Session Number: C

Session Title: Cervical Myelopathy: Where are we now?

Session Type: Symposium

Location: Room 2

Date & Time: 03-10-2025, 11:00 am - 12:30 pm

INSTRUCTORS WHO CONTRIBUTED TO THIS HANDOUT: as of 2/20/2025

Moderator(s):

Ilyas Aleem, MD, MS, FAAOS, FRCSC

Faculty:

Charles H. Crawford, MD, FAAOS
Timothy A. Moore, MD, FAAOS
Lee A. Tan, MD
Elizabeth M. Yu, MD, FAAOS

CSRS ICL 2025

TITLE – Update on the Diagnosis and Treatment of Degenerative Cervical Myelopathy

INTRODUCTION

This ICL presented by the Cervical Spine Research Society (CSRS) will provide updates on the classification of cervical myelopathy, surgical treatment options as well as clinical pearls on how to avoid complications.

Name of Faculty	**Title**	**Time**
Moderators: Ilyas Aleem, MD & Elizabeth Yu, MD	Introduction	5 minutes
Charles Crawford III, MD	Classification of Myelopathy	20 minutes
Lee Tan, MD	Surgical Approaches in DCM	20 minutes
Tim Moore, MD	Tips and tricks to stay out of trouble	20 minutes

LEARNING OBJECTIVES

Objective 1: To provide an update on the diagnosis and treatment of cervical myelopathy commonly encountered by practicing spine surgeons.

Objective 2: To understand the approach to surgical decision making in the treatment of cervical myelopathy.

Objective 3: To provide clinical pearls of avoiding surgical complications in the treatment of cervical myelopathy.

Classification of Degenerative Cervical Myelopathy (DCM)

Charles H Crawford III, MD, FAAOS

Professor, Department of Orthopedic Surgery, University of Louisville School of Medicine
Adult and Pediatric Spine Surgeon, Norton Leatherman Spine Center, Louisville, KY, USA

I. Past

Nurick[1] (based on gait and ambulatory function) *Grade 0-VI[4]

- Grade 0 = normal *(nerve root signs/symptoms)
- Grade 1 = Signs of cord compression; normal gait
- Grade 2 = Gait difficulties but full employed
- Grade 3 = Gait difficulties prevent employment, walks unassisted
- Grade 4 = Unable to walk without assistance
- Grade 5 = Wheelchair or bedbound

Ranawat (Rheumatoid Myelopathy)

- Class I = Pain, no neurologic deficit
- Class II – Subjective weakness, hyperreflexia, dysthesias
- Class IIIA = Objective weakness, long tract signs, ambulatory
- Class IIIB = Objective weakness, long tract signs, non-ambulatory

II. Present (Current "State of the Art")[2-5]

Modified Japanese Orthopaedic Association (mJOA)

Motor dysfunction score of the upper extremity

- 0—Inability to move hands
- 1—Inability to eat w/a spoon, but able to move hands
- 2—Inability to button shirt, but able to eat w/a spoon
- 3—Able to button shirt w/great difficulty
- 4—Able to button shirt w/slight difficulty
- 5—No dysfunction

Motor dysfunction score of the lower extremity

- 0—Complete loss of motor and sensory function
- 1—Sensory preservation w/o ability to move legs
- 2—Able to move legs, but unable to walk
- 3—Able to walk on flat floor w/a walking aid (cane or crutch)
- 4—Able to walk up and/or down stairs w/hand rail
- 5—Moderate-to-significant lack of stability, but able to walk up and/or down stairs w/o hand rail
- 6—Mild lack of stability but walks w/smooth reciprocation unaided/
- 7—No dysfunction

Sensory dysfunction score of the upper extremities

- 0—Complete loss of hand sensation
- 1—Severe sensory loss or pain

2—Mild sensory loss
3—No sensory loss

Sphincter dysfunction score
0—Inability to micturate voluntarily
1—Marked difficulty w/micturition
2—Mild to moderate difficulty w/micturition
3—Normal micturition

Total Score
Normal = 18
Mild = 15 to 17
Moderate = 12 to 14
Severe = 0 to 11

Development of Clinical Practice Guidelines (CPG) based on above.[5]

III. Future?

1. Limitations of PROs. More Objective Data? Easier to obtain?
   i. Imaging (MRI etc…)
   ii. Wearable Sensor Technology

IV. References

1. Nurick S. The natural history and the results of surgical treatment of the spinal cord disorder associated with cervical spondylosis. Brain: J Neurol 1972 95(1):101–108

2. Benzel EC, Lancon J, Kesterson L, Hadden T. Cervical laminectomy and dentate ligament section for cervical spondylotic myelopathy. J Spinal Disord. 1991 Sep;4(3):286-95.

3. Kato S, Oshima Y, Oka H, Chikuda H, Takeshita Y, Miyoshi K, Kawamura N, Masuda K, Kunogi J, Okazaki R, Azuma S, Hara N, Tanaka S, Takeshita K. Comparison of the Japanese Orthopaedic Association (JOA) score and modified JOA (mJOA) score for the assessment of cervical myelopathy: a multicenter observational study. PLoS One. 2015 Apr 2;10(4):e0123022.

4. Tetreault, L., Kopjar, B., Nouri, A. *et al.* The modified Japanese Orthopaedic Association scale: establishing criteria for mild, moderate and severe impairment in patients with degenerative cervical myelopathy. *Eur Spine J* **26**, 78–84 (2017).

5. Fehlings MG, Tetreault LA, Riew KD, Middleton JW, Aarabi B, Arnold PM, Brodke DS, Burns AS, Carette S, Chen R, Chiba K, Dettori JR, Furlan JC, Harrop JS, Holly LT, Kalsi-Ryan S, Kotter M, Kwon BK, Martin AR, Milligan J, Nakashima H, Nagoshi N, Rhee J, Singh A, Skelly AC, Sodhi S, Wilson JR, Yee A, Wang JC. A Clinical Practice Guideline for the Management of Patients With Degenerative Cervical Myelopathy: Recommendations for Patients With Mild, Moderate, and Severe Disease and Nonmyelopathic Patients With Evidence of Cord Compression. Global Spine J. 2017 Sep;7(3 Suppl):70S-83S.

Surgical Approaches in Degenerative Cervical Myelopathy

Lee A. Tan, MD
Associate Professor, Department of Neurological Surgery, UCSF
Co-director of UCSF Spine Center, San Francisco, CA, USA

I. DCM Definition
- Proposed by Nouri & Fehlings et al[1] in 2015
- Overarching term that describes various degenerative conditions of the cervical spine that cause myelopathy
- Includes conditions such as CSM, OPLL, OYL, Cervical DDD

II. Pathophysiology - Spinal cord dysfunction[2] may be due to:
- Static cord compression (disc herniations, OPLL, OYL)
- Dynamic cord compression (spondylolisthesis, C1-2 instability, etc)
- Increased cord tension from cervical malalignment (cord stretched in kyphosis)

III. Surgical approaches and techniques
- Anterior – Arthroplasty, ACDF, corpectomy, anterior osteotomy with uncinectomy, vertebral body sliding osteotomy (VBSO)
- Posterior – Laminoplasty[3], Lami/fusion, Posterior column osteotomy, cervical & upper thoracic PSO
- Combined approach – A/P, P/A, APA, PAP

IV. Factors influencing choice of surgical approaches
- Location of neural compression
- # of Levels of compression
- Flexibility of the spine
- K-line
- Surgeon preference and expertise

V. Case examples

VI. References

1. Nouri A, Tetreault L, Singh A, Karadimas SK, Fehlings MG. Degenerative Cervical Myelopathy: Epidemiology, Genetics, and Pathogenesis. Spine (Phila Pa 1976). 2015 Jun 15;40(12):E675-93. doi: 10.1097/BRS.0000000000000913. PMID: 25839387.
2. Kato S, Fehlings M. Degenerative cervical myelopathy. Curr Rev Musculoskelet Med. 2016 Sep;9(3):263-71. doi: 10.1007/s12178-016-9348-5. PMID: 27250040; PMCID: PMC4958380.
3. Ghogawala Z, Terrin N, Dunbar MR, Breeze JL, Freund KM, Kanter AS, Mummaneni PV, Bisson EF, Barker FG 2nd, Schwartz JS, Harrop JS, Magge SN, Heary RF, Fehlings MG, Albert TJ, Arnold PM, Riew KD, Steinmetz MP, Wang MC, Whitmore RG, Heller JG, Benzel EC. Effect of Ventral vs Dorsal Spinal Surgery on Patient-Reported Physical Functioning in Patients With Cervical Spondylotic Myelopathy: A Randomized Clinical Trial. JAMA. 2021 Mar 9;325(10):942-951. doi: 10.1001/jama.2021.1233. PMID: 33687463; PMCID: PMC7944378.

Cervical Myelopathy: Tips and Tricks to Stay Out of Trouble Symposium AAOS 2025

Tim Moore, MD FAAOS
Professor, Department of Orthopaedic Surgery
CWRU School of Medicine
MetroHealth Medical Center
Clevleand, Ohio

I. Preoperative
- a. Questionnaire
  - i. Clumsiness in hands/gait
  - ii. Bowel/bladder symptoms
  - iii. Apprehension/anxiety with rapid head mvmts
- b. Physical exam
  - i. Appearance
    1. Early appointments
    2. Unshaven
    3. Polo type shirts
    4. Velcro, slip on shoes
  - ii. Rising from seated position
  - iii. Gait
  - iv. Signs
- c. Mimickers
  - i. CTS
  - ii. Adhesive capsulitis
    1. Thumbs up back
- d. Make Diagnosis

II. Perioperative
- a. Patient buy in
  - i. "BLO" bring a loved one
- b. Offering surgical intervention
  - i. Signs vs Symptoms
  - ii. Patient decision
  - iii. Avoid "Need to have surgery"
- c. Appropriate investigations
  - i. MRI – tells you where
  - ii. CT – tells you how
  - iii. CTA – vertebral artery course
- d. Informed consent
- e. Day of surgery
  - i. Anesthesia, nursing

ii. Meet with patient and family
iii. Regular bowel habits

III. Surgery
a. Control your OR
i. Be there for intubation
ii. MAP
iii. Spinal cord monitoring?
b. Choose procedure that's best in your hands
i. Know your complication profile
ii. Meticulous surgical technique
1. Bovie electrocautery
2. Frequent irrigation
3. Instrument contamination
4. Ligamentum nuchae closure
iii. Laminoplasty
c. ERAS

IV. Postoperative
a. Generalities and Expectations
i. Stop progression of myelopathy symptoms
ii. Smoker with signal change in cord
iii. Not predictable for relief of neck pain
iv. 2 week, 3 month, 6 month, 1 year, 2 year postop appointments
b. Home Instructions
i. Pain control
ii. No intentional chin to chest for 6 weeks

References:

1. Clarke E, Robinson PK. Cervical myelopathy: a complication of cervical spondylosis. Brain. 1956;79(3):483-510.

2. Fehlings MG, Tetreault LA, Riew KD, Middleton JW, Aarabi B, Arnold PM, et al. A Clinical Practice Guideline for the Management of Patients With Degenerative Cervical Myelopathy: Recommendations for Patients With Mild, Moderate, and Severe Disease and Nonmyelopathic Patients With Evidence of Cord Compression. Global spine journal. 2017;7(3 Suppl):70s-83s.

3. Kouri A, Tanios M, Herron JS, Cooper M, Khan M. Mimickers of Cervical Spondylotic Myelopathy. JBJS Rev. 2018;6(10):e9.

4.. Mathkour M, Werner C, Riffle J, Scullen T, Dallapiazza RF, Dumont A, et al. Reperfusion "White Cord" Syndrome in Cervical Spondylotic Myelopathy: Does Mean Arterial Pressure Goal Make a Difference? Additional Case and Literature Review. World Neurosurg. 2020;137:194-9.

5. Robba C, Qeva E, Borsellino B, Aloisio S, Tosti G, Bilotta F. Effects of propofol or sevoflurane anesthesia induction on hemodynamics in patients undergoing fiberoptic intubation for cervical spine surgery: A randomized, controlled, clinical trial. J Anaesthesiol Clin Pharmacol. 2017;33(2):215-20.

6. Witiw CD, Mathieu F, Nouri A, Fehlings MG. Clinico-Radiographic Discordance: An Evidence-Based Commentary on the Management of Degenerative Cervical Spinal Cord Compression in the Absence of Symptoms or With Only Mild Symptoms of Myelopathy. Global spine journal. 2018;8(5):527-34.