clinical composite score (CCS) to MRI precision for identification of meniscal tears. The battery contains a history of knee trap or lock, passive terminal knee flexion pain, passive knee extension pain, tenderness to the joint base, and a good McMurray test. If all of these symptoms have been detected in patients, the incidence of meniscal tears is confirmed by a high predictive value of 92.3 percent, 99 percent specificity and 11.2 percent sensitivity. Therefore, medical experience, in conjunction with special testing, will achieve a diagnostic accuracy of 90 percent, which is marginally prevalent to the diagnostic accuracy of MRI alone [8]. Several reports are suggesting that patients with meniscal tears with exercise therapy will improve their functioning and activities [9]. Taking into the consideration and analysis of all the strategies and treatment of different articles, it is possible to cure patients by the conservative treatment provided the injury is diagnosed at an early stage by special tests during clinical practices [10].

Conventional meniscal tear care usually involves vigorous workouts that aim to increase the assortment of motion and muscle strength and strengthen discomfort, stability, and elasticity [11,12]. Generally, surgical therapy is considered the primary cure, whereas conservative therapy is considered the alternative because long-term care is provided, and poor results are made. Similar and conflicting findings are reported for both surgical and conservative therapies [13,12]. It requires further work on non-operational alternative treatment strategies to address the signs of meniscal tears, as there is substantial support for effective alternative non-operational therapy [14]. The manual treatment of Mulligan's squeeze technique is utilized to treat localized joint line pain, restricted ROM and the symptoms which are shown in meniscal tear patients [15]. Our study was aimed to find out the effectiveness of the Mulligan squeeze technique along with conventional therapy in improving functional outcomes in patients with a meniscal tear.

METHODS

Approval from the Institutional ethical committee was taken, and subjects recruited from the orthopedic department of Nizam's institute of medical sciences. Entire 90 participants were evaluated for eligibility criteria and 40 were excluded before randomization, and 50 subjects who met inclusion criteria were randomly allocated in group A (experimental group) and group B (conventional group) by simple random sampling using the lottery method. Twenty-three subjects received the intervention and two refused active participation after allocation in each group. Three subjects in each group were lost the follow-up due to personal reasons. Twenty subjects in each group received intervention thought the study.

The inclusion criteria of the study were subjects aged between 18-50, with no gender specificity, joint line tenderness, restricted ROM, pain with terminal Knee flexion and extension and rotations and feeling of locking and instability of knee joint. The subjects with knee contracture, fractures, dislocations, infections, tumors, rheumatoid arthritis, vascular injuries and any surgeries to the lower extremities were excluded from the study.

Detailed physical assessments and tests were performed after patients were encompassed in the study, and were arbitrarily assigned into two clusters by the principal investigator. Patients who met the requirements submitted the informed consent.

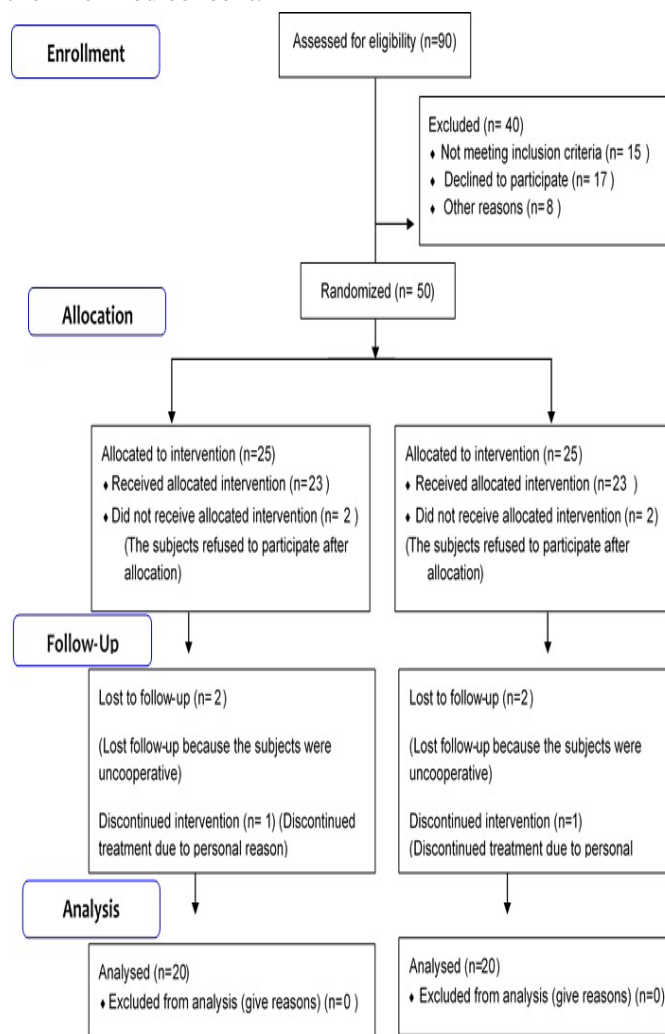


Figure1: Study flow chart

The outcome measure includes the Numerical pain rating scale (NPRS), Knee Range of Motion (KROM), Patient-specific functional score (PSFS). Based on this, the pre-treatment evaluation was done on day one as a baseline measurement, and post-treatment evaluation was done at 4th week. The final assessment was done on the 6th week using the parameters mentioned above.

INTERVENTION TECHNIQUE

GROUP I: Received MC “Squeeze” technique and conventional therapy.

1. The MC “Squeeze” technique was administered according to the principles of the Mulligan Concept. The patient is placed in supine with better access to the joint line, and the affected knee has been placed at 90 degrees of flexion or bent to the pain-free extent of the patient. The psychologist put the medial border of one thumb over the region of the tremendous joint line pain and swelling and reinforced the first with the other thumb to create an overlap grip spot. The patient then extends the knee to the maximum pain-free range, while the therapist should keep the hand position and grip on the joint line as the joint space is closed. After achieving the peak knee-length, the client voluntarily returned their knee to full flexion as the trainer raised the pressure toward the joint core with the rubbing thumb. For two seconds, the trainer continued to hold the pressure on the joint line, as the patient exerted extra pressure by raising the tibia with both hands to the center of the knee flexion [16].

2. **Conventional Therapy:** Subjects received exercises that included Static Quadriceps, Static Hamstrings and Vastus medialis obliques strengthening. Active hip, knee and ankle ROM exercises, multiple angle isometrics, AROM, and strengthening for the unaffected lower limb and after exercises gait training given on parallel bar in front of the mirror.

DOSAGE: Mulligan’s squeeze technique was applied in 3 sets of 10 repetitions in one session. All exercises were repeated ten times with 10sec hold and relaxed each time.

GROUP II: Received conventional therapy. Subjects were in the supine position and received exercises, which include Active hip, knee and ankle ROM exercises, Static Quadriceps, Static Hamstrings and Vastus medialis obliques strengthening. In sitting position, multiple angle isometrics exercise for affected leg, and AROM and strengthening for the unaffected lower limb and after exercises gait training given on parallel bar in front of the mirror.

DOSAGE: All exercises were repeated ten times with 10-sec hold and relaxed each time.

RESULTS

The intragroup analysis of NPRS, PSFS, and ROM was done with the “F” test (Friedman Test) and Inter-group analysis of NPRS and PSFS was done with the “Mann-Whitney Test,” and ROM was done with independent “t” test.

The whole treatment was conducted for six weeks. The participants of the study were predominantly males (32 subjects, 80%). The mean age of all the patients was 28.87 ±7.09 years. The left knee injury was found to be higher (n=24) compared to the right knee injury (n=16). Before

treatment, the mean level of pain on NPRS, the functional ability PSFS, and Knee Range of motion was determined by using Universal Goniometer. The statistical analysis proved that the study groups were found to be similar concerning baseline findings for all the parameters.

For ROM, the mean values were 99±18.5 for group A and 102.75±12.92 for group B (Fig 2), and it shows that after day 1 of ROM, there is no significant difference between Group A and Group B; however, the difference was significant between the groups at 4th and 6th week of ROM as from Table1.

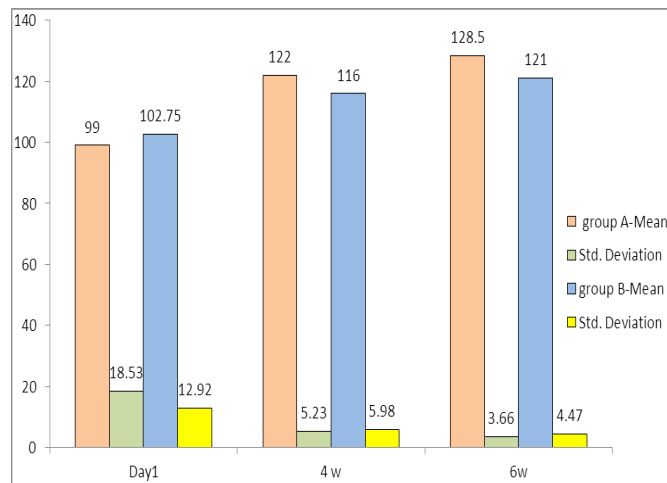


Figure 2. Represents of ROM in Group A vs. Group B

Assessment		t-test for Equality of Means				
		T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
ROM_day1	Equal variances assumed	-0.742	38	0.463	-3.75	5.05333
ROM_4w	Equal variances assumed	3.376	38	0.002	6	1.77705
ROM_6w	Equal variances assumed	5.802	38	0	7.5	1.29269

Table 1: Analysis of ROM for Groups A and B

The mean PSFS for groups A and B was found as 3.39±1.18 and 3.89±0.81 for day1, 7.3300±.7767 and 6.0300±.9358 for 4thw and 8.4850±.6055 and 7.1100±.8391 for 6thw, respectively (Fig 3). From Table 2, the results suggest a significant difference between Group A and B in all three time periods. Intergroup analysis of PSFS was done with the “Mann-Whitney Test.”

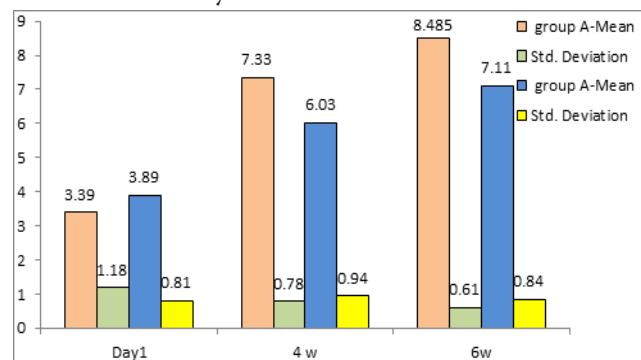


Figure 3: Represents of PSFS in Group A vs. Group B

	PSFS_day1	PSFS_4w	PSFS_6w
Mann-Whitney U	124.000	56.000	34.000
Wilcoxon W	334.000	266.000	244.000
Z	-2.060	-3.911	-4.498
Asymp. Sig. (2-tailed)	0.039	0.000	0.000
Exact Sig. [2*(1-tailed Sig.)]	0.040a	0.000a	0.000a

Table 2: Mann-Whitney Test for PSFS, Statistics

Similarly, the mean NPRS for groups A and B was calculated as 7.35 ± 1.18 and 7.2 ± 1.15 ($p = 0.698$) for day 1, 3.3 ± 0.987 and 4.95 ± 1.3169 for 4th w, and 1.1 ± 0.7881 and 3.05 ± 1.2344 for 6th w, respectively. It is clear from (Table 3) that there is no significant difference between Group A and Group B in day1 of NPRS, while a substantial difference exists between Group A and B in the 4th and 6th weeks NPRS.

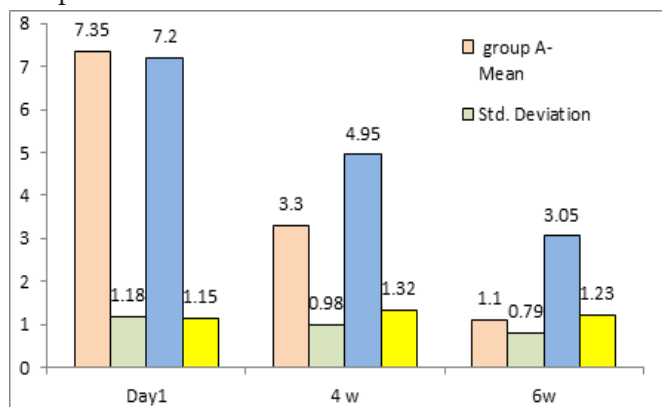


Figure 4: Represents of NPRS in Group A vs. Group B.

	NPRS_day1	NPRS_4w	NPRS_6w
Mann-Whitney U	185.000	67.000 277.000 -	28.000 238.000
Wilcoxon W	395.000	3.688	-4.826
Z	-0.418	0.000	0.000
Asymp. Sig. (2-tailed)	0.676	0.000a	0.000a
Exact Sig. [2*(1-tailed Sig.)]	0.698a		

Table 3: (Mann-Whitney) Test Statistics of NPRS.

The intragroup comparison revealed a clear trend toward improvement in all assessed parameters in both study groups. While the intergroup comparisons demonstrated a reduction in the pain intensity as NPRS was higher in group A (Mulligan squeeze group, $Z = -4.826$, $p = 0.0001$) compared to group B (conventional therapy). The improvement in the PSFS scores was also greater in group A compared to group B ($Z = -4.498$, $p = 0.0001$).

Group A showed significantly better improvement in Range of Motion also. Although mean ROM scores improved after intervention in both study groups ($T = 5.802$, $p = 0.0001$).

DISCUSSION

The work was conducted to investigate the efficiency of Mulligan's squeeze technique along with conventional therapy as an adjunct to traditional therapy alone in dipping discomfort and refining ROM and handy ability of patients clinically diagnosed with a meniscal tear. Konan et al. performed the visual diagnostic test and measured meniscal tears correctly. Finally, they concluded that combining the joint line sensitivity test with McMurray's or

Thessaly's test further enhanced the accuracy of meniscal damages physical diagnosis [17]. In our study, the patient displayed joint line tenderness and inflammation, and a positive 20o Thessaly test, McMurray test, and Apley's test are used for medical meniscal injury diagnosis. Clinically ill 40 subjects were distributed in two teams of 20 each, equally and individually. Evaluation of pain (NPRS), knee ROM (Goniometer) and physical disability (PSFS) are done for both categories. All the parameters were measured at baseline day 1, 4th week and 6th week following the completion of intervention in both groups successfully.

The results of this randomized controlled study clearly show the significant difference between both groups. Still, the results suggest that group A has a more significant difference when comparing to group B according to the outcome measures.

The pain was assessed on NPRS. An alternate approach for the treatment of meniscal pathologies according to Hudson et al. (2016): a case-series study of the Mulligan theory "squeeze" technique shows positive outcomes on NPRS pain [11]. The results of our research have shown a trend in the improvement of pain intensity over the six weeks in two groups. But significantly experimental group (A) shows better improvement in terms of pain when compared to the control group (B). This could be due to the additional effect of the Mulligan squeeze technique in group A.

Varghese Jibu George et al., (2019) recently conducted a study to examine the efficacy of mobilization of OA knee disability with activity. In this research, mobilization with movement for knee weakness is more successful because it shows better results for increasing the range of movement [18]. The results of our study showed a significant (t value is 5.802 and its p-value 0.0001) difference between Group A and Group B in 6weeks of ROM. The more significant improvement is seen in the range of motion in the experimental group (A) compared to the control group (B).

The application of the Mulligan concept to treat recreational dancers with patellofemoral pain syndrome shows positive results in improving patient-oriented measures such as NPRS and PSFS [19]. In our study, the results show a significant difference between Group A and Group B in day1 of PSFS as confirmed by statistical analysis (Z value is -2.06 and its p-value 0.04), and a significant change exists between Group A and Group B in 4week of PSFS, (Z value is -3.911 and its p-value 0.0001). A significant difference exists between Group A and Group B in 6week of PSFS (Z value is -4.498 and its p-value 0.0001). Better improvement is seen in PSFS in the experimental group (A) compared to the control group (B).

The results show that the Mulligan 'squeeze' approach has positive effects on patient performance and health-related quality of life over a planned duration of 6 weeks together with traditional therapy (experimental group A), and was clinically and objectively equivalent to conventional treatment alone (control group B).

CONCLUSION

Both the treatment groups, the Mulligan Squeeze technique along with conventional therapy (experimental group A) and conventional therapy (control group B) are useful in falling pain and improving knee joint range of movement and functional activities in early return to work. But, as per our results and statistical analysis, there is more significant improvement was observed among group A, showing that the application of Mulligan squeeze technique is more effective. It is therefore concluded from this study that the Mulligan squeeze technique is more effective in improving outcomes in meniscal tear patients.

LIMITATIONS

Short duration study (6 weeks) and the study population was limited to those who were able to attend the physiotherapy department. This excluded the patients who could not participate in treatment due to financial condition, transport, work or other reasons. A recommended activity (gym, lifting heavy objects) was not monitored at home despite the ergonomic recommendation.

FUTURE SCOPE

Studies with long term follow up and larger sample size is recommended for generalization of the result. The study was carried out on pain, ROM, functional activities, and others can also be included gait for future studies. Future studies can be done by using MRI scans as an outcome measure to record the changes in menisci position before & after the interventions to get the objective result to support the findings. In future studies, evaluation of pain and outcomes after each treatment, the session can be recorded for more accuracy of results.

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