

Immediate Effect of Two Selected Mulligan Techniques on Lumbar Mobility

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Abstract

Background: Non-specific low back pain (NSLBP) has become a major public health problem worldwide. Mulligan has a great role in the treatment of NSLBP.

Aim of Study: The study was conducted to compare between immediate effect of SNAG and mulligan lion position in range of motion (ROM), pain, functional ability and kinesiophobia on patients with nonspecific low back pain.

Subjects, Material and Methods: Thirty-four patients with NSLBP participated in the study. Their ages ranged from 20 to 40 years old. They were randomized into two groups. Group A received mulligan SNAG from sitting position and McGill stabilization exercises. Group B received mulligan modified lumbar SNAG lion position and the same McGill stabilization exercises as in group A.

Results: The findings of the study showed that: There was improvement in lumbar flexion, extension ROM and pain in group B regarding o group A. There was no significant difference between group A and B in Oswestery Disability Index and Kinesiophobia.

Conclusion: In the present study, it could be seen that immediate effect of Modified lumbar SNAGs (lion position) in addition to McGill stabilization exercises was more effective than mulligan SNAGs from sitting addition to McGill stabilization exercises on flexion and extension lumbar range of motion, & pain but not in function and kinesiophobia. So, using mulligan lion position combined with McGill stabilization exercises may be a major strategy in dealing with NSLBP patients.

Key Words: Immediate effect of SNAG — Lion position — Mulligan — Lumbar sagittal mobility — Nonspecific low back pain — McGill.

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Introduction

NONSPECIFIC low back pain (NSLBP) is a global health problem. It is the top leading cause of disability. The mean prevalence and incidence of LBP ranged from 1.4 to 20.0% and 0.024-7.0% [1]. The incidence of LBP in female is higher than in male [2,3].

Low back pain (LBP) is also classified as acute (less than six weeks), sub-acute (six to twelve weeks), and chronic phases (more than twelve weeks) [4].

Patients with LBP deteriorate not only their physical health, such as muscle strength, flexibility, and mobility, but also their functional status/performance, which prevents them from returning to work and normal activities [5].

Low back pain (LBP) is managed by a variety of treatment modalities [6]. Orthopedic Manual therapy (OMT) is most commonly recommended form of treatment of LBP and it is also frequently used in clinical practice in various countries [7,8,9].

In the late 1990s, the spinal mobilization with limb movement was developed by Mulligan, Mulligan introduced a new technique in manual therapy [10]. Mulligan has a great role in the treatment of LBP. He applied many techniques for example mobilizations with movement (MWM) or sustained natural apophyseal glides (SNAGs). MWM is effective and useful. It reduces pain, increases range of movement (**ROM**), provides immediate results, improves the mobility of the restricted joints and decreases symptoms [11].

General techniques of mulligan are MWM, SNAGs and natural apophyseal glides (NAGs). Lumbar SNAG have immediate and short term on pain and function in treatment of patients with NSLBP [12].

McGill stabilization exercises significantly improved the function compared with conventional exercise, including curl up, & Side Bridge and bird dog exercise [29].

Mulligan has special techniques, one of them is modified lumbar SNAG (lion position). It has short term effect in reducing pain and activity limitation [13]. Up to investigator knowledge, No previous studies comparing immediate effect of mulligan SNAG and lion position in (ROM), pain, functional ability and kinesiophobia in addition to McGill exercises.

Aim of the work:

To compare between immediate effect of SNAG and mulligan lion position in addition to McGill exercises on range of motion (ROM), pain, functional ability and kinesiophobia on patients with NSLBP.

Subjects and Methods

Study design:

This study is double blinded clinical trial study. The patient is blinded about the treatment group and the research assistant for assessment of all patients is blinded from treatment. This was a pre-post two groups study conducted at outpatient clinic of Badr central hospital, Ministry of Health, Beheira, Egypt. Prior to data collection, the study was approved by the ethical committee of scientific research of the faculty of Physical Therapy, Cairo University (No: P.T.REC/012/004356), and the study protocol was registered on clinical trials.gov with approval number (NCT05856279). It lasted from January to May 2023.

Participants:

Thirty-four NSLBP patients from both sexes with NSLBP were recruited for the study. Sample size calculation was carried out Using G-power version 3.1.9.7 for windows and regarding F-test study, alpha level of 0.05, confidence interval 95%, and effect size of 0.29, calculated from the previous study of Hidalgo et al. (2015) with a sample of 32 patients, Patients randomized to either group A or group B using random generator link (<http://www.graphed.com/quickcalcs/randomizel>). Patients were not be aware of group allocation to keep blindness.

Inclusion criteria:

Patients were allowed to get involved in the study if they had the subsequent criteria:

- 1- 34 Subjects showing score from 3 to 7 on VAS [13].
- 2- Patients with non-specific sub-acute and chronic low back pain with Pain duration of 6 week or more [14].
- 3- Age ranges from 20-40 years old from both sexes [12].
- 4- BMI (18.5-29.9 KG/M²) [15].

Exclusion criteria:

While patients were excluded from the study if they exhibited one of the subsequent criteria:

- 1- Any known contraindication to Orthopedic Manual Therapy OMT (e.g. fracture, osteoporosis, myelopathy, multiple adjacent radiculopathies, cauda equina syndrome, vertebral bone disease and bony joint instability [12].
- 2- Infective conditions of spine, autoimmune disorders, Pacemakers, malignancy [13].
- 3- History of surgery or injection at lumbar spine 1 year ago [14].

Assessment instrumentations:

- 1- Two bubble inclinometer.
- 2- Visual analogue scale (VAS).
- 3- The Arabic version of Oswestry Low Back Pain Disability Index.
- 4- The Arabic version of Tampa Scale Kinesiophobia (TSK).
- 5- Mulligan belt.

Assessment procedures:

They were conducted throughout 1 week before the starting of treatment session, Pain and range of motion would be assessed immediately after the treatment session, then Function and kinesiophobia would be assessed after one week each patient in the two groups. They were selected for assessment in the current study as their validity and reliability (both inter-rater and intra-rater) are proved [16,17,18].

Assessment of BMI:

The BMI, which describes relative weight for height, is calculated as weight (kg)/height squared (m²).

Assessment of range of motion:

Patients were requested to stand in a comfortable position. Inferiorly S2 and superiorly T12 spinous process were used for double inclinometer measurement technique. The patient was instructed to perform active lumbar flexion and extension. The actual ROM of lumbar area when bending forward and backward were calculated by subtracting the number (degree) obtained by the lower inclinometer from the number (degree) obtained by the upper inclinometer [16,19,20].

Assessment of pain severity:

Pain levels were assessed with the VAS. It is a 100mm horizontal scale with 'no pain' and 'worst possible pain' labels at the line's extreme [21].

Assessment of functional disability:

Oswestry Disability Index is well validated and reliable. It is a 10-item self-assessing questionnaire; each item contains 6 levels of answers that can be scored from 0 to 5. These items are: Pain, personal

care, lifting and moving objects, walking, sitting, standing, sleep disorders caused by the low back pain, sex life, social life, and traveling. A total score was calculated, percentage of disability (score obtained divided by 50 and multiplied by 100 ranges from 0% (no disability) to 100% (complete disability). Percentage of disability ranges from 0% (no disability) to 100% (complete disability) [17,22].

Assessment of kinesiophobia:

The Arabic version of Tampa Scale Kinesiophobia (TSK) to assess the fear of [re] injury associated with physical movement. Respondents rated 17 items on a four-point scaleranging from 1 ["strongly disagree"] to 4 ["strongly agree"]. The items include such statements as "I wouldn't have this much pain if there weren't something potentially dangerous going on in my body". The total score had a range of 17 to 68 [18].

Treatment procedures:

In group (A), received SNAGs from sitting and McGill stabilization exercises.

Procedure for SNAGs:

SNAGs were applied in the sitting position with the patient's pelvic stabilized with a Mulligan belt. The therapist's hand's ulnar aspect was used over the spinous process of the superior vertebra of the involved segment for flexion glide and other hand on the table for support. The patient was asked to perform active movement (flexion). If pain persists during the movement try adjusting the vertebral level, glide direction and or force. The glide would be performed six repetitions for three sets for one session [23].

In group (B), received modified lumbar SNAGs (lion position) and McGill stabilization exercises.

Modified lumbar SNAGs (lion position) would be applied:

The therapist stood to one side of the patient and applies (SNAG) centrally to the spinous process of the involved segment. The medial border of the hand was hooked under the chosen segment while the other arm encircles the trunk to stabilize the upper body. The therapist maintained the glide while the patient sat back towards their heels (for flexion). The glide would be performed six repetitions for three sets for one session. The patient is in quadruped position then asking patient to perform full lumbar flexion and therapist is trying to perform over pressure [23,24].

McGill stabilization exercises:

McGill stabilization exercises (including Curl up, Side Bridge and Bird Dog) Patients will perform:

1- Curl up (for training the rectus and obliques abdominis muscles and controlling pelvic motion)

(patient is in supine position and ask patient to raise his trunk).

2- Side Bridge (for training the quadrates lumborum muscles, as a key muscle in spinal stability) (patient is in side lying position and asking patient to raise his side).

3- Bird Dog with one hand or one foot and one hand and the opposite leg (for training the anterior and posterior lumbar muscles, especially).

The transverse abdominis as a home program: 7 days a week and 10 repetitions of each exercise for 2 times per day and a rest interval of 2 minutes between exercises for 1 week. Patients would be instructed by exercises in Arabic version with pictures as a brochure to apply at home [12,25].

Statistical analysis:

Unpaired t-test was conducted for comparison of subject characteristics between groups. Chi squared test was conducted for comparison of sex distribution between groups. Normal distribution of data was checked using the Shapiro-Wilk test. Levene's test for homogeneity of variances was conducted to test the homogeneity between groups. Mixed MANOVA was conducted to investigate the effect of treatment on VAS, ODI, TSK and lumbar ROM. Post-hoc tests using the Bonferroni correction were carried out for subsequent multiple comparison. The level of significance for all statistical tests was set at $p < 0.05$. All statistical analysis was conducted through the statistical package for social studies (SPSS) version 25 for windows (IBM SPSS, Chicago, IL, USA).

Results

Subject characteristics:

Table (1) showed the subject characteristics of group A and B. There was no significant difference between groups in age, weight, height, BMI, duration of illness and sex distribution ($p > 0.05$).

Effect of treatment on VAS, ODI, TSK and lumbar ROM:

Mixed MANOVA revealed a significant interaction effect of treatment and time ($F = 5.84, p = 0.001$). There was a significant main effect time ($F = 202.51, p = 0.001$). There was no significant main effect of treatment ($F = 1.28, p = 0.329$).

Within group comparison:

There was a significant decrease in VAS, ODI and TSK post treatment in both groups compared with that pretreatment ($p > 0.001$). The percent of decrease in VAS, ODI and TSK of group A was 58.14, 31.17 and 18.01% respectively and that in group B was 74.24, 37.25 and 26.68% respectively. (Table 2).

There was a significant increase in lumbar flexion and extension post treatment in both groups compared with that pretreatment ($p>0.001$). The percent of increase in flexion and extension ROM of group A was 29.69 and 49% respectively and that in group B was 33.97 and 69.69% respectively. (Table 3).

Between group comparison:

There was no significant difference between groups pretreatment ($p>0.05$). Comparison between groups post treatment revealed a significant decrease in VAS and a significant increase in lumbar flexion and extension ROM of group B compared with that of group A ($p<0.05$). There was no significant difference in ODI and TSK between groups post treatment ($p>0.05$). (Tables 2,3).

Table (1): Comparison of subject characteristics between the group A and B.

	Group A	Group B	MD	t-value	P-value
	Mean ± SD	Mean ± SD			
Age (years)	31.06±8.25	29.47±7.75	1.59	0.57	0.56
Weight (kg)	75.23±7.48	73.88±11.30	1.35	0.41	0.68
Height (cm)	167.29±12.28	168.12±10.95	-0.83	-0.21	0.83
BMI (kg/m ²)	26.98±2.24	26.17±3.21	0.81	0.85	0.40
Duration of illness (years)	3.94±2.19	3.60±2.26	0.6	0.72	0.47
Sex, N (%):					
Females	10 (59%)	10 (59%)		(7.2)	j
Males	7 (41%)	7 (41%)			

SD : Standard deviation.
 MD: Mean difference.
 x² : Chi squared value.
 p-value: Probability value.

Table (2): Mean VAS, ODI and TSK pre and post treatment of group A and B.

	Pre treatment	Post treatment	MD	% of change	p-value
	Mean ± SD	Mean ± SD			
VAS:					
Group A	5.47±1.32	2.29±1.21	3.18	58.14	0.001
Group B	5.24±1.25	1.35±1.17	3.89	74.24	0.001
MD	0.23	0.94			
	p<0.001	p=0.02			
ODI (%):					
Group A	28.71±11.64	19.76±7.93	8.95	31.17	0.001
Group B	27.65±10.37	17.35±8.01	10.3	37.25	0.001
MD	1.06	2.41			
	p=0.178	p=0.38			
TSK:					
Group A	39.53±5.83	32.41±5.14	7.12	18.01	0.001
Group B	40.59±7.09	29.76±4.84	10.83	26.68	0.001
MD	-1.06	2.65			
	p=0.163	p=0.13			

SD : Standard deviation.
 MD: Mean difference.
 p-value: Probability value.

Table (3): Mean flexion and extension ROM pre and post treatment of group A and B.

ROM (degrees)	Pre treatment	Post treatment	MD	% of change	value
	Mean ± SD	Mean ± SD			
<i>Flexion:</i>					
Group A	29.71±8.74	38.53±7.86	-8.82	29.69	0.001
Group B	33.59±9.07	45±6.84	-11.41	33.97	0.001
MD	-3.88	-6.47			
	<i>pC121</i>	<i>p=0.01</i>			
<i>Extension:</i>					
Group A	11.53±5.70	17.18±6.26	-5.65	49	0.001
Group B	13±4.38	22.06±6.13	-9.06	69.69	0.001
MD	-1.47	-4.88			
	<i>pt).41</i>	<i>p=0.02</i>			

SD: Standard deviation. MD: Mean difference. p-value: Probability value.

Discussion

The findings of the study showed that: There was a significant increase in flexion and extension ROM of group B compared with that of group A post treatment. There was a significant decrease in VAS of group B compared with that of group A post treatment. There was no significant difference in ODI between group A and B post treatment. There was no significant difference in TSK between group A and B post treatment.

Our hypothesis regarding ROM was rejected, as there is significant difference in ROM between the two groups. This result comes in agreement with the findings of Hidalgo [12] who found that within group explanatory analysis demonstrated highly significant differences in ROM before and after intervention in SNAG group. Also Shetty [13] found that Modified Lumbar Snags which has a great role in the treatment of Low back pain in subjects may experience limited Range of motion.

However, the findings of the current study was not supported by a previous study conducted by Waqqar [26] who conducted that statistically there was no significant difference between the effects of Mulligan SNAGs and McKenzie in improving Lumbar ROM. Mulligan SNAGs improved lumbar ROM more effectively than McKenzie EEP in all directions including flexion, extension, side bending and rotation.

Our hypothesis regarding pain with SNAGs was rejected, there was a significant improvement in pain with the finding of Hidalgo et al., [12]. This result comes in agreement with Shetty et al., [13] who found that Modified Lumbar Snags has significant effect on pain.

However, the findings of the current study was not supported by a previous study conducted by Konstantinou et al., [27] who found that Mean pain scores did not change.

Our hypothesis regarding functional ability was accepted, the current study revealed that there is no significant difference between the two groups. This finding was also reported by Hidalgo [12] who found that suggested improvements favoring lumbar SNAG's as compared to placebo for functional disability. There is significant improvement with moderate to large effect-sizes in favor of the Real-SNAG group.

The results of the study were augmented by the finding of Bhat [20], he conducted that a statistically significant improvement was seen for functional ability in both the groups (SNAGs group and Myofascial release group) but was not clinically significant in the Myofascial release group. The analysis observed no statistically significant difference ($p < 0.05$) between the groups at both the immediate and short term.

Our hypothesis regarding kinesiophobia was accepted. There is no significant difference between groups and this result of the study supported by Hidalgo [12] who found that Kinesiophobia (Tampa scale) before and 2-weeks after the intervention improved but not considered to be significant but presented moderate effect size.

This result was reinforced by Paquin et al., [28] who applied SNAGs in cervical spine. The change was also significant for pain catastrophizing (80% improvement) and kinesiophobia (0.07% improvement on the TSK).

Fear avoidance beliefs did not significantly change after the intervention. However, questionnaires used to measure pain-related cognitive-affective factors did not show significant fear-avoidance beliefs, kinesiophobia and pain catastrophizing in their sample before the intervention.

Conclusion:

In the present study, it could be seen that Modified lumbar SNAGs (lion position) was more effective

tive than mulligan SNAGs from sitting on flexion and extension lumbar range of motion, pain but not in function and kinesiophobia.

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التأثير الفوري لإثنين من التقنيات المختارة لموليجان على المدى الحركي السهمى القطنى فى الم اسفل الظهر الغير محدد

المقدمة: أصبحت آلام أسفل الظهر الغير محدد. مشكلة صحية عامة رئيسية فى جميع أنحاء العالم. يلعب موليجان دوراً كبيراً فى علاج الم اسفل الظهر الغير محدد. يجب استكشاف التأثير الفورى لوضعية ليون موليجان وسناج فى نطاق الحركة، والألم، والقدرة الوظيفية ورهاب الحركة على المرضى الذين يعانون من آلام أسفل الظهر غير المحددة.

الهدف من الدراسة: أجريت الدراسة للمقارنة بين التأثير الفورى لسناج ووضعية ليون موليجان فى نطاق الحركة، والألم، والقدرة الوظيفية، ورهاب الحركة على المرضى الذين يعانون من آلام أسفل الظهر غير المحددة.

الطريقة: تم تقييم المرضى الذين يعانون من الم اسفل الظهر الغير محدد من حيث المدى الحركي والألم والقدرة الوظيفية ورهاب الحركة. كان هناك ما مجموعه ٣٤ شخصاً تم تضمينهم، وجميعهم لديهم الم اسفل ظهر غير محدد. تراوحت أعمار هؤلاء الأشخاص من ٢٠ الى ٤٠ وكانوا من كلا الجنسين. تم مشاركة المرضى باستخدام استطلاع تم إرساله إلى العيادات الخارجية بمستشفى بدر المركزى فى البحيرة، مصر. تشكلت مجموعتان من نفس الحجم (المجموعة أ والمجموعة ب). تلقت المجموعة الأولى برنامجاً منزلياً تضمن تمارين تثبيت ماكجيل ووضعية ليون موليجان، ليتم إجراء ٣ مجموعات من موليجان كل مجموعة ٦ مرات لجلسة واحدة وبرنامجاً منزلياً تضمن تمارين تثبيت ماكجيل. والمجموعة ب تلقت موليجان سناج من وضع الجلوس ٣ مجموعات من موليجان كل مجموعة ٦ مرات لجلسة واحدة وبرنامجاً منزلياً تضمن تمارين تثبيت ماكجيل. تم تقييم الألم ب الفاس والمدى الحركي للفقرات القطنية باستخدام مقياس الميل الفقاعية، والقدرة الوظيفية مع النسخة العربية من اوسويستري، ورهاب الحركة مع مقياس تامب.

النتائج: أظهر الفحص الإحصائى للبيانات فى هذه الدراسة ما يلى: تحسنت المجموعة ب أكثر بكثير فى مدى الحركة بعد العلاج مقارنة بالمجموعة أ. كان VAS فاس فى المجموعة ب بعد العلاج أقل بكثير من ذلك فى المجموعة أ. فى المجموعات المعالجة أوب لم يكن هناك فرق ذو دلالة إحصائية فى الوظيفة. لم تتغير مستويات TSK مقياس تامب بشكل ملحوظ بين المجموعتين أوب بعد العلاج.

الختاتمة: فى هذه الدراسة، يمكن ملاحظة أن التأثير الفورى لسناج القطنية المعدلة (وضع ليون) كان أكثر فاعلية منموليجان سناج من الجلوس على الانثناء وتمديد نطاق الحركة القطنية، والألم ولكن ليس فى الوظيفة ورهاب الحركة. لذلك، قد يكون استخدام وضع ليون موليجان مع تمارين تثبيت مكجيل فى التعامل مع مرضى الم اسفل الظهر الغير محدد.