

Research Paper Review

This review is published with the permission of Research Review Service (<u>www.researchreviewservice.com</u>)

Abduction extension cervical nerve root stress test: anatomical basis and clinical relevance European Spine Journal 2013; 22: 1522–5

Farshad M. and Min K.

ABSTRACT

Purpose

While the Lasègue straight leg raising test is an established test for lumbar nerve root compression, an established equivalent for cervical nerve root compression is missing. The aim of this bi-modal study was to find the most effective way to stretch the cervical nerve roots anatomically in cadavers and to assess its value in the clinical setting.

Methods

Three positional maneuvers of the upper limb were tested on three cadavers to determine the displacement by stretch of the nerve roots C5, C6 and C7. The maneuver which was most efficient in nerve root displacement was applied in 24 patients with confirmed symptomatic cervical nerve root compression (cases) and 65 controls to assess the clinical value of the test.

Results

The most efficient way to displace the cervical nerve roots by stretch was to apply dorsal pressure on the humeral head with the shoulder in 80° of abduction and 30° of extension, with slight elbow flexion while the head is facing the contralateral side. This maneuver produced 4-5 mm of nerve root displacement in cadavers. This test aggravated radicular symptoms in 79% of the patients with cervical nerve root compression and was negative in 98% of the controls.

Conclusion

The described abduction extension test with posterior push on the humeral head creates a fulcrum over which the brachial plexus can be displaced to create stress on cervical nerve roots. This simple test is easy to perform clinically and aggravates radicular symptoms in most of the patients with cervical nerve root compression while it is negative in nearly all of the controls..

ANALYSIS

Reviewed by Dr. Michael Haneline DC (Research Review Service)

Author's Affiliations

Department of Orthopaedics, Balgrist University Hospital, University of Zurich, Zurich, Switzerland.

Background Information

The Lasègue (straight leg raise) test is commonly used in determining the presence of lumbar nerve root compression. The test has been shown to have adequate sensitivity, but low specificity (1). In addition, the displacements of the nerve roots that occur during the straight leg raise test have been measured in previous studies.

Likewise, tests for cervical radiculopathy, comprised of various arm and neck positions are in use, though there is little information about what effect these different positions have on the cervical nerve roots, nor has the clinical value of these tests been sufficiently examined.

One such test is the upper limb tension test (ULTT), also referred to as the brachial plexus tension test. The ULTT has been proposed as being useful in ruling out cervical radiculopathy (2, 3), although it has been criticized because one of the positions utilized (shoulder abduction) has been reported to actually relieve radicular symptoms.

There were two purposes for this study:

- 1. To systematically determine which position of the upper extremity and the head most effectively stretches the cervical nerve roots; and
- 2. to investigate the clinical value of the optimal testing position in patients with cervical radicular compression.

PERTINENT RESULTS

- Cadaver testing showed that the C5–C7 nerve roots were displaced from 2 to 6 mm during all tests. The Abduction Extension Cervical Nerve Root Stress Test (AECNRST) produced the same or more root stretch when compared with the other two maneuvers. Adding wrist flexion or extension did not change the values.
- The amount of root stretch increased progressively from C5 to C7 with the AECNRST. This phenomenon was not observed with the other two tested positions.
- In the cases group, the AECNRST aggravated or produced dermatome-specific paresthesia in 17 of the 24 patients (71%) and pain in 14 of the 24 patients (58%).
- A positive test (i.e., production of new or aggravation of pain and/or paresthesia) was found in 19 of the 24 patients (79%) that had symptomatic cervical radicular compression. However, in the control group, only one of the 65 patients reported new paresthesia with the AECNRST.
- The sensitivity of the AECNRST was 79% and specificity was 98% for cervical radicular

compression.

• The test's accuracy was 93%, positive predicative value was 95%, negative predicative value was 93% and the likelihood ratio for a positive result was 51.5.

CLINICAL APPLICATION & CONCLUSIONS

One of the main purposes of this study was to determine the most effective position of the upper extremity and head to aggravate cervical radicular symptoms. The highest values of nerve root displacements in the cadavers were observed with the AECNRST, which involves retroversion of the shoulder while in 80 degrees of abduction, with the examiner exerting a slight push on the posterior aspect of the humeral head (see picture below). The maneuver stretches the brachial plexus, thus exacerbating any radicular symptoms.



The authors suggested that the AECNRST is recommended for daily clinical use in the diagnosis of cervical radicular compression symptoms.

In spite of the authors' recommendation to use the test in clinical practice, this study did not deliver enough data to truly validate the AECNRST; however, it does provide an anatomic rationale for the test as well as evidence on its clinical value. Further research, which is in process by the authors, is still needed. Until then, tests like this remain reasonable inclusions in a comprehensive physical examination.

STUDY METHODS

There were two phases in this study; the first phase was carried out on cadavers and involved an anatomical analysis of actual movements of the cervical nerve roots throughout various arm and head positions. The second phase was a prospective clinical trial involving patients with cervical radiculopathy that correlated to nerve compression as seen on MRI.

The C5, C6 and C7 nerve roots in two male and one female cadavers were exposed via laminectomy

and facetectomy. With the cadaver's head turned toward the contralateral side, each nerve root was tested in the following standardized manner: A suture was used to grasp the nerve root and then the nerve root was cut from the spinal cord. The displacement of the nerve root in mm was measured by a scale that was fixed to the occiput and connected to the suture. The following predefined movements of the ipsilateral upper extremity were then carried out:

- 1. abduction of the shoulder to 100 degrees with the elbow flexed to 130 degrees,
- 2. abduction of the shoulder to 110 degrees with the elbow fully extended with a pronated forearm, and
- 3. abduction and extension of the shoulder, which was termed the abduction extension cervical nerve root stress test (AECNRST).

Flexion and extension of the wrist were also performed in each of the three positions to determine whether it had any effect on root traction.

In the prospective clinical trial phase, 24 patients with MRI confirmed cervical radiculopathy (the cases group) were consecutively assessed via the AECNRST. Another 65 patients that were seen for reasons other than cervical radiculopathy (the control group) were also evaluated by the AECNRST.

The AECNRST was defined as positive if new pain or paresthesia, or exacerbation of preexisting pain or paresthesia along a dermatome was reported by the patient. In order to be considered a true positive, the dermatomal symptoms had to match the level of the MRI identified nerve compression.

Patients were excluded from the study if they had myelopathic symptoms or known shoulder pathologies.

STUDY STRENGTHS/WEAKNESSES

The accuracy values (e.g., sensitivity, specificity, etc.) that were presented and used to quantify the validity of the AECNRST might be inaccurate given that the cases group was comprised of patients that already had dermatome-specific radicular symptoms. The authors suggested that a better research design to assess validity would be a prospective cohort of patients who would undergo blinded AECNRST first, followed by MRI.

Only 3 cadavers were used, but the authors suggested that, since the differences of nerve root displacements were consistent among the cadavers, a larger sample would not likely provide any additional information.

Removing the posterior osseous elements of the involved vertebrae might have altered the amount of nerve displacement that occurred. However, the authors did not investigate it.

The authors did not present information on how their statistical analysis was carried out, thus leaving us with questions about the correctness of the study's findings. However, after checking their calculations using the VassarStats website at http://www.vassarstats.net, they appear to be correct.

Additional References

- 1. Van der Windt D, Simons E, Riphagen I, et al. Physical examination for lumbar radiculopathy due to disc herniation in patients with low-back pain. Cochrane Database Syst Rev 2010; (2): CD007431.
- 2. Rubinstein S, Pool J, van Tulder M, Riphagen I, de Vet H. A systematic review of the diagnostic accuracy of provocative tests of the neck for diagnosing cervical radiculopathy. Eur Spine J 2007; 16(3): 307–319.
- Wainner R, Fritz J, Irrgang J, et al. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. Spine 2003; 28(1): 52– 62.

This review is published with the permission of Research Review Service (www.researchreviewservice.com)