



IMMEDIATE AND SHORT TERM EFFECTS OF MULLIGAN MOBILIZATION WITH MOVEMENT, ON PAIN, DISABILITY AND RATIO OF VASTUS MEDIALIS AND VASTUS LATERALIS ACTIVITY IN INDIVIDUALS WITH KNEE OSTEOARTHRITIS IN THE AGE GROUP 50-70 YEARS.

Physiotherapy

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ABSTRACT

Knee osteoarthritis is a common cause of knee pain and functional impairment. In this study immediate and short term effect of Mulligan mobilization with movement (MWM) technique on Pain,disability,and ratio of vastus medialis and vastus lateralis activity were assessed on 40 individuals with knee osteoarthritis in the age group of 50-70 years.

Method- Duration of study for each participant was 2 weeks which included 4 sessions- on day 1,3,5 and 12.Immediate effect was assessed immediately after each treatment session and short term effect was assessed one week after the final treatment session i.e on day 12.Outcome measures were Numerical Pain Rating Scale,Knee outcome Survey and EMG activity of vastus medialis and vastus lateralis.

Result-Significant immediate effect of MWM on pain was obtained in every session.($p < 0.0001$).There was significant short term effect of Mulligan on pain. ($p < 0.0001$).Significant effect of MWM on disability reduction was also seen ($p < 0.0001$). There was no immediate or short term effect of MWM on ratio of EMG activity of vastus medialis and vastus lateralis muscles.($p = 0.5$)

Conclusion- Mulligan MWM has immediate and short term effect on pain and disability but not on ratio of vastus medialis and vastus lateralis activity in individuals with knee osteoarthritis in the age group of 50-70 years.

KEYWORDS

Osteoarthritis (OA), Vastus Medialis(VM), Vastus Lateralis (VL), Electromyography(EMG), Mobilization with movement (MWM)

INTRODUCTION- Osteoarthritis is a chronic degenerative condition commonly seen in the knee joint.⁽¹⁾

It is a common cause of pain and functional impairment,which may result in physical disability.^(2,3)

Structural changes which take place in the joint and articular cartilage during development of osteoarthritis lead to changes in biomechanical alignment of joint,which results into muscle imbalance and dysfunction, as kinesiology of the muscles working to stabilize the joint gets altered.These changes produce functional impairments.

Vastus Medialis(VM) and Vastus Lateralis(VL) muscles of quadriceps muscle group are mainly responsible to enhance the dynamic efficiency of knee function(Tang et al.2001).

According to McConnell(1996) the VM/VL ratio should be 1:1 in clinically healthy individuals and it is found altered in individuals with knee pain.

Lack of equilibrium between the VM and the VL is a risk factor which is responsible for dynamic dysfunction of the knee joint and abnormal patellar tracking.^(4,5)

Variety of conservative and evidence based physical therapy interventions are available for treatment of osteoarthritis knee⁽⁶⁻⁸⁾

Mulligan Mobilization with Movement is one of them used widely for treating osteoarthritis knee as it is effective in improving pain, joint stiffness, range of motion and function. (Brian Mulligan 2004,Deyle GD 2000)

It has been proved that Mulligan reduces pain by correcting positional faults. Many studies have proved the effect of Mulligan on reducing the pain and disability in individuals with osteoarthritis knee, but on extensive review of literature there has been apparently no data proving the effect of Mulligan MWM technique on activity of VM and VL.

Hence this study aims to find out whether along with reduction in pain and improvement in function by correcting positional faults at tibiofemoral joint can Mulligan MWM alter the activity of VM and VL, and hence can it alter the ratio of VM to VL activity which is claimed to be altered in individuals with osteoarthritis knee.

METHODOLOGY- Interventional study carried out in tertiary health care centre in the duration of 1 year.

INCLUSION CRITERIA- 1.Males and females diagnosed as knee

OA (Mild And Moderate K- LGrade 1 And 2) from medical OPD with history of knee pain since 6 months and within the age group 50-70 years

2.Pain on NPRS- ranging from 3-6.

3.Individuals with normal to overweight BM(18.5-29.9)

EXCLUSION CRITERIA-

1. Secondary knee OA
2. Individuals with any previous surgery of knee
3. Limb length discrepancy
4. Congenital and other deformities
5. Infective Arthritis
6. Collagen tissue disorders
7. Any neuromuscular disease or systemic illness
8. Manual labourers
9. Individuals with Diabetes Mellitus and Hypertension not under control.

Material-Plinth,Noraxon myotrace plus portable EMG device, Ruler,Universal goniometer,Weighing machine,Measuring tape, Skin pen marker, Velcro straps, cotton,ethyl alcohol,surface EMG electrodes.

Method- 40 Individuals with age group 50 to 70 years selected by the convenience sampling method from the medical OPD who were prescribed medications and were not on any other form of therapy.Total duration of the study for each participant was 2 weeks.It included 4 clinical sessions.

First 3 sessions i.e on day 1,day 3 and day 5 were for Mulligan MWM treatment and evaluation of outcome measures pre and post treatment. There was interval of 48 hours between each session. 4th session was for the follow up and only for evaluation of outcome measures which was on day 12 i.e one week after the final treatment session.

Outcome measures were- Numerical pain rating scale(NPRS), Knee outcome survey (KOS-ADL) ,and Ratio of EMG activity (RMS) of VM and VL muscles (at 60 degree knee flexion angle during wall slide squat)

As the KOS scale asks participants to rate knee symptoms and function over the previous few days, it was not appropriate to administer this questionnaire at the subsequent second and third consultation. Thus, the KOS-ADLS was completed at baseline i.e on day 1 and at the follow-up i.e on day 12 only.

Immediate effect of Mulligan MWM was evaluated immediately after every treatment session.

Short term effect – one week after the final treatment session i.e on day 12.

STATISTICAL ANALYSIS

Statistical analysis was done by Graphpad Prism software.

For parametric data- A)EMG activity (RMS) of VM and VL
B) Numerical Rating Scale tests used -

1. Paired t test for within the group comparison
2. Unpaired t test for between group comparison

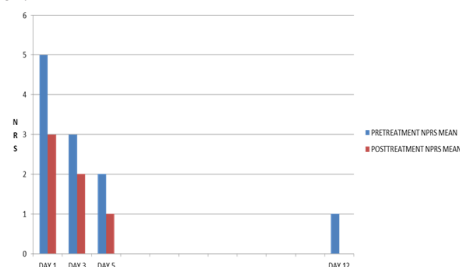
For parametric data which did not pass the normality curve and also for Non parametric data like KOS tests used-

1. Wilcoxon signed rank test for within the group comparison
2. Man whitney test for between group comparison

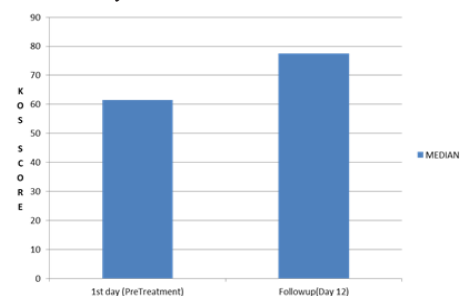
RESULTS

1. Immediate and short term effects of MWM on pain

Comparison of NPRS Pre-treatment and Post –treatment in all 3 sessions (day 1,3,5) showed that pain reduced immediately after treatment. The p value is <0.0001 in all 3 sessions which is considered statistically extremely significant. For short term effect of MWM, P value obtained is <0.0001 which is extremely significant. Hence there is significant immediate and short term effect of MWM on pain reduction.



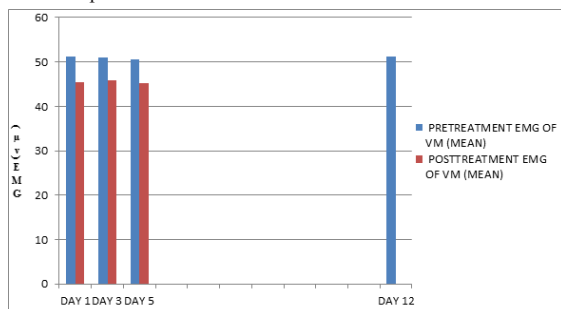
2. Effect of MWM on disability –Comparison of Knee outcome survey (KOS-ADLs) on 1st day to 12th day. P value obtained is <0.0001 which is extremely significant. This result shows that there is significant improvement in the score of Knee Outcome Survey and reduction in disability after all 3 treatment sessions.



3. Immediate and short term effects of MWM on EMG activity of VM in all 3 sessions-

Immediate effect -results show that EMG activity of VM significantly decreases immediately after the treatment in every session. P value obtained in all 3 sessions is <0.0001

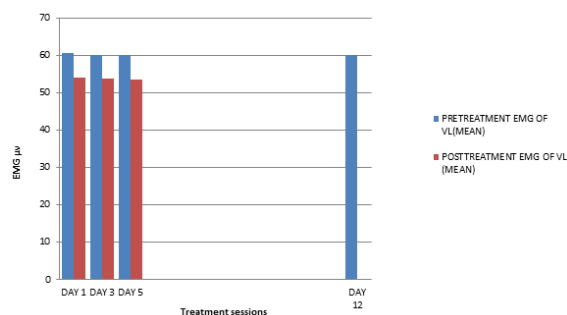
Short term effect result obtained indicates no significant difference between day 1 and day 12 VM EMG activity (p value = 0.7624) hence there is no specific short term effect



4. Immediate and short term effects of MWM on EMG activity of VL- Immediate effect

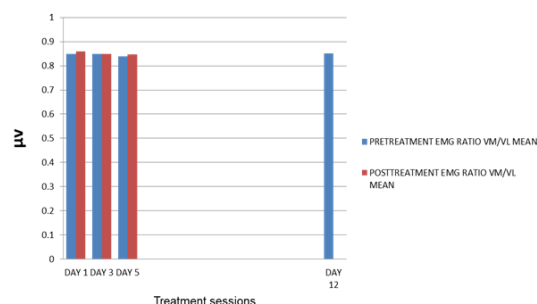
-Results show that VL EMG activity decreases significantly immediately after the treatment in every session. P value obtained in all 3 sessions is <0.0001

Short term effect-result indicates no significant difference between day 1 and day 12 VL EMG activity (p value = 0.6550) hence there is no specific short term effect.



5. Immediate and short term effects of MWM on VM/VL of EMG activity-

No significant difference was found between pre and post treatment VM/VL EMG immediately and even on follow up session. Hence there is no immediate or short term effect of MWM on VM/VL EMG activity.



DISCUSSION-Above study showed that Mulligan MWM has significant immediate and short term effect on pain.

Similar effect of reduction in pain by Mulligan MWM was also found by Hiroshi Takasaki and Toby Hall (2012) in individuals with osteoarthritis knee.

Mechanisms by which Mulligan MWM achieves pain relief are biomechanical and neurophysiological mechanisms i.e correction of positional faults and stimulation of mechanoreceptors (Vicenzino 2011, Mulligan 2004). One more mechanism of pain relief can be - alterations in concentrations of inflammatory mediators by large range of movement used in application of MWM which resulted in deactivation of nociceptors which were initially activated by those inflammatory mediators. (Schmidt 1996, Buckley 2003)

Significant improvement in the scores of KOS-ADL was found which can be because of

1. Pain reduction
2. Weight bearing position used in the treatment of Mulligan MWM which is a functional position.

While assessing immediate effect, the isolated activities of VM and VL got markedly reduced simultaneously, so the ratio VM/VL remained same as that before treatment. Short effect of MWM on EMG activity of VM and VL did not show any significant effect. Hence the ratio also remained constant.

The reason behind reduced EMG activity of VM and VL immediately post MWM could be that only correction of positional fault did not seem to have any effect on the muscle activity of VM and VL. On the contrary the VM and VL reduced their activity as they were not accustomed to the improved mobility.

These similar findings of reduction of EMG activity (RMS) immediately after the treatment was found on masseter muscle following maitland mobilization (Taylor et al 1994).

Georgias (2009) described that a Maitland mobilization to L3 vertebra results in statistically significant decrease in surface EMG activity (RMS) of erector spinae muscle.

Studies done by Bolton 2006, Dishman Burke 2003, Lewis et al 2001 described that passive movements may increase the muscle spindle activity and at the end range of mobilization there is stimulation of Golgi tendon organ activity which leads to reflex inhibition of muscles and hence reduction in muscle activity.

From this study it can be concluded that Mulligan MWM improves function by reducing pain but it does not improve EMG activity of VM and VL muscles which is required for the long term maintenance of reduced pain and improved function. Hence for that other exercise programs like strengthening exercises have to be incorporated along with Mulligan MWM for long term treatment benefits and only with Mulligan MWM will not be sufficient.

CONCLUSION-

1. There is immediate and short term reduction in pain with Mulligan MWM
2. There is short term reduction in disability with Mulligan MWM.
3. There is no immediate and short term change in ratio of EMG activity of VM and VL muscles with Mulligan MWM.

REFERENCES

1. Harris ED, Budd RC, Genovese MC et. Al. Kelley's textbook of rheumatology- Elsevier publication 7th edition; 2005
2. Cortim, Rigon C et al.- Epidemiology of osteoarthritis: prevalence, risk factors and functional impact. *Aging Clinical Exp.* (2003; 15:359-63)
3. De Fillipis L, Gulli S, Calini A, Romancoc, Munao F, Trimarchi G, et al. Epidemiology and risk factors of osteoarthritis: literature review data from "OASIS" study (in Italian) *Reumatismo* 2004; 56: 169-84
4. McConnell J.- Management of patellofemoral problems. *Journal of Manual Therapy* 1996; 1(2):60
5. Sakai N, Luo ZP, Rand JA, An KN- The influence of weakness in the Vastus Medialis oblique muscle on the patellofemoral joint: in vitro biomechanical study. *Journal of Clinical Biomechanics* 2000; 15: 335-339.
6. Zhang W et al- recommendations for management of hip and knee osteoarthritis- part II - OARSI evidence based, expert guidelines - 2008 feb 16(2): 137-62
7. Jordan KM, Arden NK, Doherty M, et al. EULAR Recommendations 2003: an evidence based approach to the management of knee osteoarthritis: Report of a Task Force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT). *Ann Rheumatoid Diseases*- 2003; 62: 1145-55.
8. Zhang W, Nuki G, Moskowitz RW, et al. OARSI recommendations for the management of hip and knee osteoarthritis: Part III: changes in evidence following systematic cumulative update of research published through January 2009. *Osteoarthritis Cartilage* 2010; 18:476-99