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CONSERVATIVE PHYSIOTHERAPY MANAGEMENT OF CERVICAL SPONDYLOTIC RADICULOPATHY WITH RADIAL NERVE TENSION SIGNS: A CASE REPORT

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cervical radiculopathy, cervical spondylosis, radial nerve, neurodynamics, physiotherapy, Mulligan mobilisation-with-movement, McKenzie method, neck disability index, numeric pain rating scale

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Abstract

Background: Cervical spondylosis with radiculopathy is a common cause of neck pain with referred upper-limb symptoms in middle-aged adults. Conservative physiotherapy is the recommended first-line management strategy. Accurate clinical differentiation of cervical radiculopathy from peripheral entrapment neuropathies, shoulder pathology, and vascular causes requires systematic neurodynamic testing, segmental provocation assessment, and appropriate imaging.

Case Presentation: A 45-year-old male office worker presented with a one-week history of right-sided neck pain radiating along the radial nerve distribution to the wrist. Clinical examination revealed a positive upper-limb neurodynamic test (ULNT2b), an extension-provoked and flexion-relieved pain pattern, preserved and equal radial pulses bilaterally, brisk deep tendon reflexes without upper motor neuron signs, and a positive cervical compression test. Plain cervical radiographs demonstrated loss of cervical lordosis with multilevel spondylotic osteophytes; right shoulder radiographs were within normal limits.

Intervention: A three-phase conservative physiotherapy programme was implemented, guided by clinical irritability assessment at each stage. Phase 1 (Days 1–5) comprised electrophysical agents (therapeutic ultrasound, conventional TENS), thermal application, postural and ergonomic education, cervical offloading strategies, and introductory neuromuscular exercises. Phase 2 (Days 6–30) advanced to Mulligan mobilisation-with-movement, cervical isometrics, and progressive rotator cuff and scapular strengthening. Phase 3 (Month 1 onward) introduced progressive resistance training and McKenzie-based directional exercises. Repeat cervical radiography at seven weeks confirmed radiographic stability without new structural findings.

Outcome: At one-month follow-up, pain intensity on the Numeric Pain Rating Scale (NPRS) reduced from 8/10 to 3/10 (62.5% relative reduction, exceeding the established minimal clinically important difference [MCID]). Neck Disability Index (NDI) scores improved from 25/50 (moderate disability) at baseline to 7/50 (minimal disability) at one-month follow-up, surpassing the published MCID. Active cervical range of motion improved substantially across all planes: extension from 27° to 35°, flexion from 45° to 61°, right rotation from 45° to 63°, left rotation from 50° to 65°, left lateral flexion from 30° to 42°, and right lateral flexion from 36° to 47°.

Conclusion: This case illustrates a structured, irritability-guided, phase-based conservative physiotherapy approach to cervical radiculopathy with radial nerve mechanosensitivity. Clinically meaningful improvements in pain, disability, and cervical mobility were achieved within one month, supporting the role of individualised staged conservative management in this patient population. This case report was prepared following the CARE (CAse REport) guidelines.

1. Introduction

Cervical spondylosis is a progressive degenerative condition of the cervical spine characterised by intervertebral disc degeneration, facet joint arthrosis, uncovertebral osteophyte formation, and loss of normal cervical lordosis. When these structural changes encroach upon the intervertebral foramina or the spinal canal, compression of the cervical nerve roots may result in radiculopathy presenting as neck pain that radiates into the upper limb in a dermatomal or peripheral nerve distribution, often accompanied by paraesthesiae, sensory deficit, motor weakness, or reflex change. The annual age-adjusted incidence of cervical radiculopathy has been estimated at 83.2 per 100,000 population, with peak incidence in the fifth and sixth decades of life and a higher rate in men (107.3 per 100,000) than women (63.5 per 100,000) [1]. Spondylosis and disc degeneration together account for the majority of cases [2].

Establishing a clinical diagnosis of cervical radiculopathy requires careful differentiation from peripheral entrapment neuropathies (such as carpal tunnel syndrome and cubital tunnel syndrome), primary shoulder pathology (rotator cuff disease, glenohumeral instability, subacromial impingement), and vascular causes of arm pain including thoracic outlet syndrome. Upper-limb neurodynamic tests (ULNTs), segmental provocation tests (the cervical compression or Spurling's test), and directional preference assessment using the McKenzie Method of Mechanical Diagnosis and Therapy (MDT) are clinical tools that support this differential diagnosis process and guide treatment planning. Wainner et al. [3] demonstrated that a cluster of clinical findings including positive ULNT1, positive Spurling's test, cervical distraction test, and ipsilateral rotation less than 60° substantially increases the probability of a cervical radiculopathy diagnosis.

Conservative management, encompassing physiotherapy, analgesia, and patient education, is the recommended primary treatment pathway for most patients with cervical radiculopathy in the absence of progressive neurological deficit or myelopathy. Evidence-based clinical guidelines support the use of manual therapy, exercise, and postural education in improving pain and functional outcomes in this population [4]. Mulligan mobilisation-with-movement (MWM) has demonstrated efficacy in reducing pain and improving range of motion in cervical radiculopathy through a proposed mechanism of correcting minor positional faults and reducing nociceptive input [5,6]. Scapular stabilisation and rotator cuff strengthening have been advocated as components of a comprehensive cervical rehabilitation programme, targeting proximal

kinetic chain dysfunction that commonly co-exists with cervical nerve root irritation [7].

This case report describes the clinical reasoning, staged intervention, and one-month outcomes for a 45-year-old male presenting with right-sided cervical spondylotic radiculopathy with radial nerve mechanosensitivity, managed conservatively in an outpatient physiotherapy setting. This report adheres to the CARE (CAse REport) reporting guidelines [8].

2. Case Presentation

2.1 Patient Information

A 45-year-old male office worker presented to an outpatient physiotherapy clinic with a chief complaint of right-sided neck pain radiating to the right upper limb, with symptom onset approximately one week prior to initial assessment. The patient's occupational history was notable for prolonged sedentary work requiring sustained cervical flexion and forward head posture at a computer workstation. No history of cervical spine trauma, prior surgery, systemic illness, malignancy, or inflammatory arthropathy was recorded. There were no bilateral upper or lower limb neurological symptoms, no bowel or bladder dysfunction, and no gait disturbance to suggest cervical myelopathy.

At rest, the patient reported mild background pain rated 3/10 on the Numeric Pain Rating Scale (NPRS, 0 = no pain, 10 = worst imaginable pain). Pain intensity increased markedly to 8/10 with cervical extension and extension combined with bilateral rotation. Symptoms were consistently relieved by cervical flexion and by assuming a supine resting position. Radicular pain followed the course of the right radial nerve, extending from the lateral aspect of the forearm to the dorsum of the wrist.

2.2 Physical Examination

Observation and palpation of the cervical spine revealed no focal bony tenderness at the spinous processes or paraspinal musculature. Active cervical range of motion was most restricted in extension and right rotation, the directions that reproduced and aggravated radicular symptoms at baseline.

Neurological examination demonstrated deep tendon reflexes graded 3+ bilaterally at the brachioradialis, biceps, and triceps (brisk but without clonus or hypertonicity). The upper motor neuron screen was negative: Babinski's sign and Hoffman's sign were bilaterally absent, indicating the absence of myelopathic involvement and directing clinical reasoning toward a lower motor neuron or nerve root level of dysfunction.

The radial nerve neurodynamic test (ULNT2b: shoulder girdle depression, shoulder abduction, elbow extension, forearm pronation, wrist and finger flexion) was positive on the right side, reproducing the patient's familiar radial distribution pain at a Level 1 sensitising position (shoulder depression and abduction alone). This

finding indicated heightened mechanosensitivity of the radial nerve and associated neural connective tissue [3]. The radial pulse was present and equal bilaterally, effectively reducing the clinical probability of a vascular thoracic outlet contribution to the arm symptoms.

The maximum cervical compression (Spurling's) test reproduced right-sided radiating pain, with symptom provocation greater in cervical extension than in flexion. Active cervical flexion consistently relieved the radiating symptoms. This extension-provoked, flexion-relieved directional pattern is consistent with dynamic foraminal narrowing during extension loading and foraminal widening during flexion, supporting a compressive radiculopathy mechanism at the affected nerve root level [4].

2.3 Imaging

Plain radiographs of the cervical spine (anteroposterior and lateral projections, obtained on 9 April 2026) demonstrated loss of cervical lordosis with multilevel spondylotic changes and marginal osteophyte formation, consistent with the degree of degenerative change commonly seen in this age group. Right shoulder radiographs (anteroposterior and lateral projections) were within normal limits, supporting the exclusion of primary glenohumeral or subacromial pathology as the source of arm symptoms.

Advanced cross-sectional imaging (MRI) was not available at initial assessment. While MRI is the preferred investigation for definitive identification of the affected nerve root level and quantification of foraminal stenosis, the combination of positive clinical neurodynamic and provocation findings with radiographic evidence of multilevel spondylosis was considered sufficient to support a working clinical diagnosis and initiate conservative management. MRI would be indicated if symptoms failed to improve, if neurological deficit progressed, or if alternative pathology remained a clinical concern [4].

2.4 Clinical Diagnosis

The constellation of clinical findings a positive ULNT2b reproducing familiar radicular symptoms, an extension-provoked and flexion-relieved pain pattern on segmental provocation testing, preserved bilateral radial pulses, and radiographic evidence of multilevel cervical spondylosis with marginal osteophytosis was consistent with right-sided cervical spondylotic radiculopathy. Based on the radial nerve distribution of symptoms, the C6 or C7 nerve root level was considered the most likely site of involvement, concordant with published epidemiological data identifying C7 as the most frequently affected root in cervical spondylotic radiculopathy, followed by C6 [2]. Primary shoulder pathology and a vascular aetiology were considered clinically unlikely, based on unremarkable shoulder radiographs and a bilaterally preserved radial pulse, respectively.

3. Therapeutic Intervention

A three-phase conservative physiotherapy programme was implemented, guided by clinical irritability assessment at each review point. Progression between phases was symptom-driven rather than time-fixed, consistent with evidence-based principles of irritability-guided rehabilitation for cervical radiculopathy [4].

3.1 Phase 1: Symptom Modulation (Days 1–5)

Initial management prioritised reduction of neural and articular irritability and protection of sensitised structures. The following interventions were employed:

- Therapeutic ultrasound to the right cervical paraspinal region: continuous mode; frequency 1 MHz, intensity 1.2 W/cm², duration 7 minutes. Applied to promote deep thermal effects and facilitate tissue extensibility in the acute phase.
- Conventional transcutaneous electrical nerve stimulation (TENS) applied along the course of the right radial nerve: intensity titrated to patient comfort; duration 15 minutes. Used for short-term gate-control analgesia.
- Hot fomentation to the cervical paraspinal region, prescribed as a home-based superficial thermal modality for symptom relief.
- Postural and ergonomic education addressing workstation configuration, monitor height, seated cervical posture, and avoidance of sustained cervical end-range positioning.
- Soft cervical collar prescribed for use during road travel only, to restrict aggravating end-range cervical movement in the acute phase.
- Cervical pillow recommended to maintain neutral cervical alignment during sleep.
- Cranio-cervical flexion exercise (chin tuck) initiated in supine lying, targeting deep cervical flexor recruitment without provocation of radicular symptoms.
- Active shoulder range-of-motion exercises prescribed to preserve shoulder girdle mobility and prevent secondary disuse during the period of cervical symptom restriction.
- General aerobic activity (10–20 minutes of daily walking) recommended to promote systemic well-being and maintain non-provocative functional movement.

3.2 Phase 2: Active Rehabilitation and Manual Therapy (Days 6–30)

At five-day clinical reassessment, a reduction in neural irritability and absence of symptom worsening permitted progression to active rehabilitation and the introduction of manual

therapy. Passive electrotherapeutic modalities were continued as required for analgesia. The following interventions were added or advanced:

- Mulligan mobilisation-with-movement (MWM) applied to the cervical spine: a pain-free accessory glide applied concurrent with active cervical movement, directed at reducing mechanical irritation of the affected nerve root during motion. MWM has been shown in randomised controlled trials to improve pain, disability, and cervical range of motion in cervical radiculopathy [5,6].
- Cervical isometric exercises initiated in four directions (flexion, extension, and bilateral lateral flexion) with minimal manual resistance, to promote early deep cervical stabiliser activation.
- Cranio-cervical flexion exercise (chin tuck) progressed from supine lying to sitting position.
- Rotator cuff strengthening commenced with emphasis on muscular endurance: prone horizontal shoulder abduction with external rotation at 90° of abduction; bilateral shoulder external rotation at 0° of abduction using mild-to-moderate resistance elastic band or tubing. Scapular and rotator cuff strengthening addresses proximal kinetic chain dysfunction commonly associated with cervical radiculopathy and has been advocated as a component of cervical rehabilitation [7].
- Upper, middle, and lower trapezius strengthening exercises introduced individually to address periscapular neuromuscular deficits.

3.3 Phase 3: Progressive Strengthening and Load Tolerance (Month 1 Onward)

At one-month clinical reassessment, gains in cervical stability and shoulder strength permitted progression to resistance-based training. McKenzie-based directional preference exercises were formally introduced at this stage, reflecting the reduction in neural mechanosensitivity over the preceding rehabilitation period:

- Cervical isometric exercises progressed by incrementally increasing theraband resistance in all four directions, guided by patient symptom response.
- Chin retraction advanced from sitting to include cervical extension against theraband resistance, subsequently progressed to standing and functional postures to challenge postural stability under load.
- Prone horizontal shoulder abduction with external rotation progressed from 90° to 100–120° of shoulder abduction, with progressive loading using light dumbbells or weighted cuffs as tolerated.

- Bilateral shoulder external rotation progressed from 0° to 90° of abduction in the scapular plane, using progressively stronger resistance bands.
- Scapular stabilisation exercises introduced to improve dynamic shoulder girdle control during functional and progressively loaded movements.

Throughout Phase 3, symptom monitoring guided all exercise progressions. Careful evaluation was performed at each session to ensure that increasing resistance did not reproduce or aggravate cervical or radicular symptoms.

4. Follow-Up Imaging

Repeat cervical spine radiographs (anteroposterior and lateral projections) were obtained on 31 May 2026, approximately seven weeks after the initial films of 9 April 2026. Visual comparison of the two studies demonstrated similar overall vertebral alignment and degenerative features (loss of cervical lordosis with multilevel spondylotic change), without an obvious new abnormality on either projection. No acute structural findings (fracture, subluxation, or marked interval change in alignment) were apparent.

Several important limitations apply to this radiographic comparison. First, conservative physiotherapy is not expected to reverse established spondylotic or osteophytic changes over a seven-week interval; radiographic stability rather than regression is the anticipated and appropriate finding at this timepoint. The clinical value of interval radiography in this case lay primarily in excluding structural progression or a new pathological finding, rather than in demonstrating treatment response [4]. Second, the comparison here was based on photographic reproductions of conventional radiographic films rather than original digital (DICOM) images, introducing potential artefact from differences in photographic angle, exposure, and screen glare. Formal interval comparison by a reporting radiologist using original digital studies is recommended before any conclusion regarding interval change is incorporated into the clinical record or relied upon for management decisions. Clinical outcome measures remain the principal indices of treatment response in this case, consistent with current guideline recommendations [4].

5. Outcomes

5.1 Pain

Pain intensity on the NPRS reduced from 8/10 at initial presentation to 3/10 at one-month follow-up, representing a 5-point absolute reduction and a 62.5% relative reduction. This substantially exceeds the established minimal clinically important difference (MCID) of approximately 2 points on the NPRS for patients with neck pain [8], and the minimal detectable change of 2.0–3.0 points reported in the literature for this instrument

[8]. The magnitude of improvement indicates a treatment response of high clinical significance.

5.2 Functional Disability

Functional status was assessed using the Neck Disability Index (NDI), a validated 10-item, 50-point self-report questionnaire evaluating the impact of neck pain on activities of daily living, including personal care, lifting, reading, headache, concentration, work, driving, sleep, and recreation [9]. At baseline, the patient's NDI score was 25/50 (moderate disability range). At one-month reassessment, the NDI score had improved to 7/50 (mild disability range), representing an 18-point absolute reduction. This improvement substantially exceeds the published MCID of 5–10 points (10–20% of the 50-point scale) for patients with neck pain, as reported in the systematic review by MacDermid et al. [9], noting that MCID estimates for the NDI are higher in patients with cervical radiculopathy than in those with uncomplicated mechanical neck pain [9]. The patient's categorical improvement from moderate to mild disability represents a clinically meaningful change in self-reported neck-related function.

5.3 Cervical Range of Motion

Active cervical range of motion improved substantially across all primary movement planes at one-month reassessment, assessed by clinical goniometry. Baseline and post-treatment values were as follows: extension 27° to 35°, flexion 45° to 61°, right rotation 45° to 63°, left rotation 50° to 65°, left lateral flexion 30° to 42°, and right lateral flexion 36° to 47°. The greatest absolute gains were observed in extension and right rotation the movements most restricted and most provocative of radicular symptoms at initial examination with restoration of near-full range in the majority of planes without reproduction of upper limb radicular symptoms.

5.4 Summary of Outcomes

Outcome Measure	Baseline (9 April 2026)	One-Month Follow-Up
Pain Intensity (NPRS, 0–10)	8/10	3/10
Functional Disability (NDI)	25/50 (Moderate disability range)	7/50 (Mild disability range)
Active Cervical ROM	Extension 27°, Flexion 45°, R. Rotation 45°, L. Rotation 50°, L. Lat. Flexion 30°, R. Lat. Flexion 36°	Extension 35°, Flexion 61°, R. Rotation 63°, L. Rotation 65°, L. Lat. Flexion 42°, R. Lat. Flexion 47°

Table 1. Clinical outcome data at baseline and one-month follow-up. NPRS: Numeric Pain Rating Scale; NDI: Neck Disability Index, ROM: Range of Motion. NDI category boundaries follow established classification: 0–4 = no disability, 5–14 = mild, 15–24 = moderate, 25–34 = severe, 35–50 = complete disability [9].

6. Discussion

This case demonstrates a structured, irritability-guided conservative physiotherapy approach to cervical spondylotic radiculopathy with radial nerve mechanosensitivity, achieving clinically meaningful improvements in pain, disability, and cervical mobility within one month. Several aspects of the clinical reasoning and management warrant discussion in the context of the existing evidence base.

6.1 Clinical Reasoning and Differential Diagnosis

The clinical assessment adhered to a systematic differential diagnostic framework, prioritising the exclusion of non-radicular and non-mechanical causes of arm pain. The presence of a bilaterally preserved radial pulse and normal shoulder radiographs effectively reduced the probability of a vascular thoracic outlet contribution and primary shoulder pathology, respectively. The positive ULNT2b at a Level 1 sensitising position, combined with an extension-provoked and flexion-relieved pain pattern on the Spurling's compression test, provided strong clinical evidence for a compressive radiculopathy mechanism mediated by dynamic foraminal narrowing consistent with the radiographic demonstration of multilevel cervical spondylosis. Wainner et al. [3] demonstrated that positive ULNT findings in combination with other clinical tests substantially increase diagnostic probability for cervical radiculopathy, supporting the use of such test clusters in clinical practice.

The finding of brisk but non-clonus reflexes (3+) bilaterally without Babinski or Hoffman positivity warranted clinical interpretation. Bilaterally brisk deep tendon reflexes in the absence of upper motor neuron signs may represent a normal physiological variant or early physiological reactivity, however, the complete absence of myelopathic signs on clinical examination directed management toward a radiculopathy rather than myelopathy pathway. Serial neurological monitoring is recommended throughout follow-up, with MRI indicated if reflexes further increase, if bilateral symptoms emerge, or if any gait disturbance is noted [4].

Published epidemiological data from Radhakrishnan et al. [2] identify the C7 nerve root as the most commonly affected level in cervical spondylotic radiculopathy, followed by C6. The radial nerve distribution of symptoms in this case extending along the dorsolateral aspect of the forearm to the wrist is anatomically consistent with either C6 or C7 root irritation, noting that the radial nerve carries fibres primarily from C5 to C8 with predominant contributions from C6 and C7. Definitive nerve root level identification would require MRI correlation with clinical findings.

6.2 Rationale for a Phase-Based Conservative Approach

The phased sequencing of treatment from passive symptom modulation to active rehabilitation and manual therapy reflects evidence-informed practice frameworks for cervical radiculopathy, which recommend tailoring intervention intensity to the degree of clinical neural irritability [4]. During the acute phase, reducing mechanical and chemical sensitisation of the affected nerve root is prioritised before introducing loaded or end-range movements, premature progression to provocative exercises risks symptom exacerbation and may delay recovery.

The introduction of Mulligan mobilisation-with-movement (MWM) in Phase 2 is supported by randomised controlled trial evidence demonstrating improvements in pain, disability, and cervical range of motion in patients with cervical radiculopathy [5,6]. The proposed mechanism involves correction of a minor positional fault at the facet joint, reducing compressive loading on the sensitised nerve root during active movement, and thereby enabling pain-free restoration of movement. The deliberate deferral of McKenzie-based directional preference exercises until the one-month mark reflected continued neural mechanosensitivity at the Phase 1 and Phase 2 assessments, rather than adherence to a fixed time-based protocol.

The inclusion of rotator cuff and scapular stabilisation strengthening from Phase 2 onward reflects evidence supporting the role of proximal kinetic chain rehabilitation in patients with cervical radiculopathy [7]. Periscapular and rotator cuff muscle weakness or neuromuscular inhibition frequently accompanies cervical radiculopathy, both as a consequence of nerve root dysfunction and as a response to pain-related disuse. Targeted rehabilitation of these structures may reduce the neuromuscular demands on the sensitised cervical neural system and facilitate return to functional upper-limb activities.

6.3 Limitations

Several limitations of this case report require acknowledgement. As a single-case report, generalisability is inherently restricted the observed improvements cannot be attributed to specific treatment components in the absence of an experimental control condition. The report is based on retrospective review of routine clinical documentation rather than a prospective case-report data-collection protocol. MRI was not performed, precluding definitive nerve root level identification and foraminal stenosis quantification. Longer-term follow-up data beyond one month are not available in this report. Future prospective documentation would benefit from systematic recording of standardised outcome measures at each clinical contact, consistent with CARE guideline recommendations [1].

7. Conclusion

In this patient with right-sided cervical spondylotic radiculopathy and radial nerve mechanosensitivity, a structured three-phase

conservative physiotherapy programme progressing from electrophysical agents and postural offloading, through Mulligan mobilisation-with-movement and progressive shoulder strengthening, to progressive resistance training and McKenzie-based directional exercises achieved clinically meaningful short-term outcomes within one month of initiation. Pain intensity reduced from 8/10 to 3/10 on the NPRS (exceeding the established MCID), NDI score improved from 25/50 (moderate disability) to 7/50 (mild disability), representing an 18-point reduction that substantially exceeds the published MCID for cervical radiculopathy, and active cervical range of motion improved substantially across all planes (extension: 27°–35°, flexion: 45°–61°, right rotation: 45°–63°, left rotation: 50°–65°, left lateral flexion: 30°–42°, right lateral flexion: 36°–47°). Radiographic stability at seven weeks was consistent with the expected outcome of conservative management at this timepoint. This case underscores the clinical utility of systematic neurodynamic assessment, irritability-guided staging of conservative rehabilitation, and structured outcome monitoring in the management of cervical radiculopathy, and supports continued investigation through prospective observational and randomised controlled trial designs.

Declarations

Ethics Approval and Consent for Publication

This case report was prepared in accordance with the Declaration of Helsinki. Written informed consent was obtained from the patient for publication of this case report and all associated clinical data, including radiographic findings, clinical measurements, and the anonymised description of the clinical course. No institutional ethics approval is required for anonymised case reports at the reporting institution, however, local requirements should be confirmed prior to submission.

Conflict of Interest

The authors declare no conflict of interest with respect to the research, authorship, or publication of this case report.

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Data Availability Statement

The de-identified clinical data supporting this case report are available from the corresponding author, Dr. Arka Ghosh (arkaghosh120596@gmail.com), on reasonable request, subject to applicable patient confidentiality requirements and institutional ethics regulations.

CARE Checklist

Authors have read the CARE case report guidelines and the manuscript was prepared and revised according to the CARE checklist [1]. A

completed CARE checklist has been submitted as a supplementary file.

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