

Review Article

An evidence-based clinical guideline for the diagnosis and treatment of cervical radiculopathy from degenerative disorders

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Abstract

BACKGROUND CONTEXT: The North American Spine Society (NASS) Evidence-Based Clinical Guideline on the Diagnosis and Treatment of Cervical Radiculopathy from Degenerative Disorders provides evidence-based recommendations on key clinical questions concerning the diagnosis and treatment of cervical radiculopathy from degenerative disorders. The guideline addresses these questions based on the highest quality clinical literature available on this subject as of May 2009. The guideline's recommendations assist the practitioner in delivering optimum efficacious treatment of and functional recovery from this common disorder.

PURPOSE: Provide an evidence-based educational tool to assist spine care providers in improving quality and efficiency of care delivered to patients with cervical radiculopathy from degenerative disorders.

STUDY DESIGN: Systematic review and evidence-based clinical guideline.

FDA device/drug status: not applicable.

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Disclaimer: This review article summarizes a published evidence-based guideline. It is a product of the NASS Evidence-Based Guideline Development Committee, approved by the NASS Board of Directors and accepted for publication outside The Spine Journal's peer review process.

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METHODS: This report is from the Cervical Radiculopathy from Degenerative Disorders Work Group of the NASS' Evidence-Based Clinical Guideline Development Committee. The work group consisted of multidisciplinary spine care specialists trained in the principles of evidence-based analysis. Each member of the group formatted a series of clinical questions to be addressed by the group. The final questions agreed on by the group are the subjects of this report. A literature search addressing each question using a specific search protocol was performed on English language references found in MEDLINE, EMBASE (Drugs and Pharmacology), and four additional evidence-based databases. The relevant literature was then independently rated by a minimum of three reviewers using the NASS-adopted standardized levels of evidence. An evidentiary table was created for each of the questions. Final recommendations to answer each clinical question were arrived at via work group discussion, and grades were assigned to the recommendations using standardized grades of recommendation. In the absence of Levels I to IV evidence, work group consensus statements have been developed using a modified nominal group technique, and these statements are clearly identified as such in the guideline.

RESULTS: Eighteen clinical questions were formulated, addressing issues of natural history, diagnosis, and treatment of cervical radiculopathy from degenerative disorders. The answers are summarized in this article. The respective recommendations were graded by the strength of the supporting literature, which was stratified by levels of evidence.

CONCLUSIONS: A clinical guideline for cervical radiculopathy from degenerative disorders has been created using the techniques of evidence-based medicine and best available evidence to aid both practitioners and patients involved with the care of this condition. The entire guideline document, including the evidentiary tables, suggestions for future research, and all references, is available electronically at the NASS Web site (www.spine.org) and will remain updated on a timely schedule. © 2011 Elsevier Inc. All rights reserved.

Keywords:

Diagnosis; Imaging; Treatment; Cervical radiculopathy from degenerative disorders; Clinical practice guideline

Introduction

In an attempt to improve and evaluate the knowledge base concerning the diagnosis and treatment of cervical radiculopathy from degenerative disorders, the Cervical Radiculopathy from Degenerative Disorders Work Group of the North American Spine Society (NASS) Evidence-Based Clinical Guideline Development Committee has developed an evidence-based clinical guideline on the topic. The Institute of Medicine has defined a clinical guideline as “systematically developed statements to assist practitioner and patient decisions about health care for specific clinical situations” [1].

The application of the principles of evidence-based medicine (EBM) to guideline development helps create an explicit linkage between the final recommendations in the guideline and the evidence on which these recommendations are based [2]. When using the principles of EBM, the clinical literature is extensively searched to answer specific questions about a disease state or medical condition. The literature that is identified in the search is then rated as to its scientific merit using levels of evidence, determined by specific rule sets that apply to human and clinical investigations. The specific questions asked are then answered using studies of the highest possible levels of evidence that have been obtained from the searches. As a final step, the answers to the clinical questions are reformulated as recommendations that are assigned grades of

strength related to the soundness of the best evidence available at the time of answering each question. The intent of the grade of recommendation is to indicate the strength of the evidence used by the work group in answering the question asked.

Methods

For this clinical guideline, the guideline development process was broken down into 12 steps. In Step 1, guideline participants, trained in the principles of EBM, submitted a list of clinical questions focused on diagnosis and treatment of cervical radiculopathy from degenerative disorders that the guideline should address. In Step 2, multidisciplinary teams composed of surgical, medical, interventional, and radiological specialists were assigned to groups, each of which was assigned a subset of the questions to be answered. Step 3 consisted of each group identifying appropriate search terms and parameters to direct the literature search according to the NASS-instituted Literature Search Protocol. The literature search was then completed in Step 4 by a medical research librarian according to the NASS Literature Search Protocol and stored in a cross-referencing database for future use or reference. The following electronic databases were searched for English language publications: MEDLINE (PubMed), EMBASE (Drugs and Pharmacology), American College of Physicians Journal

Club, Cochrane Database of Systematic reviews, Database of Abstracts of Reviews of Effectiveness, and Cochrane Central Register of Controlled Trials. Work group members then reviewed all abstracts from the literature search in Step 5. The best research evidence available was identified and used to answer the targeted clinical questions. That is, if adequate Level I, II, or III studies were available to answer a specific question, the work group was not required to review Level IV or V evidence. In Step 6, the members independently developed evidentiary tables summarizing study conclusions, identifying strengths and weaknesses, and assigning levels of evidence. To systematically control for bias, at least three work group members reviewed each article selected and independently assigned a level of evidence per the NASS Levels of Evidence table. The final level of evidence assigned was that agreed on by at least two-thirds of the reviewers.

To formulate evidence-based recommendations and incorporate expert opinion when necessary, work groups participated in Webcasts in Step 7. Expert opinion was incorporated only where Levels I to IV evidence was insufficient, and the work groups deemed a recommendation was warranted. For transparency in the incorporation of consensus, all consensus-based recommendations in this guideline are clearly stated as such. Voting on guideline recommendations was conducted using a modification of the nominal group technique in which each work group member independently and anonymously ranked a recommendation on a scale ranging from 1 (“extremely inappropriate”) to 9 (“extremely appropriate”) [3]. Consensus was obtained when at least 80% of work group members ranked the recommendation as 7, 8, or 9. When the 80% threshold was not attained, up to three rounds of discussion and voting were held to resolve disagreements. If disagreements were not resolved after these rounds, no recommendation was adopted. When the recommendations were established, work group members developed guideline content, referencing the literature that supported the recommendations.

In Step 8, the completed guideline was submitted to the NASS Evidence-Based Guideline Development Committee and the NASS Research Council for review and comment. Revisions to recommendations were considered only when substantiated by a preponderance of appropriate levels of evidence. Once evidence-based revisions were incorporated, the guideline was submitted to the NASS Board of Directors for review and approval in Step 9. In Step 10, the NASS Board-approved guideline was submitted for inclusion in the National Guidelines Clearinghouse.

In Step 11, the recommendations will be submitted to the American Medical Association Physician Consortium for Performance Improvement, a multispecialty collaborative group engaged in the development of evidence-based performance measures. In Step 12, the guideline recommendations will be reviewed every 3 years and the literature base updated by an EBM-trained multidisciplinary team with revisions to the recommendations developed

in the same manner as in the original guideline development.

Results

Definition and natural history

Question 1: What is the best working definition of cervical radiculopathy from degenerative disorders?

Cervical radiculopathy from degenerative disorders can be defined as pain in a radicular pattern in one or both upper extremities related to compression and/or irritation of one or more cervical nerve roots. Frequent signs and symptoms include varying degrees of sensory, motor, and reflex changes as well as dysesthesias and paresthesias related to nerve roots without evidence of spinal cord dysfunction (myelopathy).

Workgroup Consensus Statement.

Question 2: What is the natural history of cervical radiculopathy from degenerative disorders?

To address the natural history of cervical radiculopathy from degenerative disorders, the work group performed a comprehensive literature search and analysis. The group reviewed 31 articles that were selected from a search of MEDLINE (PubMed), Cochrane Register of Controlled Trials, and Web of Science and EMBASE (Drugs and Pharmacology). However, all identified studies failed to meet the guideline’s inclusion criteria because they did not adequately present data about the natural history of cervical radiculopathy. The plurality of studies did not report results of untreated patients, thus limiting conclusions about natural history. This includes works that have been frequently cited as so-called natural history studies but are in fact reports of the results of one or more medical/interventional treatment measures [4–8]. In other investigations, data were reported for untreated and conservatively treated patients together without an analysis specific to the untreated group. Other commonly cited studies did not report subgroup analyses of patients with cervical radiculopathy alone and thereby presented generalized natural history data regarding a heterogeneous cohort of patients with isolated neck pain, cervical radiculopathy, or cervical myelopathy.

Because of the limitations of available literature, the work group was unable to definitively answer the question posed related to the natural history of cervical radiculopathy from degenerative disorders. In lieu of an evidence-based answer, the work group did reach consensus on the following statement addressing natural history.

It is likely that for most patients with cervical radiculopathy from degenerative disorders signs and symptoms will be self-limited and will resolve spontaneously over a variable length of time without specific treatment.

Workgroup Consensus Statement.

Diagnosis and imaging

Question 3: What history and physical examination findings best support a diagnosis of cervical radiculopathy from degenerative disorders?

It is suggested that the diagnosis of cervical radiculopathy be considered in patients with arm pain, neck pain, scapular or periscapular pain, and paresthesias, numbness and sensory changes, weakness, or abnormal deep tendon reflexes in the arm. These are the most common clinical findings seen in patients with cervical radiculopathy [9–13].

Grade of Recommendation: B

It is suggested that the diagnosis of cervical radiculopathy be considered in patients with atypical findings such as deltoid weakness, scapular winging, weakness of the intrinsic muscles of the hand, chest or deep breast pain, and headaches. Atypical symptoms and signs are often present in patients with cervical radiculopathy and can improve with treatment [9,11,14–17].

Grade of Recommendation: B

Provocative tests including the shoulder abduction and Spurling's tests may be considered in evaluating patients with clinical signs and symptoms consistent with the diagnosis of cervical radiculopathy [18–22].

Grade of Recommendation: C

Because dermatomal arm pain alone is not specific in identifying the pathologic level in patients with cervical radiculopathy, further evaluation including CT (computed tomography), CT myelography, or MRI (magnetic resonance imaging) is suggested before surgical decompression [9,13,23].

Grade of Recommendation: B

Question 4: What are the most appropriate diagnostic tests (including imaging and electrodiagnostics), and when are these tests indicated in the evaluation and treatment of cervical radiculopathy from degenerative disorders?

Magnetic resonance imaging is suggested for the confirmation of correlative compressive lesions (disc herniation and spondylosis) in cervical spine patients who have failed a course of conservative therapy and who may be candidates for interventional or surgical treatment [24–28].

Grade of Recommendation: B

In the absence of reliable evidence, it is the work group's opinion that CT may be considered as the initial study to confirm a correlative compressive lesion (disc herniation or spondylosis) in cervical spine patients who have failed a course of conservative therapy, who may be candidates for interventional or surgical treatment, and who have a contraindication to MRI [29].

Work Group Consensus Statement

Computed tomography myelography is suggested for the evaluation of patients with clinical symptoms or signs that are discordant with MRI findings (eg, foraminal compression that may not be identified on MRI). Computed tomography myelography is also suggested in patients who have a contraindication to MRI [24,26–28,30–32].

Grade of Recommendation: B

The evidence is insufficient to make a recommendation for or against the use of electromyography for patients in whom the diagnosis of cervical radiculopathy is unclear after clinical examination and MRI [33,34].

Grade of Recommendation: I (Insufficient Evidence)

Selective nerve root block with specific dosing and technique protocols may be considered in the evaluation of patients with cervical radiculopathy and compressive lesions identified at multiple levels on MRI or CT myelography to discern the symptomatic levels. Selective nerve root block may also be considered to confirm a symptomatic level in patients with discordant clinical symptoms and MRI or CT myelography findings [35,36].

Grade of Recommendation: C

Outcome measures for medical/interventional and surgical treatment

Question 5: What are the most appropriate outcome measures to evaluate the treatment of cervical radiculopathy from degenerative disorders?

The Neck Disability Index, Short Form-36, Short Form-12, and Visual analog scale are recommended outcome measures for assessing treatments of cervical radiculopathy from degenerative disorders [37–49].

Grade of Recommendation: A

The modified Prolo, Patient-Specific Functional Scale, Health Status Questionnaire, Sickness Impact Profile, Modified Million Index, McGill Pain Scores, and modified Oswestry Disability Index are suggested outcome measures for assessing treatment of cervical radiculopathy from degenerative disorders [33,42,48–53].

Grade of Recommendation: B

Medical/interventional treatment

Question 6: What is the role of pharmacologic treatment in the management of cervical radiculopathy from degenerative disorders?

A systematic review of the literature yielded no studies to adequately address the role of pharmacologic treatment in the management of cervical radiculopathy from degenerative disorders.

Question 7: What is the role of physical therapy/exercise in the treatment of cervical radiculopathy from degenerative disorders?

A systematic review of the literature yielded no studies to adequately address the role of physical therapy/exercise in the management of cervical radiculopathy from degenerative disorders.

Emotional and cognitive factors (eg, job dissatisfaction) should be considered when addressing surgical or medical/interventional treatment for patients with cervical radiculopathy from degenerative disorders [54].

Grade of Recommendation: I (Insufficient Evidence)

Question 8: What is the role of manipulation/chiropractics in the treatment of cervical radiculopathy from degenerative disorders?

A systematic review of the literature yielded no studies to adequately address the role of manipulation/chiropractics in the management of cervical radiculopathy from degenerative disorders. The review did identify several case reports and series describing serious vascular and nonvascular complications and adverse outcomes associated with manipulation including radiculopathy, myelopathy, disc herniation, and vertebral artery compression [55–58]. The true incidence of such complications is unknown, and estimates vary widely. Some complications have occurred in patients with previously unrecognized spinal metastatic disease who did not have premanipulation imaging. Most patients with serious complications of manipulation require emergent surgical treatment.

As the efficacy of manipulation in the treatment of cervical radiculopathy from degenerative disorders is unknown, careful consideration should be given to evidence suggesting that manipulation may lead to worsened symptoms or significant complications when considering this therapy. Premanipulation imaging may reduce the risk of complications.

Work Group Consensus Statement

Question 9: What is the role of epidural steroid injections for the treatment of cervical radiculopathy from degenerative disorders?

A systematic review of the literature revealed limited high-quality studies to address this question. There is Level IV data indicating that transforaminal epidural steroid injections may provide relief for 60% of patients, and about 25% of patients referred with clear surgical indications may obtain at least short-term pain relief negating the need for surgery. Interestingly, there is limited Level II evidence that suggests that the addition of steroid to local anesthetic does not improve pain relief in these patients at 3 weeks postinjection. All the studies that qualified as at least Level IV data used transforaminal epidural injections under fluoroscopic or CT guidance as the method of treatment. For this reason, the work group was unable to make recommendations regarding the safety or efficacy of interlaminar

epidural steroid injections for the treatment of cervical radiculopathy.

The literature search yielded a number of publications demonstrating that transforaminal epidural steroid injections are not without risk and the potential complications, including spinal cord injury and death, need to be considered before performing this procedure [59,60].

Transforaminal epidural steroid injections using fluoroscopic or CT guidance may be considered when developing a medical/interventional treatment plan for patients with cervical radiculopathy from degenerative disorders. Due consideration should be given to the potential complications [61–64].

Grade of Recommendation: C

Question 10: What is the role of ancillary treatments such as bracing, traction, electrical stimulation, acupuncture, and transcutaneous electrical nerve stimulation in the treatment of cervical radiculopathy from degenerative disorders?

Ozone injections, cervical halter traction and combinations of medications, physical therapy, injections, and traction have been associated with improvements in patient-reported pain in uncontrolled case series. Such modalities may be considered recognizing that no improvement relative to the natural history of cervical radiculopathy has been demonstrated [7,65,66].

Work Group Consensus Statement

Emotional and cognitive factors (eg, job dissatisfaction) should be considered when addressing surgical or medical/interventional treatment for patients with cervical radiculopathy from degenerative disorders [54].

Grade of Recommendation: I (Insufficient Evidence)

Surgical treatment

Question 11: Does surgical treatment (with or without preoperative medical/interventional treatment) result in better outcomes than medical/interventional treatment for cervical radiculopathy from degenerative disorders?

Surgical intervention is suggested for the rapid relief of symptoms of cervical radiculopathy from degenerative disorders when compared with medical/interventional treatment [67,68].

Grade of Recommendation: B

Emotional and cognitive factors (eg, job dissatisfaction) should be considered when addressing surgical or medical/interventional treatment for patients with cervical radiculopathy from degenerative disorders [54].

Grade of Recommendation: I (Insufficient Evidence)

Question 12: Does anterior cervical decompression with fusion (ACDF) result in better outcomes (clinical or

radiographic) than anterior cervical decompression (ACD) alone?

Both ACD and ACDF are suggested as comparable treatment strategies, producing similar clinical outcomes, in the treatment of single-level cervical radiculopathy from degenerative disorders [48,69–73].

Grade of Recommendation: B

The addition of an interbody graft for fusion is suggested to improve sagittal alignment after ACD [48,69].

Grade of Recommendation: B

Question 13: Does ACDF with instrumentation result in better outcomes (clinical or radiographic) than ACDF without instrumentation?

Both ACDF with and without a plate are suggested as comparable treatment strategies, producing similar clinical outcomes and fusion rates, in the treatment of single-level cervical radiculopathy from degenerative disorders [74–76].

Grade of Recommendation: B

The addition of a cervical plate is suggested to improve sagittal alignment after ACDF [74–76].

Grade of Recommendation: B

Although plate stabilization may be indicated in some patients undergoing multilevel ACDF, there is insufficient evidence that this practice results in significant improvement in clinical outcomes for degenerative cervical radiculopathy.

Work Group Consensus Statement

Question 14: Does anterior surgery result in better outcomes (clinical or radiographic) than posterior surgery in the treatment of cervical radiculopathy from degenerative disorders?

Either ACDF or posterior foraminotomy are suggested for the treatment of single-level degenerative cervical radiculopathy secondary to foraminal soft disc herniation to achieve comparably successful clinical outcomes [73,77,78].

Grade of Recommendation: B

Compared with posterior laminoforaminotomy, anterior cervical discectomy and fusion is suggested for the treatment of single-level degenerative cervical radiculopathy from central and paracentral nerve root compression and spondylotic disease.

Work Group Consensus Statement

Question 15: Does posterior decompression with fusion result in better outcomes (clinical or radiographic) than posterior decompression alone in the treatment of cervical radiculopathy from degenerative disorders?

A systematic review of the literature yielded no studies to adequately compare the outcomes of posterior

decompression with posterior decompression with fusion in the treatment of cervical radiculopathy from degenerative disorders. Most decompression and fusion appears to be indicated for multilevel stenosis resulting in myelopathy or for instability because of trauma, tumor, or inflammatory disease. Because of limited indications and, thus, limited sample size, there is likely little to gain and a low probability of generating meaningful data to compare effects of posterior decompression alone with posterior decompression and fusion for degenerative disease resulting in cervical radiculopathy.

Question 16: Does ACD and reconstruction with total disc replacement result in better outcomes (clinical or radiographic) than ACDF in the treatment of cervical radiculopathy from degenerative disorders?

Anterior cervical decompression with fusion and total disc arthroplasty are suggested as comparable treatments, resulting in similarly successful short-term outcomes, for single-level degenerative cervical radiculopathy [44,79].

Grade of Recommendation: B

Question 17: What is the long-term result (>4 years) of surgical management of cervical radiculopathy from degenerative disorders?

Surgery is an option for the treatment of single-level degenerative radiculopathy to produce and maintain favorable long-term (>4 years) outcomes [73,80–82].

Grade of Recommendation: C

Question 18: How do long-term results of single-level compare with multilevel surgical decompression for cervical radiculopathy from degenerative disorders?

A systematic review of the literature yielded no studies to adequately address the comparison of long-term results of single-level compared with multilevel surgical decompression in the management of cervical radiculopathy from degenerative disorders. After this review, it is clear that most patients with true radiculopathy suffer from one-level and occasionally two-level disease. The incidence of multilevel disease without the additional presence of myelopathy is rare. Thus, there is likely little to gain and a low probability of generating meaningful data to answer this question.

Discussion

This evidence-based clinical guideline for diagnosis and treatment of cervical radiculopathy from degenerative disorders has several functions. It is an educational tool for both clinicians and patients, and as such this particular guideline is intended to facilitate the diagnosis and treatment of cervical radiculopathy from degenerative disorders. This guideline also serves to focus and rate the clinical data on this topic. An evidence-based guideline such as this

allows a physician access to the best and most current evidence and reduces the burden of “keeping up with the literature” that spans innumerable journals from a broad spectrum of disciplines. In addition, this evidence-based clinical guideline has the potential to improve the appropriateness and effectiveness of patient care by basing decisions on the best evidence available. Finally, the creation of this guideline serves to identify knowledge gaps in the clinical literature on the diagnosis and treatment of cervical radiculopathy from degenerative disorders. High-quality clinical guidelines ideally identify and suggest future research topics to improve guideline development, and thus patient care, as detailed in the current guideline. The NASS Web site, www.spine.org, contains the complete clinical guideline summarized in this article, along with extensive descriptive narratives on each topic outlining the evidence and work group rationale for the answers to each question. In addition, more extensive descriptions are provided of the guideline development process used at NASS, along with all of the references used in this guideline and suggestions for future research studies on the diagnosis and treatment of cervical radiculopathy from degenerative disorders. The core clinical guideline on the Web site is intended to be a “living document” with periodic updates of the literature and recommendations.

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