

Study on Carryover Effect of Mulligan's Mobilization with Movement under Water Versus Land Based Mulligan's Mobilization with Movement on Functional Mobility of Knee Joint

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ABSTRACT

Background: Knee osteoarthritis causes pain and functional disability more commonly in elderly population. Knee osteoarthritis is not only the most common type of arthritis but also causes greater disability and clinical symptoms. This study has been done to find out and compare the carryover effects of Mulligan's mobilization with movement with and without water.

Methods: Ethical clearance was obtained from Institutional Ethical Committee, KIMSUDU, Karad. An experimental study was conducted with 84 subjects which were divided into two groups using consecutive sampling with random allocation was done. Group A was treated with under water Mulligan's MWM and Group B was treated with land based Mulligan's MWM. The outcome measures used were Visual Analogue Scale (VAS), Western Ontario and McMaster Universities index (WOMAC) and 30 seconds sit to stand test.

Results: Pre-interventional analysis done for VAS, WOMAC and 30 Second sit to stand test showed no significant difference with p values 0.1931, 0.9408, 0.4580 respectively. Post-interventional analysis done for VAS showed Not quite significant difference, $p=0.0768$, for WOMAC no significant difference ($p=0.9919$) and 30 seconds sit to stand score showed very significant difference ($p=0.0044$)

Conclusion: The study concludes that there is very significant effect of underwater Mulligan's mobilization with movement on functional mobility of knee joint.

Keywords: functional mobility, MWM, Land based, under water, pain.

INTRODUCTION

Knee osteoarthritis is the most common condition caused due to degeneration. It is a disorder caused by multiple factors and is characterized by decreased thickness of articular cartilage, marginal hypertrophy of bones, subchondral sclerosis and certain alterations in the morphological and biochemical contents of the synovial membrane and joint capsule. [1,2]

Knee osteoarthritis causes pain and functional disability more commonly in elderly population. Knee osteoarthritis is not only the most common type of arthritis but also causes greater disability and clinical symptoms. Tibiofemoral compartment of the joint is mainly affected. [3,4]

Comparing the gender distribution, women are more affected than men but the prevalence in men increases as the age progresses. [3-5] Amongst all the rheumato-

logic problems, in India osteoarthritis is the second most common problem and it is also the common joint disease with the prevalence of 22% to 39%.^[6,7]

MULLIGAN'S MOBILIZATION WITH MOVEMENT:

Mulligan's Mobilization with Movement is a technique that does not cause pain and do not have any side effects. A skilled therapist can perform this technique comfortably as it is not an intensive form of treatment. Moreover, these glides are easy to learn so can be used easily in clinical practice. If the technique is applied in a correct pattern, the glide helps in relieving various types of pain.^[8]

UNDER WATER TREATMENT:

Due to the unique and effective properties of water, it is used in various rehabilitation programs. Relative high specific heat, thermal conductivity, buoyancy, greater resistance and hydrostatic pressure to the body are the various properties of water.^[9]

Hydrotherapy is mostly recommended as the choice of treatment is elderly population as the recent studies prove that elderly individuals show better performance in water as it is safer and has low risk of fall.^[10]

Furthermore, subjects with OA show higher level of treatment adherence with hydrotherapy than other forms of conservative managements.

It is argued that hydrotherapy offers additional physiological and biomechanical benefits compared to land based exercises for subjects with knee OA and these could lead to better clinical outcomes. Furthermore, aquatic buoyancy potentially reduces weight bearing stresses on joints, bones and muscles. Hydrotherapy also allows the performances of close chain exercises, which are potentially painful with greater weight bearing.^[11]

The buoyancy of water unloads weight bearing anatomical structures and thus can allow subjects with load sensitive joints to perform exercises with less trauma and pain.^[12,13]

MATERIALS AND METHODOLOGY

After the approval was obtained from the protocol and institutional ethical committee, Krishna Institute of Medical Sciences, Karad, subjects were recruited for this study from the physiotherapy outpatient department, Krishna Hospital, Karad. The purpose and motive of this study was explained thoroughly to the patients. Consent was taken from the patients in written form and the subjects willing to participate in this single session study intervention were recruited. 84 subjects fulfilling the inclusion and exclusion criteria were selected and allocated in two groups by convenient sampling technique with random allocation (Group A and B). Outcome measures used were VAS for pain, For assessing the physical functions the Western Ontario and McMaster Universities osteoarthritis index (WOMAC) and 30 second sit to stand test to evaluate the functional mobility of knee joint.

GROUP A: Mulligan's Mobilization with Movement under water. Glides (10 movements in one glide, 3 sets)

GROUP B: land-based Mulligan's Mobilization with Movement. Glides (10 movements in one glide, 3 sets)

Statistical Analysis:

Statistical Analysis was done using Instat Software.

Paired 't' test was used for statistical analysis of pre and post intervention within group.

Unpaired 't' test was used for between group statistical analysis of Group A and Group B.

RESULTS

In the present study within group analysis of pre interventional mean VAS score was 6.75 ± 1.825 in Group A and 6.25 ± 1.699 in Group B whereas post-interventional mean VAS score was 4.70 ± 02.010 in Group A and 5.44 ± 1.744 in Group B respectively.

Intra group analysis of VAS score revealed statistically reduction in pain post intervention for both the groups. This was

done using paired t test Group A ($p < 0.0001$) Group B ($p < 0.0001$).

In the present study the between group analysis of pre interventional means of VAS score was 6.75 ± 1.825 in Group A and 6.25 ± 1.699 in Group B whereas post-intervention means VAS score was 4.70 ± 0.010 in Group A and 5.44 ± 1.744 in Group B respectively. Inter group analysis of VAS score was done by using unpaired t test.

Pre interventional analysis showed no significant difference between group A and group B ($p = 0.1931$). Post intervention analysis showed no quite significant difference between Group A and Group B ($p = 0.0768$).

In the present study pre interventional mean WOMAC score was 67.33 ± 10.311 in Group A and 67.5 ± 10.194 in Group B whereas post-interventional mean WOMAC score was 65.5 ± 10.771 in Group A and 65.52 ± 10.650 in Group B respectively.

Within group analysis of WOMAC score revealed statistically reduction in physical function disability post intervention for both the groups. This was done using paired t test Group A ($p < 0.0001$) Group B ($p < 0.0001$).

In the present study between group analysis of pre interventional means of WOMAC score was 67.33 ± 10.311 in Group A and 65.5 ± 10.194 in Group B whereas post-intervention means WOMAC score was 65.5 ± 10.778 in Group A and 65.52 ± 10.650 in Group B respectively. Inter group analysis of WOMAC score was done by using unpaired t test.

Pre interventional analysis showed no significant difference between group A and group B ($p = 0.9408$). Post intervention analysis showed no significant difference between Group A and Group B ($p = 0.9919$).

In the present study within group analysis of pre interventional mean 30 seconds sit to stand Score was 6.571 ± 1.990 in Group A and 6.285 ± 1.486 in Group B whereas post-interventional mean of 30 seconds sit to stand Score was 9.095 ± 2.162

in Group A and 8.761 ± 1.885 in Group B respectively.

Intra group analysis of 30 seconds sit to stand Score revealed statistically reduction in pain post intervention for both the groups. This was done using paired t test Group A ($p < 0.0001$) Group B ($p < 0.0001$).

In the present study between group analyses of pre interventional means of 30 seconds sit to stand Score was 6.571 ± 1.990 in Group A and 6.285 ± 1.486 in Group B whereas post-intervention means 30 seconds sit to stand Score was 8.761 ± 1.885 in Group A and 7.595 ± 1.768 in Group B respectively. Inter group analysis of 30 seconds sit to stand Score was done by using unpaired t test.

Pre interventional analysis showed no significant difference between group A and group B ($p = 0.4580$). Post intervention analysis showed very significant difference between Group A and Group B ($p = 0.0044$).

1. VISUAL ANALOUGE SCALE

TABLE NO 1: Comparison of pre-pre and post-post VAS score in between groups.

Group	Pre- treatment		Post-treatment	
	Mean \pm SD	Median	Mean \pm SD	Median
A	6.75 ± 1.825	6.750	4.70 ± 0.010	4.750
B	6.25 ± 1.699	6.200	5.44 ± 1.744	5.350
'p'	0.1931		0.0768	
Inference	Not significant		Not quite significant	

2. WOMAC

TABLE NO 2: Comparison of pre-pre and post-post WOMAC score in between groups.

Group	Pre- treatment		Post-treatment	
	Mean \pm SD	Median	Mean \pm SD	Median
A	67.33 ± 10.311	68.000	65.5 ± 10.778	67.000
B	65.5 ± 10.194	67.500	65.52 ± 10.650	67.000
'p'	0.9408		0.9919	
Inference	Not significant		Not significant	

3. 30 SECONDS SIT TO STAND SCORE

TABLE NO 3: Comparison of pre-pre and post-post 30 seconds sit to stand Score in between groups.

Group	Pre- treatment		Post-treatment	
	Mean \pm SD	Median	Mean \pm SD	Median
A	6.571 ± 1.990	6.000	8.761 ± 1.885	9.000
B	6.285 ± 1.486	6.000	7.595 ± 1.768	7.000
'p'	0.4580		0.0044	
Inference	Not significant		very significant	

DISCUSSION

OA is traditionally thought of as a non-inflammatory type of arthritis, with mechanical

factors having a central role, inflammatory mechanisms can be present. Pain relief is a main motivator for patients with OA to seek medical Attention. However, a secondary benefit of successful treatment is slowing the decrease in patient's quality of life. Although there is no cure, current strategies are primarily aimed at reducing pain and improving joint function.

The gender involvement and the mean age in this study correlates with the study on prevalence conducted by Chandra Prakash Pal et.al. In this present study, 84 subjects with osteoarthritis of knee fulfilling the inclusion and exclusion criteria, between age group 50 to 70 years were taken. Out of 84 subjects, 38 were male and 46 were female. Group A had 14 male and 24 females, group B had 24 male and 18 female. The study included more females as compared to males. The mean age of the participants in group A was 59.404 and in group B was 59.219. There was no significant difference between the mean ages of the participants in both groups. This was done using unpaired t test. These results correlate with the previous literature. [1]

In this study, mulligan's movement with mobilization was applied to the participants. Mulligan's concept is a technique in which the glide is applied safely till the available end range under full control without pain. This provides mechano-receptive afferent impulse to the central nervous system. This technique is a contemporary form of joint mobilization in which a glide is applied by a therapist up to the pain free end range which involves active movements by the subjects. [14,15]

When the treatment is initiated, accessory movements are used. When subjects can perform 60% of normal range of motion pain free, for gaining the further normal range of motion the physiological mobilization must be applied. Physiological movement is painful and can be performed actively or passively whereas the accessory glide is applied at peripheral joint. The basic principle of Mulligan's movement with mobilization is that the pain should be

reduced or vanished at noticeable extent during the treatment application. [16]

Mulligan's movement with mobilization is a technique that does not cause pain and do not have any side effects. A skilled therapist can perform this technique comfortably as it is not an intensive form of treatment and if in case the therapist find it difficult to maintain the glide, mulligan belt can be used and the subject is voluntarily involved. Moreover, these glides are easy to learn so can be used easily in clinical practice. If the technique is applied in a correct pattern, the glide helps in relieving various types of pain. [18]

Assessment of knee osteoarthritis can be done with the use of various scales. For pain assessment visual analogue scale is used in this study. The participants were asked to mark their pain intensity on a straight 10 cm long line with 0 on one end and 10 on another. [22]

In this study, within group analysis of VAS score revealed statistically reduction in pain after the intervention for both the groups. This was done using paired t test. Inter group analysis of VAS score was done by using unpaired t test. Pre interventional analysis showed no significant difference between group A and group B. Post intervention analysis showed no significant difference between Group A and Group B. this result of pain reduction correlates with the study carried out by Dharmesh Solanki et.al. which concluded that internal rotation glide helps to decrease pain better than medial rotation glide. Thus in this study the pain was reduced after the single session in both the groups, and both groups were equally benefited. So for pain reduction after single session treatment both the treatment methods were similarly effective. The pain reduction can be explained possibly due to the Positional fault theory (Mulligans,1995) that is joint alterations occur due to chronic/poor arthrokinematics which causes inconsistent bony congruencies, after the application of glide, Mulligan's movement with mobilization

relocates joints in correct alignment and thus immediate pain relief occurs.

For assessing the physical functions the Western Ontario and McMaster Universities osteoarthritis index (WOMAC) is commonly used. The WOMAC helps to find the specific diseases, personal health management and physical conditions. Clinically WOMAC is an important functional tool to evaluate pain, stiffness and physical functions. The WOMAC index comprises of 24 categories which include 5 categories of pain, 2 categories for stiffness and 17 categories for physical functions. The score is measured after asking the questions to the subjects in 3 sections. Section A for pain, section B for stiffness and section C for functional difficulty. Participant rate the score as per their severity out of 5. The index can be filled up in 5 minutes. This is the worldwide used index. [8,17-19]

In this present study, both the groups showed significant improvement in WOMAC Score. These results correlated with the study carried out by Reepa Avichal Ughreja et.al which concluded that Mulligan's MWM is significantly effective in relieving pain and improving functional status in osteoarthritis of the knee. However, in this present study there was no significant difference between the post session comparisons. As this was a single session study, this may be because the patient could not analyze all the components and difference felt after the treatment.

The physical functions showed improvement on WOMAC score, this could be possibly due to the reduction in pain and buoyancy effect which reduces joint loading. Water pressure also help to improve sensory input and helps in joint pain relief due to which leads to better physical performance. [10]

30 second sit to stand test is done to evaluate the functional mobility of knee joint. The reliability of this test is excellent inter rater and test retest reliability in subjects with knee and hip osteoarthritis. Test shows acceptable responsiveness in

subjects after 9 physiotherapy exercise sessions. The 30 second sit to stand test appears to be more responsive than timed UP and GO test or 40 m self-packed walk test in subjects with osteoarthritis. [20-23]

In the present study, the 30 sec sit to stand test showed significant improvement in both the groups, however the post session analysis between the groups showed that the under water treatment was better than the land based single session of Mulligan's MWM. There is paucity literature that explains about the single session effect of under water treatment on functional mobility of knee joint. However, as the MWM glide requires active participation, the patient involvement was better under water as compared on land as the weight exerted on the joint was lesser due to the buoyancy effect. Thus as the effect of glide under water was better, the functional mobility of the joint possibly must have shown improvement.

Thus when the internal rotation glide of Mulligan's movement with mobilization was applied to the subjects with grade 1 and grade 2 knee osteoarthritis, the significant difference was seen in all the outcomes in both the groups on statistical analysis of within group values. However a between group analysis revealed no significant difference on pain by VAS and on physical functions by WOMAC score.

The functional mobility assessment done by 30 seconds sit to stand test showed extremely significant difference in between group analysis. The group A under-water Mulligan's movement with mobilization was better than group B land based Mulligan's movement with mobilization.

Considering all the outcomes and their results, the carryover effect of Mulligan's mobilization with movement under water is better.

CONCLUSION

The present study concludes that there was significant improvement in VAS, 30 seconds sit to stand test and WOMAC score in both the groups.

However, land based Mulligan's mobilization with movement and under water Mulligan's mobilization with movement were equally effective in reducing pain and improving physical functions.

Whereas, the functional mobility of knee joint was improved better in under water Mulligan's mobilization with movement than land based Mulligan's mobilization with movement.

Based on the statistical analysis it could be concluded that the carryover effect of under water treatment was better when compared to land based Mulligan's Mobilization with Movement.

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How to cite this article: Benkar AP, Rayjade A. Study on carryover effect of Mulligan's mobilization with movement under water versus land based Mulligan's mobilization with movement on functional mobility of knee joint. Int J Health Sci Res. 2019; 9(8):181-187.
