



COMPARISON BETWEEN MCKENZIE EXTENSION AND NECK ISOMETRIC EXERCISES IN THE MANAGEMENT OF NONSPECIFIC NECK PAIN: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

OBJECTIVE: To compare the effects of neck exercises (McKenzie extension and isometric exercises) in the management of non-specific neck pain and range of motion in patients with neck pain.

METHODS: This randomized controlled trial was conducted in physiotherapy departments of Dr. Akbar Niazi Teaching Hospital, Islamabad. Forty consecutive patients with acute to sub-acute cases of neck pain (<3 month) were enrolled. Based on lottery method two groups (n=20 in each group) were differentiated, Group-I (control) received isometric neck exercises and group-II (treatment) received McKenzie extension exercises for 4-weeks along with hot packs therapy. Neck pain was measured using numeric pain rating scale (NPRS). All patients were tested on baseline, at 2nd and 4th week.

RESULTS: Mean age of the sample was 33.85±4.80 and 33.50±5.20 years in group-I and group-II respectively. Male to female ratio was 4:1 in both groups. Mean body mass index was 24.54±1.50kg/m². NPRS at baseline was 5.80±0.41 in group-I while 6.10±0.64 in group-II (p-value=0.001). NPRS decreased to 3.75±0.72 in group-I and 3.00±0.73 in group-II after 4-weeks (p-value=0.001). Neck flexion (degrees) at baseline was 31±2.05 in group-I and 35.75±1.83 in group-II (p-value=0.001) while after 4weeks increased to 35.50±4.26 in group-I and 40±4.29 in group-II (p-value=0.002). Neck extension (degrees) at baseline was 44±2.05 in group-I and 40.75±1.83 in group-II (p-value=0.001) while after 4-weeks increased to 48.5±4.01 in group-I and 45±4.29 in group-II (p-value=0.011).

CONCLUSION: McKenzie exercises are more significant and show more improvement in reduction of pain and associated symptoms of neck and increased movements quicker than isometric exercises.

KEY WORDS: Exercise (MeSH); Isometric Exercise (MeSH); Neck Pain (MeSH); McKenzie exercises (Non-MeSH); Muscle Stretching Exercises (MeSH); Exercise Therapy (MeSH); Numeric pain rating scale (Non-MeSH); Exercise Movement Techniques (MeSH); Musculoskeletal Pain (MeSH).

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INTRODUCTION

The most occurring disorder of musculoskeleton is neck pain.¹ It is the important disease after lumber pain for time off occupation. The occurrence of this pain is ranged from 64.6% to 75.5% yearly.² The management of cervical pain is

tough and expensive. Neck pain is associated with other pathological conditions like nerve compression, fracture, facet and inter-vertebral disc prolapsed/dislocation. Mostly neck pain is idiopathic. Therapeutic interventions is mostly used for the management of neck pain.²

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The McKenzie method is a classification-based treatment for patients with spine pain and was introduced in 1981 by physical therapist Robin McKenzie.³ Philosophy behind this treatment is to enhance patient involvement and educate them for neck, back and other extremity issues. McKenzie method aims to centralize the pain or move the pain from spine.⁴

McKenzie method has three stages i.e. evaluation, treatment and prevention. Evaluation is achieved by sustained positions and repeated movements. Symptoms of spine that elicits need of centralization, are divided into three categories i.e. derangement syndrome, postural syndrome and dysfunction syndrome. The exercise chosen in this method depends on direction i.e. lateral shift of spine, flexion or extension. Treatment stage aims to reduce pain, centralize symptoms that migrate through the middle line of body and complete recovery from pain. Purpose of prevention step is to educate and encourage patient for regular exercises and self-care.⁵

Isometric contractions produces force without change in length of muscle which is common in muscles responsible for grip i.e. of forearm and hand.⁶ Isometric contractions are occasionally described as overcoming or yielding and are often used for posture maintenance.⁷ Pain reduction due to isometric exercises might occur due to cortical changes, motor neuron pool recruitment and/ or changes at the level of tissues. Strategies for spinal and supraspinal activation may differ across type of contraction. Activation of motor unit that occur during isometric contractions is significantly higher than

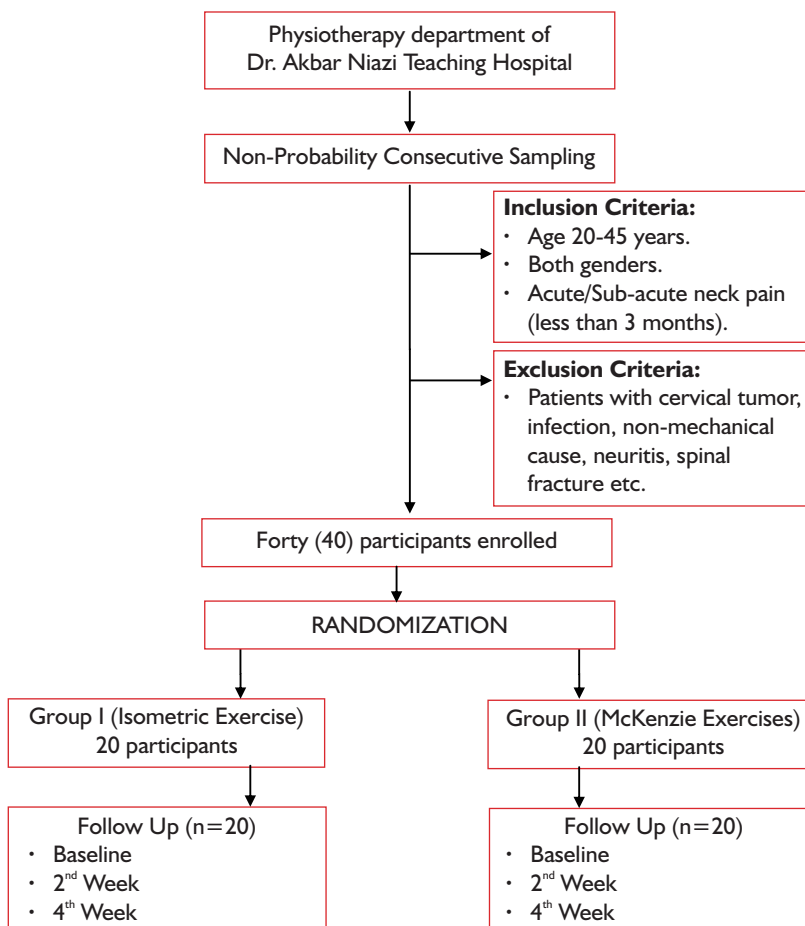


Figure 1: Methodology flow chart

that occur during concentric or eccentric contractions.⁸

The rationale behind doing this study was that limited scope of practicing McKenzie extension exercises in contrast with isometric exercises in our setup. Furthermore, we required discovering the efficiency of isometric exercises to re-establish the purposeful capability of the muscles of neck and lessen the pain in the treatment of unclear and vague cervical pain in patients either feminine or masculine. Therefore, this study will provide us fresh first-hand and local evidence about McKenzie exercises in neck pain. This study was conducted to compare the effects of neck exercises (McKenzie extension and isometric exercises) in the management of non-specific neck pain and range of motion in patients with neck pain.

METHODS

A randomized controlled trial was conducted from first week of July to 4th week of July 2018 in physiotherapy department of Dr. Akbar Niazi Teaching Hospital (ANTH) Islamabad. The approval was taken from ethical committee of the hospital. After informed written consent a total of 40 patients (sample size was calculated by using formula, whereas α (two-tailed) = 0.05, β = 0.20, E = 0.44, $S(\Delta)$ = 1.00, $Z\alpha$ = 1.960, $Z\beta$ = 0.84, $\{A = 1, B = (Z\alpha + Z\beta)^2 = 7.84, C = (E/S(\Delta))^2 = 0.1936\}$ and $AB/C = 40.495$)⁹ were enrolled in this study. Patients of ages 20-45 years, both genders with acute and sub-acute cases of neck pain (less than 3 months)¹⁰ presenting in OPD were enrolled in the study while patients with cervical tumor, infection, non-mechanical cause of neck pain, neuritis, spinal fracture, cervical surgeries and shoulder diseases (tendonitis, bursitis and capsulitis) were excluded from study. Twenty patients were randomly allocated to group

I (Isometric exercises or control group) and 20 to group II (McKenzie exercises or treatment group) by non-probability consecutive sampling. Two groups were made by the help of lottery method in which name of all the patients were written on chits and folded then, the 3rd person was called on to choose the chits randomly to be included in group I and group II.

The following procedure was done for evaluation of the patients; neck pain which was measured by numeric pain rating scale (NPRS), it has 0-10 numbering. It has also pain 0: no, 1-3: mild, 4-7: moderate and 8-10: worst possible.¹¹ Neck range of motion which was measured by goniometry. Both groups were tested once before the start of therapy (at baseline), at 2nd week and then at the end of treatment 4th week.²⁰ patients from group I acknowledged isometric exercises whereas 20 patients of group II were acknowledged McKenzie exercises. The protocol for both the group I and group II involved application of hot packs therapy for 10 minutes, exercises and neck posture education for a total of 8 treatment sessions (2 sessions a week) of 10 minutes, over a period of 4 consecutive weeks. At the beginning of the therapy session, all patients were given a brief explanation of treatment and informed written consent was taken. Mackenzie interventions are retraction, retraction with extension, retraction extension with rotation and retraction with lateral flexion done for 5-15 repetitions.¹⁰ Isometric exercises for neck pain are flexion, extension, lateral flexion (side bends) both sides and rotation both sides done for 5-10 repetitions with a hold of 6sec against resistance in each direction.¹⁰ In addition; standard home exercise protocol was followed twice a day (Figure 1).

All analyses were performed with SPSS statistical software version 21. Quantitative variable pain was calculated in terms of Mean and Standard Deviation. Mean pain score at baseline and at end of treatment sessions between two groups was compared by using independent sample T test keeping p value ≤ 0.05 as significant.

RESULTS

Total 40 patients (20 in each group) were evaluated for treatment of neck pain. Mean age in group I was 33.85 ± 4.80 years and mean age in

group II was 33.50 ± 5.20 years. Out of 20 patients in group I, 16 (80%) were male and 4 (20%) were female. In group II male and female ratios were 17 (85%), 3 (15%) respectively. The mean of body mass index (BMI) of 40 patients were $24.54 \pm 1.50 \text{ kg/m}^2$.

NPRS at baseline was 5.80 ± 0.41 in group-I while 6.10 ± 0.64 in group-II. Comparing the NPRS between groups, there was significant difference found from 0 to 4 weeks in both groups ($P \leq 0.05$) (Table I).

Comparison of range of motion in flexion and extension between two groups was done. Baseline degree of flexion was 31 ± 2.05 & 35.75 ± 1.83 in group I & group II respectively and baseline degree of extension was 44 ± 2.05 & 40.75 ± 1.83 in group I & group II respectively. There was significant difference found at the end of treatment sessions in both groups ($P \leq 0.05$) (Table II).

DISCUSSION

In this study, 'pain and movements' in neck pain were evaluated before and after subjecting the neck pain to McKenzie and isometric exercises in an attempt to reduce the signs and symptoms and to increase movements of neck.

This study showed that in group I mean pain was 3.75 ± 0.72 at end of treatment sessions. Whereas in group II mean pain was 3.00 ± 0.73 ($p = 0.001$), so there was a significant reduction in pain and increase range of motion at the end of treatment sessions. Edmond, et al.¹² analyzed a small cohort of patients, reported a complete centralization occurrence rate of 83% in patients with neck pain. But there were symptomatic reduction in radicular pain reporting a centralization occurrence rate of 85% in patients with acute pain. Kjellman and Oberg¹³ McKenzie treatment was more favorable than general exercise and the ultrasound in control group, with a more rapid improvement in neck pain intensity during the first 3 week.

Boyoung I, et al.¹⁴ neck pain is often accompanied by protective muscle spasm which developed pressure within the homonymous muscle, thus producing ischemia, more pain and abnormal neck posture. They showed that postural correction was effective in reducing neck pain and muscle spasm other studies have

showed that spasm of the sternocleidomastoid and perhaps temporomandibular pain may be reduced by postural correction.

Ylinen J, et al.¹⁵ conducted a randomized controlled trial regarding the active neck muscle training in the treatment of chronic neck pain in women showed a marked improvement in the symptoms. The author had two groups each equally divided with a population of 60 patients. The groups were divided into isometric strength training and stabilization exercise and dynamic strengthening exercise groups. Both the interventions groups on 12 month training reported effective for decreasing pain and disability with chronic non-specific neck pain in women with a p value ranging to less than 0.001. Patients advised with stretching and aerobic exercises alone proved to be less effective in comparison to strength training.

In our study there was significant reduction of neck pain through McKenzie treatment within the group. The group II showed more improvement than group I.

The effectiveness of physical rehabilitation interventions for acute neck pain is grossly affected by psychosocial, physical, and occupational factors. In order to manage patients with acute pain effectively, treatment strategies should address as many aspects as possible such as pain, disability and physical impairment.

Main limitation of our study was a small sample size of the study. Therefore, it is suggested that a larger study can be

carried out to analyze the efficacy of McKenzie protocol in the management of non-specific neck pain and range of motion in patients with neck pain. It can also be carried out with increased duration of treatment protocol with quality of life index. Looking at the findings from our study, we advocate to use McKenzie exercises as it is improved the patient's pain and reduced morbidity.

CONCLUSION

The study concluded that McKenzie exercises are more significant and show more improvement in reduction of pain and associated symptoms of neck and increased movements quicker than isometric exercises. Large scale, multicenter, randomized controlled trials are recommended to validate the efficacy of McKenzie protocol in our population.

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TABLE I: NUMERIC PAIN RATING SCALE WITHIN STUDY GROUPS (N=40)

Numeric Pain Rating Scale	Group I	Group II	t*	P-Value
	Mean \pm SD	Mean \pm SD		
Baseline	5.80 ± 0.41	6.10 ± 0.64	-5.00	0.001
2nd week	4.70 ± 0.66	4.00 ± 0.73	-4.34	0.001
4th week end of sessions	3.75 ± 0.72	3.00 ± 0.73	-3.36	0.001

*Independent sample t test

TABLE I: CERVICAL RANGE OF MOTION FLEXION AND EXTENSION BETWEEN THE GROUPS (N=40)

Numeric Pain Rating Scale		Group I	Group II	t*	P-Value
		Mean \pm SD	Mean \pm SD		
Flexion (degree)	Baseline	31 ± 2.05	35.75 ± 1.83	-7.72	0.001
	End of treatment	35.50 ± 4.26	40 ± 4.29	-3.33	0.002
Extension (degree)	Baseline	44 ± 2.05	40.75 ± 1.83	5.28	0.001
	End of treatment	48.5 ± 4.01	45 ± 4.29	2.67	0.011

*Independent sample t test

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AUTHORS' CONTRIBUTIONS

Following authors have made substantial contributions to the manuscript as under:

NA: Conception and study design, acquisition of data, drafting the manuscript, final approval of the version to be published.

AA: Study design, analysis and interpretation of data, drafting the manuscript, final approval of the version to be published.

BA: Acquisition of data, critical review, final approval of the version to be published.

MI: Analysis and interpretation of data, drafting the manuscript, final approval of the version to be published

SH: Study design, drafting the manuscript, final approval of the version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest

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NIL



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