

Original article

Japanese Orthopaedic Association Cervical Myelopathy Evaluation Questionnaire: Part 3. Determination of reliability

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Abstract

Background. The manner of measuring the outcome of cervical myelopathy must be patient-oriented and have sufficient reliability and validity. The current Japanese Orthopaedic Association (JOA) scoring system for cervical myelopathy is widely used but has not met this requirement. The first- and second-round surveys established 24 items for inclusion on a new questionnaire for cervical myelopathy. The purpose of this study (the third-round survey A) was to confirm the reproducibility of patient responses to the selected questions.

Methods. A total of 201 patients with cervical myelopathy and with no change of symptoms between the two interviews were included. Each patient was interviewed twice using the same questionnaire at an interval of 4 weeks. The reliability of the questionnaire was evaluated by determining the extension of the weighted kappa coefficients.

Results. The weighted kappa coefficient for each item was >0.4 , confirming that the test–retest reliability was acceptable.

Conclusions. The newly developed JOA Cervical Myelopathy Evaluation Questionnaire was proven to have sufficient reliability.

statistics, and (2) more patient-oriented. For the first- and second-round surveys, the committee created a new questionnaire of 77 items including SF-36 (the Medical Outcome Study Short-Form 36-Item Health Survey)³ to assess health-related quality of life (HRQOL) and 41 items to assess functioning of the cervical spinal cord and cervical spine. In these surveys, 53 items were excluded.^{1,2} The purpose of this study (the third-round survey A) was to confirm the reproducibility of the selected 24 questions written in Japanese (see Appendix). The questionnaire was self-administered, so interobserver reliability did not need to be confirmed. To examine the reliability of the questionnaire, only test–retest reliability was evaluated.

Materials and methods

Inclusion criteria were as follows: (1) Patient had to have cervical myelopathy secondary to cervical disc herniation, cervical spondylosis, or ossification of the posterior longitudinal ligament (OPLL); and (2) there was no change of symptoms between the two interviews, which was judged by attending surgeons. Exclusion criteria included (1) patient had other musculoskeletal disease requiring medical treatment; (2) patient had a mental disease and so could potentially furnish inappropriate answers; (3) patient was postoperative; 4) patient had participated in the former surveys.

We asked 460 Japanese board-certified spine surgeons to participate in the survey between January 2004 and June 2004. Patients were recruited from the outpatient clinic of each surgeon during the planned inquiry period. Self-assessment was used in this study. Each patient was interviewed using the same questionnaire twice at an interval of 4 weeks (± 3 days). The attending surgeon filled out the patient's information

Introduction

As described in Part 1¹ and Part 2,² the Japanese Orthopaedic Association (JOA) decided to revise the assessment tools for cervical myelopathy and develop a new JOA Cervical Myelopathy Evaluation Questionnaire (JOACMEQ). The point of the revision was to make it: (1) more scientific from the standpoint of medical

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regarding the diagnosis and the presence or absence of concomitant diseases and judged the severity using a three-step rating scale (mild, moderate, severe). This study was approved by the Ethics Committee of the Japanese Society for Spine Surgery and Related Research, and informed consent was obtained from each patient.

The reliability of the questionnaire was evaluated by determining the extension of the weighted kappa coefficients. According to the most widely accepted criteria proposed by Landis and Koch, a kappa coefficient of ≥ 0.4 was judged reliable.⁴ The 95% confidence intervals were calculated for all reliability coefficients.

All statistics were calculated using SPSS software (version 12; SPSS, Chicago, IL, USA).

Results

Of 304 patients who participated in this survey, 103 were excluded owing to a change of symptoms between the two interviews or an inappropriate patient administration interval, leaving 201 available for the study (74 women, 127 men). The mean \pm SD patient age was 63.8 \pm 12.8 years (Table 1). The diagnosis was cervical disc herniation in 29, cervical spondylotic myelopathy in 113, and OPLL/other in 59. Table 2 lists the severity of patient myelopathy evaluated by the current JOA scoring system and shows that the characteristics of the recruited patients were not specific. The distribution of answers for each item during the second interview is

Table 1. Baseline participant demographics ($n = 201$)

Parameter	Male	Female	Total
No. of patients	127	74	201
Age (years)			
30s	7	4	11
40s	12	8	20
50s	26	13	39
60s	41	13	54
70s	32	27	59
80s	9	9	18
Average	63	65.2	63.8
SD	12.4	13.5	12.8
Minimum	30	34	30
Maximum	89	84	89
Median	64	69	66
Diagnosis			
Cervical disc herniation	17	12	29
Cervical spondylosis	68	45	113
OPLL	39	16	55
Other	3	1	4

OPLL, ossification of the posterior longitudinal ligament

shown in Table 3, and neither ceiling nor floor effects were observed. The results for test–retest reliability are shown in Table 4. The weighted kappa coefficient for each item was >0.4 , showing that the test–retest reliability of JOACMEQ was acceptable. Among the three groups with severity judged as mild, moderate, or severe, there was some difference in the weighted kappa coefficient for some items, but the difference was statistically not significant. The difference among the three diseases (cervical disc herniation, cervical spondylosis, OPLL) was also statistically not significant (data not shown).

Table 2. Distribution of the severity evaluated by the current JOA scoring system

Score	No.
Motor function	
Upper extremity	
0	1
1	10
2	37
3	90
4	63
Lower extremity	
0	1
0.5	0
1	21
1.5	22
2	40
2.5	20
3	40
4	57
Sensory function	
Upper extremity	
0	2
0.5	22
1	88
1.5	61
2	28
Trunk	
0	1
0.5	1
1	14
1.5	26
2	159
Lower extremity	
0	1
0.5	15
1	55
1.5	44
2	86
Bladder function^a	
0	4
1	17
2	52
3	127

JOA, Japanese Orthopaedic Association

^aData defect: $n = 1$

Table 3. Distribution of answers for each item in the second interview

Item	1	2	3	4	5	No answer
C01	108 53.70%	80 39.80%	13 6.50%			
C02	155 77.10%	41 20.40%	5 2.50%			
C03	124 61.70%	53 26.40%	17 8.50%	6 3.00%		1 0.50%
C04	105 52.20%	61 30.30%	23 11.40%	10 5.00%	2 1.00%	
C05	86 42.80%	74 36.80%	37 18.40%			4 2.00%
C06	132 65.70%	43 21.40%	15 7.50%	10 5.00%		1 0.50%
C07	65 32.30%	103 51.20%	33 16.40%			
C08	114 56.70%	70 34.80%	16 8.00%			1 0.50%
C09	129 64.20%	57 28.40%	14 7.00%			1 0.50%
C10	111 55.20%	60 29.90%	27 13.40%			3 1.50%
C11	121 60.20%	68 33.80%	12 6.00%			
C12	138 68.70%	52 25.90%	11 5.50%			
C13	68 33.80%	88 43.80%	44 21.90%			1 0.50%
QOL01	6 3.00%	16 8.00%	77 38.30%	90 44.80%	11 5.50%	1 0.50%
QOL02	39 19.40%	91 45.30%	69 34.30%			2 1.00%
QOL03	36 17.90%	97 48.30%	66 32.80%			2 1.00%
QOL04	33 16.40%	74 36.80%	93 46.30%			1 0.50%
QOL05	16 8.00%	29 14.40%	91 45.30%	44 21.90%	20 10.00%	1 0.50%
QOL06	15 7.50%	49 24.40%	67 33.30%	47 23.40%	22 10.90%	1 0.50%
QOL07	11 5.50%	26 12.90%	95 47.30%	43 21.40%	25 12.40%	1 0.50%
QOL08	12 6.00%	35 17.40%	92 45.80%	45 22.40%	15 7.50%	2 1.00%
QOL09	17 8.50%	46 22.90%	102 50.70%	30 14.90%	5 2.50%	1 0.50%
QOL10	8 4.00%	56 27.90%	65 32.30%	55 27.40%	17 8.50%	
QOL11	18 9.00%	60 29.90%	74 36.80%	38 18.90%	11 5.50%	

Discussion

Measurements of the outcome of cervical myelopathy must have sufficient reliability and validity and should be proven by means of statistical evaluation. The current JOA scoring system for cervical myelopathy has been widely used but has not been shown to meet such a requirement.^{5,6} A manner of measuring patient-based outcome has also been regarded as essen-

tial for evaluating a patient's health status. We sought to develop a new questionnaire using a psychometric method. The newly proposed document, which is self-administered and disease-specific, includes function of the cervical spinal cord and cervical spine as well as health-related quality of life. The first- and second-round surveys selected 24 of 77 items after repeated discussions among the subcommittee members.^{1,2}

Table 4. Reproducibility of each item

Item	Item no.	κ	95% CI
C01	3	0.76	0.69–0.82
C02	3	0.59	0.50–0.67
C03	4	0.71	0.64–0.77
C04	5	0.74	0.69–0.79
C05	3	0.75	0.70–0.80
C06	5	0.69	0.63–0.76
C07	3	0.80	0.75–0.85
C08	3	0.65	0.58–0.71
C09	3	0.68	0.62–0.75
C10	3	0.63	0.57–0.69
C11	3	0.72	0.65–0.77
C12	3	0.55	0.47–0.62
C13	3	0.71	0.66–0.76
QOL01	3	0.57	0.51–0.63
QOL02	3	0.68	0.62–0.74
QOL03	3	0.64	0.58–0.70
QOL04	3	0.73	0.67–0.78
QOL05	5	0.58	0.52–0.63
QOL06	5	0.55	0.49–0.60
QOL07	5	0.62	0.56–0.67
QOL08	5	0.56	0.50–0.61
QOL09	5	0.56	0.50–0.61
QOL10	5	0.62	0.57–0.67
QOL11	5	0.49	0.42–0.54

In this third survey, we succeeded in confirming the reliability of the 24 items. The next steps are to check the validity of the questionnaire, perform a factor analysis to determine the underlying cluster of the question-

naire items, complete the measurement scale, and confirm the responsiveness of the questionnaire.

Conclusion

The newly developed JOA Cervical Myelopathy Evaluation Questionnaire (JOACMEQ) was proven to be sufficiently reliable.

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Appendix

Twenty-four items as candidates for JOACMEQ (temporary English version)

With regard to your health during the last week, please circle one response for each of the following questions that best applies. If your condition varies depending on the day or the time, circle the response that corresponds to your condition at its worst.

- C01 Can you fasten the front buttons of your blouse or shirt with both hands?
 1) possible without difficulty
 2) possible if I spend time
 3) impossible
- C02 Can you eat a meal with your dominant hand using a spoon or a fork?
 1) possible without difficulty
 2) possible if I spend time
 3) impossible
- C03 Can you raise your arm? (Answer for the weaker side.)
 1) I can raise it straight upward
 2) possible, although the elbow and/or wrist is a little flexed
 3) possible up to shoulder level
 4) impossible
- C04 Can you walk on a flat surface?
 1) possible without difficulty
 2) possible but slowly without any support
 3) possible only with the support of a handrail, a cane, or a walker
 4) possible but slowly even with support
 5) impossible
- C05 Can you stand on either leg without holding onto something? (or the need to support yourself)
 1) possible on both legs individually for more than ten seconds
 2) possible on either leg for more than ten seconds
 3) impossible with either leg
- C06 Do you have urinary incontinence?
 1) no
 2) when sneezing or straining
 3) when retaining urine over a period of more than 2 hours
 4) frequently
 5) always
- C07 How often do you go to the bathroom at night?
 1) rarely
 2) once or twice
 3) three times or more
- C08 Do you have a feeling of residual urine in your bladder after voiding?
 1) rarely
 2) sometimes
 3) most of the time
- C09 Can you initiate (start) your urine stream immediately when you want to void?
 1) most of the time
 2) sometimes
 3) usually not
- C10 While in the sitting position, can you look up at the ceiling by tilting your head upward?
 1) possible without difficulty
 2) possible to some degree
 3) impossible
- C11 Can you drink a glass of water without stopping despite the neck symptoms?
 1) possible without difficulty
 2) possible to some degree
 3) impossible
- C12 Can you look at your feet when you go down the stairs?
 1) possible without difficulty
 2) possible to some degree
 3) impossible
- C13 While in the sitting position, can you turn your head toward the person who is seated to the side but behind you and speak to that person while looking at his/her face?
 1) possible without difficulty
 2) possible to some degree
 3) impossible

Appendix

Twenty-four items as candidates for JOACMEQ (in Japanese)

最近1週間ぐらいを思い出して、設問ごとに、あなたの状態にもっとも近いものの番号に○をつけてください。

日や時間によって状態が変わる場合は、もっとも悪かったときのものをお答えください。

最近の1週間:

問1 ブラウスやワイシャツなどの前ボタンを両手を使ってかけることができますか。

- 1) 不自由なくできる 2) 時間をかければできる 3) できない

問2 きき手でスプーンやフォークを使って食事ができますか。

- 1) 不自由なくできる 2) 時間をかければできる 3) できない

問3 片手をあげることができますか。(左右の手のうち悪いほうで答えてください)

- 1) まっすぐ上にあげることができる
 2) すこし手が曲がるが上にあげることができる
 3) 途中まで(肩の高さぐらいまで)ならあげることができる
 4) できない

問4 平らな場所を歩くことができますか。

- 1) 不自由なく歩くことができる
 2) ゆっくりとならば歩くことができる
 3) 支持(手すり、杖、歩行器など)があれば、歩くことができる
 4) 支持を使ってもゆっくりとしか歩くことができない
 5) できない

問5 手で支えずに片足立ちができますか。

- 1) 両足とも10秒数える間以上できる
 2) どちらかの足は10秒数えるまではできない
 3) どちらの足もほとんどできない

問6 おしっこ(尿)を漏らすことがありますか。

- 1) まったくない
 2) くしゃみや気張ったときに漏れる
 3) 2時間以上おしっこ(排尿)しないと漏れる
 4) しばしば漏れる 5) いつも漏れる

問7 夜中に、トイレ(おしっこ(排尿))に起きますか。

- 1) ほとんど起きることはない
 2) 一晩に1、2回起きる
 3) 一晩に3回以上起きる

問8 おしっこ(排尿)の後も、尿の残った感じがありますか。

- 1) ほとんどのときに無い
 2) あるとき無いときがある
 3) たいていのときにある

問9 便器の前で(便器に座って)、すぐにおしっこ(尿)が出ますか。

- 1) ほとんどのときすぐに出る
 2) すぐに出るときとすぐには出ないときがある
 3) たいていのときすぐには出ない

問10 いすに腰掛けて、首だけを動かして、自分の真上の天井をみることができますか。

- 1) 不自由なくできる 2) 無理をすればできる 3) できない

問11 コップの水を一気に飲み干すことができますか。

- 1) 不自由なくできる 2) 無理をすればできる 3) できない

問12 階段を下りるときに、足元を見ることができますか。

- 1) 不自由なくできる 2) 無理をすればできる 3) できない

問13 いすに座って、後ろの席に座った人の顔を見ながら話をするのが出来ますか。

- 1) 不自由なくできる 2) 無理をすればできる 3) できない

- QOL01 How is your present health condition?
 1) excellent
 2) very good
 3) good
 4) fair
 5) poor
- QOL02 Do you have difficulty in climbing up the stairs?
 1) I have great difficulty
 2) I have some difficulty
 3) I have no difficulty
- QOL03 Do you have difficulty with one of the following: bending forward, kneeling or stooping? If you have difficulty with one of them, how difficult is it?
 1) I have great difficulty
 2) I have some difficulty
 3) I have no difficulty
- QOL04 Do you have difficulty walking more than 15 minutes?
 1) I have great difficulty
 2) I have some difficulty
 3) I have no difficulty
- QOL05 Have you been unable to do your work or ordinary activities as well as you would like?
 1) I have not been able to do them at all
 2) I have been unable to do them most of the time
 3) I have sometimes been unable to do them
 4) I have been able to do them most of the time
 5) I have always been able to do them
- QOL06 Has your work routine been hindered because of the pain?
 1) greatly
 2) moderately
 3) slightly (somewhat)
 4) little (minimally)
 5) not at all
- QOL07 Have you felt discouraged and depressed?
 1) always
 2) frequently
 3) sometimes
 4) rarely
 5) never
- QOL08 Do you feel exhausted?
 1) always
 2) frequently
 3) sometimes
 4) rarely
 5) never
- QOL09 Have you felt happy?
 1) always
 2) almost always
 3) sometimes
 4) rarely
 5) never
- QOL10 Do you think you are in decent health?
 1) yes (I am healthy)
 2) fairly (my health is better than average)
 3) not very much (my health is average)
 4) barely (my health is poor)
 5) not at all (my health is very poor)
- QOL11 Do you feel your health will get worse?
 1) very much so
 2) a little bit at a time
 3) sometimes yes and sometimes no
 4) not very much
 5) not at all

普段の生活についての質問です。**最近の1週間**のことを思い出してください。
 一番よくあてはまる1), 2), 3), …の番号に○をつけて下さい

最近の1週間:

- 問1 あなたの現在の健康状態をお答えください。
 1)最高によい 2)とてもよい 3)よい 4)あまりよくない 5)よくない
- 問2 あなたは、からだのぐあいが悪いことから、階段で上の階へ上ることをむずかしいと感じますか。
 1)とてもむずかしいと感じる
 2)少しむずかしいと感じる
 3)まったくむずかしいとは感じない
- 問3 あなたは、からだのぐあいが悪いことから、体を前に曲げる・ひざまずく・かがむ動作をむずかしいと感じますか。
 どれかひとつでもむずかしく感じる場合は「感じる」としてください。
 1)とてもむずかしいと感じる
 2)少しむずかしいと感じる
 3)まったくむずかしいとは感じない
- 問4 あなたは、からだのぐあいが悪いことから、15分以上つづけて歩くことをむずかしいと感じますか。
 1)とてもむずかしいと感じる
 2)少しむずかしいと感じる
 3)まったくむずかしいとは感じない
- 問5 あなたは、からだのぐあいが悪いことから、仕事や普段の活動が思ったほどできなかったことがありますか。
 1)いつもできなかった
 2)ほとんどいつもできなかった
 3)ときどきできないことがあった
 4)ほとんどいつもできた
 5)いつもできた
- 問6 痛みのために、いつもの仕事はどのくらい妨げられましたか。
 1)非常に妨げられた 2)かなり妨げられた 3)少し妨げられた
 4)あまり妨げられなかった 5)まったく妨げられなかった
- 問7 あなたは落ち込んでゆううつな気分を感じましたか。
 1)いつも感じた 2)ほとんどいつも感じた 3)ときどき感じた
 4)ほとんど感じなかった 5)まったく感じなかった
- 問8 あなたは疲れ果てた感じでしたか。
 1)いつも疲れ果てた感じだった
 2)ほとんどいつも疲れ果てた感じだった
 3)ときどき疲れ果てた感じだった
 4)ほとんど疲れを感じなかった
 5)まったく疲れを感じなかった
- 問9 あなたは楽しい気分でしたか。
 1)いつも楽しい気分だった
 2)ほとんどいつも楽しい気分だった
 3)ときどき楽しい気分だった
 4)ほとんど楽しくなかった
 5)まったく楽しくなかった
- 問10 あなたは、自分は人並みに健康であると思いますか。
 1)「人並みに健康である」と思う
 2)ほぼ「人並みに健康である」と思う
 3)かろうじて「人並みに健康である」と思う
 4)「人並みに健康である」とはあまり思わない
 5)「人並みに健康である」とはまったく思わない
- 問11 あなたは、自分の健康が悪くなるような気がしますか。
 1)悪くなるような気が大いにする
 2)悪くなるような気が少しする
 3)悪くなるような気がするときもしないときもある
 4)悪くなるような気はあまりしない
 5)悪くなるような気はまったくしない