CERVICAL MYELOPATHY
Outcome Measures in CSM

Ph. Bancel
DEFINITION BY THE AGENCY FOR HEALTH CARE RESEARCH AND QUALITY

An outcome measure is defined as: « a health state of a patient resulting from health care »
The scales used in Medicine are means to assess and compare different clinical parameters. The result obtained is frequently expressed by a numerical value.

Medical Scales must be validated, reliable, responsive.
Test assessing the gait and the grip
Walking and step test

- Crockard walking test (30 meters: time and step number)

Quantitative assessment of cervical spondylotic myelopathy by a single walking test
Anoushka S., Crockard A. The Lancet 354 Jul, 1999: 370-73

Use of Walking data in assessing operative results for cervical spondylotic myelopathy: long term follow-up and comparison with controls
Singh A, Choi D, Crockard A. Spine 2009 May 20;34(12): 1296-300

- « Ten Second Step » as a new quantifiable parameter of cervical myelopathy
Yukawa, Yasutsugu MD; Kato, Fumihiko MD; Ito, Keigo MD; Horie, Yumiko MD; Nakashima, Hiroaki MD; Masaaki, Machino MD; Ito, Zen-ya MD; Wakao, Norimitsu MD. Spine Volume 34, Number 1, pp 82–86

Mihara, Hisanori MD; Kondo, Soichi MD; Murata, Atsushi MD; Ishida, Koh MD; Niimura, Takanori MD; Hachiya, Masashi MD. Spine Volume 35, Number 1, pp 32–35
### Nurick’s Classification system for myelopathy on the basis of gait abnormalities

<table>
<thead>
<tr>
<th>Grade</th>
<th>Root signs</th>
<th>Cord involvement</th>
<th>gait</th>
<th>employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 0</td>
<td>Yes</td>
<td>no</td>
<td>Normal</td>
<td>Possible</td>
</tr>
<tr>
<td>Grade I</td>
<td>Yes</td>
<td>Yes</td>
<td>Normal</td>
<td>Possible</td>
</tr>
<tr>
<td>Grade II</td>
<td>Yes</td>
<td>Yes</td>
<td>Mild abnormality</td>
<td>Possible</td>
</tr>
<tr>
<td>Grade III</td>
<td>Yes</td>
<td>Yes</td>
<td>Severe abnormality</td>
<td>Impossible</td>
</tr>
<tr>
<td>Grade IV</td>
<td>Yes</td>
<td>Yes</td>
<td>Only with assistance</td>
<td>impossible</td>
</tr>
</tbody>
</table>

*Nurick S. The pathogenesis of spinal cord disorder associated with cervical spondylosis. Brain 1972;95:87-100*
Hand Test

• Grip and release, deltoid muscle weakness and grasping power quantitative assessment of cervical myelopathy by hand function test

  *Fumikate N. and Al Poster 42  CSRS-2010 (Charlotte, North Carolina)*

• The simple test for prediction of surgical outcome in patients with cervical spondylotic myelopathy

  *Yamada H and Al .  Poster 45 CSRS-2010 (Charlotte, North Carolina)*

• Pascal- Mousselard test: 9 sticks

  *(Boni Award CSRS-ES Rome)*

• Finger motion analysis of patients with cervical myelopathy

  *Sakai N.  Spine 2005 Dec 15;30(24):2777-82*
Outcome measures
Clinical scores
### Upper Extremity Function
0. Impossible to eat with chopsticks or spoon
1. Possible to eat with spoon, but not with chopsticks
2. Possible to eat with chopsticks, but inadequately
3. Possible to eat with chopsticks, but awkwardly
4. Normal

### Lower Extremity Function
0. Impossible to walk
1. Need cane or aid on flat ground
2. Need care or aid for stairs
3. Possible to walk without cane or aid, but slowly
4. Normal

### Sensory Disturbances
- **A. Upper Extremity**
  0. Apparent sensory loss
  1. Minimal sensory loss
  2. Normal

- **B. Lower Extremity**
  0. Apparent sensory loss
  1. Minimal sensory loss
  2. Normal

- **C. Trunk**
  0. Apparent sensory loss
  1. Minimal sensory loss
  2. Normal

### Bladder Function
- **0. Complete Retention**
- **1. Severe Disturbance**
  - Inadequate evacuation of the bladder
  - Straining
  - Dribbling of urine
- **2. Mild Disturbance**
  - Urinary frequency
  - Urinary hesitancy
- **3. Normal**

---


**Total 17**
Modified Japanese Orthopeadic Association Scale

Benzel’s modified Japanese Orthopeadic Association scale: An objective assessment scale quantitating the severity of the spondylotic myelopathy. 


### I Motor Dysfunction score of upper extremities
- **Inability to move hands** 0
- **Inability to eat with spoon but able to move hands** 1
- **Inability to button shirt but able to eat with spoon** 2
- **Able to button shirt with great difficulty** 3
- **Able to button shirt with slight difficulty** 4
- **No dysfunction** 5

### II Motor dysfunction of the lower extremities
- **Complete loss of motor and sensory function** 0
- **Sensory preservation without ability to move leg** 1
- **Able to move legs but unable to walk** 2
- **Able to walk on a flat floor with a walking aid (i.e cane or crutch)** 3
- **Able to walk up and/or down stairs with hand rail** 4
- **Moderate to significant lack of stability but able to walk up and/or down stairs without hand rail** 5
- **Mild lack of stability but walk unaided with smooth reciprocation** 6
- **No dysfunction** 7

### III sensation
- **Complete loss of hand sensation** 0
- **Severe sensory loss or pain** 1
- **Mild sensory loss** 2
- **No sensory loss** 3

### IV Sphincter dysfunction score
- **Instability to micturate voluntarily** 0
- **Marked difficulty with micturation** 1
- **Mild to moderate difficulty with micturation** 2
- **Normal micturation** 3

**Total 18**
1. Upper motor neuron function (gait)
   Unable to walk, wheelchair  1
   Walking on flat ground only with cane or aid  2
   Climbing stairs only with aid  3
   Gait clumsy, but no aid necessary  4
   Normal walking and climbing stairs  5

2. Upper motor neuron function (bladder and bowel function)
   Retention, no control over bladder and/or bowel function  1
   Inadequate micturition and urinary frequency  2
   Normal bladder and bowel function  3

3. Lower motor neuron function (hand function)
   Hand writing and eating with knife and fork impossible  1
   Hand writing and eating with knife and fork impaired  2
   Hand writing tying shoe laces or a tie clumsy  3
   Normal handwriting  4

4. Posterior column function (proprioception and coordination)
   Getting dressed only with aid  1
   Getting dressed clumsy and slowly  2
   Getting dressed normally  3

5. Posterior cervical roots (paresthesia and dysesthesia)
   Disabling sensations disturbing all daily activities  1
   Tolerable sensation  2
   No paresthesia or dysesthesia  3

**TOTAL : 18**
Myelopathy Disability Index

Structure / Content: There are 10 questions. Each question is scored 0 thru 3:
- Without ANY difficulty = 0 point
- With SOME difficulty = 1 point
- With MUCH difficulty = 2 points
- Unable to do = 3 points

PLEASE TICK THE ONE IN RESPONSE WHICH BEST DESCRIBES YOUR USUAL ABILITIES OVER THE PAST WEEK

Rising are you able to:
1. Stand up from an armless straight chair?
2. Get in and out of bed?

Eating are you able to:
3. Cut your meat?
4. Lift a full cup or glass to your mouth?

Walking are you able to:
5. Walk outdoors on flat ground?
6. Climb up five steps?

Hygiene are you able to:
7. Wash and dry your entire body?
8. Get on and off the toilet?

Grip are you able to:
9. Open jars which have previously been opened?

Activities are you able to:
10. Get in and out of car?

Scoring Method
Total score = Range 0-30. The final score is expressed as a percentage.
Quality of life score
NECK PAIN DISABILITY INDEX QUESTIONNARY : NDI
This questionnary assesses the neck pain which affects everyday patients activities

1. Pain Intensity
   - A I have no pain at the moment.
   - B The pain is very mild at the moment.
   - C The pain is moderate at the moment.
   - D The pain is fairly severe at the moment.
   - E The pain is very severe at the moment.
   - F The pain is the worst imaginable at the moment.

2. Personal care (washing, dressing...)

3. Lifting

4. Reading

5. Headaches

6. Concentration

7. Work

8. Driving

9. Sleeping

10. Recreation

NDI has been developed on 1989 by Howard Vernon.

It is a modification of the Oswestry Low Back Pain Disability Index published by J. Fairbank on 1980 (with the agreement of the author)

10 items : ranging from 0 to 5.

This index has been evaluated and is correlated to the SF36
The SF-36 is a multiple-purpose, short form health survey with only 36 questions.

The SF-36 consists of 8 subscales:

7. Social Functioning (SF), 8. Mental Health (MH)

Each subscale are averaged to yield a score of 0 to 100.

A score closer to 0 represents greater disability.

3 scales (PF, RP, BP) correlate most highly with the physical component (PCS)
3 scales (MH, RE, SF) correlate most highly with the mental component (MCS).

3 of the scales (VT, GH, and SF) have noteworthy correlation with both components.
In 1996, version 2.0 of the SF-36 (SF-36v2) was introduced, to correct deficiencies identified in the original version.

The SF-32 improvements include:

- Improvements in instructions and questionnaire items to shorten and simplify the wording and make it more familiar and less ambiguous.
- An improvement layout for questions and answers in the self-administered forms that makes it easier to read and complete, and that reduces missing responses.
- Greater comparability with translations and cultural adaptations widely used in the US and other countries.
- Five level response choices in place of dichotomous response choices for seven items in the two role functioning scales.
- Five level (in place of six levels) response categories to simplify items in the Mental Health (MH) and Vitality (VT) scales.
SF-12
12 question drawn from the SF-36

It is an abbreviated version of the SF-36
The SF-12 used only 12 questions drawn from the SF-36

Quality of life assessment using the Short Form -12 (SF-12) questionnaire in patients with cervical spondylotic myelopathy
Singh A, Gnanalingham K, Casey A, Crockard A.
Spine 31-6, 2006: 639-643
Surgical treatment assessment using the Japanese Orthopedic Association Cervical Myelopathy Evaluation Questionnaire in patients with cervical myelopathy

A new Outcome Measure for Cervical Myelopathy

Nikaido T. and Al.

Spine. 14;23:2568-2572
Critical review
Ancillary outcome measures for assessment of individuals with cervical spondylotic myelopathy
Kalsi-Ryan S and al. Spine .38;225:S11-S122
<table>
<thead>
<tr>
<th>instrument</th>
<th>validity</th>
<th>reliability</th>
<th>responsiveness</th>
<th>study</th>
</tr>
</thead>
<tbody>
<tr>
<td>MJOA</td>
<td>No available</td>
<td>yes</td>
<td>yes</td>
<td>1</td>
</tr>
<tr>
<td>Nurick</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>1</td>
</tr>
<tr>
<td>MDI</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>2</td>
</tr>
<tr>
<td>NDI</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>No in a CSM population</td>
</tr>
<tr>
<td>EMS</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>1</td>
</tr>
<tr>
<td>SF36</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>6</td>
</tr>
<tr>
<td>VAS</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
<td>Not in CSM population</td>
</tr>
</tbody>
</table>

Ancillary outcome measures for assessment of individuals with cervical spondylotic myelopathy
Kalsi-Ryan S and al. Spine 38;225:S11-S122
Efficacy and safety of surgical decompression in patients with cervical spondylotic myelopathy.

Result of the Aospine North America prospective multicentric study

M. Fehlings and Al.

*J Bone Joint Surg Am.*

2013;95:1651-1658

- mJOA
- Nurick
- NDI
- SF-36v2
Out come measures used by the board of CSRS-ES

- J. Casamitjana : Spain
- A. Jackowski : Great Britain
- R. Bartels : Netherlands
- C. Vieggeert-Lankamp : Net
- C. Villas : Spain
- B. Zoega : Iceland
- H. Koller : Germany
- Y. Robinson : Sweden
- C. Olerud : Sweden
- B. Lind : Sweden
- P. Bancel : France

- mJOA
- EMS, mJOA
- mJOA
- mJOA, EMS, Cooper
- JOA
- mJOA
- mJOA, EMS, WT, Elec
- mJOA
- mJOA
- mJOA
- mJOA
CONCLUSION

mJOA Nurick MDI NDI 30MWT

N-A

mJOA EMS 30MWT

Europe

JOA JOACMEQ Gait Test Grasping Test

Japan
CONCLUSION

• There does not exist a single or composite of outcome instruments that measures myelopathy imperment.
• It is the reason different scales may be recomended:
  1. A clinical scale as mJOA or EMS
  2. Quality of life score as SF36-v2 or SF-12
  3. Gait test: 30MWT
  4. Grip test:
     As 9 sticks of Pascal -Mousselard
• However:
  1. No outcome measures assess clearly « mild » CSM
  2. No outcome measures bring prognosis.
And join us for
The CSRS-ES
Instructional Course
( Barcelona March )
31th Annual Meeting
London