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# The Dual Lens: A Protocol Study On The Effectiveness Of Conservative Management And Diagnostic Tools In Cervical Radiculopathy – A Prospective Cohort Study

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***Abstract:***
***Introduction***: *Cervical radiculopathy is a prevalent condition characterized by neck pain and neurological symptoms due to nerve root compression. The first-line of treatment in most cases is conservative management, yet data on long-term outcomes remain limited. This prospective cohort study will investigate the effectiveness of conservative therapies, evaluate the diagnostic accuracy of commonly used clinical tests, and examine the influence of lifestyle and occupational factors on recovery.*
***Methods and analysis:*** *This is a prospective cohort study. total of 69 participants aged 18–60 years with clinically diagnosed cervical radiculopathy will be registered and monitored over the following 12 months post completion of initial management. Outcome measures included pain severity, functional disability, quality of life, grip strength, and range of motion. Clinical tests such as Spurling's, ULTT, and distraction/compression included for diagnostic performance. The study also analyzed how environmental and occupational influences on symptom progression. The findings are expected to reinforce the role of conservative treatment, inform test-based diagnostic decisions, and all the physiotherapy treatments will be systematically recorded to determine the most beneficial techniques for managing cervical radiculopathy and support more holistic and personalized approach to rehabilitation planning.*
***Keywords:*** *Cervical radiculopathy; Diagnostic accuracy; Physiotherapy management; Pain; Quality of life; Hand dexerity.*

## INTRODUCTION

Neck pain is among the most prevalent musculoskeletal disorders globally, ranking as the fourth leading cause of disability, with an age-standardized prevalence rate of 27.0 per 1,000 population in 2019.[1] As a multifactorial condition, neck pain is influenced by both psychological factors—such as stress, anxiety, sleep disturbances, and personality traits—and biological factors, including age, gender, neuromuscular disorders, and autoimmune diseases.[1,2]

The cervical spine comprises seven vertebrae (C1–C7), each separated by intervertebral discs. Notably distinct from other spinal segments, the cervical spine supports significant head movement while protecting vital neural structures. The cervical spinal nerves, eight pairs (C1–C8), emerge through foramina between vertebrae, making them susceptible to compression injuries.[2,3]

Cervical radiculopathy is a clinical syndrome resulting from compression or irritation of one or more cervical nerve roots. Common etiologies include degenerative changes such as spondylosis, disc herniation, instability, trauma, or neoplasms. Patients typically present with neck and/or shoulder pain, and differential diagnosis should rule out cardiac, infectious, musculoskeletal, and malignant causes[2,4]

The incidence of cervical radiculopathy is approximately 85 per 100,000 people annually, with higher rates in males (107.3/100,000) compared to females (63.5/100,000)[4]. Root involvement is most common at C7 (46.3–69%), followed by C6 (17.6–19%), C8 (6.2–10%), and C5 (2–6.6%)[5]

Diagnosis involves a combination of clinical tests and imaging. Common physical examination techniques include: Spurling's Test (Sensitivity: 40–60%, Specificity: 85–95%), Neck Compression & Distraction Tests (Sensitivity: ~50%, Specificity: 90%), Upper Limb Tension Test (ULTT) (Sensitivity:

70–90%, Specificity: 15–30%), Shoulder Abduction Test (Specificity: 80–90%, Sensitivity: 40–50%). Imaging such as MRI is commonly used to confirm nerve root compression, while spiral CT remains superior in identifying bony foraminal stenosis[3]. Electrodiagnostic studies (EMG, NCV) may also support diagnosis.[7] Management of cervical radiculopathy includes both surgical and conservative approaches. Surgery is reserved for cases with significant disc herniation or persistent symptoms. However, 75–90% of patients respond well to conservative treatment, including NSAIDs, Vitamin B12 and D3 supplementation, and physiotherapy.[6,7]

Physiotherapy strategies range from manual therapy and neural mobilization to electrotherapy (TENS), postural correction, and exercise therapy. Complementary therapies such as Ayurveda and naturopathy are also employed in some contexts.[8,9] Despite widespread use, there is limited evidence suggesting that surgical treatment offers superior outcomes in the acute phase.[10,11] Given the multifactorial nature of cervical radiculopathy and the lack of integrated, long-term data, a prospective study tracking symptom progression, functional capacity, and quality of life is essential. Such data may support more individualized and effective rehabilitation plans.[12,13]

**Research gap:**

During the search for review of literature, most of the studies related to cervical radiculopathy were found to be reporting the effects of one approach over the other. None of the studies have comprehensive report on all possible treatment strategies. The novelty of this exploration study lies in the potential application for analyzing and generating insights from the data, from which researchers can potentially uncover new patterns, factors that may influence the duration and severity of the symptoms, correlations, and personalized treatment approaches that may not have been previously identified. This can lead to more effective diagnosis, treatment, and rehabilitation strategies for patients with cervical radiculopathy

**Objectives**

This study aims to identify the long-term outcomes of conservative management in patients with cervical radiculopathy, while also evaluating the influence of environmental and lifestyle factors, including occupational demands, on the development and progression of the condition. Additionally, it seeks to determine the diagnostic accuracy specifically the sensitivity and specificity—of commonly used clinical tests. Finally, the study will assess changes in patient's quality of life throughout the duration of follow-up.

## METHODOLOGY:

**Study protocol**

This is a prospective, observational cohort study, conducted in (SDM medical college and hospital). Cervical radiculopathy patients diagnosed by the medical practitioner and referred for physiotherapy treatment, who meet with the inclusion criteria will be recruited for participation in the study. Patients will be informed about the study's purpose and importance, and informed consent will be obtained. Demographic data will be recorded followed by detailed assessment. Pain assessment will be taken using Numerical Pain Rating Scale (NPRS), cervical range of motion will be assessed using an Inclinometer micro-FET, grip strength will be evaluated using Jamar Dynamometer. Special tests like spluring's test, Upper Limb Tension Test (ULTT), compression and distraction test will be performed on the participants by the researcher. Patients will be evaluated on Neck Pain Disability Index (NPDI), World Health Organization- Quality of Life Brief (WHO-QOL BREF), Cervical Radiculopathy Impact Scale (CRIS) and Nine-Hole Peg Test (NHPT) on the day of enrollment.

The researcher will record demographic details, preliminary assessment, special test, and diagnostic approaches by the physician. Individualized Treatment protocols will be planned in consultation with the senior physical therapy faculty and the approaches will be recorded.

Additionally, all physiotherapy treatment interventions will be systematically recorded to identify which therapy techniques contribute most effectively to symptom relief and functional improvement in patients with cervical radiculopathy. Patients willing to come on a daily bases will be called to the OPD for physiotherapy treatment, while others will be given a home protocol to follow. After completion of protocol the patients will be followed up for 1 year. Reassessment will be taken at the time of discharge

3,6 & 12 months. From the time of enrolment.

**Spurling's test**

This test is also referred to as Foraminal Compression Test or Maximal Cervical Compression test. It is commonly utilized in the evaluation of the cervical spine to identify cervical nerve root compression resulting in cervical radiculopathy. This test has moderate diagnostic accuracy, with a sensitivity of 0.50 and a specificity of 0.88.[22]

**Cervical compression and distraction test**:

The test is aimed at testing nerve root compression and facet joint pressure. Pain produced on cervical compression and pain relief on distraction, indicates the test is positive. The test has moderate diagnostic accuracy with a sensitivity = 0.44 and specificity = 0.97. Rubinstein SM, Pool JJ, Van Tulder MW, Riphagen II, De Vet HC. A systematic review of the diagnostic accuracy of provocative tests of the neck for diagnosing cervical radiculopathy. European spine journal. 2007 Mar;16(3):307-19.

**Upper Limb Tension Test:**

There are number of upper limb tension test depending upon the nerve to be tested, namely: median (ULTT1), radial (ULTT2), and ulnar (ULTT3). All these tests can be performed with the patient in supine lying or sitting. The patient is advised to maintained the cervical spine in lateral flexion to the side opposite to the side being tested as a common component of all the three tests. **ULTT 1 (Median Nerve)** will be performed with the patient positioned as mentioned before, shoulder will be placed in abduction and external rotation, with elbow being extended and forearm supinated while the wrist and fingers including the thumb will be maintained in extension as the therapist applies a caudal force over the shoulder as if performing depression of the joint. Provocation of pain or paresthesia along the distribution of median nerve would be recorded as positive test. **ULTT 2 (Radial Nerve)** will be performed with the patient positioned as mentioned before, shoulder will be placed in extension and with elbow being extended and forearm pronated while the wrist in flexion, flexion of the metacarpophalangeal joints, and extension of the interphalangeal joints, therapist applies a caudal force over the shoulder as if performing depression of the joint. Provocation of pain or paresthesia along the distribution of radial nerve would be recorded as positive test. **ULTT 3(Ulnar Nerve)** will be performed with the patient positioned as mentioned before, shoulder will be placed in 90-degree abduction and external rotation, with elbow being flexed and forearm pronated, while extending the wrist and fingers place the palm on the ipsilateral ear. Provocation of pain or paresthesia along the distribution of median nerve would be recorded as positive test.[19]

**Grip strength**

It is measured using a Jamar hand dynamometer. The patient should be seated on a chair with back support, their shoulder adducted and neutrally rotated, elbow bent at 90 degrees, forearm in a neutral position, and wrist positioned between 0 to 30 degrees of dorsiflexion and 0 to 15 degrees of ulnar deviation. Ensure the needle is set to zero before starting the procedure.

Once the patient is correctly positioned, instruct them to "squeeze as hard as you can, harder, harder, relax." Record the grip strength for three successive trials on each hand, noting the values in pounds. The higest recorded grip strength value will be used for statistical analysis.[24]

**Cervical range of motion**:

Inclinometer will be used to evaluate and record flexion, extension, lateral flexion, and rotation. The patient will be asked to sit upright in a chair with their thoracic and lumbar spine well-supported against the backrest. Their shoulders should be relaxed, hands resting on their thighs, and feet flat on the floor. Head will be maintained in neutral with 0 degrees rotation and lateral flexion. Inclinometer will be placed on the head, along the sagittal plane with dial set to zero. Investigator should maintain the firm contact of inclinometer on head throughout the motion with one hand and should use the free hand to stabilize the shoulder gridle or sternum. Patient is said to do cervical flexion and the range is noted, followed by neck extension and lateral flexion. For cervical rotation patient will be requested to lay down supine with head in neutral position, inclinometer will be placed in the middle of the patient's forehead and the dial set to zero. Inclinometer should be firmly maintained throughout motion by investigator with one hand placing the free hand on contralateral shoulder. Patient will be instructed to roll head into rotation without tilting the head forward, backward, or lateral.

**The Neck Pain Disability Index**:
The NDI is a widely utilized tool for evaluating the functional status of patients with neck pain. It comprises 10 questions that cover various functional activities, including pain intensity, personal care, work, lifting, reading, driving, sleeping, and recreational activities, it includes symptoms such as pain intensity, concentration, and headache. Respondent can choose from a scale of 0 to 5 for each question, A score of 0 represents no disability, while a score of 5 represents complete disability. The total score ranges from 0 to 50. A score below 4 indicates no disability, 5 to 14 indicates mild disability, 15 to 24 indicates moderate disability, 25 to 34 indicates severe disability, and a score above 34 indicates total disability.[20]

**The WHO-QOL BREF :**
**The Who-Qol Bref** it is a self-reported questionnaire which focuses on patients' perspective It is an abbreviated version of the WHOQOL100. This self-report questionnaire consists of 26 items which cover 24 items in four domains of quality of life (QOL): physical health, psychological health, social relationships, and environment. Additionally, two items assess overall quality of life and general health.[21]

**Cervical radiculopathy impact scale:**
CRIS it is a Self-administered questionnaire which focuses on condition-specific and it designed to assess the functional limitations and symptom burden associated with cervical radiculopathy condition. CRIS evaluate how neck and arm pain, numbness, tingling, and weakness affect daily activities and to measure functional disability, psychological impact, and symptom severity and it monitors treatment effectiveness over time.[17]

**Nine-hole peg test:**
The 9-Hole Peg Test (9-HPT) is a standardized, timed test it is used to assess fine motor coordination and upper limb dexterity, especially hand function. The participant picks up nine small pegs one by one and places them into nine holes in a pegboard, then removes them as quickly as possible. This test is performed separately for each hand and the time taken to complete the task is recorded. Where, shorter times indicate better dexterity.
Patients with cervical radiculopathy often have motor weakness in hand and upper extremity. Impaired hand coordination is seen usually in C6, C7, C8, or T1 due to nerve root compression, pain and sensory deficits affecting the function use of hand. 9-HPT measures hand function deterioration or improvement and assists in identifying progression or recovery during rehabilitation or after surgical intervention during treatment follow-up.[18]

**Inclusion criteria**

- Patients of any gender between 18 to 60 years of age
- Patients diagnosed with cervical radiculopathy by medical practitioner, associated with or without herniated disc, spondylosis, and/or degenerated disc.

**Exclusion Criteria:**

- Patients Diagnosed with cervical myelopathy
- Patients with history of Shoulder disorders like Peri arthritic shoulder /frozen shoulder, reflex sympathetic dystrophy of upper limb, shoulder dislocation and acute fractures
- Patient who are on active treatment for Malignancy, Rheumatoid Arthritis, Ankylotic spondylosis, systemic Infections, and polyneuropathy.

Patient with history of cervical spinal surgery will be excluded while other spinal surgeries in the previous 6months.

**Study design:** Prospective cohort study

**Study area**: Physiotherapy OPD, SDM College Of Medical Sciences & Hospital, Dharwad. The Centre caters to the medical and rehabilitation needs of patients in and around Dharwad.

**Expected Outcomes**
This study aims to Provide deeper insights into the long-term efficacy of conservative treatment for cervical radiculopathy, Assess the influence of occupational and lifestyle factors, Refine the diagnostic reliability of clinical tests, highlight variations in quality of life over time, informing more targeted rehabilitation strategies.

## DISCUSSION

This prospective cohort study aims to evaluate the long-term outcomes of conservative management in patients with cervical radiculopathy and to investigate the role of environmental factors, clinical test validity, and variations in quality of life over time. The findings of this study are anticipated to contribute meaningfully to the existing body of knowledge surrounding cervical radiculopathy, particularly by integrating a broader and more holistic view of management, prognosis, and diagnosis.

Existing literature indicates that the majority of patients with cervical radiculopathy respond well to non-surgical treatments, with improvement seen in 75% to 90% of cases[6]. The expected findings of our study are likely to support this trend, emphasizing the importance of individualized physiotherapy, pain management, and lifestyle interventions in promoting functional recovery and symptom relief. Furthermore, by incorporating standardized outcome measures such as the Neck Pain Disability Index (NPDI), WHO-QOL BREF, and grip strength assessments, we aim to quantify the changes in clinical, physical and psychosocial domains of recovery.

A critical appraisal of the existing literature reveals a substantial methodological limitation: the majority of studies focus on comparative analyses between isolated treatment modalities, rather than encompassing the full continuum of available interventions or assessing long-term patient outcomes. Furthermore, there is a notable paucity of research investigating the role of personal and environmental determinants in influencing disease trajectory and recovery processes.

Another focus of this study is the diagnostic accuracy of clinical tests commonly used in physiotherapy settings. While previous studies have reported moderate specificity and variable sensitivity for tests like Spurling's, ULTT, and compression/distraction tests[2,4], there remains ambiguity in their standalone diagnostic utility. By assessing these tests within a larger clinical context and tracking outcomes longitudinally, our study seeks to provide stronger evidence for their role in confirming or ruling out cervical radiculopathy. The findings may support the idea that these tests are most effective when used in combination rather than in isolation, consistent with current clinical reasoning frameworks.[14]

Environmental and lifestyle factors such as occupation involving prolonged static postures, repetitive neck movements, or poor ergonomic practices are increasingly recognized contributors to the onset and exacerbation of cervical radiculopathy symptoms. Our study's assessment of these variables could reveal significant correlations, which would underscore the need for workplace education, ergonomic interventions, and behaviour modification programs as preventive strategies.[15]

Quality of life is often significantly affected in patients with chronic cervical radiculopathy due to pain, mobility limitations, and psychological stress. By employing the WHO-QOL BREF over a 12-month follow-up period, our study will provide insights into how non-surgical treatment protocols impact long-term well-being. Tracking quality of life changes also allows a more patient-centred evaluation of treatment success beyond conventional pain or mobility scores.[16]

A key strength of this research lies in its prospective design, comprehensive data collection, and use of standardized outcome measures. Additionally, by evaluating a relatively under-explored set of variables such as diagnostic test performance over time, occupational risk factors, and their relationship with recovery trajectories this study may identify patterns and predictors that enhance the personalization of treatment plans.

However, there are potential limitations to consider. The study is based at a single institution, which may limit the generalizability of the results. Patient adherence to home protocols and follow-up visits could affect the completeness of data. Moreover, some influencing factors, such as nutritional status, psychological comorbidities, and socioeconomic status, may not be captured in detail despite their potential impact on rehabilitation outcomes.

**Strength and limitation:**

- Conservative management: Integrates clinical, functional, and quality-of-life measures to comprehensively assess the long-term effectiveness of conservative treatment in cervical radiculopathy. physiotherapy interventions will be documented to evaluate which technique is most effectively improve symptoms and function in cervical radiculopathy.
- Real-World Applicability: Emphasizes individualized physiotherapy and home-based care, reflecting realistic clinical scenarios and enhancing the external validity of findings.

- Clarity: Assesses the accuracy of common clinical tests over time, providing evidence to refine diagnostic strategies in physiotherapy practice.
- The focus on single-center study may limit generalizability, Faithfulness to home protocols and follow-up may affect data completeness
- Some confounding factors like nutrition status, psychological and socioeconomic not fully captured.

## CONCLUSION

This study endeavours to bridge critical gaps in the current understanding of cervical radiculopathy by exploring not only the effectiveness of conservative treatments over the long term but also the diagnostic value of clinical tests and the influence of lifestyle and occupational factors.

By integrating a broad range of outcome measures and patient-specific data, the research will help clarify which treatment approaches are most effective, how non-invasive diagnostics perform in real-world settings, and how patients' environments shape their recovery journeys. These insights could pave the way for more targeted, evidence-based, and patient-centered rehabilitation strategies.

Ultimately, this investigation is expected to reinforce the role of conservative management as a first-line treatment for cervical radiculopathy and contribute to the development of more personalized and effective clinical decision-making protocols in physiotherapy and related fields.

**Ethics and dissemination:** Ethical Clearance has been obtained from the, IEC-SDM college of medical sciences and hospital (Reg No. ECR/950/Inst/KA/2017/RR-21(DCGI). The study will involve human participants, and informed consent will be obtained from all individuals participating in the study. The study does not involve any animal experiments. The study does not involve any social media platform.

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This is a protocol paper describing a planned prospective study that outlines the methodology and objectives prior to data collection and analysis.
Ethical Clearance has been obtained from the, IEC-SDM college of medical sciences and hospital, and the trial is been registered in CTRI Trial Registration: CTRI/2024/11/077323.

**Authors' contributions**

**Dr. Sriram K, Ph.D. Scholar**

- Research design, data acquisition, data analysis, interpretation, manuscript drafting and intellectual content.

**Dr. Jyoti S. Jeevannavar, Professor**

- Conception/planning, design of the study, data analysis, manuscript drafting, final approval of the version for publication

**Dr. Santosh Jeevannavar, HOD & Professor of Orthopaedic Department**

- Conception/Planning study design, diagnosis, proof read and approval of final version of the manuscript

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