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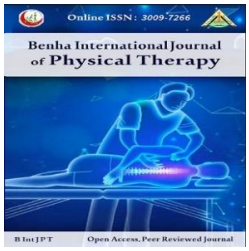

Original research

Sustained natural apophyseal glide versus neurodynamic mobilization in the management of chronic unilateral discogenic cervical radiculopathy

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Abstract

Background: Cervical radiculopathy is a pathological condition of the cervical nerve root**,** causing sensory and motor deficits. The greater demand for neurological physical therapy identifies the need for more evidence-based techniques. **Purpose:** To compare the effect of neurodynamic mobilization versus sustained natural apophyseal glides in the management of patients with chronic discogenic unilateral cervical radiculopathy. **Methods:** 42 patients complaining from cervical radiculopathy with age from 30 to 45years were randomly assigned to three equal groups. Group (A) received neural mobilization for median and radial nerve in addition to conventional treatment group (B) received sustained natural apophyseal glide (SNAG) in addition to the conventional treatment group (C) received a conventional physiotherapy program (Hot pack, stretching and strengthening exercises for cervical muscles) for 12 sessions during 4 weeks, 3 sessions /week. All patients were evaluated with the Visual analogue scale, Arabic version of the neck disability index and cervical range of motion device. **Results:** All groups had statistically significant improvements in all outcome measures post treatment. No significant differences were recorded among the three groups in the pain post treatment. Group A and B similarly improved and higher than group C in respect to neck functional performance. Group B showed significant improvement in cervical range of motion post treatment more than group A and C. **Conclusion:** Adding sustained natural apophyseal glide or neural mobilization to traditional physiotherapy program is beneficial in management of individuals with chronic unilateral discogenic cervical radiculopathy.

Key Words: Mulligan technique, Neck disability index, Visual analogue scale.

Introduction

Cervical radiculopathy is a pathological process involving the cervical nerve root. It develops when the cervical neural foramen inflamed and compresses a nerve root. It occurs annually in 85 out of 100,000 people. The most common causes for radiculopathy are cervical disc herniation followed by cervical spondylosis.[1]

As cervical radiculopathy progresses from acute to chronic, the pain level rises to its peak and then gradually decreases. Depending on the nerve

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root implicated, it might be in the chest, shoulder, arm, or neck and be characterized as sharp, achy, or burning. Classically, radiculopathy presents with pain radiating in a myotomal distribution. For example, patients with a C7 radiculopathy often experience pain in the triceps. Motor loss and reduced reflexes are less prevalent than sensory complaints, which mainly include numbness and paresthesia.[2]

Oral analgesics, steroids, manual therapy exercise, cervical collar, and cervical traction are measures to treat cervical radiculopathy conservatively, the use of long-term oral non-steroidal anti-inflammatory drugs to alleviate severe pain is recommended, but there within limit due to adverse drug reactions as gastrointestinal ulcers, serious cardiovascular events, hypertension, and acute renal failure.[3]

The greater demand for neurological physical therapy identifies the need for more evidence-based techniques. Cervical radiculopathy can be a debilitating disease that can cause significant impairment, economically from lost work and psychologically from prolonged pain and impaired social functioning, so we should find the rapid diagnosis and treatment of this condition in order to the return of the patient to the normal life. Neural mobilization in which the physiotherapists mobilize the peripheral nerve or its surrounding structures (mechanical interface) is used for assessment and treatment of various compression syndromes and other conditions that involve neuropathic pain.[4]

Improved neural mobility, increased joint range of motion (ROM), enhanced dynamic adaptability, enhanced blood flow, decreased dynamic sensitivity of the nervous system, and alleviated pain are all benefits of neural mobilization.[5] Neural mobilization techniques include sliding and tensioning. Sliding is a series of motions that lengthen the nerve bed at one joint and shorten it at another joint making dispersion of inflammatory products while tension techniques involve elongating the nerve bed leading to reduce intraneural edema and circulatory stasis.[6]

Among the mobilization strategies created by Mulligan to restore pain-free, unrestricted mobility for the majority of the body's joints is sustained natural apophyseal glides (SNAG (that was introduced by Mulligan in 1999 and is performed by applying pressure over the spinous process in an antero cranially direction Followed by overpressure which applies to the cervical region. [7] The treatment aims to increase movement within the spine and decrease symptomatic pain.[8]

Patients will benefit from the results obtained from this study by being treated with the best modalities and techniques which will relieve their symptoms and help them return to their work and life as soon as possible. The purpose of the work: is to evaluate the efficacy of neurodynamic mobilization and sustained natural apophyseal glide on pain, cervical range of motion and neck functional performance in cases of chronic discogenic unilateral cervical radiculopathy.

Methods

Study design

The Research Ethics Committee of the Faculty of Physical Therapy, Cairo University (No:P.T.REC/012/004520), has approved the study. All participants signed a written consent form after receiving full information about the purpose and the procedure of the study.

Participants:

42 male and female patients with ages were between 30 and 45 years in this study; with (C5-6) and (C6-7) disc herniation confirmed by MRI. Pain; pain was more than 3 months radiated to one upper limb. The subjects were selected from outpatient clinic of Zagazig general hospital, Abo Hamad central hospital and private clinics.

All Patients were evaluated by the neurologist and magnetic resonance imaging (MRI) of cervical spine as cervical radiculopathy.

Allocation and randomization*:*

42 patients were split equally into 3 groups. Two study group (A and B) and one control(C). Allocation concealment was secured by employing sealed, opaque envelopes.

Assessment*:*

All patients underwent the same evaluation and recording of all parameters at the beginning and the end of the study (four weeks). The degree of discomfort was measured using the VAS. It has

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high validity and reliability.[9] Assessment of cervical range of motion was assessed by cervical range of motion device (CROM) that is commonly used in clinical settings, easy to apply and effective. They also have good criterion validity and reliability.[10] neck functional performances were assessed by Arabic version of The Neck Disability Index. The Arabic version of NDI is a strong valid method for assessing self-rated disability in patients with neck pain with excellent "test-retest" reliability.[11]

Treatment procedure:

Study groups:

Patient in Group (A) received neural mobilization for median and radial in addition to traditional physiotherapy program.

1- Median nerve mobilization

a. sliding

While the patient lies on their back, the afflicted limb is positioned in the standard position: 90 degrees of abduction, external rotation, and flexion of the elbow, flexion of the wrist and fingers, and the subject's head held in a neutral posture. Beginning in the starting position, the upper limb was quickly mobilized by extending the elbow, flexion wrist and fingers. Then, the movement progressed to the position of the upper limb, which involves bending the elbow, extending the wrist and fingers. **[10]** 3 sets of 6-8 repetitions were performed and after each set; a 30 sec pause for a break was given. [11]

b. Tensioning

The 'tensioning' technique only used movements that lengthened the median nerve bed (elbow and wrist extension alone or combined with neck lateral flexion away from the symptomatic side). 3-5 repetition of 30 sec holds with 30 sec rest after each repetition

2- Radial nerve mobilization

The nerve is stretched when the wrist is bent, and released when the wrist is extended.

a. sliding

The patient is lying down and their afflicted limb is in a certain posture: 90 degrees of abduction with internal rotation, forearm pronation, elbow extension, extension of the wrist and fingers, and the subject's head is in a neutral position. Working from this stance, the wrist was flexed and extended several times

b. tensioning:

Shoulder girdle depression, abduction to 10, shoulder medial rotation, elbow extension, forearm pronation, wrist flexion, ulnar deviation, finger and thumb flexion, and contralateral side bending of cervical spine.[12]

Study group (B) received sustained natural apophyseal glide in addition to traditional physiotherapy program. Patient seated so that their spine is in a vertical position, which means it is bearing weight or loaded. [13] Placing the medial border one thumb reinforced other thumb on the spinous process of segments between C5-7. The therapist glides along the spinous process (45 degrees) in upward direction with sustained superior anteriorly. Gliding was applied rhythmically (three times per second).

The patient was instructed to consciously tilt their head in the direction of the motion deficit While the patient was turning his head, the therapist maintain the SNAGs technique, and remained in the position for at least 10 sec., and then patient may add pressure to the end of their restricted range of motion as they hold their position at the end for a few seconds. the patient voluntarily returned to the beginning position while the therapist maintained the glide. **[14]**

The procedures were repeated 3 sets of 5- 10 repetitions with one-minute rest between sets. **[15]**

Control group (C) received traditional physiotherapy program. The program included the following:

Exercise therapy, postural exercises and ergonomic training.

Exercise therapy includes isometric exercises for the muscles that rotate, extend, and flex the neck and stretching exercise for neck rotators, side bending and upper trapezius muscles and for

Hot pack was used for 10 minutes of over the patient skin area of the neck, around para spinal and trapezius muscles. [16]

Statistical Analysis

Data analysis packages used SPSS version 21. Qualitative data was presented by number and percentage; quantitative data was presented by mean, standard deviation, median and interquartile

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range. Significance tests was done (chi square for qualitative, student t test and Mann Whitney for quantitative Parametric and non-parametric respectively. Level of significance was set at 0.05.

Results

This research, which followed the concept of a randomized clinical trial, involved 42 individuals between the ages of 30 and 45 who were randomized to three groups. The groups' baseline characteristics did not significantly differ from one another In terms of age, BMI, and gender, the three groups were homogeneous (Table 1).

The results shows that there is no significant difference between the three studied groups regarding pre and post VAS (Table 2). Further, there is a significant difference between the three studied groups regarding post NDI. Moreover, there is a significant reduction in NDI post-management in all three groups. However, the reduction was better among group A & B compared to group c (Table 3).

Table (1): Demographic characteristics (Mean ± SD) between the studied groups.

	***Group A** (n=14)*	***Group B** (n=14)*	***Group C** (n=14)*	*F*	***p***
***Age** (years)*	34.08 ± 5.71	34.83 ± 4.22	33.0 ± 6.25	.342	.713
***BMI** (kg/m^2)*	27.69 ± 1.99	26.61 ± 2.83	26.96± 2.91	.624	.541
Gender					
Male	8 (57.1%)	6 (42.9%)	7 (50%)	.583	.747
Female	6 (42.9%)	8 (57.1%)	7 (50%)		

Table (2): VAS distribution between the studied groups

VAS	***Group A** (n=14)*	***Group B** (n=14)*	***Group C** (n=14)*	***F***	***P***
Pre *Mean ± SD*	6.92 ± 0.669	6.5 ± 0.674	6.67 ± 1.07	.771	.471 **P1=0.16, P2=0.64, & P3=0.62**
Post *Mean± SD*	3.33 ± 1.05	2.71 ± 1.01	3.42 ± 0.901	KW 2.86	.239 **P1=0.16, P2=0.97, & P3=0.17**
P-value	<0.001	<0.001	<0.001		

K: Kruskal wallis test, P1: Group 1 vs Group 2, p2: Group 1 vs Group 3, p3: Group 2 vs Group 3

Table (3): Neck disability index distribution between the two studied groups

NDI	***Group A** (n=14)*	***Group B** (n=14)*	***Group C** (n=14)*	***F***	***P***
Pre *Mean ± SD*	39.42 ± 9.98	35.0 ± 9.5	35.42 ± 7.88	.850	.437 **P1=0.28, P2=0.29 P3=0.97**
Post *Mean± SD*	14.58 ± 6.22	12.75 ± 3.11	21.33 ± 10.02	8.65	.013 **P1=.4, P2=.05 P3=.003**
P-value	<0.001	<0.001	<0.001		

K: Kruskal wallis test, P1: Group 1 vs Group 2, p2: Group 1 vs Group 3, p3: Group 2 vs Group 3.

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Table (4): Cervical range of motion distribution (Mean ± SD) between the studied groups

		Group A (n=14)	**Group B** (n=14)	**Group C** (n=14)	**F**	**P**
Cervical flexion	**Pre**	42.42 ± 8.88	38.58 ± 8.48	38.75 ± 9.51	.701	**.503** P1=.31, P2=.32, P3=1
	Post	50.17 ± 6.19	53.33 ± 6.83	45.83 ± 8.09	3.39	**.046** P1=.25, P2=.14, P3=.02
	P	.04	<.001	.07		
Cervical extension	**Pre**	56.33 ± 8.13	51.67 ± 7.79	58.08 ± 8.95	1.92	**.163** P1=.21, P2=.62, P3=.07
	Post	62.83 ± 7.13	65.33 ± 6.97	64.92 ± 7.75	.405	**.670** P1=.5, P2=.45, P3=1
	P	.05	.002	.05		
Left side bending	**Pre**	37.5 ± 5.84	32.17 ± 4.88	34.0 ± 6.25	2.73	**.080** P1=.02, P2=.17, P3=.37
	Post	41.33 ± 4.12	43.3 ± 3.6	38.08 ± 4.91	4.68	**.016** P1=.31, P2=.11, P3=.009
	P	.1	<.001	.12		
Right side bending	**Pre**	32.83 ± 5.92	31.92 ± 5.09	32.83 ± 5.39	.112	**.894** P1=.58, P2=1, P3=.7
	Post	38.92 ± 4.87	40.92 ± 5.9	36.83 ± 4.84	1.83	**.176** P1=.34, P2=.25, P3=.08
	P	.02	.004	.05		
Right rotation	**Pre**	66.0 ± 8.49	59.75 ± 5.71	65.5 ± 7.63	2.67	**.084** P1=.05, P2=.95, P3=.04
	Post	72.42 ± 8.59	74.0 ± 4.69	70.08 ± 7.91	.883	**.423** P1=.56, P2=.58, P3=.23
	P	.11	**<.001**	.204		
Left rotation	***Pre***	64.33 ± 11.9	58.75 ± 8.29	63.67 ± 6.79	1.31	**.285** P1=.13, P2=.7,P3=.18
	Post	70.0 ± 9.84	72.42 ± 6.68	69.17 ± 7.02	.538	**.589** P1=.52, P2=.7,P3=.31
	P	.15	<.001	.11		

SD: Standard deviation, group (A): neural mobilization group, group (B): SNAG group , group (C): traditional control group. P: Probability value. P1: Group 1 vs Group 2, p2: Group 1 vs Group 3, p3: Group 2 vs Group 3

This table shows that there is no significant difference between the three studied groups regarding pre cervical flexion, cervical extension, left side bending, right side bending, right rotation, and left rotation.

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In group A: There was statistically significant difference between pre and post regarding cervical flexion, right side pending. In group B: There was statistically significant difference between pre and post regarding cervical flexion, cervical extension, left side bending, right side pending, right rotation, and left rotation. In group C: There was no statistically significant difference between pre and post treatment. There is higher in cervical range of motion post-management in group B compared to group A & C.

Discussion

This study set out to examine the effects of neural mobilization (median neve and radial nerve) and sustained natural apophyseal glides on pain, neck disability index, and cervical range of motion in patients with chronic unilateral discogenic cervical radiculopathy. The trial was designed as a randomized controlled clinical trial.

This research included 42 male and female patients with cervical radiculopathy were randomly allocated to one of three equal study groups. The treatment program was applied three times per week for four weeks for every patient to compare results before and after treatment. All groups had statistically significant improvements in all outcome measures post treatment. No significant variations were recorded among the three groups in respect to the pain ($p > 0.05$) post treatment. Hence(Nerve or joint)mobilization not improve pain more than traditional treatment. Group A and B similarly improved and higher than group C in respect to neck functional performance. Group B improved significantly higher than group A and C in respect to cervical flexion, and left side bending ($P < 0.05$).

This study's findings corroborate the use of neurodynamic approaches for improving neck functional performance due to several causes. Neurodynamic techniques, which involve brief oscillatory movements, were effective in dispersing the edema, alleviating hypoxia and reducing associated symptoms when the nerve root was compressed and microcirculation was compromised. It has been postulated that nerve mobility in pain-free variants might alleviate compression and, thus, lessen its mechanosensitivity. [19]

A number of guidelines and reviews have reached the same conclusion: that patients with cervical radiculopathy would benefit most from a conservative treatment approach that included a multimodal management strategy that included spinal and neurodynamic mobilization in addition to a targeted exercise program or therapeutic modalities. This would help alleviate pain, disability, and improve motor functions.[20]

This study showed that there is a significant reduction in (VAS, NDI) and significant improving cervical range of motion post-management in all three groups. However, the improving was better among group (B (compared to group (C (therefore, the addition of SNAG techniques to the selected physical therapy program was more effective than using the selected physical therapy program only. The underlying mechanism of the effect of cervical SNAGs seems likely to be either purely mechanical, reflexogenic, or a combination of them.[21]

The superior and inferior facets in turn form the posterior boundary for the intervertebral foramen, which is one of the interfaces which compress the cervical nerve roots. This technique based on a biomechanical explanation where repositioning of the superior articular facet using a SNAG would cause correction of positional fault, thus resulting in reduced pain and increased ROM in the neck.[22]

The accessory movement (glide) applied to the spinous process of cervical vertebra that enhances the circulation and nutrition to the joint, leading to washing out of nociceptive metabolites. We propose that exercises applied after SNAG's share in the maintenance of the pain free physiological movement obtained by SNAG's .The combined benefits of decreased neck discomfort and increased neck mobility may explain why this research also found that NDI significantly improved in group (B) SNAG intervention; the facet joints and discs get some of their nutrients from motions that are produced by mobilization and it aids in the relaxation of muscles around the joints by stimulating mechanoreceptors and proprioceptors in and around the affected areas.[23]

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Conclusion:

Based on the results supported by this study, it could be concluded that there were no significant differences were recorded among 3 groups (neural mobilization, SNAG technique and traditional treatment) in respect to the pain post treatment. Group A and B similarly improved and higher than group C in respect to neck functional performance. Group B (SNAG technique) improved significantly higher than group A (neural mobilization) and group C (traditional treatment) in respect to cervical range of motion. Therefore, adding neurodynamic techniques or SNAG technique to the selected physical therapy program are as an effective, reliable, noninvasive technique at physical therapy clinics in case of chronic unilateral discogenic cervical radiculopathy

Conflict of interest:

No conflicts of interest are disclosed by the writers.

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