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Review Article

Value of Surgery and Nonsurgical Approaches for Cervical Spondylotic Myelopathy: WFNS Spine Committee Recommendations

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Cervical spondylotic myelopathy (CSM) is a common cause of adult spinal cord dysfunction. Although the therapeutic options for moderate to severe CSM patients have been established well, the existing guidelines for therapeutic decisions in mild cases of CSM are unclear. We present a review of literature on conservative treatment and surgery for CSM and suggest general recommendations applicable in various clinical presentations and in different geographic locations across the globe, with due considerations to available resources and locally prevalent practices.

Keywords: Cervical spondylotic myelopathy, Degenerative cervical myelopathy, Surgical management, Recommendations

INTRODUCTION

Cervical spondylotic myelopathy (CSM) is generally a progressive disease with potentially dangerous consequences. However, the natural history of CSM is unpredictable in a given individual. This uncertainty is particularly a challenge in making right management decisions in persons with mild CSM (modified Japanese Orthopaedic Association [mJOA] score 15–17). There is also a subset of patients with magnetic resonance imaging (MRI) (done for unrelated or trivial reasons) suggesting of cord compression with or without cord signal changes. They may have coexistent radiculopathy. Typically, they present with mild symptoms without gross interference with activities of daily living, such as numbness in limbs, stiffness in lower limbs or urinary urgency. Neurological examination will be either normal or with minor abnormalities such as brisk deep tendon reflexes, extensor plantar response and positive Romberg's sign.

The Spine Committee of the World Federation of Neurosurgical Societies (WFNS) formulated a consensus meeting on the management of CSM to develop recommendations for global applicability during Annual Conference of Neuro Spinal Surgeons Association, India at Nagpur in September 2018. Previously published guidelines[1-3] were reviewed and complemented with review of the literature (PubMed) during the last 10 years to generate consensus recommendations.

MATERIALS AND METHODS

WFNS Spine Committee formulated a group of neuro-spinal surgeons to develop guidelines for treatment of CSM. The goal was to provide clinicians with evidence-based recommendations applicable across the globe for standardized care in patients with CSM. Each prioritized question was discussed using modified Delphi method to establish consensus through voting.

The term degenerative cervical myelopathy (DCM) describes myelopathy resulting from cervical degenerative disc disease, ossification of the posterior longitudinal ligament (OPLL) or a combination of both. However, since it was a common term used for many years, the consensus was to use the term cervical spondylotic myelopathy instead of degenerative cervical myelopathy. OPLL which is commonly associated with cervical spondylotic changes in many Asian countries will not be mentioned separately.

The presenting features of CSM may be any one or a combination of the following 3 features: (1) myelopathy, (2) radiculopathy, (3) cord compression in MRI. A patient with severe cord compression but no signs or symptoms may suddenly worsen after a trivial fall during the period of conservative management or they may develop significant complications if operated upon.

WFNS Spine Committee considered following observations and challenges while formulating recommendations applicable across the globe:

(1) The heterogeneity of population worldwide with differences in knowledge and attitude regarding symptoms and signs of DCM. Cultural and socioeconomic factors have varied influence on patient's perception of disease and expectation on outcome of interventions.
(2) The differences in surgical preferences and practices in various regions.
(3) Variations in reported outcome measures in DCM.

The relevant questions explored are as follows:

(1) When is a surgical treatment recommended for CSM?
(2) When is a conservative (nonsurgical) treatment recommended for CSM?
(3) Is there a role of nonoperative treatment for patients with cord compression in imaging, but no clinical evidence of myelopathy?
(4) What is the best management strategy for mild CSM- presenting with myelopa-thy/radiculopathy/MRI changes?
(5) What is the cost-effectiveness of surgery versus conservative treatment for mild CSM?
(6) Does surgery for mild CSM result in minimally identifiable clinical difference?

Reported outcome themes vary widely as analyzed in systematic review by Davies et al.[4] The themes include function (JOA, mJOA, Nurick score), complications, quality of life (Japanese Orthopedic Association Cervical Myelopathy Evaluation Questionnaire, Short Form 36 Health survey system), pain and imaging (X-ray, MRI). JOA, though widely accepted and incorporated in clinical studies, has practical challenges when applied in different cultures. Applying regional modifications would improve usability of mJOA.

Citations for systematic reviews, meta-analyses, reviews of clinical trials, evidence-based medicine, consensus development conferences, and guidelines were searched in PubMed Clinical Queries for Systematic Reviews with keywords as 'cervical myelopathy.' Reviews on nonoperative and conservative management of DCM were identified and analyzed. Systematic reviews on 'cervical myelopathy' yielded 150 reviews. Six of the 150 systematic reviews were relevant for analyzing the role of nonoperative treatment.[5-9]

RESULTS AND DISCUSSION

Globally, CSM is very common with an estimated incidence of over 50% in population over 40 years of age. According to the Healthcare Cost and Utilization Project National US Inpatient Sample database, 15,000–20,000 patients are hospitalized each year for surgical treatment of CSM at an annual cost of several hundred million dollars. Passias et al.[10] in their analysis observed that there was increased number of surgeries in the last 10 years. While anterior cervical discectomy and fusion increased by double fold, posterior alone by 4 fold, combined approach increased by 7 fold, thus increasing the economic burden significantly. Unfortunately, it was also noticed that the overall morbidity also increased by 33.82%. The triggering costs associated with surgery and its complications represent an economical burden, especially in developing countries. Therefore, the recommendations with a global outreach need to be cautious and should consider evidence-based conclusions as well as its applicability according to local resources.

The Cochrane Database of Systematic Reviews by Nikolaidis et al.[1] explored whether surgical treatment of cervical myelopathy was associated with improved outcome compared to conservative treatment. Original review found only one study suitable for analysis after screening over 13,000 citations from 1966 to 1998. Further revision of the review in 2010 added updated information of the same study by Kadanka et al.[11] in 2002. The authors noted that mJOA and gait scores were better among conservatively managed patients at 6 months, but by 2 years no differences were noted between the 2 groups in terms of functional disability. Though this study is very well designed, it lacks statistical power precluding any generalized guidelines.

Rhee et al.[2] reviewed the role of nonoperative management of cervical myelopathy through a systematic search in PubMed

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and the Cochrane Collaboration Library for articles published between 1956 and 2012. They included all articles that compared nonoperative treatments or observation with surgery for patients with cervical myelopathy or asymptomatic cervical cord compression to determine their effects on clinical outcomes. Nonoperative treatments included physical therapy, medications, injections, orthoses, and traction. They noted a paucity of evidence regarding effectiveness of nonoperative treatment of cervical myelopathy. They suggested that, given the lack of evidence and considering the generally progressive nature of cervical myelopathy, nonoperative treatment cannot be routinely recommended.

A wide range (20%–60%) of patients will deteriorate neurologically without surgical intervention with nonoperative treatment (quality of evidence: moderate).[12]

In the largest prospective evaluation and the first global assessment of surgical outcomes in patients with CSM, Fehlings et al.[13] noted that surgery results in improved clinical outcomes, functional status and quality of life as evaluated by the modified Japanese Orthopedic Association Scale. Four hundred seventy-nine symptomatic patients with image evidence of CSM were evaluated in this prospective, multicenter study from 16 global sites. The improvements after surgical decompression were sustained between follow-up examinations at 1 year and 2 years after surgery. The study is particularly relevant in formulating a global consensus statement as there were significant regional differences in demographics, disease presentation and surgical preferences between various centers.

Cervical Spine Research Society (CSRS) developed with the help of a broad range of specialists analyzed systemic reviews in literature and with their clinical expertise formulated a multidisciplinary guideline and recommendations in the management of CSM. These guidelines are endorsed by AOSpine North America. The details of the recommendations are summarized

Table 1. Comparison of AOSpine North America and CSRS guidelines and WFNS Spine Committee Recommendations

Grade	AOSpine North America and CSRS guidelines (2017)	WFNS Spine Committee Recommendations (2019)
Moderate to severe CSM (mJOA score < 15)	Recommend surgical intervention *Quality of evidence: moderate* *Strength of recommendation: strong*	Surgical intervention is recommended.
Mild CSM (mJOA score 15–17)	Suggest offering surgical intervention or a supervised trial of structured rehabilitation for patients with mild DCM. If initial nonoperative management is pursued, we recommend operative intervention if there is neurological deterioration and suggest operative intervention if the patient fails to improve. *Quality of evidence: very low to low* *Strength of recommendation: weak*	Suggest offering surgical intervention or rehabilitation for patients with mild CSM. If at the beginning nonoperative management was followed, we recommend operative intervention when rapid progression of symptoms appear. Nonoperative management may be considered for slowly progressive disease.
Nonmyelopathic patients with evidence of cervical cord compression without signs or symptoms of radiculopathy	Suggest not offering prophylactic surgery. Suggest that these patients be counselled as to potential risks of progression, educated about relevant signs and symptoms of myelopathy, and be followed clinically. *Quality of evidence: no identified evidence; based on clinical expert opinion* *Strength of recommendation: weak*	Should not be offered a prophylactic surgery. These patients should be counselled about the potential risk of worsening, educated about the signs and symptoms of progression and followed up regularly. An informed consent should be obtained about neurological deficits that may follow trivial injury.
Nonmyelopathic patients with cord compression and clinical evidence of radiculopathy with or without electrophysiological confirmation	Patients are at a higher risk of developing myelopathy and should be counselled about this risk. Suggest offering either surgical intervention or nonoperative treatment consisting of close serial follow-up or a supervised trial of structured rehabilitation. In the event of myelopathic development, the patient should be managed according to the recommendations above. *Quality of evidence: low* *Strength of recommendation: weak*	Patients are potential candidates who may deteriorate thus carrying high risk and hence need to be counselled about it. These patients are recommended to undergo surgery or close observation with rehabilitation if the patient refuses to undergo surgery. In the event of developing myelopathic signs they are advised to go for surgery at the earliest. An informed consent should be obtained about neurological deficits that may follow trivial injury.

CSRS, Cervical Spine Research Society; WFNS, World Federation of Neurosurgical Societies; DCM, degenerative cervical myelopathy; CSM, cervical spondylotic myelopathy; mJOA, modified Japanese Orthopaedic Association.

in literature.[3]

These recommendations by the multidisciplinary guideline development group were noted to be relevant, credible and of good quality. It is recent enough (2017) and it has used the Grading of Recommendation, Assessment, Development and Evaluation (GRADE) approach. Based on these factors, it was decided to consider it as source guideline recommendation. While the recommendations of AOSpine North America and CSRS guided by Fehlings et al.[3] were well done and accepted worldwide, a few additional points were added to meet global requirements. While quality of evidence and strength of recommendation was clear in finalizing the recommendations in moderate and severe CSM, they are not convincing in other grades in mild group and in cases with radiological evidence of cord compression with and without radiculopathy. We followed GRADE-ADOLOPMENT of guideline recommendations method[14] to develop adapted recommendations. Prioritized questions matched with those of source guideline recommendations. Each prioritized question was discussed using modified Delphi method to establish consensus through voting.

WFNS SPINE COMMITTEE RECOMMENDATIONS

WFNS Spine Committee endorses the guidelines of Fehlings et al.[3] The new and adapted WFNS Spine Committee Recommendations after consensus are summarized below (Table 1):

(1) For patients with moderate and severe CSM surgical intervention is recommended. We recommend using mJOA or its regional modifications to classify CSM as severe, moderate or mild.

(2) We suggest offering surgical intervention or rehabilitation for patients with mild CSM (mJOA score 15–17). If at the beginning nonoperative management was followed, we recommend operative intervention when rapid progression of symptoms appear. Nonoperative management may be considered for slowly progressive disease.

(3) Nonmyelopathic patients with radiologic evidence of cord compression but without signs and symptoms of radiculopathy should not be offered a prophylactic surgery. These patients should be counselled about the potential risk of worsening, educated about the signs and symptoms of progression and followed up clinically regularly. An informed consent should be obtained about neurological deficits that may follow trivial injury.

(4) Nonmyelopathic patients with radiologic evidence of cord compression and with clinical evidence of radiculopathy are potential candidates who may deteriorate thus carrying high risk and hence need to be counselled about it. These patients are recommended to undergo surgery or close observation with rehabilitation if the patient refuses to undergo surgery. In the event of developing myelopathic signs they are advised to go for surgery at the earliest. An informed consent should be obtained about neurological deficits that may follow trivial injury.

(5) There is a consistent lack of evidence regarding the value of nonoperative treatment of cervical myelopathy in the literature. Hence nonoperative treatment may not be the final decision in most cases.

(6) Predicting factors that indicate a possible deterioration during nonoperative management are: circumferential cord compression in axial MRI, reduced diameter of cerebrospinal fluid space, hypermobility of spinal segment, angular edged deformity, instability, greater angle of vertebral slip, lower segmental lordotic angle, and presence of OPLL.[15,16]

(7) Important predictors of myelopathy development include the presence of symptomatic radiculopathy, prolonged motor evoked potentials and somatosensory evoked potentials and electromyography signs of anterior horn cell lesions (low evidence).[17]

(8) Duration of symptoms has a greater impact on outcomes. Substantial delay in surgical management leads to suboptimal outcome.[18,19] In other words, patients are likely to achieve a better result after surgery if they have a shorter duration of symptoms (low evidence).

(9) As there is still clinical equipoise between surgery and conservative treatment in mild CSM, the WFNS Spine Committee strongly encourages randomized controlled trials comparing surgical versus nonsurgical interventions in mild CSM.[20] There is also a need to analyze the cost-effectiveness, standardized methodology and costs of long-term follow-up in mild CSM.[21]

CONFLICT OF INTEREST

The authors have nothing to disclose.

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