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Research Paper: Immediate Effects of Maitland Mobilization and Mulligan Techniques on Flexion and Extension Range of Motion in Patients With Chronic Nonspecific Low Back Pain: A Randomized Pilot Study

Mohammad Javaherian[1], Siamak Bashardoust Tajali[2*], Behrouz Attarbashi Moghaddam[3], Abbas Ali Keshtkar[4], Maryam Azizi[1]

1. MSc., Department of Physiotherapy, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran.
2. Assistant Professor, Department of Physiotherapy, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran.
3. Associate Professor, Department of Physiotherapy, School of Rehabilitation, Tehran University of Medical Science, Tehran, Iran.
4. Assistant Professor, Endocrinology and Metabolism Research Center, Tehran University of Medical Sciences, Tehran, Iran.

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ABSTRACT

Introduction: Nonspecific Chronic Low Back Pain (NSCLBP) is one of the most common musculoskeletal disorders among different societies. Manual therapists use different approaches for NSCLBP management and or treatment. Comparing manual techniques is a considerable controversial debate among treatment approaches. This study aimed at comparing the immediate effects following Maitland mobilization technique and Mulligan Sustained Natural Apophyseal Glide (SNAG) on flexion and extension in patients with the NSCLBP.

Materials and Methods: Eighteen volunteers with NSCLBP were randomly divided into three groups: Posteroanterior (PA) mobilization, SNAG, and Sham SNAG. The PA mobilization techniques (Grade III) were performed on prone lying position (four sets of four repetitions; last 30 seconds for each technique). The SNAG techniques were performed accompanying with active flexion in sitting position (four sets of six repetitions). The sham SNAG technique was applied in sitting position while therapist touched gently patients' backs (three sets of four repetitions). Flexion and extension Range of Motions (ROMs) were measured before and immediately after applied interventions (by inclinometer).

Results: Within group analysis showed significant changes of flexion and extension in ROMs in SNAG and PA mobilization groups. Between groups analysis pointed out significant difference between the SNAG and placebo groups after interventions.

Conclusion: Our results revealed increased flexion ROM following the SNAG technique and increased extension ROM after Maitland PA mobilization. However, our limited sample size might influence final results. More studies with larger sample size will be suggested.

*** Corresponding Author:**
Siamak Bashardoust Tajali, PT. PhD
Address: *Department of Physiotherapy, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran.*
Tel: *+98 (21) 77685105*
E-mail: *s_bashardoust@sina.tums.ac.ir*

1. Introduction

Low Back Pain (LBP) is the most common musculoskeletal disorder that affects many people during their lifetimes [1, 2]. About 70% of people experience LBP at least once [3]. It is a very costly disorder for patients and governments [3]. These costs include diagnosis and treatment expenses, absence from work and reimbursement disability payments [4]. The prevalence of LBP in Iranian community is 17% in students, 62% in nurses and 84%, in pregnant women [5, 6]. Researchers have classified LBP variously. One of the most popular mechanical classification is labeling LBP as specific or non-specific, introduced by O'Sullivan [7]. LBP is also classified as acute, sub-acute, and chronic phases based on the involvement period. LBPs which last more than 12 weeks are categorized as chronic LBPs [8].

There are different methods for LBP treatment such as surgery, oral medication, injection at lumbar region, psychotherapy, chiropractic, physiotherapy and so on [9]. Manual therapy is a common physiotherapy approach for LBP treatment. Physiotherapist can apply wide range of manual techniques such as mobilization, manipulation, massage, and so on. Posteroanterior (PA) mobilization technique is a type of vertebral mobilization applied in Maitland's grading technique [10]. Mobilization With Movement (MWM) is another type of manual therapy proposed by Robert Mulligan for LBP treatment, since patients move parts of their body actively during application of the MWM techniques by physiotherapist [11]. When it is applied for spinal vertebra, the technique is called Sustained Natural Apophyseal Glide (SNAG) [12].

In fact, the SNAG technique adds active movement of patients' body to the joint mobilization technique in a weight bearing position without oscillation grading. It is important to compare these two methods based on Range of Motion (ROM), since SNAG is reported to improve flexion ROM more than PA mobilization. However, no identified study supported that this improvement may happen following the SNAG technique. This study aims to compare effects of the SNAG and PA mobilization techniques on flexion and extension ROMs in patients with Nonspecific Chronic Low Back Pain (NSCLP).

2. Materials and Methods

Study design

This double-blinded randomized controlled trial study was held in physiotherapy clinic at school of rehabilitation of the Tehran University of Medical Sciences from April to May 2017. Participants were allocated to SNAG, PA mobilization and placebo groups using blocked-balanced randomization method. All volunteers in three groups received one session of treatment. The outcome measures were assessed before and immediately after treatment session. All participants were informed about assessment and intervention procedure and signed written consent forms before research involvement. In case of refusing to continue with any reason and in any stage, the participant and relevant information were excluded from final analysis. The professional Ethics Committee of Tehran University of Medical Sciences reviewed and authorized the study protocol (confirmation code: IR.TUMS.FNM.REC.1396.21.02).

Inclusion and exclusion criteria

All patients with LBP, pain duration of 12 weeks or more [8], Visual Analogue Scale (VAS) score equal to 3 or higher, with no pain radiation to lower limb(s), who felt increased pain with forward flexion recruited for this study. Patients with sensory-motor disturbances, bleeding or malignancy bleeding, osteoporosis or fracture at lumbar region, history of surgery or injection at lumbar spine, or any situation which contraindicate mobilization were excluded from study. Patients could withdraw from the research at any stage.

Randomization

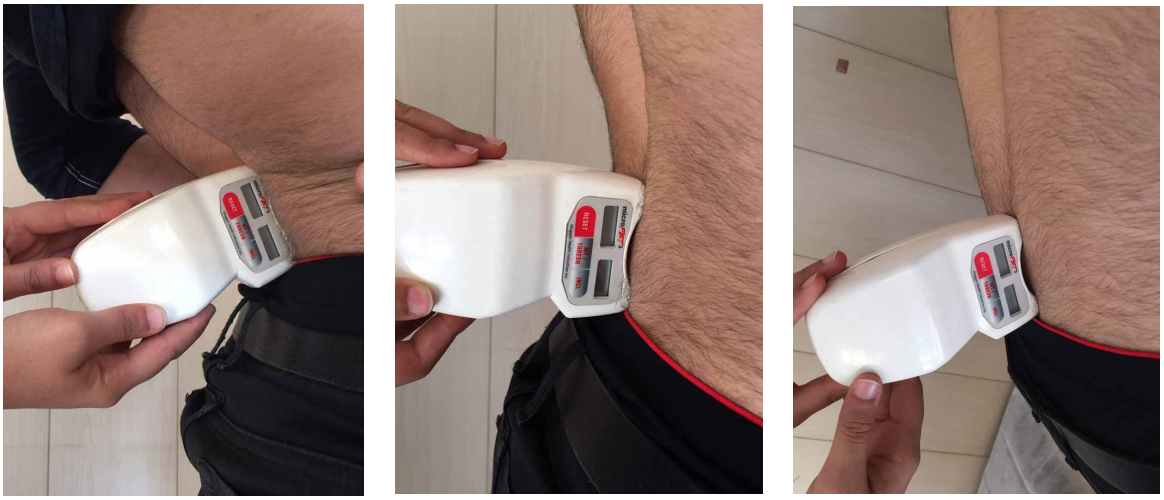
All eligible patients were allocated to the groups with a blocked-balanced randomization method. The researchers set 18 blocks that each one consisted of 6 group numbers (group×2). A researcher blindly selected three of them by table of random numbers and put them in the envelops. Finally, we had 18 participants which distributed into three groups.

Blinding procedure

The assessor of the patients (a physiotherapist) was blinded to the groups and type of treatment. The other researcher (another physiotherapist) who performed intervention techniques, opened envelops exactly before the intervention and was blinded to the randomization method. The patients were blinded to the treatment and placebo groups due to similarity of SNAG and placebo techniques.

Outcome measures

Lumbar flexion and extension ROM were measured before and after treatment using an accurate analogue



A B C

Figure 1. Assessment of flexion and extension range of motion in lumbar spine by inclinometer

A) Neutral, B) Flexion, C) Extension

angle by inclinometer [13, 14]. An inclinometer (HOGGAN Health Industries - MicroFE7 model, USA) was calibrated before the study. Two landmarks were set at lumbar spine; first landmark was located between posterior superior iliac spines and the other one 15 cm above the first one. The patients stand upright and were requested to flex their spines forward. The assessor took right position base on inclinometer at first line after full flexion and set inclinometer angle to zero, then moved the inclinometer slowly toward second landmark (Figure 1 A-B). The researchers applied similar techniques for lumbar extension ROM while the patients were asked to extend their spines (Figure 1 B-C).

Interventions

In the SNAG group (3 males, 3 females), patients were seated on a table and their feet were supported and stabilized with a mulligan mobilization belt around their waists. Four sets of six repetitions were performed on L4 spinous process. In this group, patients must not feel pain during technique application (Figure 2 A).

In the PA mobilization group (3 males, 3 females), patients lie prone on a table and therapist performed four sets of 30 seconds mobilization on L4 spinous process area (Grade III, 1 Hz frequency) with 30 seconds rest between them (Figure 2 B).

In the sham group (4 males, 2 females), patients took siting position on a table and were under two sets of 4 repetition flexion (like SNAG), while therapist touched their lumbar gently on caudal direction with no force (Figure 2 C).

Statistical analysis

Statistical analyses were carried out using SPSS 22. The Kolmogorov-Smirnov test was performed to check normal distribution of outcome measures. AS a result, all data were normally distributed. Analysis of variances (ANOVA) was carried out to identify differences in flexion and extension ROMs between study groups. The ANOVA analysis was followed with Scheffe post hoc analysis to detect differences in ROMs. The researchers

A B C

Figure 2. A) SNAG; B) PA mobilization; C) Sham technique

performed Cohen's d effect size measure to evaluate differences before and after at each group. An online calculator was applied for Cohen's d analysis [15, 16]. The results were reported as mean +90% confidence interval. Alpha value was considered equal to 0.05 for all analysis.

3. Results

Eighteen patients with the CNSLBP (8 females and 10 males) with mean(SD) age of 38.22(9.32) years participated in this study. Their characteristics are presented in Table 1.

Flexion ROM improved in SNAG and PA mobilization groups (P<0.05); however, it was not statistically improved in the placebo group. Extension ROM was improved in PA mobilization group, but didn't show any significant changes in the SNAG and placebo groups (P>0.05). The Cohen's d effect size measure indicates these change at Table 2.

Between-group comparison

All measures were similar at baseline (P>0.05), but flexion ROM was different between the groups (F=4.1, P=0.038). The post hoc analysis showed this difference between the SNAG and placebo groups. Table 3 shows mean difference and analysis between the groups.

Table 1. Distribution of participant characteristics at baseline

	SNAG (n=6)	PA Mobilization (n=6)	Placebo (n=6)
Women (%)	2(33.3%)	3(50%)	3(50%)
Men (%)	4(66.6%)	3(50%)	3(50%)
Age, y (Mean±SD)	40.17±12.07	36.67±6.89	37.83±9.74
BMI, kg/m2 (Mean±SD)	25.64±3.77	26.89±3.59	24.25±3.43
Flexion ROM (Mean±SD)	4.26±1.40	3.46±0.91	4.05±.084

Within-group Comparison:

JMR

SNAG=Sustained Natural Apophyseal Glide; PA=Posteroanterior; SD=Standard Deviation; LBP=Low Back Pain; ROM=Range of Motion.

Table 2. Between and within groups analysis on flexion and extension ROMs

Outcome Measures		SNAG (Mean±SD)	PA-Mobilization (Mean±SD)	Placebo (Mean±SD)	F	P
Flexion	Before	37.83±12.93	35.33±4.36	36.5±8.26	0.11	0.89
	After	56.5±13.14	48.83±6.73	39.67±9.66	4.1	0.038
	Cohen's d (CI)	1.81* (0.68-2.94)	2.38* (1.13-3.62)	0.36 (-0.58-1.32)		
Extension	Before	14.83±4.83	14.97±4.57	13.17±3.18	0.23	0.73
	After	23.33±7.96	24±6.69	17.67±6.83	0.98	0.39
	Cohen's d	0.03 (-0.92-0.98)	(0.48-2.66)*	0.84 (-0.14-1.83)		

JMR

SNAG=Sustained Natural Apophyseal Glide; PA=Posteroanterior; SD=Standard Deviation; CI=Confidence Interval; ROM=Range of Motion.

* Indicates significant difference.

Table 3. Scheffe post hoc analysis on flexion ROM after intervention

		Mean Difference	Sig.
SNAG	PA Mobilization	7.66	0.44
	Placebo	16.83	0.038
PA Mobilization	SNAG	-7.66	0.44
	Placebo	9.16	0.32

SNAG=Sustained Natural Apophyseal Glide; PA=Posteroanterior; ROM=Range of Motion.

4. Discussion

This study was designed as a double blinded randomized controlled pilot research to compare effects of SNAG and PA mobilization manual methods on flexion and extension ROMs of people with chronic nonspecific low back pain. The results revealed that SNAG technique on lumbar spine might improve flexion ROMs better than the PA mobilization. In contrast, the Maitland PA mobilization might improve extension ROM in these patients.

Other authors provided similar research framework with no clarification for lumbar ROM measurements after applied techniques [17]. So, the present study might be the first published article that reported lumbar ROM changes in NSCLBP following these manual techniques. Almost, all previous researchers who investigated effects of the MWM for other parts of body reported effectiveness of these techniques on ROMs improvement [18-23].

Indeed, there were two studies reported the effects of lumbar SNAG application on the ROM of the LBP patients. Hidalgo et al. conducted a placebo-controlled trial with similar SNAG and placebo intervention groups. They reported that significant improvement in all trunk ROM directions (exception of lumbar extension) might happen following the SNAG technique application [24]. However, the method of trunk ROM assessment in Hidalgo study was different from our study. These researchers measured trunk ROMs in sitting position by an advanced system and did not measure extension. Konstantinou et al. in another placebo-controlled trial reported that trunk flexion ROM may significantly increase following the SNAGS on the NSCLBP. These researchers didn't also measure lumbar extension ROM [25]. Our results supported these study results on trunk flexion after the SNAG application.

There were also two studies about the PA mobilization on NSCLBPs. Pwers et al. compared the effects of single session PA mobilization and press up lumbar extension on extension ROM and reported that both groups had increase extension ROM with no significant difference between them. This result might be due to type of compared interventions leading to increase extension ROM [26]. The other study, Shum et al. reported active lumbar ROM changes between asymptomatic subjects and patients with the LBP. These researchers showed a significant increase in active flexion and extension following the PA mobilization [27]. The Shum et al. findings on flexion increase following the PA mobilization do not agree with our results.

There were some limitations for our study. One limitation was different experiences of manual therapist and assessor. Another limitation was small sample size which may influence the study results. We suggested to perform similar study in future to compare these manual methods much accurately and with more identified outcome measures.

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Conflict of Interest

The authors declared no conflicts of interest.

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