

Effectiveness of Mulligan's Bent Leg Raise Technique Versus Muscle Energy Technique on pain intensity and Hamstring flexibility in patients with knee osteoarthritis

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Objective: To determine the effectiveness of Mulligan's bent leg raise technique and muscle energy technique on pain intensity and hamstring flexibility in patients with knee osteoarthritis.

Methodology: This randomized clinical trial was conducted with non probability purposive sampling technique. Data were collected from Allied Hospital, Faisalabad, Pakistan. Participants were incorporated according to addition and omission basis. A total of 114 participants were blindly arranged in A and B groups. Group A was treated by Mulligans bent leg raise (BLR) technique while group B was treated by post isometric relaxation muscle energy technique (PIR-MET). Visual analogue scale, active knee extension test (AKE) and knee oxford score (KOS) were used. Total 12 sessions were given for consecutive 4 weeks. SPSS, pair t test and independent t test were used for interpretation of results.

Result: BLR group had 32% male and 68% female (n=50) while MET group had 43% male and 57% female (n=51). Intra group comparison by pair t test showed significant difference in VAS ($P<0.000$), AKE ($P<0.000$) as well as KOS score ($P<0.000$) before and after the interventions. Inter group comparison showed significant difference in VAS and non-significant difference in AKT ($P>.358$) and KOS ($P>.636$) after 6 and 9 sessions between groups.

Conclusion: Mulligans bent leg raise technique showed more improvement than post isometric relaxation muscle energy technique in lowering the pain level and improved knee extension movement and participants functional activities in osteoarthritis patients. (Rawal Med J 202;45:358-362).

Keywords: Mulligan bent leg raise, Muscle energy technique, Hamstring flexibility, Pain intensity, Osteoarthritis.

INTRODUCTION

Osteoarthritis (OA) is a widespread health issue of community. It is the central reason of functional abnormality that affects the person quality of life globally.¹ Older adults of Rural and non Rural India had osteoarthritis from 33 to 46% and women were more affected from this disease.² The clinical syndrome of joint pain, stiffness, and loss of joint function in OA is generally caused by loss of cartilaginous tissue, hardening of cortical bone and calcified cartilage, build up subchondral bone cysts, or osteophytes.³ Hamstring muscle provide uniformity to affect postural balance during the forceful motion of anteroposterior plane i.e. abduction and adduction.⁴ The extensibility of back of thigh muscle is necessary to maintain full arc of motion of joints and locomotor system activity so, protecting from damage.⁵

Muscle energy technique (MET) is a type of manual

therapy, in which individual uses its own muscle, from a specific point, in a particular way, and despite a counter force implemented by therapist.⁶ Mulligan Techniques are executed in a specific direction or in a range of movement that is pain free, and increases the hip flexion and knee extension.⁷ Osteoarthritis knee patients have major physiological changes like weakness and reduction in flexibility which leads to functional limitations along with that pain. There are many of interventions that are available that have more focus on pain.^{8,9} Comparison between both these techniques has not document in knee osteoarthritis patients. The objective of this study was to determine the effectiveness of Mulligan's bent leg raise (BLR) technique and muscle energy technique in patients with knee OA.

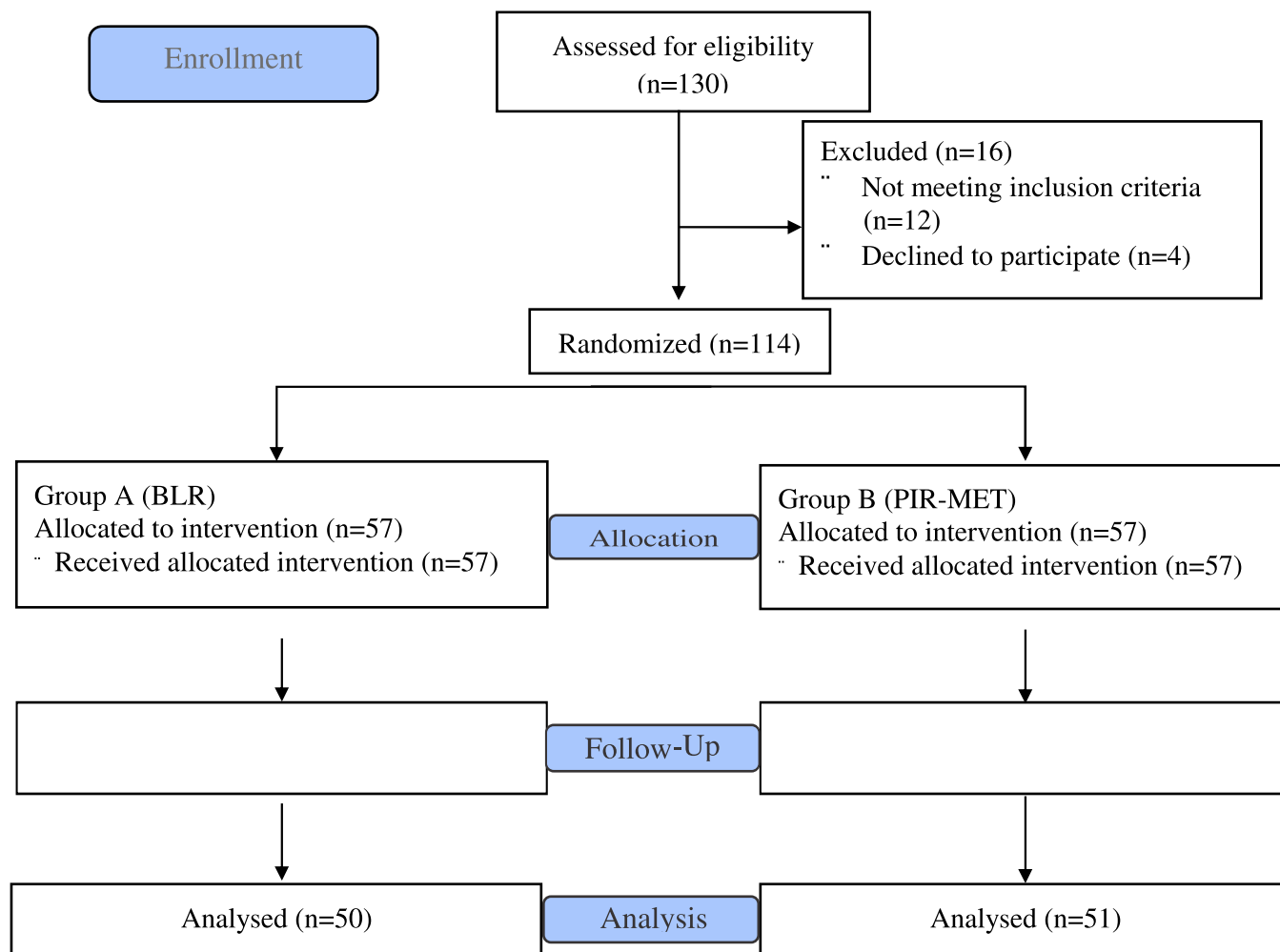
METHODOLOGY

This randomized single blinded clinical trial was

conducted from December 2018 to June 2019 after getting the ethical approval from institutional review board. Consent form was signed by all the participants. Data were collected from Physiotherapy Department, Allied hospital, Faisalabad. A sample size of 114 was calculated through open epi tool.¹⁰ Participants were randomly allocated in two groups through computer generated random number (Consort chart). The inclusion criteria were diagnosed patients with knee OA,

radiographic evidence of grade I or II in Kellgren and Lawrence criteria for knee osteoarthritis,¹¹ age 40 to 65 years and both genders. Participants with history of recent lower extremity, spinal surgeries or pathologies, any deformities with spine, or hip joints knee joint, any neurological disorders or disease such as poliomyelitis etc. and musculoskeletal problems associated with the knee joint e.g. Osteoporosis were excluded from the study.

CONSORT FLOW DIAGRAM



VAS¹² was used for measuring the pain. AKE test¹³ was used for determined the extensibility of hamstring muscles with goniometer. KOS was used for evaluation of pain and function of knee. Before the application of Mulligans BLR technique and post isometric relaxation technique, hot pack was

applied on the back muscle of thigh in prone position for 10 minutes.¹⁰ Soon after the hot pack, one group was treated by Mulligan BLR technique in which patients were lying in supine position. The technique was performed with 3 reps per set, 30 second hold and one minute rest between each rep.¹⁵

Second group was treated by post isometric relaxation MET. For that purpose, participants were lying in supine position and performed isometric contraction of hamstring muscle with 50 percent of their effort and then move the leg to level of limitation and apply the pressure. This technique was performed with 30 sec hold and 5 sec rest, (2 sets of 10 repetitions per day 2 sets/ session).¹⁶ Total 12 sessions were given to patients for consecutive 4 week (3 sessions per week).¹⁷ Follow up was at end of 3rd 6th 9th and 12 sessions. Baseline and post treatment reading were taken by visual analogue scale, active knee extension test as well as with knee oxford score.

Statistical Analysis: All data were analyzed by SPSS version 24. Pair t- test was used for determine the difference within group subjects while independent t- test was used for difference among group.

RESULTS

The total sample size was 114. Each group had 57 participants; 7 dropped out from BLR group whereas 6 from MET group. Thus, 101 participants were analyzed. BLR group had 32% male and 68% female from 50 participants while MET group had 43% male and 57% female from 51 participants (Table 1).

Table 1. Demographic data at baseline.

Variable	MET group		BLR group	
Age	51±7.6		53.1±8.4	
	Minimum=40	Maximum=65	Minimum=40	Maximum=65
Gender (Male/female)	22/29		16/34	
OA Grades (1&2)	Grade 1 23	Grade 2 27	Grade1 15	Grade 2 36
Joints (tibiofemoral/patellofemoral/both)	11/15/25		12/27/11	
Previously physical therapy treatment taking(yes/no)	26/25		24/26	

Table 2. Comparison of VAS, Range of motion and Knee Oxford Scale values.

		Paired Samples Statistics					
		Baseline	1 follow up	2 follow up	3 follow up	4 follow up	p value*
VAS	Group A	7.24±1.30	5.60±0.85	3.70±0.86	1.82±0.77	.50±.78	P<0.001
	Group B	5.64±1.21	4.64±1.21	3.64±1.21	2.58±1.13	1.58±1.13	P<0.001
ROM	Group A	43.02±9.24	30.14±9.21	17.66±8.52	6.40±6.25	.28±1.84	P<0.001
	Group B	36.64±7.07	26.52±6.32	16.43±5.61	6.66±4.38	.03±0.28	P<0.001
KOS	Group A	22.08±3.70	26.50±3.73	31.28±3.64	35.82±3.42	40.20±4.10	P<0.001
	Group B	27.70±3.87	30.76±3.89	34.01±3.92	37.29±4.03	40.58±4.12	P<0.001

*within group

Table 3. Independent t-test to compare the results of group A and B.

Parameter	Treatment (group 1 Vs group 2)	T-statistic	Sig. (2-tailed)	Mean Difference	95% Confidence Interval	
					Lower	Upper
VAS	Baseline	6.36	.000	1.59	1.09	2.08
	1 follow up	4.54	.000	.95	.53	1.36
	2 follow up	0.25	.801	.05	-.36	.46
	3 follow up	-3.96	.000	-.76	-1.15	-.38
	4 follow up	-5.58	.000	-1.08	-1.47	-.70
ROM	Baseline	3.896	.000	6.37	3.12	9.61
	1 follow up	2.300	.024	3.61	.49	6.72
	2 follow up	.857	.394	1.22	-1.61	4.07
	3 follow up	-.248	.804	-.26	-2.39	1.86
	4 follow up	.923	.358	.24	-.276	.75
KOS	Baseline	-7.448	.000	-5.62	-7.12	-4.12
	1 follow up	-5.615	.000	-4.26	-5.77	-2.75
	2 follow up	-3.623	.000	-2.73	-4.23	-1.23
	3 follow up	-1.977	.051	-1.47	-2.95	.005
	4 follow up	-.474	.636	-.38	-2.01	1.23

Pain intensity was reduced from 7.24 to 0.5 in group A and from 5.46 to 1.58 in group B. (Mean difference -1.08) Range of motion had reduced from 43.0 to 0.28 in group A while in group B from 36.6 to .03 (mean difference is 0.24) KOS also improved in group A. The intra group comparison had found by paired sample t test that showed significant difference in VAS ($P<0.000$) and ROM ($P<0.000$) (Table 2). Independent t test also showed the significant difference in values of VAS ($P<0.000$), and did not showed the significant difference in range of motion ($P>0.358$) and KOS ($P>.634$) between groups after 2 and 3 follow up (Table 3).

DISCUSSION

This study showed that Mulligans BLR technique with hot pack and MET with hot pack were effective in osteoarthritis patients to minimize the pain intensity, or improving hamstring flexibility. However, Mulligans BLR was more effective in term of decreasing pain and enhancing the movement. Grade I OA patients showed more improvement then grade 2 patients. Adkitte et al used the 6 days protocol of MET and back thigh muscle flexibility improved significantly ($p<0.01$).¹⁸ Addala et al had also applied MET in OA with protocol for 6 weeks (2 sessions per week, 12 sessions). MET reduced the level of pain and improved the knee range of motions.¹⁹

We used the 4 week protocol (12 sessions) of MET that reduced the intensity of pain ($P<0.000$) and reduced the knee flexion ($P<0.000$) as well. Pyala et al found the instantly and permanent effect of manual stretch and MET on back thigh muscle flexibility and reported that MET was more potent than manual stretch in increasing the back of thigh muscle flexibleness.²⁰

This current study also found that PIR muscle energy approach reduced level of pain intensity ($P<0.000$) and reduced their knee flexion and improved knee extension range of motion ($P<0.000$) in OA patients of grade 1 and 2. This technique also improved their activities of daily living by decreasing pain and hamstring flexibility. Kage et al discussed the efficacy of BLR or active release approach on hamstring flexibility. They used the single session of BLR technique (3 reps per set). Both techniques were effective in improving the hamstring muscle extensibility and knee range of motion ($p<0.001$).²¹ Our study also showed BLR was more useful in reducing pain intensity. This technique improved the patient's activities level by decreasing pain and improving hamstring muscle flexibility.

CONCLUSION

We found that 12 sessions of Mulligans bent leg raise technique and post isometric relaxation muscle energy technique were effective in lessening the pain level and improved knee extension movement and functional activities in osteoarthritis patients. However, BLR was showed more improvement than muscle energy technique in decreasing pain level and increasing ROM.

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Conception and design: Komal Tariq, Filza Shoukat
Collection and assembly of data: Komal Tariq, Filza Shoukat
Analysis and interpretation of the data: Komal Tariq, Filza Shoukat
Drafting of the article: Komal Tariq, Filza Shoukat
Critical revision of the article for important intellectual content: Filza Shoukat, Umair Ahmed
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Conflict of Interest: None declared

Rec. Date: Jun 28, 2019 Revision Rec. Date: Dec 10, 2019 Accept Date: Feb 16, 2020

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