Combination of Cervical Traction with Transcutaneous Electrical Nerve Stimulation on Patient with Cervical Radiculopathy:A Case Report

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Abstract

Cervical radiculopathy is the result of cervical nerve root pathology with the sensory, motor and reflexes changes that may lead to chronic pain and disability. Although, conservative interventions including cervical traction, TENS and exercises have been previously shown to be effective in reducing pain and disability caused by cervical radiculopathy, the combined effect of the same has not been documented. The purpose of this study is to present the effect of cervical traction combined with TENS followed by exercises on pain and disability in a patient with cervical radiculopathy. A 34-year-old man presented with an acute history of neurological cervicobrachial pain and whose diagnosis was confirmed with cervical radiculopathy as per the clinical prediction rule. Cervical traction and TENS was applied simultaneously followed by exercises to reduce the patient's pain and disability measured at baseline and after 1 week using the Numeric Pain Rating Scale, the Neck Disability Index and the Patient-Specific Functional Scale. Improvements in all outcome measures were noted over a period of one week. Results showed that the patient's pain had almost disappeared and he was able to return to job without difficulties and limitations. In conclusion, the findings of this study support that the application of cervical traction combined with TENS can produce significant improvements in terms of pain and disability in cervical radiculopathy.

Keywords: *Cervical radiculopathy, Cervical traction, TENS, Transcutaneous electrical nerve stimulation*

Background and Purpose:

The prevalence of the cervical radiculopathy (CR) ranges from 3.5 per 1000 people and the annual incidence from 83 cases to 210 cases per 100,000 people with a peak from 50 -59 years. . Gender preference for the cervical radiculopathy varies but the most commonly affected region is C6 and C7 on both the sexes.[(1)(2)]

Cervical Radiculopathy mostly occurs due to mechanical or inflammatory stimuli around the cervical nerve rootswhichis either due to disc herniation or osteophytes formation causing nerve root compression, inflammation or both but sometimes

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it can also be caused due to tumors, trauma, synovial cysts, meningeal cysts, dural arteriovenous fistula or tortous vertebral arteries.[1][2]Herniated disc causes 21.9 % of CR cases. A herniated disc can causes nerve damage both by mechanical and chemical pathways. Mechanically, compression of the nerve with soft disc causes localized ischemia. Disc degeneration and local ischemia activates pro-inflammatory factors which are mediated by tumour necrosis factor- alpha, interleukin factor-6 and matrix metalloproteinases. This pro-inflammatory factors causes more sensitization and increases pain in the area.[2][3][4]

The clinical prediction rule (CPR) for CR purposed by Wainner et al consists of four test i) cervical spurling test ii) distraction test iii) ipsilateral cervical spine rotation less than 60 cc iv) Upper limb tension test which are the confirmatory diagnosis for the cervical radiculopathy. [5] The CPR has 99% specificity when all four tests are positive and 94% specificity when three tests are positive. The diagnosis is then confirmed by various radiographs for which MRI remains the first choice. Therefore, physical findings and imaging studies are equally important for the confirmation of the diagnosis as radiographs findings may not necessarily corelate the signs and symptoms of the patient.[5][6]

The main goal of treatment for the management of cervical radiculopathy is the pain management and to reduce pressure in the nerve root. Conservative treatment mostly includes mechanical or manual cervical traction, TENS, posture correction and strengthening of the deep cervical flexors.[7]

Transcutaneous electrical nerve stimulation (TENS) is a type of electrical stimulation which mostly aims for the symptomatic pain relief by stimulating the sensory nerve fibers either by pain gate mechanism or opioid system. As proposed by gate control theory, TENS produces an activation of inhibitory interneurons in the substantia gelatinosa in the dorsal horn of the spinal cord by the electric stimulation of large diameter fibres(A-beta -fibres), which inhibit the transmission of nociceptive signals from small diameter fibres (A delta and C) and as per opioid mechanism , it stimulates the release of endorphin, leading to vasodilation in the injured tissue. [8]

The use of cervical traction is useful for the distraction of the cervical segments, for enlarging the intervertebral foramen space as well as it reduces the pressure over the intervertebral disc causing decrease in the mechanical irritation over the nerve roots. Similarly, cervical traction reduces adhesions inside the dural sleeve and can ease the nerve root compression inside the central foramina. Traction can be given either manually or mechanically. [9] [10] Previously, Constantine et al concluded that intermittent cervical traction was equally beneficial while treating patients with cervical radiculopathy even if the cause was large volume herniated disc. [11] Savva et al conducted a combined study among the subjects of Cervical Radiculopathy where neural mobilization was given which increased the nerve sliding as well as modulated the mechanosensitivity of the affected cervical nerve root while maintaining the cervical traction which had elongated the cervical neural foramina and had decreased the intradiscal pressure. [1]

Although the effect of cervical traction and TENS has been recognized in many studies, the effect of both modalities applied simultaneously has not been previously investigated. Therefore, the objective of this case study is to present the effect of cervical traction combined with TENS on pain and disability in a patient experiencing CR.

Case Description:

A security guard aged 34 years visited physiotherapy department with a chief complain of neck pain radiating on lateral aspect till his right wrist 4 days prior to visiting the department. The initial symptom was cervical pain 6/10 Numerical pain rating scale NPRS, which presented suddenly while pulling a blanket which was underneath his back. The intensity increased to 7/10 NPRS and severity of symptoms increased significantly with pain radiating from the Occiput to his right lateral side of upper extremity up to the wrist next day with tingling sensation. The pain was progressive in nature which aggravated more during night time for which patient visited the doctor on the 3rd day where he was prescribed with Analgesics. On the 4th night patient pain exacerbated to 9/10 NPRS and patient had to visit the casualty where he was given analgesic and was advised Physiotherapy. In addition, a clear medical history was provided with no evidence of previous neck pain, shoulder pain and tingling sensation or other associated symptoms. As per the NPRS score patient's pain was 8/10 where the severity and the irritability was severe even though he was on analgesics.

On Examination:

During the observation forward head posture and increased thoracic kyphosis was noted. On palpation, the patient had grade III tenderness over C5-C6 spinous process, paraspinal neck and scapular muscles. Spasm was present in bilateral upper trapezius muscles. During the initial assessment all the cervical movements were as follows:

Cervical movements:

Movements	Range		Pain
flexion	0-10o		Present
Extension	0-10 o		Present
Lateral flexion	Contralateral side 0-30 o	Ipsilateral side 0-10 o	Ipsilateral side: Pain present
Rotation	Contralateral side 0-30 o	Ipsilateral side 0-10 o	Ipsilateral side: Pain present

Bilateral upper extremity active ROM was assessed in supine lying to rule out shoulder component where all the movements were within functional limits and pain free. Maitland Grades III posterior–anterior passive accessory intervertebral movements were applied over all cervical spinous processes and identified the reduced mobility at C5–C6. Spurlings test, distraction test both were positive. Upper limb tension tests were performed on the patient of which ULTT 1 was positive because they had reproduced or alleviated the patient's symptoms. Neurological tests were performed which included dermatome, myotome and deep tendon reflex testing. The patient had a decreased sensation over the dermatomal

distribution of C6 area and weakness while performing the movements supplied by C6 nerve root as well as decreased biceps reflex was noted when compared to contralateral side.

Diagnosis:

The Clinical prediction rule was used for the confirmation of the diagnosis, which included positive cervical spurling test, positive distraction test, ipsilateral rotation less than 60 degrees and positive ULTT which shows that the patient is having cervical radiculopathy. For the confirmation, patient was suggested for MRI.

Goal:

Patient perception was to decrease pain, increase cervical mobility, improve sleep and return to his job.

Intervention:

The patient was seen for a total of 7 sessions. Initially for 3 sessions patient was given 15 minutes of Moist Heat followed by cervical traction in a seated position manually followed by 20 minutes of TENS parameter 100Hz with the current set between 10-30 mA with pulse duration of 50 microseconds followed by nerve glides and Chin Tuck exercises. Since the pain did not subside he visit his primary physician and MRI was taken which showed diffuse disc protrusion at C5-C6 more in the sub foraminal zone (right> left), narrowing both neural foramina and compressing over the C6 nerve roots on both sides (right> left) and was advised to continue physiotherapy.

On the 4th session patient came for continuing the physiotherapy where Moist heat was given for 15 minutes followed by 20 minutes intermittent cervical traction of 10kg along with TENS of 100Hz with the current set between 10-30 mA together in a supine lying position followed by nerve glides and deep neck flexors strengthening exercises. Patient on the 5thsession stated that pain was being centralized and his pain was being reduced NPRS 4/10 for which same treatment protocol was continued till 7th session and was advised for follow up after 2 days.

During the follow up, patient mentioned that his neck pain completely subsided 0/10 NPRS and he could perform all the cervical movements without any pain as well as he was able to go back to his work and his sleep was not disturbed at night as well.

Result

After the completion of the physiotherapy sessions, the patient demonstrated rapid improvements in pain and function. The patient rated his pain 0/10 with all activity which was 8/10 in the initial assessment and also scored 30% disability on the Neck Disability Index (NDI) which was 86% in the initial assessment. On Patient specific functional scale (PSFS) patient scored 31 out of 40 after end of last treatment session which was 1 out of 40 before treatment. Patient returned to his prior level of function and full-time work duties.

Discussion

The case study shows that the patient with CR caused due to herniated discs with severe pain and disability when treated with combination of cervical traction and TENS simultaneously along with exercise was effective in reducing the symptoms.

Various modalities like traction ,TENS, manual therapy, multi modal approach is widely used which includes deep neck flexors strengthening, cervical collars and a postural correction to maintain the muscle strength and for maintaining the integrity of the widened intervertebral foramen.[12][13]The use of cervical traction is useful as it helps in opening of the intervertebral foramen space, and reduces the pressure over the intervertebral disc. Therefore, it can

be useful in patients with herniated discs as supported by Constanine et al and RR. Khan et al.[11][14]Various studies by Ibrahim et al, Antonio et al ,Cleland et al and Jellad et al Albaayrak et al Rabia et al shows that traction when combined with multimodal approaches can improve pain and level of disability among the patients of cervical radiculopathy whereas states even grip strength can be improved with the same approaches.[15–20]Julie at al found that addition of mechanical traction along with multimodal approaches can be beneficial for long term course where as Adeselo et al and Colombo et al are in favour of beneficial for short term course.[21][22][23]

The commonly used TENS in the clinical practice is of high frequency and low intensity commonly called as Conventional Tens. This kind of Tens stimulate selectively large diameter fibres (A-beta) in dermatomes site which inhibits activity in second order nociceptive neurones in the Periaqueductal gray, rostral ventromedial medulla and spinal cord by the process called segmental mechanisms which helps in inhibiting pain. Similarly, it also activates endogenous inhibitory mechanisms in the CNS involving opioid GABA and muscarinic receptors. During the inflammation, Conventional Tens reduces central neuron sensitization and decreases the release of the excitatory neurotransmitters' glutamate and substance P in the spinal cord causing inhibition of pain.[24][25]

In the present case, patient had severe pain radiating from the occiput to his right lateral side of upper extremity up to the wrist which aggravated with movements like the cervical flexion and extension. The pain could be due to hypersensitivity caused by disc herniation leading to local ischemia which had stimulated pro-inflammatory factors which had caused further sensitization and increase in pain.[26] Therefore cervical traction along with TENS was given simultaneously where traction will reduce the pressure over the disc space and the TENS will stimulates the large diameter fibres which will inhibits the central neuron sensitization. Traction was given in supine lying as soft tissues and muscles are relaxed more in supine lying which increases posterior vertebral space in gravity eliminated position which helps to alleviate compression over the trapped nerve roots. [14]After each session patient was asked to perform deep cervical flexors strengthening exercises as these exercises are effective for the postural correction as well for the reduction of pain in the long term as suggested by previous studies.[27,28] Similarly, nerve glides technique was performed in order to improve nerve sliding as well to inhibit the mechanosensitivity of the affected cervical nerve root.[1]

Sleijser-Koeharst et al proposed a five- variable model in order to identify the subjects with cervical radiculopathy who were most likely to achieve the poor recovery with conservative treatment. These variables included: a longer duration of the symptoms, absence of the paraesthesia, a higher neck pain intensity and disability score at baseline, a lower active rotation towards the affected side and it may take 6-12 months for the patients to be symptom free. [29] Since the patient falls under all these categories, we expect poor prognosis on him but his symptoms were resolved within a week as was acute in onset. Thus it can be said that when cervical traction combined with TENS can give better result in patient with CR. However the effect of cervical traction combined with TENS in CR has been reported the findings cannot be generalization future high quality RCT study with long term follow up is required.

Conclusion

The findings of this case study supports application of cervical traction combined with TENS followed exercises can produce significant improvements in

terms of pain and disability in CR. However Future studies using larger sample sizes and objective outcome measures are required to further enhance our knowledge on the effect of cervical traction combined TENS in cervical radiculopathy.

Conflict of Interest – None

Ethical Clearance- A written informed consent was obtained from the patient and the study was performed with the approval of the Institutional Review Board for studies involving human subjects.

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