Case report: Role of pressure biofeedback on pain, mobility and endurance in mechanical neck pain

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Abstract

Mechanical neck pain, characterized by non-specific ache in the cervical-thoracic area, is often exacerbated by neck movements due to abnormal tension or strain on the spinal column's muscles. This condition is prevalent, especially among females, and is linked to various factors such as repetitive motions, prolonged postures, and diminished cervical muscular strength. The deep cervical flexors (DCF) play a crucial role in maintaining posture and stability in the cervical region. Chronic neck pain weakens these muscles, leading to hyperactivity in the superficial neck muscles and resulting in cervical deficits. This study evaluates the effectiveness of endurance training on the deep cervical flexors using a pressure biofeedback unit and visual input variation. A 25-year-old female patient with chronic neck pain underwent a physiotherapy intervention involving DCF training with pressure biofeedback, along with active exercises. The intervention aimed to improve pain management, mobility, and endurance of the deep cervical flexors. Results showed significant improvements in pain levels, endurance time, and neck disability index scores after two weeks of physiotherapy. The study concludes that pressure biofeedback is an effective rehabilitation method for managing mechanical neck pain by enhancing muscle coordination, reducing pain, and improving cervical mobility and endurance.

Introduction

A non-specific ache of the cervical-thoracic area is referred to as mechanical pain. Movements of the neck exacerbate the pain, which is brought on by abnormal tension or strain on the spinal column's muscles.[1]

As one ages, neck discomfort and related problems become more prevalent. Most often, it affects females. Strains and strains of the neck's muscles or ligaments account for most mechanical neck symptoms. [1]

In 2010, 4.9% of people worldwide were estimated to have neck pain. of which 4.0% were male and 5.8% were female. Between 2% and 11% of the general population was disabled because of neck pain. Between 11% and 14% of working people said that neck pain limited their ability to do certain tasks.[2]

In Asia, 13% of people had neck pain at one year.Numerous factors, including repetitive motions, prolonged periods of the same posture, inadequate workstation design, hereditary susceptibility, diminished cervical muscular strength and endurance, and sprains and strains of the neck's muscles and ligaments, are linked to chronic mechanical neck pain.[3]

The deep cervical flexors (DCF) are essential for maintaining posture control and giving the cervical region stability. Chronic neck discomfort weakens DCF, which causes the superficial neck muscles to become hyperactive. Numerous cervical deficits result from the loss of proper lordotic alignment caused by this ongoing imbalance between the superficial and deep flexor muscles.[3]

DCF training is a crucial component of therapy since chronic neck pain also affects the neuromuscular coordination between the deep and superficial muscles. In a systematic review, Blomgren J et al. (2018) noted that DCF is a low load, resistance-free motor training program that is controlled by inflated pressure sensor's feedback. In a recent comprehensive study, Tsiringakis G et al. (2020) found that inducing motor control training of DCF with pressure biofeedback is better and more efficient than only strengthening and endurance training of cervical muscles for neck pain and impairment.[3]

Numerous physical structures in the cervical region, such as the intervertebral disk, muscles, tendons, brain structures, zygapophyseal joints, and vertebral end plates, can serve as sources of nociception.Nevertheless, there is little evidence to support the hypothesis that these patho-physical factors are a major cause of mechanical neck pain in the majority of patients, regardless of age.[4]

The goal of the current study was to evaluate the effectiveness of endurance training on the deep cervical flexor in relation to a pressure biofeedback unit and a visual input variation. Use of pressure feedback to evaluate the deep cervical flexor muscles endurance in a patient experiencing mechanical neck pain. The outcome measures used are NPRS and cervical endurance test.

Case description

A 25-year female patient came with chief complaint of pain in neck, unable to move neck completely since three months. she could not perform her occupation demanded work and couldn't sleep adequately as the pain was aggravating day by day. She had constant dull aching pain since 3 moths which aggravated more with side flexion and flexion. On NPRS she graded her pain to be 7. On palpation she had triggers over C5-C7 paraspinal region and upper trapezius were tight. She came to physiotherapy department on advice of orthopaedic consultant

On pain assessment we observed that pain site was on upper trapezius and paraspinal c5-c6 region, type of pain was dull aching, pain was [experienced more in the morning, pain relieved when had analgesics.On palpation tenderness and warmth was present on the bilateral upper trapezius and paraspinal c5-c7

On examination of active ROM with Goniometer

flexion	0-20˚
Extension	0-30 ˚
Right side flexion	0-40 ˚
Left side flexion	0-40 ˚
Right rotation	0-35 ˚
Left rotation	0-35 ˚

End field- empty

STRENGTH-

Resisted isometrics

Cervical region	
Flexors	Weak and painful
Extensors	Weak and painful
Right side flexors	Weak and painful
Left side flexors	Weak and painful
Right rotators	Weak and painful
Left rotators	Weak and painful

REFLEXES

Superficial reflexes (abdominal) were intact

Deep reflexes

	Right	Left
Biceps	++	++
Triceps	++	++
Supinator	++	++

BALANCE- static and dynamic - intact

Special tests were performed to rule out other conditions – Spurling's and distraction tests were negative

According to triage classification of neck pain given by clinical practice guidelines this patient was at grade 2 where patient presents with no signs of structural involvement but had difficulty in daily living activities

Red flags were ruled out like vascular changes in neck, malignancy, fracture and spinal cord injury.

Procedure

Patient in supine hook lying position, pressure cuff inflated to 20 mm hg placed back of neck, dial given to the patient and was asked to perform craniocervical flexion and hold the pressure for 5 seconds at 5 pressure levels between 22- 30 mmHg. Two min of rest interval was given between in each level. Session was performed twice a week for 2 weeks along with active exercises mentioned below.

Physiotherapy intervention

Warm up exercises

static stretches to sternocleidomastoid, trapezius and levator scapulae – 3 reps 15 sec hold

Active neck ROM exercises – 10 REPS

Strength and endurance training: CCFT training with pressure biofeedback: - patient tolerance. Head lift holding exercise: - as patient tolerance

Cool down exercises: dynamic Stretches to neck – sternocleidomastoid, levator scapula and trapezius – 10 reps

Home exercises-

Exercise	Repetitions	Sets	Hold (seconds)
Chin tucks	10	5	5
Head tilt	10	5	5
Head turn	10	5	5

Trapezius exercises

Exercises	Repetition	Sets	Hold
I exercise	5	5	10
Y exercise	5	5	10
W exercise	5	5	10

Thoracic mobility exercises

Exercise	repetitions	Sets
Side lying – trunk rotations	10	3
Thoracic extension with bar	10	3
Cat and camel	10	3

Patient advised to follow warm up and cool down as per treatment protocol

Results

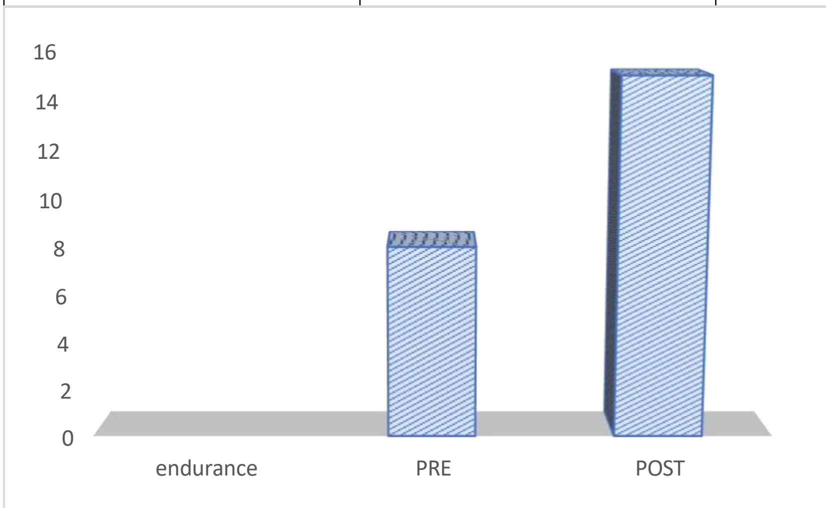
Pre- post assessment was with two weeks of physiotherapy intervention

NPRS

	PRE- Assessment	Post- Assessment
NPRS	7	3

Endurance time hold

	PRE- ASSESSMENT	POST- ASSESSMENT
CRANIO-CERVICAL REGION	8 Seconds	15 seconds



NDI

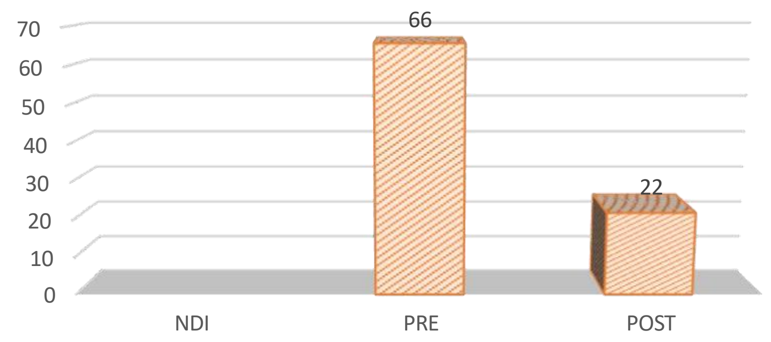
	PRE-ASSESSMENT	POST- ASSESSMENT
NECK-DISABILITY INDEX	66%	22%

Neck Disability Index score: pre-Assessment

33/50=66.0 percent.

Neck disability index score- post- assessment

11/50= 22%



	NDI	PRE	POST
Series1		66	22

Discussion

Pressure biofeedback is a successful rehabilitation method that guides postural changes and muscle activation, especially in the neck area, using real-time monitoring. Clinicians can monitor the activation of deep cervical muscles, such as the longus colli and longus capitis, which are crucial for cervical spine stabilization, by using pressure-sensitive devices, such as inflatable cuffs or pressure sensors. Patients benefit from this input by having better muscular coordination and function, which is particularly crucial for those who have neck pain, decreased mobility, and endurance problems. In order to improve stability and avoid overusing superficial muscles that exacerbate discomfort, the approach mainly helps retrain the deep cervical flexors.[4]

Pressure biofeedback helps manage pain by addressing muscular imbalances that frequently make cervical discomfort worse. The sternocleidomastoid and upper trapezius are two overactive superficial muscles that can cause stress and pain in many people with cervical pain, particularly those who have whiplash, cervical spondylosis, or poor posture. Patients can retrain their muscles and lessen their dependence on these overactive superficial muscles by using pressure biofeedback to encourage the activation of the deeper stabilizing muscles. By lessening muscular spasms, alleviating the tension on the cervical joints, and enhancing the cervical spine's general stability, this procedure helps reduce pain.

Additionally, pressure biofeedback is essential for increasing cervical mobility. Range of motion is limited in many cervical pain patients because of joint dysfunction, muscular stiffness, or poor muscle coordination. Pressure biofeedback enables patients to move their necks more smoothly and controllably by helping them engage the right muscles in real time. increased cervical mobility and reduced discomfort during neck-movement-intensive tasks including nodding, tilting the head, and looking up are the results of this increased muscle coordination. Patients can eventually improve their cervical spine's functional mobility, which lessens the restrictions that frequently come with pain. Furthermore, pressure biofeedback has a key role in enhancing the deep cervical muscles' endurance, which is essential for maintaining good posture and lowering tiredness. Fatigue and weakness Hence, this study focuses on endurance training of cervical flexors for reducing pain, improving range of motion and endurance of deep cervical flexors for better outcome in mechanical neck pain.

Conclusion

Pressure biofeedback in the cervical region has shown significant promise in improving pain management, mobility, and endurance for people with cervical spine dysfunction. This approach helps patients rectify muscle imbalances, especially the overuse of superficial muscles and the under activation of deep cervical flexors, which are frequently the cause of pain and limited movement. It does this by giving real-time feedback on muscle activation. Retraining these deep muscles helps to enhance mobility by facilitating smoother, more coordinated neck movements and reducing pain. In order to help people maintain good posture and lessen tiredness throughout extended activity, pressure biofeedback is also essential for developing muscle endurance.

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