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Effect Of Proprioceptive Training And Motor Control Exercises Along With Conventional Exercises On Pain, Rom, Proprioception And Strength In Patients With Chronic Non-Specific Neck Pain - A Single Blinded Randomized Pilot Study.

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ABSTRACT:

BACKGROUND: Neck pain (NP) is considered to occur insidiously and is multi-factorial in origin. It includes one or more of the following causes: poor posture, anxiety, depression, neck strain, and sporting or occupational activities. Joint position sense, an individual's ability to reproduce and perceive previous predetermined positions or ranges of motion of a joint, is a significant component of proprioception. Motor control therapeutic exercises are relevant to improving neck pain patients' status.So, this study aimed to compare the effectiveness of proprioceptive training and motor control on pain, ROM, proprioception, and strength in patients with chronic non-specific neck pain.

MATERIALS AND METHOD:
Six individuals aged 18-50 years having chronic neck pain were divided into 3 groups of 2 individuals in each. They were given intervention of proprioceptive training, motor control training, and conventional neck exercise, respectively. Pain, ROM, proprioception, and strength were assessed pre-intervention and immediate post-intervention.

RESULTS: VAS ($p=0.05$), ROM ($p=0.03$), proprioception ($p>0.10$), and strength ($p>0.01$) showed significant improvement in all three groups. However, both experimental groups showed better improvement in outcome measures after 4 weeks.

CONCLUSION: Propriocetive training and motor control exercises were better than conventional neck exercises in improving pain, ROM, proprioception, and strength in patients with chronic nonspecific neck pain.

KEYWORDS: Chronic neck pain, Motor control exercise, Proprioceptive training, Randomized Control Trial.

INTRODUCTION

Neck pain is among the most common musculoskeletal disorders in the general population. Point prevalence ranges from 6% to 22% and up to 38% of the elderly population, while lifetime prevalence ranges from 14.2% to 71% [1]. It carries a sizeable personal burden; it is second only to back pain in disability-adjusted life years (DALYs) and represents one-fifth of total DALYs attributed to musculoskeletal conditions. Although neck pain is generally thought to have a favorable prognosis, one-third of people develop chronic neck pain [2]. Neck pain (NP) is considered to occur insidiously and is multi-factorial in origin. It includes one or more of the following causes: poor posture, anxiety, depression, neck strain, and sporting or occupational activities. Based on the duration of NP, the International Association for the Study of Pain proposed classification as Acute NP, which usually lasts < 7 days, sub-acute neck pain lasting for > 7 days but < 3 months, and chronic neck pain with a duration of 3 months or more[3]. Clinical practice guidelines for chronic neck pain recommend conservative treatment, including exercise and manual therapy, guided by impairment/function-related assessment of
the neck [2].

The cervical range of motion may be affected by several musculoskeletal conditions. Limitations in the range of motion can lead to muscle imbalances, changes in the articulating surfaces, and pain. These conditions, along with muscle spasms due to joint dysfunction or irritation and structural problems such as vertebral rotation, can adversely affect the normal range of motion of the neck. Limitations in ROM can lead to muscle imbalance, changes in the articulating surfaces, and pain. Physical therapy goals may include restoring normal cervical range of motion [4].

Proprioception is a sense of bodily movement position, which includes position sense (joint position sense) and movement sense (kinaesthesia). The ascending proprioceptive information reaches the central nervous system via the afferent pathway, contributing to movement and postural neuromuscular control [5]. The primary measure to clinically operationalize cervical proprioception is the Joint Position Sense Error (JPSE). Joint position sense, an individual's ability to reproduce and perceive previous predetermined positions or ranges of motion of a joint, is a significant component of proprioception[4].

The deep cervical flexor (DCF) has a primary postural function in supporting and straightening the cervical lordosis. It has been found that specific muscles in the cervical spine tend to weaken in NP, the most common of these being the DCF. The main action of deep cervical flexor muscle, which supports deep cervical flexor motion segments, is craniocervical flexion (CCF). Hence, DCF training is clinically recommended for the management of NPs [6].

Motor control therapeutic exercises are relevant to improving neck pain patients' status. Motor control therapeutic exercises have been demonstrated to increase motor control and reduce pain and disability in patients with neck pain. Changes in motor control that could cause pain or dysfunction require practitioners to work on the components of motor learning for a successful intervention capable of producing satisfactory motor learning and retention. Such an intervention requires repetitive training [7].

Several associated conditions can easily alter the ROM and proprioception in chronic non-specific neck pain patients. Therefore, we must identify whether proprioceptive training and motor control exercises significantly affect pain, ROM, proprioception, and strength in patients with nonspecific neck pain. So, this study aimed to compare the effectiveness of proprioceptive training and motor control on pain, ROM, proprioception, and strength in patients with chronic non-specific neck pain.

PROCEDURE:

After receiving ethics clearance from the Institutional Ethical Committee, the pilot study was conducted on patients with chronic non-specific neck pain. Participants were included according to inclusion criteria and exclusion criteria. The purpose of the study was explained, and written informed consent was obtained from all the participants. Subjects were allocated to Group A, B, and Group C. Group A received proprioceptive training and conventional neck exercises. Group B received motor control exercises along with conventional neck, and Group C received only conventional neck exercises.

Recruitment of samples: 6 Participants were recruited from Dr. Vithalrao Vikhe Patil Foundation's College of Physiotherapy. This study's purpose and test method were fully explained to potential subjects, and those who volunteered to participate were included. Samples were recruited according to inclusion and exclusion criteria.

OUTCOME MEASURES:

Pain intensity was measured via an 11-point Visual Analogue Scale (VAS) (r =0.94) (0–10; 0 means no pain; 10 means worst pain)[10]. Cervical ROM was measured by Inclinometer (r = 0.89-0.94)[11]. Deep neck flexor muscle strength was assessed using pressure biofeedback (r = 0.78)[8], and proprioception was assessed by the Joint position sense test (r = 0.95)[12].

INTERVENTION

After obtaining clearance from the Institutional Ethical Committee from the Dr. Vithalrao Vikhe Patil Foundation, College of Physiotherapy, Ahmednagar, instructions were given to the participants about the study and its benefits and risks in their language. After the baseline evaluation, the intervention groups received treatment as follows: 1 session/day for 2 weeks. Moreover, follow-up appointments were planned after 2 weeks of the intervention.

Group A (Proprioceptive Training Group)

1) Eye-head-neck co-ordination exercise[13]
2) Eye-head-neck-upper limb coordination exercise[14]
3) Oculomotor exercises[13]

Each of these three exercises were performed for three sets of 10-12 repetitions, approximately 10 to 20 minutes.

Group B (Motor Control Exercises)

1) Craniocervical flexor exercise:
2) Craniocervical extensor exercise;
3) Strengthening neck retraction (Sitting)
4) Strengthening neck retraction (Lying) [16]

Each of these four exercises was performed for three sets of 10-12 repetitions, approximately 10 to 20 minutes.

Group C (Conventional Neck Exercises)

All three groups were treated with a conventional exercise program, which included the following exercises:

1) Cervical active range of motion exercises[3]
2) Cervical isometric strengthening exercises
3) Self stretching (Upper trapezius, Levator scapulae)

Hold for 30 seconds, performed 3 times/session [9].

4) Strengthening exercises (Middle trapezius, Lower trapezius)
5) holds for 5 seconds, 10 repetitions 3 sets/session [15].

POST INTERVENTION READING:

Evaluated the same as pre-intervention reading.

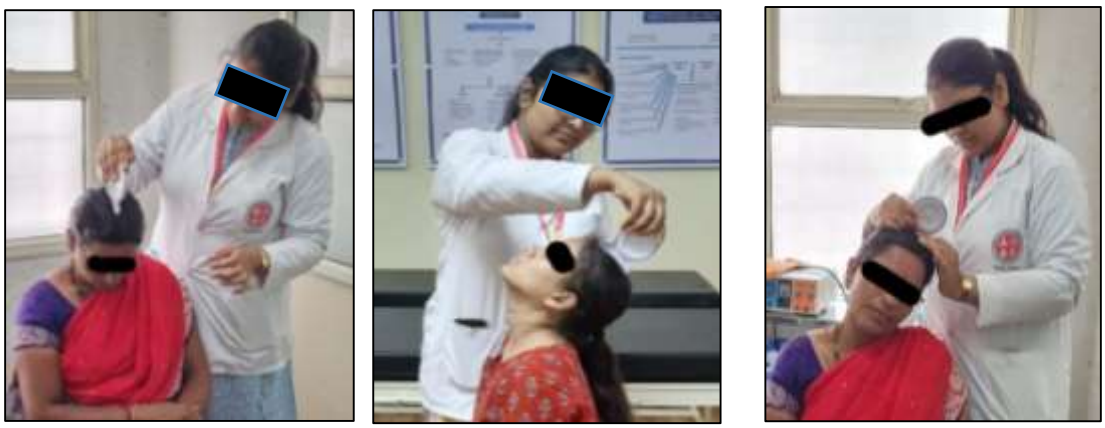

Fig I: Assessment of cervical range of motion by using inclinometer.

Fig II: Assessment of proprioception by joint position

Fig III: Assessment of deep muscle strength by

Fig IV: Eye-head-neck Co-

Fig V: craniocervical flexor

Fig VI: Strengthening neck retraction.

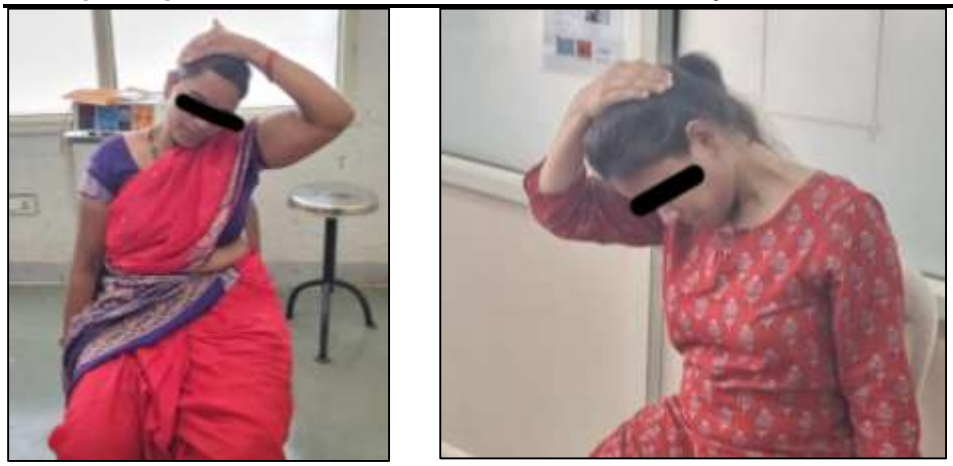

Fig. VII: Self stretching (Upper trapezius, Levator

Fig. VIII: Strengthening

Fig. IX: Cervical Isometric

RESULT ANALYSIS:

Statistical analysis was done by using GraphPad Instat Version 3.06. A descriptive statistics test was used to compare the participants' general characteristics. Since the data were normally distributed, A one-way ANOVA test was used to analyze data within and between groups. VAS ($p=0.05$), ROM ($p=0.03$), proprioception ($p>0.10$), and strength ($p>0.01$) showed significant improvement in all the three groups. However, both experimental groups showed better improvement in outcome measures after 4 weeks.

Table I: Between-group data analysis of Visual Analogue Scale for Pain.

Pain	Group A		Group B		Group C		P value	Result
	mean	SD	mean	SD	mean	SD	0. 05	significant
	5.5	0.547	2.5	0.54	1.0	1.26		

Table II:Between-group data analysis of cervical ROM.

ROM	Group A		Group B		Group C		P value	Result
	mean	SD	mean	SD	mean	SD		significant
flexion	25	7.07	25	7.07	62.5	5.25	> 0.1	
extension	17.5	4.18	30	3.16	55	3.16	0.03	
Rt. rotation	34.16	7.36	47.5	6.89	70.83	7.36	> 0.1	
Lt. rotation	35.85	4.91	47.5	5.24	70.0	10.0	0.09	
Rt. side flexion	38.33	6.83	35.83	6.64	65.0	4.4	> 0.1	
Lt. side flexion	35.0	8.36	57.6	2.58	67. 5	5.24	> 0.1	

Table III:Between-group data analysis of strength.

Strength	Group A		Group B		Group C		P value	Result
	mean	SD	mean	SD	mean	SD		significant
	3.16	0.75	3.41	0.80	7.58	0.73	> 0.10	

Table IV:Between-group data analysis of proprioception.

Proprioception	Group A		Group B		Group C		P value	Result
	mean	SD	mean	SD	mean	SD		significant
	9.25	0.8	5.16	0.98	2.5	1.04	> 0.10	

DISCUSSION

The present study was undertaken to determine the effectiveness of proprioceptive training and motor control exercises along with conventional neck exercises on pain, ROM, proprioception, and strength in patients with chronic nonspecific neck pain.

In this study, both groups showed statistically significant improvement in pain after receiving treatments. Moreover, the Motor control group showed a better effect than the control group and proprioceptive group. The results obtained for pain reduction in the Motor control group could be similar to the previous studies where pain intensity was reduced following motor control exercises over the neck area. In a study conducted by Gupta et al.of 30 dentists with chronic neck pain, deep neck flexor training was given to one group. In contrast, isometric exercises were given to the other group. At the end of 4 weeks, the NDI for pain and digital photography for the anterior head position were evaluated. Although pain and functionality decreased in both groups, posture improved only in the deep neck flexor group. As a result, deep neck flexor training gives more effective results in people with anterior head position. Another study conducted by Besta Hazal Gumuscu et al.[18]. This study was conducted on 45 patients with neck pain. Patients were divided into 3 groups: Group 1 (conventional treatment), Group 2 (conventional treatment plus deep cervical flexor training), and Group 3 (conventional treatment plus stabilization of the neck and core region). The exercise programs were applied for four weeks, three days a week. They concluded that in addition to conventional treatment, applying deep cervical flexor muscle training to patients with neck pain may be more effective in reducing pain and disability and increasing ROM than conventional treatment alone. Stretching and isometric contraction simultaneously stimulate the muscle and joint mechanoreceptors and proprioceptors. This would reduce the pain sensation, making the consecutive stretch easier and more tolerable.[18]

In this study, motor control exercises improved the cervical range of motion more effectively. Muscle tissue has excellent contractile properties and the unusual potential to extend considerably under specific circumstances. A muscle that has been stretched continuously receives sensory information about the length and force of the stretching activity. If the receptors receive enough information, they set off an inhibitory response that relaxes the muscle, allowing it to grow longer than it did earlier. In a study conducted by Yesim Dusunceli et al.[17] Sixty patients with neck pain were randomized to 3 groups, as follows: Group 1 – physical therapy agents including transcutaneous electrical nerve stimulation, continuous ultrasound, and infra-red irradiation; Group 2 – physical therapy agents + isometric and stretching exercises; and Group 3 – physical therapy agents + neck stabilization exercises. This study concluded that neck stabilization exercises

have advantages in pain and disability outcomes, compared with isometric and stretching exercises in combination with physical therapy agents for managing neck pain.[17]

This study concluded that motor control exercises are more effective than proprioceptive training in reducing pain and improving ROM and cervical proprioception. Previous research has also found that motor control exercises may reduce pain, improving ROM and cervical proprioception.

CONCLUSION

Proprioceptive training and motor control exercises were better than conventional neck exercises in improving pain, ROM, proprioception, and strength in patients with chronic nonspecific neck pain. When compared, motor control exercises seem more effective than proprioceptive training in reducing pain and improving ROM and cervical proprioception.

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