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Myokinetic Chain-Based Rehabilitation for Shoulder Asymmetry Secondary to Cervical Radiculopathy: A Case Study

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Abstract: ***Background**: Cervical radiculopathy is a relatively common cervical spine syndrome that occurs as a result of compression of nerve root, causing pain in the neck, weakening of the muscles, restriction in neck movements, and functional limitations. The asymmetry of the shoulder is most common in cases of cervical radiculopathy and is primarily manifested by muscle tightness and weakness. **Case Presentation**: A 30-year-old female patient presented with right-hand radiating pain, cervical spine stiffness, and visible unilateral shoulder dropping. The myokinetic chain activation and myokinetic stretching technique was used to correct shoulder asymmetry. Intervention-The patient underwent a structured physiotherapy treatment programme consisting of myokinetic chain activation and stretching of isolated upper fibers of trapezius muscle according to their muscle tone along with neck isometric, shoulder stretching, scapular stabilization, and postural correction exercises to correct the shoulder asymmetry, and associated pain and symptoms. **Result**: The patient demonstrated a significant reduction in pain, marked increase in muscle weakness, and decreased left upper trapezius tone. The patient reported less discomfort in sleeping, during overhead activity, and functional activity. **Conclusion**: The combine effect of myokinetic chain activation an stretching can be effective in shoulder asymmetry that occurs with cervical radiculopathy. These Intervention was effective in reducing muscle tightness, improving muscle strength, and posture control.*

Keywords: Myokinetic chain activation, myokinetic stretching, upper trapezius, radiating pain, shoulder asymmetry, and cervical radiculopathy

1. Background

Chronic Cervical Radiculopathy (CR) is a debilitating condition characterized by neck discomfort and sensory, motor, and reflex anomalies in the affected dermatome and myotome. The incidence and prevalence of cervical radiculopathy are poorly recognized in epidemiological studies. The estimated annual incidence of CR was 83 cases per 100,000 adults, with a predominance in middle-aged and older populations and those subjected to physical loads involving extensive or repetitive neck movements. Degenerative processes, such as disc degeneration and dehydration, may lead to facet joint degeneration and osteophytosis. In other cases, disc herniation causes the nerve root to be compressed, leading to sensory disturbances, such as tingling, numbness, or loss of sensation, and motor deficits, such as paresis, spasticity, and tightness of the affected muscle with trigger points or taut bands. The muscle groups that are commonly affected by CR include mostly the C6-C7 dermatome and the triceps, biceps brachii, and deltoid groups of muscles. In severe cases, the manifestations of CR affect the activities of daily living of the patients.

Chronic mechanical neck pain is a debilitating condition that is more prevalent among people who sit at a desk working on a computer for long durations in an inappropriate posture. Physiotherapy is the primary intervention for people living with chronic mechanical neck pain. Manual therapy, stretching and strengthening, postural and muscle energy, and trigger point facilitation, are some of the physiotherapy treatments for chronic mechanical neck pain. Advanced physiotherapy treatments for chronic mechanical neck pain include cupping therapy, dry needling, instrument-assisted, cervical traction, and kinesiological tapping.

Kinetic chain activation therapy (KCAT) is a new treatment for myofascial pain. Kinetic chain activation treatment (KCAT) was developed by Dr. K M Annamalai, which mainly focuses on restoring function by influencing fascia that plays a role in limiting the joint range of motion during active and passive motion using the distal to the proximal approach. This study aimed to prove the effectiveness of myokinetic chain activation and myokinetic stretching to alleviating muscle weakness and tightness that causes dropped shoulder in cervical radiculopathy.

Myokinetic stretching techniques are based on the fundamental principles of myofascial meridian theory, in which myofascial chains are actively or passively stretched until a desired release of the taut band is achieved.

Myokinetic chain activation and myokinetic stretching are used by targeting the kinetic chain, which promotes effective restoration. This helps improve the range of motion by enhancing muscle strength and reducing stiffness and tightness.

In this case report, the pain scale, shoulder range of motion, neck range of motion, muscle tone and strength assessment, trigger point tenderness, and functional activities were monitored pre- and post-intervention. These were to achieve the goals that include elimination or reduction of stiffness and increase the mobility in the neck, enhance the strength and hence eliminate radiating pain.

People with CR usually have a slight body build and often show visible dropped shoulders bilaterally. They present with acute pain in one or both of the shoulders, radiating to the ipsilateral upper limbs and other anatomical structures. Patients also present with signs and symptoms that are indicative of CR affecting the lower cervical radiculopathy. Specifically, the presentation includes features of decreased

strength and sensation predominantly affecting the mid-cervical region radiating to the upper extremities, although the manifestation varies in relation to the affected dermatome and myotome. Moreover, more than ninety percent (90%) of patients presenting with CR also present with arm pain; therefore, any complaint of arm pain should raise clinicians' suspicion of CR.

Aim: To evaluate the combined effect of myokinetic chain activation and myokinetic stretching technique in muscle weakness and muscle tightness in cervical radiculopathy.

Objectives
- To examine shoulder asymmetry.
- To evaluate the weak muscle.
- To examine the tight muscle.
- To examine functional ability.
- To evaluate posture.

2. Case Description

The patient was a 30-year-old female homemaker who complained of neck pain radiating to the ipsilateral shoulder, arm forearm with tingling sensation over the dermatome distribution for a duration of 10 month. The patient reported a gradual onset of symptoms that were exacerbated by prolonged sitting, movements of the neck and shoulder, and activities of daily living and overhead activities. Moreover, the symptoms were predominantly unilateral and mainly manifested on the right side of the neck and upper limb. The symptoms affected the activities of daily living of the patient, and daily activities such as prolonged use of a mobile phone and house chores aggravated the signs and symptoms. The patient denied any history of trauma or road traffic accident and any previous cervical spine surgery. However, the patient reported a history of right-sided shoulder dislocation since last 6 month. The personal history of the patient reveals an active lifestyle with increased workload over the years.

The patient presented with forward head posture with rounded shoulders. There was rightside shoulder drop with compensatory head tilt to the same side to minimize discomfort. Moreover, the patient presented with visible muscle spasm in the upper trapezius and levator scapula, which limited the range of motion of the cervical spine. Tenderness was noted over the cervical paraspinal, upper trapezius, levator scapula and scalene muscles on the right side.

Cervical range of motion was assessed to rule out restricted range of motion during movement and to determine the range of motion of the shoulder. Manual muscle test was performed to assess the muscle grade of the upper trapezius, levator scapula and shoulder muscles including anterior, middle and posterior deltoid, pectoralis minor and major, rhomboid major and minor, and serratus anterior. The special tests performed to rule out cervical radiculopathy include Spurling's test, cervical distraction test, shoulder abduction Relief test, upper limb tension test and shoulder shrug test to determine symmetry of the movement of the shoulder.

Outcome measures –
- Range of motion assessment by goniometry.
- Modified ashworth scale for muscle tone assessment.
- Muscle manual testing used for muscle strength assessment.
- NPRS scale used for pain evaluation.

3. Uniqueness of study

The uniqueness of this study is that we combined the effects of muscle activation and muscle stretching for symmetry of the shoulder and reduced the effect of cervical radiculopathy. The muscle activation worked on the biomechanics of muscle and myokinetic stretching worked on the sustained pressure while stretching to reduce muscle tightness. In this study, the therapist focus on both muscle weakness and tightness simultaneously to improve posture.

4. Physiotherapy Intervention

The physiotherapy program was designed to reduce myofascial pain, reduce therapeutic tightness, restore tone, improve mobility, restore functional ability and perform daily living activities. The treatment protocol was given for four weeks. Every week session was included reassessment of the pain, mobility, asymmetry, spine spasm and strength. Manual therapy was provided according to the patient's efficiency. The principle of physiotherapy management was to educate the patient about the disease process and procedure of their protocol and what precaution should be taken during and after exercise and at home. Educate the home based program to maintain the progression and avoid complication.

The protocol was set according to the treatment week. Each week included a phasewise protocol.

5. Phase 1 – Pain management and improve mobility, control muscle spasm

- Gentle myofascial release mainly manually for the initial two days.
- Cupping therapy was administered to the patient to reduce muscle spasms. Dynamic release and static release cupping over the tight muscles throughout the treatment twice a week.
- A progression was added to the patient's protocol, including base exercises to improve mobility. The exercises were chin tuck exercises and normal range of motion of cervical and shoulder.
- TENS is given for 10-15 minute in continuous mode and US for pain relief upto 5 minute over the trapezius muscle.

6. Phase 2- Myokinetic stretching

- The patient was sitted in a comfortable position. The therapist placed hand on the patient's neck and other hand to support the mandible by the elbow therapist stabilize the shoulder and gently moved the neck from the neural position to the side to perform cervical lateral flexion to the opposite side to stretch the trapezius

muscle. Hold the stretch for 5-10 second and repeat 5 time.

- Other stretching performed of levator scapulae, pectoralis major and minor, scalene, sternocleidomastoid, and pectoralis muscles.
- Cervical mobility includes neck flexion, extension, lateral flexion, and rotation.
- Shoulder mobility includes shoulder flexion, extension, abduction, external rotation, and internal rotation.
- Shoulder shrugging and wall slides.

7. Phase 3- Myokinetic strengthening

- Activation technique by making cupped hand tapping over the left side upper trapezius, deltoid muscle, pectoralis minor and major muscle, and rhomboid major and minor muscle. And perform the movement of muscles with a resistance.
- Isometric exercise performed by applying a sustain pressure with contraction of neck flexors, extensors, lateral flexors and rotators.
- Shoulder shrugging with resistance.
- Theraband exercise with normal muscle resistance during chin tuck.
- Ergonomic correction – with support, mirror therapy and avoidance of postural abnormality.

8. Phase 4– Integrated kinetic chain strengthening

- All the previous exercise continue with increased in repetition.
- Resistive exercises with theraband and weight cuff for shoulder muscle strengthening.
- Wall push-up, chin tuck, shoulder retraction, and protection added for maintaining the condition.
- Postural training for improvement of adaptive forward head posture.
- Home exercise program.

9. Result

After the physiotherapy treatment included in the myokinetic chain activation and myokinetic stretching techniques, along with the appropriate cervical and scapular physiotherapy management, the patient has improved symptoms of cervical radiculopathy and shoulder asymmetry.

As a result, the introduction of myokinetic chain activation and stretching into the physiotherapeutic complex positively affected the pain level, range of motion, flexibility, scapular stability, and the shoulder asymmetry and function in the case of cervical radiculopathy accompanied by shoulder asymmetry.

Table 1: Range of motion

Movement	Pre-Rehabilitation	Post-Rehabilitation
1) Cervical		
a) flexion	35°	50°
b) Extension	50°	55°
c) lateral flexion Right	15°	35°
Left	20°	40°
d) Rotation Right	50°	65°
Left	40°	45°
2) shoulder		
a) flexion	120°	155°
b) Abduction	80°	90°
c) Extension	60°	65°
d) Internal rotation	40°	45°
e) Internal rotation	45°	45°

Table 2: Muscle tone Assessment

Muscles	Pre-Rehabilitation	Post-Rehabilitation
1) Upper trapezius	2/5	0/5
2) levator scapulae	1/5	0/5

Table 3: Muscle Strength Assessment

Muscles	Pre-Rehabilitation	Post-Rehabilitation
1) Sternocleidomastoid	3/5	4/5
2) Splenius capitis	4/5	5/5
3) levator scapulae	3/5	4/5
4) Upper trapezius	3/5	4/5

Table 4: NPRS scale

Activity	Pre-Rehabilitation	Post-Rehabilitation
1) At rest	4/10	0/10
2) During mild activity	6/10	0/10
3) During overhead activity	10/10	2/10
4) During sleeping on affected side	8/10	1/10

10. Discussion

The findings of this case are consistent with recent studies that highlight the role of physiotherapy and exercise in the management of CR Singh et al., (2021) These articles emphasize the importance of an active management approach to CR rather than a symptomatic management approach. A recent scoping review by C pparmichael et al on scapular pain reported that 72% of the included studies on cervical radiculopathy described scapular pain as a symptom.

Evidence for myokinetic stretching in the management of cervical radiculopathy is available, with a randomized clinical trial by Saleem et al (2025) comparing myokinetic stretching relaxation with post isometric receiving group mechanical traction and both interventions yielded significant within group improvement in pain, cervical range of motion and neck disability.

11. Limitation

- Small sample size may limit the generalizability of the findings.
- Moreover, the study can have a short intervention period; therefore, it cannot demonstrate the intervention's effect in the long run.
- The study shows that shoulder asymmetry can have multiple causes; therefore, an intervention's effect might not be relevant only for patients with radiculopathy.
- Myokinetic interventions' effectiveness can vary depending on participants' muscle strength, flexibility, posture, and adherence to the suggested treatment.
- The study's results might not be generalizable to all patients with radiculopathy and shoulder asymmetry since it was conducted on one patient or in one setting.

12. Conclusion

The present case study was undertaken to evaluate the effect of myokine chain activation and myokinetic stretching techniques on shoulder asymmetry in patient with cervical radiculopathy The intervention not only focus on reducing the signs and symptoms of cervical radiculopathy but also address the musculoskeletal imbalances and altered cervicoscapular alignment associated with patient's dropped shoulder – following physiotherapy intervention was observed in pain, cervical mobility, muscular flexibility, scapular control and shoulder symmetry. Thus, this study conclude that myokinetic chain activation combined with myokinetic stretching is a useful physiotherapy approach for addressing the dropped shoulder associated with cervical radiculopathy.

13. Future Scope of the Study

- The comparison of the myokinetic chain activation and myokinetic stretching can be made in larger groups of patients.
- The objective assessment of the postural and biomechanical parameters can help to measure the changes in shoulder alignment.
- The effectiveness of myokinetic activation and stretching can be compared to different subgroups of patients with cervical radiculopathy.
- The comparison of the effectiveness to other physiotherapeutic interventions can be made, such as neural mobilization techniques, stabilization exercises, or manual therapy.

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