

A Comparative Study Of Mulligan Mobilization With Movements (Mwms) Technique Versus Conventional Physical Therapy On Knee Strength After Total Arthroplasty

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Abstract

Introduction: Knee injury are common happen, some of the conditions might need the surgery to overcome the problems that they are facing. After knee surgery there is some differences in quadriceps volume and strength. Mulligan Mobilize With movement (MWM) and strengthening exercise proven that help in reducing pain and improve muscle strength. However there is lack of evidence that compare the effectiveness of MWM and conventional physiotherapy (CPT) on knee strength after total knee arthroplasty.

Objective: To determine the relationship between mulligan mobilization with movement technique and conventional physical therapy after total knee arthroplasty.

Methodology: A qualitative research model in the form of experimental research was carried out in this study. 30 participants that had total knee arthroplasty and met the inclusion criteria were included and randomly allocated into MWM and CPT group. The result were collected and analyzed using SPSS.

Results: It was found that pain reduction ($p=0.22$) and improvement of muscle strength ($p=0.41$) when comparing between MWM and CPT group. There was no significant different when we see on the comparison results ($p>0.05$). However when see on the results pre and post intervention among groups, there was significant different. ($p<0.05$)

Conclusion: Both MWM and strengthening exercise were beneficial for patient who had total knee arthroplasty.

Keywords: Mulligan mobilization with movement, total knee arthroplasty, strength, pain

Introduction:

Knee joint is one of the important joint in human body. Knee joint provide the movement of flexion and extension, and might have some medial and lateral rotation. This joint is important for human beings because it act as the role for people to stand, walk, run and others. Knee injury are common happen due to some forces involved such as varus, valgus, hyperextension, hyperflexion, internal rotation, external rotation, anterior translation, posterior translation and axial load. With combinations of the forces, it might cause the injury in knee.(1) Beside from the injury to knee, there are still a lot of knee condition that human beings facing. Knee osteoarthritis cause a pain and activity limitation. Knee osteoarthritis affect the knee joint through pain, stiffness, muscle weakness, atrophy, balance loss and functional limitation. Knee osteoarthritis mostly occur in elder population. (2) This condition might need for the knee surgery. After knee surgery there is some differences in quadriceps volume and strength.(3) These complications can be treated through rehabilitation which are strengthening exercise, stretching exercise, range of motion exercise and others.(4) Mulligan mobilization technique is one of the manipulative technique that use by the physiotherapist in order to benefits the patients. Principles of mulligan technique are based on the Kaltenborn concept which a passive mobilization performed with pain free. To apply this mulligan technique, patient should have the sign of loss of joint movement, pain during movement or pain during functional activity.(5)

Problem statement

Lack of knowledge about the mulligan mobilization with movement techniques under the knee strength after total Arthroplasty.

Objective:

To determine the relationship between mulligan mobilization with movement technique and conventional physical therapy after total knee arthroplasty.

Purpose of study

To investigate the effect of Mulligan Mobilization With Movement technique on total knee arthroplasty under pain and muscle strength.

Methodology

Parameters

Before the treatment pain Visual Analog Scale and Manual Muscle Testing been tested. Pain Visual Analog Scale contain of 1 to 10 score which indicate pain from low to high and Manual Muscle Testing contain 1 to 5 score which indicate strength from low to high. After the intervention, both outcome been tested again.

Study setting

Hospital Rehabilitasi Cheras

Study design

Randomized controlled trial design

Study Sampling

By randomly allocating the post operative patients in two groups which were conventional group and mulligan mobilize with movement group. 30 peoples were selected from the Hospital Rehabilitasi Cheras through the randomize controlled trial. The conventional group of patients received the strengthening exercise that focus on knee and trunk muscle. The exercises that being given were core stabilization exercise, trunk back strengthening exercise and knee strengthening exercise. However the conventional group did not undergoes any

mulligan mobilize with movement therapy. Moreover for mulligan mobilize with movement group, the patient being provided with the technique of mobilize with movement but without any conventional therapy.

Target population

Target population was geriatric around 40-80 years old in Cheras Rehabilitation Hospital. Because the normal ages for the cartilage of joint started to wear off is started on the old age due to overuse.

Study duration

The study duration is carried out for around one year.

Treatment duration

Each patients received the treatment for one month. Three days per week for the interventions, three sets and ten repetitions for the interventions. The data collected on first and fourth week.

Inclusion criteria

Patients recruited from Hospital Rehabilitasi Cheras. Inclusion criteria included women and man with ages between 40 to 80 that had undergoes total knee Arthroplasty in Hospital Rehabilitasi Cheras.

Exclusion criteria

Exclusion criteria excluded the red flag and any cardiac disease. The patient with bilateral total knee Arthroplasty and have osteoporosis condition must also be excluded.

Techniques

The participants employed using random sampling in this study. The participants were chosen based on their capacity and permission to perform the research on their inmates. Based on the inclusion and exclusion criteria, the participants screened for the suitability towards this research.

Concern form was distributed among the inmates and participant chosen based on their willingness to participate in this research. The chosen participants were given suitable date for the assessments involving pre and post assessments date. The pre assessments date and post assessments date was to check for the outcome measure which were Pain Visual Analogue Scale and Manual Muscle Testing.

Data collection

The participants were received the consent before start for the session. Researcher asked for the question and fill up for the assessment. After the assessment, make sure the participants understand the procedure and try to solve their questions and problems. Researcher guided the participants through out the session. Thirty participants screened for the inclusion and exclusion criteria. Participants were separated into two groups with different exercises. Data were collected pre and post exercise program. For pre was the first week and post was the fourth week. Two outcome measures used in this research which were pain Visual Analogue Scale and Manual Muscle Testing. Data had been stored in excel and it will decompose after three month of final data collection process. The researcher can trace the participants data and monitor it for the data collection purpose for the whole fourth weeks.

Exercise procedures

Conventional post operative knee strengthening exercise group

During the first week, consent form was given to patients. Patients in conventional group started to go for the strengthening exercise and range of motion exercise which were isometric contraction exercise, straight leg raise and blood circulatory exercise. After some physiotherapy sessions, teach

the patients with core stabilization training which were squatting with bracing and hollowing the stomach. And also teach for knee strengthening with towel. The number of the physiotherapy sessions being recorded. Intensity of the exercise adjusted under patients comfortable and tolerable.

Mulligan mobilize with movement group

During first week, consent form was given to patients. Patients in this group will receive the mulligan mobilize with movement therapy. Before start the treatment we need to let the surgical incision to heal, this is because the mulligan mobilize with movement is the technique that apply the over pressure at the end range of the joint. The study reported that the technique of mulligan mobilize with movement applied on patient according which are medial glide, lateral glide, medial rotation glide, lateral rotation glide or anterior-posterior glide. Patient will be placing in supine position and patients will actively flex the knee during the mobilization and apply the pressure on the end range of the joint. Physical therapist will glide the joint depend on the glide that been chosen. The mobilization performed for three sets of tens times and can be

increase due to patient toleration. Avoid the pain during the treatment. After the treatment, record for the physical therapist sessions and the outcome of the patients. (6)

Statistical tools

The data was analyzed by SPSS version 26.0 with significance set at $P < 0.05$.

Results:

Data collected was been analyzed by using SPSS version 26.0. Baseline data of study sample was shown in table 1. The demographic of data show that 66.7% of male and 33.3% of female involved in the study samples. 20% of malay, 20% of Indian and 60 percent of chinese samples involved in the study. Two study group with 15 subject of each group involved in the study. Total of the subject involved was 30. Average age of 62.80 of subjects involved in this study. After one month of intervention, with using Wilcoxon signed rank test. The results of Visual Analog Scale (VAS) and Manual Muscle Testing (MMT) in Mobilization With Movement group (MWM) and conventional physiotherapy group (CPT) was observed.

Table 1: Demographic characteristics of study samples

| | Mean (SD) | Frequency | Percentage (%) |
|------------------|-----------|-----------|----------------|
| Gender | | | |
| Male | | 20 | 66.7 |
| Female | | 10 | 33.3 |
| Ethnicity | | | |
| Malay | | 6 | 20 |
| Chinese | | 18 | 60 |
| Indian | | 6 | 20 |

| <u>Study group</u> | | |
|--------------------|--------------|----|
| MMM | 15 | 50 |
| CPT | 15 | 50 |
| <hr/> | | |
| Age | 62.80 (10.4) | |

Note: SD: Standard deviation; MMM: Mulligan mobilization with movement; CPT: Conventional physical therapy

Table 2 showed that the comparison of result of Pain Visual Analog Scale and Manual Muscle testing in each group. In Mulligan Mobilize With Movement group, the pre and post result of visual analog scale and muscle manual testing been compared. The mean of pre pain visual analog scale was 6.06 and after the treatment the score reduce to to 2.67. Standard deviation 1.1 for pre Visual Analog Scale and 1.5 for post Visual Analog Scale. The percentile range of the visual analog scale is between 5 to 7 before treatment and 1 to 4 after treatment. As the p-value is less than 0.05, this indicated that the score of pain reduce significantly after the treatment. The mean of manual muscle testing for Mulligan Mobilize With Movement group before the treatment was 2 and after the treatment it increase to 2.93. Standard deviation for pre Manual Muscle Testing was 0 and 0.26 for post Manual Muscle Testing. The percentile range is between 2 to 2 before treatment and 3 to 3 after treatment. As the p value show that it less than 0.05, so it indicate the score increase significantly after treatment. As for the conventional physiotherapy group, same the pre and post result of visual analog scale and muscle manual testing been compare. The mean of pre pain visual analog scale

was 6.07 and after the treatment the score reduce to to 3.13. Standard deviation 0.88 for pre Visual Analog Scale and 1.85 for post Visual Analog Scale. The percentile range of the visual analog scale was between 5 to 7 before treatment and 1 to 5 after treatment. As the p-value was less than 0.05, this indicated that the score of pain reduce significantly after the treatment. The mean of manual muscle testing for conventional physiotherapy group before the treatment was 2 and after the treatment it increased to 2.80. Standard deviation for pre Manual Muscle Testing was 0 and 0.77 for post Manual Muscle Testing. The percentile range was between 2 to 2 before treatment and 2 to 3 after treatment. As the p value showed that it less than 0.05, so it indicated the score increase significantly after treatment. Both treatment were effective, but there are differences among the group. The score of both outcome in Mulligan Mobilize With Movement group is slightly better than conventional physiotherapy group. Mann-Whitney test was used to compare the outcome of results between Mobilization With Movement group (MWM) and conventional physiotherapy group (CPT).

Table 2: Results of VAS and MMT in MMM and CPT Group

| | Mean | SD | Percentile | | Z | p ^a |
|-------|------|----|------------------|------------------|---|----------------|
| | | | 25 th | 75 th | | |
| <hr/> | | | | | | |

| | | | | | | |
|-----------------------|------|------|------|------|--------|-------|
| <u>MMM group</u> | | | | | | |
| VAS-pre intervention | 6.06 | 1.10 | 5.00 | 7.00 | -3.487 | 0.000 |
| VAS-post intervention | 2.67 | 1.50 | 1.00 | 4.00 | | |
| MMT-pre intervention | 2.00 | 0.00 | 2.00 | 2.00 | -3.742 | 0.000 |
| MMT-post intervention | 2.93 | 0.26 | 3.00 | 3.00 | | |
| <u>CPT group</u> | | | | | | |
| VAS-pre intervention | 6.07 | 0.88 | 5.00 | 7.00 | -3.449 | 0.001 |
| VAS-post intervention | 3.13 | 1.85 | 1.00 | 5.00 | | |
| MMT-pre intervention | 2.00 | 0.00 | 2.00 | 2.00 | -2.762 | 0.006 |
| MMT-post intervention | 2.80 | 0.77 | 2.00 | 3.00 | | |

Note: SD: Standard deviation; MMM: Mulligan mobilization with movement; CPT: Conventional physical therapy; VAS; Visual analogue scale; MMT: Manual muscle testing; ^a: Wilcoxon signed ranks test

Table 3 showed the result of Visual Analog Scale and Manual Muscle Testing between two groups. First of all the outcome that compare in here was Visual Analog Scale, the result shown that mean rank of Mulligan Mobilize With Movement group was higher than conventional physiotherapy group which was 17.33 compare to 13.67. The mean different was 0.47 and standard error was 0.31. For 95% of CI difference between two groups, the lower value is -0.18 and upper value was 1.11. P value for pain Visual Analog Scale between two groups was more than 0.05. Next was the outcome of Manual Muscle Testing compare between

two groups. The result show that mean rank of Mulligan Mobilize With Movement group was higher than conventional physiotherapy group which was 16.60 compare to 14.40. The mean different was 0.13 and standard error was 0.21. For 95% of CI difference between two groups, the lower value was -0.31 and upper value was 0.58. P value for

Manual Muscle Testing between two groups was more than 0.05. Although the P value in both outcome measure was more than 0.05, but the mean rank show that it was slightly higher in Mulligan Mobilize With Movement group

Table 3: Comparison of Outcome Results between MMM and CPT Group

| Outcome | Mean Rank | Mean difference | SE difference | 95% CI of the U difference | | P ^a |
|---------|-----------|-----------------|---------------|----------------------------|-------|----------------|
| | | | | Lower | Upper | |
| | | | | | | |

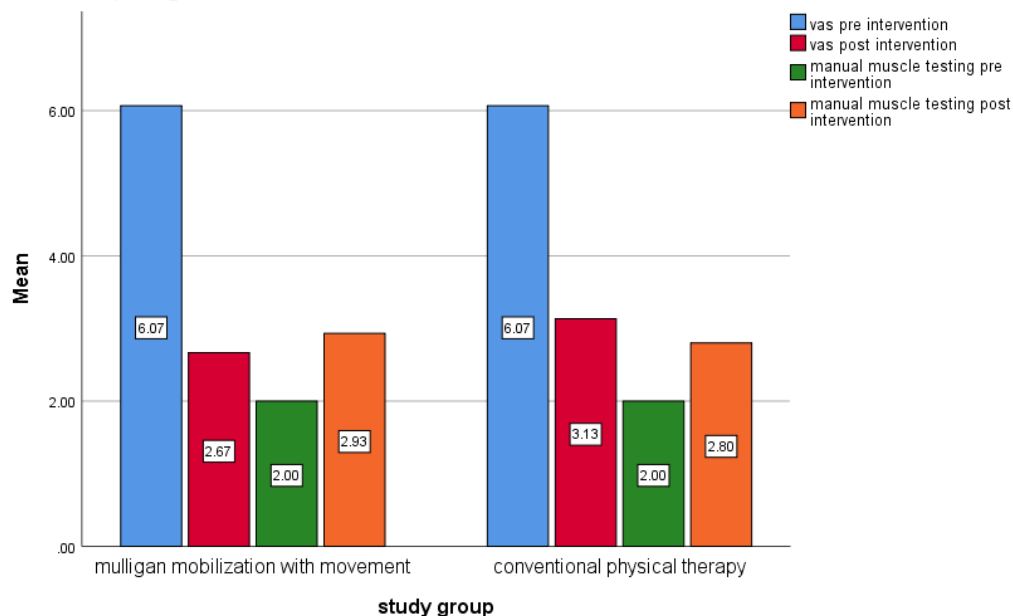
| | | | | | | | |
|------------|-------|------|------|-------|------|-------|-------|
| <u>VAS</u> | 17.33 | 0.47 | 0.31 | -0.18 | 1.11 | 85.00 | 0.223 |
| MMM | 13.67 | | | | | | |
| CPT | | | | | | | |
| <u>MMT</u> | | | | | | | |
| MMM | 16.60 | 0.13 | 0.21 | -0.31 | 0.58 | 96.00 | 0.410 |
| CPT | 14.40 | | | | | | |

Note: SE: Standard error; MMM: Mulligan mobilization with movement; CPT: Conventional physical therapy; VAS; Visual analogue scale; MMT: Manual muscle testing; a: Mann-Whitney test

Graph 1 shown a bar chart of results of pre and post intervention between Mulligan Mobilize with Movement group and conventional physiotherapy group. In the bar chart, the mean value of Visual Analog Scale before the treatment for both group was 6.07. However after the intervention the result shown that mean value of Visual Analog Scale was 2.67 and for conventional physiotherapy group was 3.13. For the

manual muscle testing score in both group before the treatment the mean value was 2.00. After the intervention, the result showed that in Mulligan Mobilize with Movement group mean value was 2.93 and for conventional physiotherapy group mean value was 2.80. In here we can see that both are effective, but the result of value show that Mulligan Mobilize with Movement group more benefits for patients.

Graph 1: Distribution of VAS and MMT in pre and post intervention between MMM and CPT group



Note: MMM: Mulligan mobilization with movement; CPT: Conventional physical therapy; VAS; Visual analogue scale; MMT: Manual muscle testing

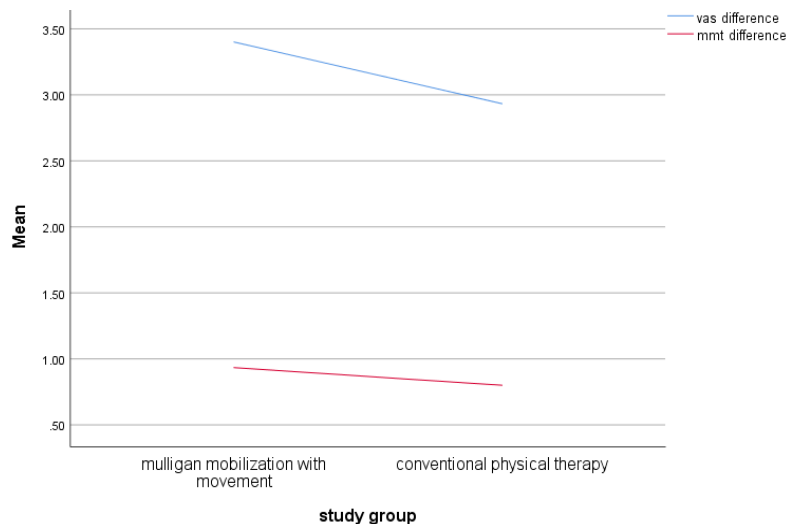
Graph 2 shown line graph of result changing Visual Analog Scale and Manual Muscle testing after intervention between Mulligan

Mobilize with Movement group and conventional physiotherapy group. Blue line show the Visual Analog Scale different

between two groups, it showed that the outcome changing in Mulligan Mobilize with Movement group was slightly greater than conventional physiotherapy group. Red line show the Manual muscle testing score

different between two groups, it showed that Mulligan Mobilize with Movement group was slightly higher than conventional physiotherapy group.

Graph 2: Distribution showing changes VAS and MMT after intervention between MMM and CPT group



Note:MMM: Mulligan mobilization with movement; CPT: Conventional physical therapy; VAS; Visual analogue scale; MMT: Manual muscle testing

The result concluded that pain reduction ($p=0.22$) and improvement of muscle strength ($p=0.41$) when comparing between MWM and CPT group. There was no significant different when we see on the comparison results ($p>0.05$). However when see on the results pre and post intervention among groups, there was significant different. ($p<0.05$)

Discussion

The result obtained in this study state that there was difference between effect of Mulligan Mobilize With Movement and conventional group in total knee arthroplasty. Although the p value shown in table 4 was more than 0.05 which both intervention are effective in reducing pain and improving the muscle strength, but the result in table 2 shown that score of both outcome in Mulligan Mobilize With Movement group is slightly better than

conventional physiotherapy group. Joint mobilization was one of the skill used as manual therapy, it provide the good result in general musculoskeletal disorders. Theoretically joint mobilization provide through the movement of bone and the direction of the pressure during mobilization can be determined by the physiotherapist. Joint positioning also known as manual therapy. Mulligan mobilization With movement concept with combine of Kaltenborn and with additional of one dimension of direction of mobilization, it provided that use of this technique help in pain free conditions.(7) Normally after total knee arthroplasty, some complications faced by the patients such as loss of muscle strength, range of motion and others, so physiotherapist will provided the treatment of exercises such as strengthening, range of motion exercise. In this study, strengthening exercise been provided to conventional

group to investigate the result on pain and muscle strength. In this study, the results of muscle strength may cope with the pain, when the pain reduce the patient start to regain the muscle strength after doing the exercises.

Conclusion:

Thus this study proposes that, Mulligan Mobilization With Movement or conventional therapy as strengthening exercise are effective in patient after total knee arthroplasty as in improving muscle strength and pain relief. But in the table of result, the data show that the Mulligan Mobilization With Movement is slightly better than conventional physiotherapy group.

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