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Myofacial Release for the Management of Cervical Compressive Myelopathy – Case Study

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ABSTRACT

Cervical compressive myelopathy commonly occurs due to degeneration or disc herniation. The persons with cervical meylopathy are usually advised for surgical decompression. Person with signs of cervical cord compression was treated with myofacial release and found to be improved in signs as well as the symptoms. Total 34 numbers of similar cases (31 males and 3 females) age ranging from 25 to 61 years were treated by myofascial release of periscapular soft tissue structures over last 2 & ½ years (2017 to 2020) and found to return back to their activities after 6 months of follow up.

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Introduction

Compression of the cervical spinal cord is known as cervical myelopathy that occurs when the size of the canal is decreased and / or the volume of its content is increased [1,2]. A decrease in spinal canal size commonly results from degenerative changes in the cervical spine such as disc degeneration, degeneration of facet joints, osteophyte formation, segmental ossification of the posterior longitudinal ligament, ligamentum flavum hypertrophy, disc herniation etc. Patients with a congenitally narrow spinal canal (<13mm) have a higher risk for the development of symptomatic cervical myelopathy. Compression due to extradural mass (tumors), post-traumatic deformities, infections (tuberculosis), post-traumatic kyphosis, vascular disorders (vascular malformations, spinal cord infarct and epidural hematoma), nutritional disorders etc. may also cause compression [3-7].

Cervical myelopathy occurs predominantly due to pressure on the anterior spinal cord by anterior disc herniation, spondylitic spurs, an ossified posterior longitudinal ligament or spinal stenosis.

Epidemiology: Cervical spondylotic myelopathy is the most common disorder of the spinal cord in persons older than 55 years of age [8-10]. Radiologic spondylotic changes increase with ageing - 90% of asymptomatic persons older than 70 years have some form of degenerative change in the cervical spine [5]. Both sexes are affected equally. Cervical spondylosis usually starts earlier in men (50 years) than in women (60 years). It causes hospitalisation at a rate of 4.04 per 100,000 person/years [6-8].

Common Symptoms & signs: Cervical myelopathy can cause a variety of signs and symptoms depending on severity of the spinal cord compression as well as its location [4]. Onset is insidious, may occur suddenly due to injury, over activities or unaccustomed activities.

Early symptoms of this condition are 'numb, clumsy, painful hands' and disturbance of fine motor skills. Weakness and numbness occur in a non-specific/non-dermatomal pattern. As spinal cord degeneration progresses, lower motor neuron findings in the upper extremities, such as loss of strength, atrophy of the interosseous muscles and difficulty in fine finger movements, may be present. Typical neurological signs of long-tract involvement are exaggerated tendon reflexes, presence of Babinski and Hoffman's sign, spastic quadriplegia, unsteady or clumsy gait, sensory loss and bladder-bowel disturbance [7]. Neck pain and stiffness, shoulder and scapular pain, paresthesia in one or both arms or hands, signs of radiculopathy, ataxia and dexterity loss may be present [8-12]. Once the disorder is diagnosed, complete remission to normality never occurs and spontaneous temporary remission is uncommon. In 75% of the patients, episodic worsening with neurological deterioration occurs, 20% have slow steady progression, and 5% experience rapid onset and progression [4].

Diagnostic Procedures: A detailed and thorough neurological examination plus MRI is the current standard to diagnose the presence of cervical myelopathy. Clinical Examination: The diagnosis of cervical myelopathy is primarily based on the clinical signs found on physical examination and is supported by imaging findings [9]. According to Cook et al. selected combinations of the following clinical findings are effective in ruling out and ruling in cervical spine myelopathy [8]. Combinations of three of five or four of five of these tests enable post-test probability of the condition to 94–99%:

1. Gait deviation
2. +ve Hoffmann's test

3. Inverted supinator sign
4. +ve Babinski test
5. Age 45 years or older
6. Spurling's test, Distraction test
7. Hyperreflexic biceps, quadriceps, Achilles
8. Pain constancy
9. L'hermitte's sign
10. Romberg test

Although these tests exhibit moderate to substantial reliability among skilled clinicians, they demonstrate low sensitivity and are not appropriate for ruling out myelopathy. One method used to improve the diagnostic accuracy of clinical testing is combining tests into clusters. These often overcome the inherent weakness of stand-alone tests [8].

Management

There is no consensus about the treatment of mild and moderate forms of cervical myelopathy. Patients with cervical myelopathy that are treated with a conservative approach such as antiinflammatory medication and physical therapy may have some short-term benefit in relief of painful symptoms. As the condition is degenerative and progressive, slow and continued progressive neurologic deterioration will occur. Patients with progressive neurologic changes such as weakness, numbness with signs of severe spinal cord compression, severe or disabling pain may be benefitted with surgery [14]. When myelopathy is caused by factors of a progressive nature, such as spinal cord tumors, surgical treatment is likewise indicated [15,16]. The principal aim of surgery for cervical myelopathy is decompression of the spinal cord by discectomies or corpectomies with or without instrumented fusion, laminectomy with or without instrumented fusion or laminoplasty. Surgical decompression is generally considered if the symptoms affect daily life, but early surgical intervention is thought to be more effective. Therefore, early detection may be the key to minimize postoperative degeneration [17]. Final outcomes from the surgery vary. Typically, one-third of patients improve, one-third stay the same, and one-third continue to worsen over time, with respect to their pre-surgical symptoms [10-14]. Surgical treatment does not show better results than conservative treatment over two years of follow-up [13].

Physical Therapy Management

Kadaňka et al. found no difference in long term outcomes (2 years after the intervention) between patients who received conservative or surgical treatment. Even after 10 years, there were no differences found between the surgery and the conservative group [18]. Fouyas et al also confirmed these findings [19]. The only prognostic factor in which surgery can generally be recommended is with a circumferential spinal cord compression seen on an axial MRI [20].

Rhee JM et al. describes myelopathy as a typically progressive disorder and that there is little evidence that conservative treatment halts or reverses its progression. So they recommend routinely not prescribing non-operative treatment as the primary modality in patients with moderate to severe myelopathy [21].

The goals of physiotherapy treatment are pain relief, to improve function, to prevent neurological deterioration, to reverse or improve neurological deficits. Cervical myelopathy can be treated symptomatically. Possible therapies include cervical traction and manipulation of the thoracic spine. This is useful for the reduction of pain scores and level of disability in patients with mild cervical myelopathy. Other signs and symptoms, such as weakness, headache, dizziness, and hypoesthesia, can also be positively affected [22]. Cervical traction can be combined with other treatments like electrotherapy and exercises. Joghataei et al. reported a significant increase in grip strength after 10 weeks of this combined treatment [23].

Manual therapy techniques

This is used to reduce the neck pain with natural apophyseal glides and sustained natural apophyseal glides for cervical extension and rotation [14]. Manipulation and mobilizations can be effective when they are combined with exercise therapy [24,25].

Exercises

The effects of exercise therapy specifically on cervical myelopathy have not been studied, but there is evidence for exercises for mechanical neck pain. For example: stretching, strengthening exercises, active range of motion exercises, home exercise programs [19].

Cervical stabilization exercises: When there is an anteroposterior instability of the vertebral bodies of a degenerative nature, vertebral segment stabilization of the cervical spine can be performed with a pressure biofeedback unit (PBU). Aerobic exercises, Balance training - standing on one leg with eyes open and evolving to eyes closed; standing on a stable platform and evolving to an unstable platform with a rocker board, core stability exercises, dynamic upper and lower limb strengthening exercises, PNF exercises for the upper and lower limbs are also useful. Improving posture, practicing good posture by the keeping head and neck upright especially if one spends hours in sitting [26].

Case Description

Case-1: The patient was a 56-year-old male school teacher referred to physical therapy with a medical diagnosis of cervical myelopathy. Informed consent was obtained and the rights of the subject were protected. The patient reported with the complaint of inability to stand and walk, constant pain in bilateral lower extremities. His average pain on a visual analogue scale (VAS) was reported to be 7/10 and his worst pain was reported to be 10/10, with 0 indicating no pain and 10 indicating the worst pain he could imagine.

History of injury 3 months back due to tilting of two-wheeler in stationary position. Past history: underwent decompression of lumbar spine 2011 May and decompression of cervical spine in 2008 August. Aggravating Factors: The patient reported that his pain increased with most activities.

Physical Examination: Visual Appraisal Visual examination revealed (1) reported to the Department of Physiotherapy sitting in a wheelchair propelled by caregivers with flexion and adduction of both thighs. (2) Unable to stand even with maximum support, (3) when made to lay both lower extremities were flexed and adducted, (4) severe spasticity of bilateral hip adductors prevented him to sit without support, (5) bilateral plantar up going and severe spasticity in both lower extremities grade 4 by Modified Asworth Scale.

Diagnosis: Diagnosed as cervical myelopathy both from clinical examinations and MRI. Interventions and progression: Following the examination, the patient was instructed to do deep breathing exercises with trunk movements in sitting with hand support. Patient was made to lie in prone position in a mobilization bed with both the arms crossed across the chest with a pillow under it. Therapist was standing at the head end of the bed, with heels of both hands placed just medial to the medial angle of scapulae

and pushed outward-downwards. The Patient was asked to take a deep breath with elevation-retraction of scapulae, which was resisted by the therapist that reproduced the original pain. As the patient exhaled both the scapulae were further pushed outwarddownwards. 10-15 repetitions were given till the original pain that was reproduced on stretching and resisted retraction-elevation subsided, and then the parascapular soft tissue release was given for 2-3 minutes. On the next day patient reported that he could sleep comfortably. Treatment continued daily for 5 days/ week. As the condition improved i.e. he could lie down supine with legs straight. On the 5th day static gluteal contraction on supine lying and deep breathing exercises with trunk movements in sitting without hand support were added in the 2nd week, standing with support could be possible on the 10th day. Fair sitting was achieved by the 12th day. Deep breathing exercises with trunk and arms movements in sitting, sitting to standing with support was initiated in 3rd week and walking with support in 4th week. Balance exercises in standing were started after 4th week and progressively included arm movements, trunk movements, trunk and arms movements. He was able to walk with minimal hand support after 6th week and was discharged. After 3 months he was walking without any support.

Six-Month Follow-up: The patient was contacted by telephone 6 months after discharge. He was found to be functionally independent and return to his job.

Case-2: The patient was a 47-year-old male social worker reported to physical therapy with a medical diagnosis of cervical myelopathy. Informed consent was obtained and the rights of the subject were protected. Chief Complaint of the patient: inability to stand and walk, constant pain in bilateral lower extremities. His average pain on a visual analogue scale (VAS) was reported to be 5/10 and his worst pain was reported to be 10/10, with 0 indicating no pain and 10 indicating the worst pain he could imagine.

History of gradual onset of paresthesia, weakness of both lower limbs, unable to stand and walk over a period of 3 months. Surgery was planned, but to avoid surgery the patient reported to Department of Physiotherapy, SVNIRTAR. Past history: fall due to slippage of foot 2 years back without any significant impairment.

Physical Examination: Visual Appraisal Visual examination revealed (1) reported to the Department of Physiotherapy sitting in a wheelchair propelled by caregivers with flexion and adduction of both thighs. (2) Unable to stand even with maximum support, (3) when made to lay both lower extremities were flexed and adducted, (4) severe spasticity of bilateral hip adductors prevented him to sit without support, (5) bilateral plantar up going and severe spasticity in both lower extremities grade 4 by Modified Asworth Scale, (6) gross hypomobility of whole spine.

Diagnosis: Diagnosed as cervical myelopathy both from clinical examinations and MRI.

Interventions and progression: Following the examination, the patient was instructed to do beep breathing exercises with trunk movements in sitting with hand support and parascapular soft tissue release was applied as mentioned in the previous case. Treatment was continued daily for 5 days/ week. As the condition improved , static gluteal contraction on supine lying and deep breathing exercises with trunk movements in sitting without hand support were added on 2nd week, standing with support could be possible on the 10th day. Maitland's graded rhythmic mobilization was applied to upper thoracic spines on 11th day and on next day the condition worsened. So, from the next day onwards only parascapular soft tissue release technique was given and the condition gradually improved. Deep breathing exercises with trunk and arms movements in sitting, sitting to standing with support could be possible on the 21st day and walking with support on 25th day, balance exercises in standing were started after the 5th week and progressively included arm movements, trunk movements, trunk and arms movements. He was then able to walk with minimal hand support after 7th week and discharged. Then after 3 months, he reported walking independently. On examinations tone, reflexes were almost normal.

Six-Month Follow-up: The patient was contacted by telephone after 6 months and found to be almost normal in his functional activities and returned to activities.

Case-3: The patient was a 62-year-old male farmer referred to physical therapy with a medical diagnosis of cervical myelopathy. Informed consent was obtained and the rights of the subject were protected. Chief Complaint: the patient reported with the complaint of inability to stand and walk, constant pain in bilateral lower extremities. His average pain on a visual analogue scale (VAS) was reported to be 6/10 and his worst pain was reported to be 10/10, with 0 indicating no pain and 10 indicating the worst pain he could imagine.

History of gradual onset of paresthesia, weakness both lower limbs, unable to stand and walk over a period of 6 months. Past history: underwent decompression of lumbar spine 7 years back. Physical Examinations: Visual Appraisal Visual examination revealed (1) reported to the Department of Physiotherapy sitting in a wheelchair propelled by caregivers with flexion and adduction of both thighs. (2) Unable to stand even with maximum support, (3) when made to lay both lower extremities were flexed and adducted, (4) severe spasticity of bilateral hip adductors prevented him to sit without support, (5) bilateral plantar up going and severe spasticity in both lower extremities grade 4 by Modified Asworth Scale, (6) gross hypomobility of whole spine.

Diagnosis: Diagnosed as cervical myelopathy both from clinical examinations and MRI.

Interventions and progression: Following the examination, the patient was instructed to do beep breathing exercises with trunk movements in sitting with hand support and parascapular soft tissue release was applied as mentioned in previous case. Treatment continued daily for 5 days/ week. Patient's condition improved gradually and he was then able to walk with minimal hand support after 5th week and was discharged. He was able to ride his two-wheeler after about 2 months and returned to farming activities after 4 months.

Six-Month Follow-up: The patient was contacted by telephone 6 months after discharge and found to be almost independent in all activities.

Case-4: A 25 year young person with acute cervical myelopathy due to herniated disc lesion reported after about 7 days of traumatic onset with complaints of pain, paresthesia and weakness. He was able to walk with support. On examinations, weakness of hand muscles (left more than right), hyper-reflexia, plantar up going and spasticity in both lower limbs, no bowel or bladder involvement were found. He was advised to take relative rest i.e. continue to move within the house, use cervical collar, avoid neck movements, travelling and report after 3 weeks. After 3weeks, there was

slight improvement in grip strength. His average pain on a visual analogue scale (VAS) was reported to be 6/10 and his worst pain was reported to be 10/10.

Diagnosis: Diagnosed as cervical myelopathy due to HDL on both clinical examinations and MRI. Interventions and progression: Following the examination, patient was given parascapular soft tissue release as mentioned in the previous case. Treatment continued daily for 5 days/ week. As the condition improves, he was asked to perform repeated neck retraction, isometric neck extensors exercises 10 repetition every alternate waking hours. Patient's condition improved gradually and he could then able to walk without support, no pain after 3rd week and was discharged. He was able to ride his two wheeler after about 3 months and returned to his office. Followup: The patient was contacted by telephone 6 months after discharge and found to be completely normal.

Discussion

A total of 34 similar cases (31 males and 3 females), ages ranging from 25 to 61 years were treated by myofascial release of periscapular soft tissue structures over last 2 & ½ years (2017 to 2020). 16 cases were of herniated disc lesion C5-C6, 10 cases were degenerative , 5 cases post surgical and 3 post-traumatic. Compression due to spinal tumors, infections, vascular malformations, spinal cord infarct and epidural hematoma, etc. were excluded from the study.

Fascia is a biologically plausible source of nociception and mechanoception and is intimately involved with autonomic nervous system (SNS), both myelinated and unmyelinated fibers found in fascia are probably of an autonomic origin. The deep fascia is abundantly rich in vascular and nerve supply with interfacial nerve fibers throughout [27].

Stretching of fascia induces a casade of neuro-physiological changes. Manual stretching of fascia selectively stimulate specific descending inhibitory pain pathway and decreases sympathetic response. As pain is considered as autonomic nervous system phenomenon, facilitation of receptors (Ruffini and paccini corpuscles) located in located in fascia triggers sympathetic response termed as sympathetic tone.Stretching of fascia inhibits the sympathetic facilitation reducing perception of pain [23-29].

Manual stretching causes the neuro-dynamic gliding between nerves and fascial sheath surrounding it, producing hypoalgesia and decreased sympathetic response possibly due to activation of descending inhibitory pain modulation pathway. Abnormal and noxious factors such as spasticity, immobilization,changes in fascial architectures etc. takes more time to produce a change.

The manual stretching of levator scapulae muscle also stretches the deep cervical fascia paravertebral layer covering it. Peripherally this mechanical force through mechano-transduction property of fascial tissue tends to modulate the nociceptive pathways and cell signaling through stimulation of mechano-receptors(Ruffini and paccini corpuscles).Fascia is a part of connective tissue that permeates human body as a unified structure organized into surfaces of muscle, forming a loose packing around peripheral nerves, and forming a part of the neurological system it decreases the repeated nociceptive transmission through activation of large diameter A- beta fibres that blocks the C- type pain carrying fibers at cord level by blocking the pain gate (As per gate control theory by Ronald Melzac and Patric wall in 1965). This also reduces the facilitated transmission in dorsal horn neurons (primary afferent neurons) synaptic properties,increased firing rate, CNS excitability and reduces pain thresholds that occur due to structural and functional changes in nervous system both peripherally and centrally along with its facial system connectivity after SCI [30].

The peripheral sensitization after SCI/ spinal cord diseases is thought to be exhibited as hyper excitability and reduced activation threshold due to various molecular changes leading to ectopic action potentials in primary afferent neurons; and three central projections is likely an important mechanism of spontaneous paresthesia, dysthesia and abnormal pain sensation that demonstrates different temporal patterns [23-29]. Changes that enhanced nociception evidence indicates that there is impairment of endogenous inhibitory mechanism due to apoptosis of GABAergic spinal interneurons and activation of microglia (astrocytosis) via glutamate release, phosphorylation of nitrogen activated protein, kinase upregulation of chemokine receptors contributing to the phenomenon of central sensitization [31].

Manual stretching helps in reducing the increased rate and magnitude of temporal sensory summation (TSS) seen in chronic spinal pain patients and reduces potential for central sensitization [32]. This reduction in TSS occurred in upper and lower extremity which could be mediated by proprio-spinal neurons projecting form cervical to lumbar. There also occurs an increased activity of descending pain modulating pathways [33].

The mechanoceptive stimuli due to manual techniques might prevent glial activation in dorsal horn of spinal cord and reduces glutaminergic activity. Inhibition of temporal summation decreases the central sensitization that subsequently decreases the abnormal rate of firing of DRG neurons and circuits of nociceptive pathways decreasing abnormal pain sensations leading to neuro-plastic changes in the somato-sensory area, motor cortex, basal ganglia and limbic system [29].

Conclusion

Para-scapular soft tissue release and stretching of levator scapulae by MET is a gentle technique, applied away from the pathological site, which is well controlled by the patient. It is quite useful for mechanical cervical compressive myelopathy in relieving pain, paresthesia, abnormal tone, reflexes and improving functions.

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