



Effects of Mulligan's Mobilization Adjunct to Agility and Perturbation Exercises in Subjects with Knee Osteoarthritis

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ABSTRACT

Background: Osteoarthritis of knee is one of the common disease, mainly affecting the articular cartilage of a synovial joint. Which results in pain, decreased proprioception, muscle weakness and disability. Mulligan's mobilization helps in relieving pain and improves ROM but lacks in stability. Agility and perturbation exercises improves stability and proprioception but lack in the improvement of ROM. Mulligan's mobilization and Agility and Perturbation exercises in combination can bring better outcome results.

Purpose: The purpose of the study is to find out whether Mulligan's mobilization MWM (Internal rotation glide) as an adjunct to Agility and Perturbation can bring better outcome in patients when compared to Mulligan's alone.

Methods: 60 patients were assigned to two groups 30 each group and subjects were selected by convenient sampling method. Group A with mulligan's mobilization alone and group B SWD with Mulligan's mobilization as an adjunct to Agility and Perturbation exercises. The treatment session was performed on alternative days for 6weeks. Each subject performed all the measurement with knee function assessed NPRS, knee ROM by Goniometer, Timed up and go scale (TUG) and WOMAC index. All outcome were tested at starting the day, week 3 and final week 6 of pre and post treatment.

Results: The group analysis was done for NPRS, TUG, ROM, WOMAC in the evaluation of knee function was done using independent's' test. Among the groups paired t-test used and showed statistically significant.

Conclusion: It is concluded that Mulligan's technique with Agility and perturbation exercises is a better treatment approach than Mulligan's with conventional exercises.

Keywords: Osteoarthritis, Mulligan's Mobilization, Agility and Perturbation Exercises, SWD.

INTRODUCTION

Osteoarthritis of the knee is a most common degenerative disorder which results in disruption of articular cartilage. In every 1, 00,000 women 2,693 and in every 1, 00,000 men 1,770 people are effected with osteoarthritis.¹. The rate of prevalence of OA is more in India that is 29% to 39% when compared to western population².

Most of the individuals with knee OA complaints of pain, morning stiffness, loss of range of motion, muscle weakness, crepitus, swelling, decreased functional disability such as walking, squatting, sit to stand and stair climbing³. Joint pain of osteoarthritis is exacerbated by activity and relieved by rest. In the severe condition, it is painful to even at rest⁵. Risk factors for knee osteoarthritis: Age, gender, obesity, previous knee injury and occupation³.

Impaired proprioception is also has been reported for the patients suffering from knee osteoarthritis. It plays a vital role in the maintenance of joint stability of the knee via the sensory motor system⁶.

Treatment of OA knee is often symptom based, involves a reduction in joint pain and stiffness improves joint mobility. Decreased swelling improves physical activity, limiting or slowing the joint degradation and patient's education⁷.

Mulligan's mobilization with movement (MWM) is a manual therapy treatment technique, used in the management of various musculoskeletal conditions given by Brain mulligan in 1980.^{9,10} it is the combination of two components, joint mobilization, and active movement⁹. It helps in reducing pain and movement restriction. The treatment technique's principle is to overcome joint tracking problems or positional faults by making biomechanical changes. The therapist also evaluates various combinations of parallel and perpendicular glides to find out the correct plane and the grade of the accessory moment.

The aim of this study was to find out whether Mulligan's mobilization as an adjunct to agility and perturbation exercises can bring better outcome results in patients when compared to Mulligan's mobilization and to suggest a rehabilitation program which will be more beneficial, safe and cost effective in patients with knee osteoarthritis.

MATERIALS AND METHODS

We recruited 60 subjects from Nizam's institute of medical sciences, Hyderabad. Subjects with knee pain who were diagnosed with knee osteoarthritis by an orthopaedician were included in the study.

Criteria for inclusion were the age of 30-65 years of both sexes, knee osteoarthritis with regular knee pain with crepitus on motion, reduced knee range of motion, Kellgren and Lawrence grade I-III, moderate to severe pain on a scale of NPRS more than 5.

Exclusion Criteria included subjects diagnosed with secondary OA knee, A recent intra articular steroid injection to knee within three months, any systemic and/or neurological illness, rheumatoid arthritis, osteomyelitis, any neurological disorders, spinal disorders, obesity, , Dementia, inflammatory conditions like Ankylosing spondylitis, , Rheumatoid arthritis, Osteoporosis, Diabetic neuropathy, Red flags such as Trauma, Cancer, Constitutional Symptoms (Fever, Malaise, Weight Loss), Recent Infection, Mental retardation, Hemiparesis / Hemiplegia.

The subjects were randomly assigned into 2 groups by lottery method without any bias who met the inclusion and exclusion criteria. Informed consent was obtained from a patient who met the criteria, baseline measurements were Numerical pain rating scale for knee pain intensity, knee ROM with Universal Goniometer, WOMAC index, TUG for knee specific disability.

Group 1 included Mulligan's mobilization MWM internal rotation glide, conventional therapy, and SWD, Group 2 included Mulligan's mobilization MWM Internal rotation glide, Agility and perturbation exercises, SWD.

Pre-treatment evaluation was done on the first day as a baseline measurement, by asking the patient to mark along the line to determine their level of pain on NPRS. The functional disability of each patient was assessed by WOMAC scale. Knee ROM using Universal Goniometer and agility TUG. At the end of the session (day1), in both the groups, the subjects were assessed for any increase in pain. If no, the adverse response was reported, further sessions were carried out. In group 1 Subjects were treated with mulligan's internal rotation glide (MWM) of 3sets and 10 repetitions and taught conventional physiotherapy exercises on day1. In group 2 mulligan's internal rotation glide (MWM) of 3 sets 10 repetitions and taught agility and perturbation exercises on day1. Follow up evaluation was done at the end of 3rd week, 6th week and documented in all the two groups.

All outcome measures were taken and data analysis was done for final results.

GROUP I Conventional Therapy: Receives Mulligan's mobilization and Conventional treatment.

It includes:

- Mulligan's knee internal rotation glide – 10 repetitions for 3 times.
- Knee ROM exercises – 7 seconds hold for 10 times.
- Static quadriceps and hamstrings – 7 seconds hold for 10 times.
- VMO exercises – 7 seconds hold for 10 times.
- SWD- 10 minutes.

The treatment consists, alternative days in a week for 6 weeks. **GROUP II Experimental Group:** Receives Mulligan's MWM along with Agility and Perturbation exercise treatment. Mulligan's MWM consists of internal rotation glide and patients were selected if the glide reliefs knee pain. The treatment consists of 10 glides per set, 3 sets per session, every alternative day for 6 weeks.

Agility and perturbation treatment includes:

- Side stepping – 5 times
- braiding (lateral stepping combined with forwarding AND backward crossover steps) – 5 times
- cross over steps during backward walking – 5 times
- back cross over steps during backward walking – 5times
- shuttle walking (forward and backward walking to and from designated markers and multiple changes in designated markers) – 5 times
- Multiple changes in direction drill. – 5 time.



Figure 1: Mulligan's Knee Internal Rotation glide

AGILITY AND PERTURBATION TRAINING



Outcome Measures

Pain (NPRS)¹² reliability: 0.86-0.95

The Western Ontario and McMaster Universities Osteoarthritis Index. (WOMAC)¹³ reliability: 0.91

Universal Goniometer¹⁴ reliability: 0.90

THE TIMED UP AND GO TEST (TUGT)¹⁵
Reliability: 0.985.

STATISTICAL ANALYSIS AND RESULTS

TABLE 1: NPRS: paired t-test

Group		M	N	SD	S.E Mean	t	P
CON	DAY1	6.36	28	1.420	.268	15.6	.00
	WEEK6	1.93	28	1.585			
EXP	DAY1	6.30	27	1.409	.271	21.1	.00
	WEEK6	.74	27	.859			

From the above table, control group t value 15.6, p value is .00<0.05 hence there is a significant difference when compared to day 1 to week 6.

Experimental group t value 21.1, p value .00<0.05 hence there is a significant difference between day 1 to week 6.

TABLE 2: AROM FLEXION: paired t-test

Group		M	N	SD	T	P
CON	DAY 1	111.43	28	15.80	-6.719	.000
	WEEK6	127.14	28	7.50		
EXP	DAY 1	105.56	27	11.29	-12.022	.000
	WEEK6	130.19	27	5.63		

From the above table, control group t value -6.719 p value .000<.05 hence there is a significant difference from day 1 to week 6.

Experimental group t value -12.022 p value .000<.05 hence there is a significant difference from day 1 to week 6.

TABLE 3: WOMAC: paired t-test

Group		Mean	N	SD	SE Mean	T	P
CON	DAY1	59.34	28	12.19	2.30	17.0	.0
	WEEK 6	19.80	28	8.24	1.55		
EXP	DAY1	62.84	27	14.75	2.83	25.4	.0
	WEEK 6	16.29	27	7.29	1.40		

From the above table, control group t value 17.0, p value .00<0.05 hence there is a significant difference from day 1 to week 6.

Experimental group t value 25.4, p value .00<.05 hence there is a significant difference from day 1 to week 6.

TABLE 4: TUG: Paired t-test

Group		M	N	SD	t	p
CON	DAY1	57.14	28	26.81	8.04	.000
	WEEK 6	22.57	28	10.35		
EXP	DAY1	65.11	27	37.61	7.63	.000
	WEEK 6	15.37	27	8.71		

This table shows that control group t value 8.046, p value is .000<.05 hence there is a significant difference when compared to day 1 to week 6.

Experimental group t value 7.639, p value .00<.05 hence there is a significant difference between day 1 to week 6.

Based on the t values of all the parameters in this study shows experimental group shows more significant difference than the control group.

DISCUSSION

NPRS: The results have shown that, an experimental group shown a significant difference when compared to control group by improving from pain by giving SWD which acts as a deep heating modality leads to vasodilatation of the tissues, improved blood circulation of that area results in decreasing edema.

Goniometer: Knee range of motion increased significantly in both groups. The increase in knee range may be due to correct the joint tracking during knee moment by passively internal rotating the knee by holding it in normal functional position.

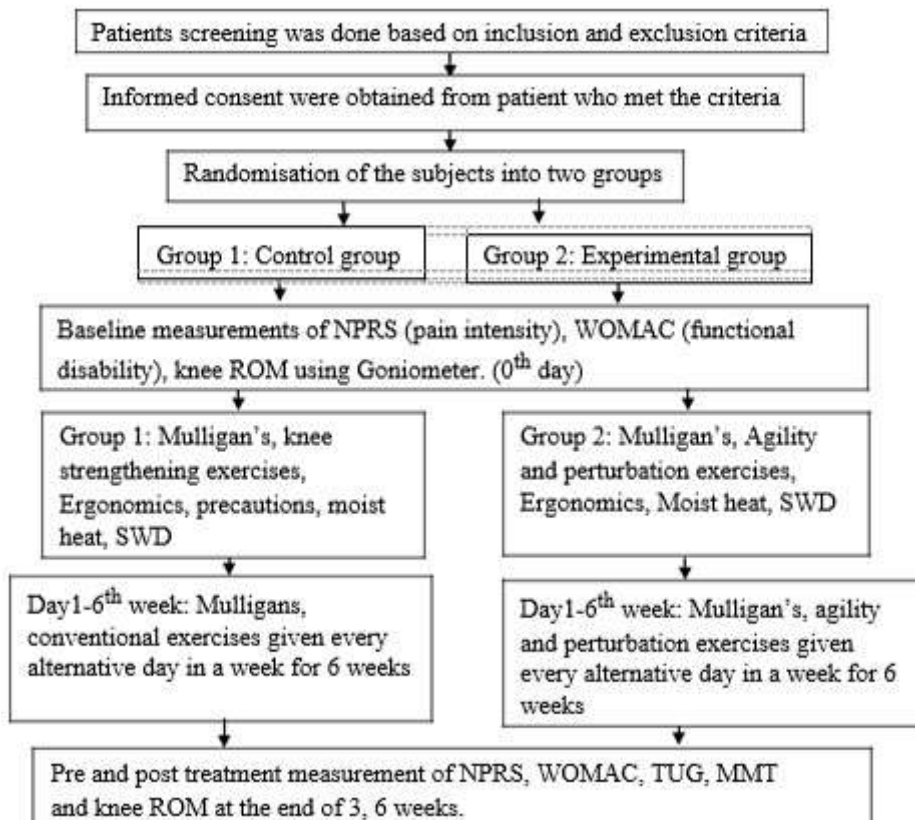
WOMAC: The mean WOMAC score values were compared by day1, 3rd and 6th weeks after treatment and the results showed equal significance in WOMAC score over 6 weeks in both the groups.

A possible explanation for the positive results is that whenever the pain decreases and range of motion improve automatically the functional ability improves.

TUG: The results have shown that, an experimental group shown a significant difference when compared to control group by improving stability and proprioception by giving quick, fast activities and perturbations. In this, joint tries to protect from falling and stimulate the Golgi tendon organ action, muscle spindle action which supplies information regarding accurate perceptual information about joint position and movement. And tries to equally balance the ground reaction forces on the knee.

PROCEDURE

CONSORT FLOW CHART OF STUDY



CONCLUSION

Mulligan along with Agility and perturbation exercises are more effective when compared to mulligan along with conventional exercises in improving proprioception, strength, the range of motion, reducing pain and disability, improving functional ability in subjects with knee osteoarthritis.

However, further studies are needed using large sample size and long term follow up.

LIMITATIONS

- 1) Limited sample size.
- 2) Results are applicable to subjects belonging to age group 30-60 years only.
- 3) Short duration study (6 weeks).

Only outcome measures (pain, ROM, disability, MMT, agility) were evaluated.

The study population was limited to those who were able to attend the physiotherapy practice.

This excluded knee osteoarthritis patients who could not attend treatment due to financial, transport, work or other reasons.

SCOPE FOR FURTHER STUDY

- Better results can be drawn if the study was conducted with large sample size for the duration.
- Different age groups can be included and separately to draw significant results.
- Use of different scales for measuring pain and functional outcome in knee osteoarthritis.

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