living. There are numerous, well-known conditions that can influence upper-extremity function, such as postoperative C5 palsy [5, 6] and late neurological deterioration [4]. Because upper-extremity function is more subtle and complicated than that of the lower extremity, a more detailed measure is essential for evaluation. However, there are few quantitative measures for total evaluation; the JOA score and its subscores are expressed as discrete variables, and the visual analog scale (VAS) can evaluate sensory function only.

The Disability of the Arm, Shoulder, and Hand (DASH) questionnaire was devised as a region-specific, patient-reported outcome measure to evaluate symptoms and functional status of the upper extremity, and the QuickDASH was developed as a shortened version [7, 8]. Many authors reported positive results of validity and responsiveness of DASH in patients with upper-extremity disorder [8, 9]. DASH and QuickDASH are appropriate for assessing disorders affecting upper-extremity functions, and symptoms can be assessed in a single, combined scale.

Although there are a few reports on the relationship between neck pain and DASH [10, 11], no report has documented the usefulness of DASH or QuickDASH for evaluating cervical myelopathy. We determined the efficacy of the QuickDASH questionnaire for evaluating functional outcomes of the upper extremity after cervical laminoplasty and compared the results with those of other commonly used assessment measures. To our knowledge, this is the first report on the usefulness of QuickDASH for cervical myelopathy.

Materials and methods

Study approval was given by the institutional review board of the Clinical Research Support Center of the University of Tokyo Hospital. Records of patients who underwent double-door laminoplasty for treatment of cervical laminoplasty between 1985 and 2008 and whose cases were followed at our department were retrospectively investigated. We mailed the questionnaires to the patients, and 608 patients who replied the questionnaires were included in the study. There were 351 patients who responded to all items. In addition, 139 were excluded by the following criteria; previous cervical spine surgery or other concomitant disease influencing symptoms and functional status of the upper extremity, including cerebral palsy, diabetic neuropathy, rheumatoid arthritis, or others. Of the 212 patients remaining, patients who had outpatient at the time of survey were included in this study.

Finally, 94 patients (59 men, 35 women) were enrolled. Average age at surgery was 62 (range 30–82) years, and mean follow-up was 61 (range 12–274) months. Diagnoses were cervical spondylosis in 57 patients, ossification of the posterior longitudinal ligament in 33, cervical disc herniation in nine, and ossification of yellow ligament in two.

The questionnaires included the QuickDASH Japanese version, Short-Form Health Survey of 36 questions (SF-36) [12, 13], Neck Disability Index (NDI) [14], and upper-extremity pain scale (Numerical Rating Scale 0–10). Patient satisfaction was also assessed by choosing either "satisfied,", "dissatisfied," or "neither."

QuickDASH consists of 11 items derived from DASH (Table 1). Each item has five response options ranging from "no difficulty or no symptom" to "unable to perform activity or very severe symptom," each scored on a scale of 1–5. These 11 items provide the QuickDASH score, which ranges from 0 (no disability) to 100 (the most severe disability) after summation of scores from all items and transformation [8].

The JOA score was used to evaluate preoperative and postoperative neurological functions at the time of survey (Table 2). The Hirabayashi method [15] was used to calculate the recovery rate of the JOA score according to the following formula: recovery rate (%) = (postoperative JOA score − preoperative JOA score) × 100/(17 − preoperative JOA score). A recovery rate >50 % was defined as an effective clinical result in JOA score [16, 17].

Table 1 Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) questionnaire

Question no.	Item
qDASH-1	Open a tight or new jar
qDASH-2	Do heavy household chores (e.g., wash walls, wash floors)
qDASH-3	Carry a shopping bag or briefcase
qDASH-4	Wash your back
qDASH-5	Use a knife to cut food
qDASH-6	Recreational activities that require little effort (e.g., card playing, knitting, etc.)
qDASH-7	During the past week, to what extent has your arm, shoulder, or hand problem interfered with your normal social activities with family, friends, neighbors, or groups?
qDASH-8	During the past week, were you limited in your work or other daily activities as a result of your arm, shoulder, or hand problem?
qDASH-9	Arm, shoulder, or hand pain
qDASH-10	Tingling (pins and needles) in your arm, shoulder, or hand
qDASH-11	During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder, or hand?

Table 2 Scoring system for cervical myelopathy proposed by the Japanese Orthopaedic Association (JOA score)

Motor dysfunction of the upper extremity
Score
0. Cannot eat with spoon
1. Can eat with a spoon, but not with chopsticks
2. Can eat with chopsticks, to a limited degree
3. Can eat with chopsticks, but awkward
4. No disability
Motor dysfunction of the lower extremity
Score
0. Cannot walk
1. Needs cane or aid on flat ground
2. Needs cane or aid only on stairs
3. Can walk without cane or aid, but slowly
4. No disability
Sensory deficit
A. Upper extremities
Score
0. Severe sensory loss or pain
1. Mild sensory loss
2. None
B. Lower extremities same as A
C. Trunk same as A
Sphincter dysfunction
Score
0. Unable to void
1. Marked difficulty in micturition (retention, strangury)
2. Difficulty in micturition (pollakiuria, hesitation)
3. None

Statistical analysis

SPSS version 17 software (SPSS Inc., Chicago, IL, USA) was used to perform statistical analyses. Internal consistency was evaluated by Cronbach α. The criterion-related validity was evaluated by calculating correlation coefficients (Spearman's ρ) between QuickDASH and other outcome measures; Student's t test, Mann–Whitney U test, Pearson's correlation coefficient, and chi-square test were used to evaluate the association between groups. Differences were considered significant at $P < 0.05$.

We also plotted the receiver operating characteristic (ROC) curves to investigate the QuickDASH cutoff value for patient satisfaction with cervical laminoplasty.

Results

The mean JOA score w as 10.1 (range 3–15) points before surgery and 13.3 (range 3–17) points after surgery. Mean JOA recovery rate was 46.2 % (range 0–100 %). Preoperative and postoperative average JOA scores were 2.4 ± 0.8 and 3.3 ± 0.8, respectively, for upper-extremity motor function and 0.8 ± 0.4 and 1.1 ± 0.5, respectively, for upper-extremity sensory function. Total JOA score and subscore for the upper extremities improved significantly after surgery ($P < 0.05$). The average postoperative QuickDASH score was 30.0 (range 0–100) points. Cronbach α of QuickDASH was 0.94, which is generally regarded as an excellent score. Table 3 shows correlations between QuickDASH and outcomes; QuickDASH showed significant correlation with outcomes from all the other assessment scales, particularly with NDI and SF-36 ($r > 0.75$).

We then determined the QuickDASH cutoff value for patient satisfaction as an endpoint. According to ROC curve analysis, a cutoff value of 34.0 gave the maximum power of QuickDASH for assessing patient satisfaction based on clinical results with cervical laminoplasty [area under the curve (AUC) 0.730] (Fig. 1).

We classified the patients into two groups according to treatment satisfaction. Patients who chose "neither" were classified into the not satisfied group. The satisfied group comprised 57 patients, and the not satisfied group comprised 37. QuickDASH score, JOA score for upper-extremity sensory function, and recovery rate were significantly better in the satisfied group than in the not satisfied group. However, there was no significant difference in JOA score for upper-extremity motor function between groups (Table 4).

Discussion

This study was conducted to evaluate the validity of QuickDASH as a measure of functional status of the upper extremity for patients after cervical laminoplasty. Results show that QuickDASH had significant correlations not only with disease-specific JOA scores but also with other generic patient-reported outcome measures. In addition, QuickDASH had an excellent correlative coefficient and significantly reflected patient satisfaction with treatment, whereas the JOA score for the upper-extremity motor function did not.

Upper-extremity function is affected by many factors, such as dexterity, weakness, numbness, and paresthesia. It is difficult to strictly divide the upper extremities into distinct parts, such as arm, shoulder, hand, neck, and scapular. Our results show that the QuickDASH was suitable for comprehensively evaluating symptoms and functional status of the upper extremities. In contrast, the JOA score is an ordinal variable, not a continuous variable, and the subscore is expressed as only 5 (motor) or 3 (sensory)

Table 3 Correlation between Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) self-report questionnaire and other test outcomes

	Correlation coefficient	*P* value
JOA score		
Motor (U/E)	−0.495	<0.01
Sensory (U/E)	−0.324	<0.01
Recovery rate	−0.509	<0.01
SF-36(PCS)	−0.753	<0.01
NRS (pain in U/E)	0.693	<0.01
NDI	0.834	<0.01

JOA Japan Orthopedic Association, *U/E* upper extremities, *PCS* physical component score, *NRS* Numeric Rating Scale, *NDI* Neck Disability Index

Table 4 Comparison between groups

	Satisfied	Not satisfied	*P* value
QuickDASH	23.2	40.5	<0.01
JOA score			
Motor (U/E)	3.4	3.2	N.S.
Sensory (U/E)	1.2	1	0.03
SF-36 (PCS)	36.3	27.6	0.02
NRS (pain in U/E)	2.2	4.6	<0.01
NDI	21.8	37.3	<0.01

QuickDASH Quick Disabilities of the Arm, Shoulder, and Hand, *U/E* upper extremity, *SF-36* Short-Form Health Questionnaire of 36 questions, *PCS* physical component score, *NRS* Numeric Rating Scale, *NDI* Neck Disability Index

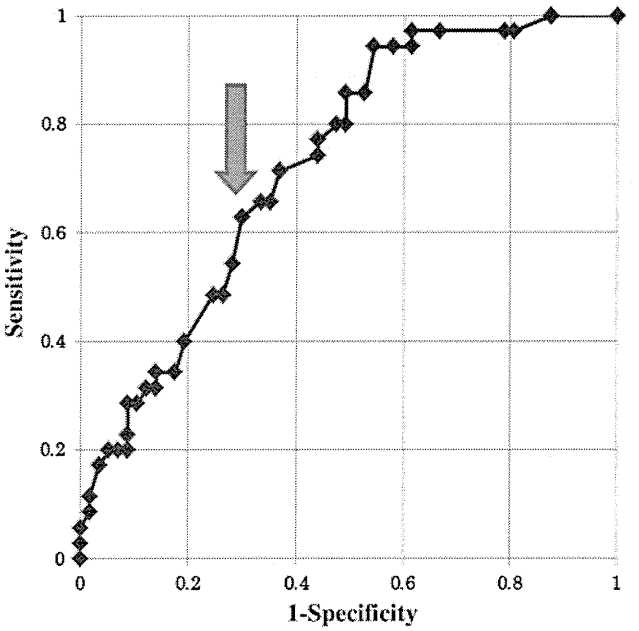

Fig. 1 Receiver Operating Characteristics (ROC) curve for determining the cutoff value for patient satisfaction following cervical laminoplasty. The *arrow* indicates the plotted point that determines the cutoff value

discrete variables [18]. This may be why the JOA score for the upper-extremity motor function did not affect postoperative satisfaction.

Several performance tests have been developed for objectively assessing the severity of hand myelopathy. For example, Kimura et al. [19] proposed the tally counter test, and Hosono et al. [20] proposed the 15-s grip–release test in addition to the conventional 10-s test. These tests are simple, reliable, and capable of detecting small functional changes. However, they do not evaluate sensory function or provide patient-reported outcomes. On the other hand, the QuickDASH is a patient-reported outcome, and we must evaluate the correlation between the QuickDASH and the other objective evaluations, such as these performance tests.

We determined the QuickDASH cutoff value to be 34.0. Although we had no preoperative QuickDASH data, the value obtained is considered to be reasonable because the mean QuickDASH scores were reported to be approximately 30 in the studies that evaluated patients with upper-extremity disorders [8]. We used patient satisfaction as an endpoint in order to determine the QuickDASH cutoff value.

However, it must also be affected by the function of the lower extremities or the degree of recovery. Preoperative QuickDASH scores are also required.

There were some limitations in this study. First, it was a retrospective design, and the relatively low follow-up rate indicates the possibility of patient selection bias. Second, there were no preoperative outcomes except for JOA score. To precisely investigate the reliability and responsiveness of the QuickDASH questionnaire to assess cervical surgery outcomes, we need to evaluate both pre- and postoperative outcomes. Finally, there are variations in the follow-up period (range 12–274 months). Late neurologic deterioration after laminoplasty is well known [4]. In order to avoid the effects of aging, outcome evaluation should take place in all patients at the same time period after operation. Also, for the same reason, comparison between QuickDASH assessment of cervical myelopathy patients and that of an age-matched control is required. However, there are no significant correlations ($r = 0.2$) between QuickDASH and the follow-up periods in this study. Imaeda et al. reported the low correlation between QuickDASH and age in their study group, so the aging effect on function may be negligible in our study. Some changes may also occur in the procedure or postoperative therapy during the long follow-up period. Our procedure was basically C3-7 laminoplasty with the hydroxyapatite (HA) spacer, and we think that

such changes across time did not affect postoperative function of the upper extremities.

Nevertheless, we regard QuickDASH as a reliable tool for obtaining patient-reported outcomes in evaluations of cervical interventions, not only because the QuickDASH scores had significant correlations with other disease-specific and general outcomes commonly used for assessing cervical diseases but also because Cronbach α for QuickDASH was excellent and reliable.

One possible problem in using QuickDASH is the influence of lower-limb function. Dowrick et al. [21] reported that the DASH score also measured disability in patients with injuries to the lower limb, and care must be taken when attributing disability measured by the DASH score to injuries of the upper limb if problems are also present in the lower limb. In fact, the QuickDASH questionnaire includes some items that must be influenced by lower-extremity function. For example, question no. 3, "Carry the shopping bag or briefcase," includes two actions: holding the bag and walking at the same time. Taking these factors into consideration, the significant correlation between QuickDASH and the other assessment outcomes may have been affected by lower-extremity function.

Finally, this study provides evidence to support the use of QuickDASH to measure upper-extremity symptoms and disability in patients with cervical surgery. The use of this questionnaire to obtain patient-reported outcomes allows subtle but significant changes in the upper extremity to be detected, which can truly reflect patient satisfaction with treatment.

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Conflict of interest No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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EPIDEMIOLOGY

Identification of Risk Factors for New-Onset Sciatica in Japanese Workers

Findings From the Japan Epidemiological Research of Occupation-Related Back Pain Study

Ko Matsudaira, MD, PhD,* Mika Kawaguchi, MSc,† Tatsuya Isomura, MSc,†‡ Mayumi Arisaka,* Tomoko Fujii, MD, MDH,* Katsushi Takeshita, MD, PhD,§ Tomoaki Kitagawa, MD, PhD,¶ Kota Miyoshi, MD, PhD,¶ and Hiroaki Konishi, MD, PhD‖

Study Design. Two-year, prospective cohort data collected for the Japan epidemiological research of Occupation-related Back pain study were used for the analysis.

Objective. To identify potential risk factors for the development of new-onset sciatica in initially symptom-free Japanese workers with no history of sciatica.

Summary of Background Data. Although the associations between individual and occupational factors and cases of new-onset sciatica are established, the effect of psychosocial factors on the development of sciatica has still not been adequately clarified.

Methods. In total, 5310 participants responded to a self-administered baseline questionnaire (response rate: 86.5%). Furthermore, 3194 (60.2%) completed both 1- and 2-year follow-up questionnaires. The baseline questionnaire assessed individual characteristics, ergonomic work demands, and work-related psychosocial factors. The outcome of interest was new-onset sciatica with or without low back pain during the 2-year follow-up period. Incidence was calculated for participants who reported no low back pain in the preceding year and no history of lumbar radicular pain (sciatica) at baseline. Logistical regression assessed risk factors associated with new-onset sciatica.

Results. Of 765 eligible participants, 141 (18.4%) reported a new episode of sciatica during the 2-year follow-up. In crude analysis, significant associations were found between new-onset sciatica and age and obesity. In adjusted analysis, significant associations were found for obesity and mental workload in a qualitative aspect after controlling for age and sex. Consequently, in multivariate analysis with all the potential risk factors, age and obesity remained statistically significant (odds ratios: 1.59, 95% confidence interval: 1.01–2.52; odds ratios: 1.77, 95% confidence interval: 1.17–2.68, respectively).

Conclusion. In previously asymptomatic Japanese workers, the risk of developing new-onset sciatica is mediated by individual factors. Our findings suggest that the management of obesity may prevent new-onset sciatica.

Key words: sciatica, new-onset, prospective study, obesity, industrial health, risk factors, Japanese workers, asymptomatic, low back pain, psychosocial factors.

Level of Evidence: 3

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Sciatica is a symptom, rather than specific diagnosis,[1] characterized by low back pain (LBP) radiating below the knee.[2,3] The condition is also known as lumbosacral radicular syndrome, radiculopathy, nerve root pain, and nerve root entrapment or irritation. A variety of pathologies lead to sciatica: although lumbar disc herniation with nerve root compression is the main cause, lumbar spinal stenoses and tumors have also been reported.[2] The lifetime prevalence of sciatica ranges from 12.2% to 43% and can be influenced by varying definitions of sciatica and/or methods of assessing the condition.[1] Sciatica is usually more persistent and severe than nonspecific LBP, which is not attributable to any identifiable pathology in the spine. Although the symptoms usually improve within several weeks of onset, 40% still experience restriction in work 3 months after new-onset sciatica, and more than 30% continue to experience restriction in work 1 year after new-onset cases.[4] Sciatica often leads to deterioration in individual well-being, prolonged absence from work, and a significant health care burden.[4–8]

From the *Clinical Research Center for Occupational Musculoskeletal Disorders, Kanto Rosai Hospital, Kanagawa, Japan; †Clinical Study Support, Inc., Chikusa-ku, Nagoya Japan; ‡Division of Clinical Research Consultation, Institute of Medical Science, Tokyo Medical University, Japan; §Department of Orthopaedic Surgery, the University of Tokyo, Tokyo, Japan; ¶Department of Orthopaedic Surgery, Yokohama Rosai Hospital, Yokohama, Japan; and ‖Department of Orthopaedic Surgery, Nagasaki Rosai Hospital, Nagasaki, Japan.

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Address correspondence and reprint requests to Ko Matsudaira, MD, PhD, Clinical Research Center for Occupational Musculoskeletal Disorders, Kanto Rosai Hospital, 1-1 Kizukisumiyoshicho, Nakahara-ku, Kawasaki 211-8510, Japan; E-mail: kohart801@gmail.com

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Prior research has identified individual and occupational factors that act as risk factors for the development of sciatica. For example, strong associations were found with age,[9] height,[10] obesity,[11] smoking, driving,[10] leisure-time physical activity,[9,11] occupation,[11] and twisting of the trunk at work.[8] Unlike individual and occupational factors, the association between psychosocial factors and the development of new-onset sciatica is still ambiguous due to both a lack of research in the area and inconsistencies in results.[9,10,12,13]

Serious cases of sciatica impact both individuals and society in the context of the workplace and health care burden inflicted. Therefore, identification of risk factors is highly important. However, research is limited, particularly on the effect of psychosocial factors on the development of sciatica. Therefore, this study aimed to examine the associations between new-onset sciatica and individual factors, ergonomic work demands, and work-related psychosocial factors in initially symptom-free Japanese workers.

MATERIALS AND METHODS

Data Source

The study analyzed a 2-year prospective cohort of the Japan epidemiological research of Occupation-related Back pain study. Ethical approval was granted by the review board of the Minister of Labour, Health and Welfare (MLHW) of Japan. Participants for the Japan epidemiological research of Occupation-related Back pain study were recruited at 16 local offices of participating organizations in or near Tokyo. The occupations of the participating employees were diverse (*e.g.*, office workers, nurses, sales/marketing personnel, and manufacturing engineers). Self-administered baseline questionnaires were dispersed among the employees by the board of each participating organization. Participants provided written informed consent for participation and returned completed questionnaires, along with their name and address for the purpose of follow-up, directly to the study administration office.

Baseline questionnaires on a prior diagnosis of lumbar radicular pain (sciatica) by an orthopedician, experience of pain and/or numbness radiating below the knee with or without LBP, episodes and severity of LBP, individual characteristics (*e.g.*, age, sex, obesity, height, smoking habits, education), ergonomic work demands (*e.g.*, manual handling at work, frequency of bending, twisting, hours of driving per day), and work-related psychosocial factors (*e.g.*, interpersonal stress at work, job control, reward to work, somatization, depression). To evaluate psychosocial factors, the Brief Job Stress Questionnaire (BJSQ) developed by the MLHW of Japan[14,15] was used. This questionnaire contains 57 questions and assesses 19 work-related factors: mental workload (quantitative aspect), mental workload (qualitative aspect), physical workload, interpersonal stress at work, work environmental stress, job control, utilization of skills and expertise, job fitness, job satisfaction, vigor, anger, fatigue, anxiety, depressed mood, somatic symptoms, support by supervisors, support by coworkers, support by family or friends, and daily-life satisfaction. Work-related stress factors were rated on a 5-point Likert scale ranging from the lowest score of 1 to the highest score of 5.

The BJSQ incorporates questions from various standard questionnaires such as the JCQ (Job Content Questionnaire),[16] the NIOSH (National Institute for Occupational Safety and Health),[17] the POMS (Profile of Mood States),[18] the CES-D (Center for Epidemiologic Studies Depression Scale),[19] the STAI (State-Trait Anxiety Inventory),[20] the SSD (Screener for Somatoform Disorders),[21] and the SUBI (Subjective Well-Being Inventory).[22] Standardized scores were developed for the 19 individual factors based on a sample of approximately 10,000 Japanese workers. The BJSQ has been shown to have internal consistency, reliability, and criterion validity with respect to the Job Content Questionnaire and NIOSH.[23]

The follow-up questionnaire was distributed 1 and 2 years after the baseline assessment. The follow-up questionnaires included questions on the experience of pain and/or numbness radiating below the knee with or without LBP (sciatica) in the past year, episodes of LBP, and severity of LBP.

Data Analysis

The outcome of our interest was the development of new-onset sciatica during the 2-year follow-up period. In this study, new-onset sciatica was defined if a participant reported no LBP in the preceding year as well as no history of lumbar radicular pain (sciatica) diagnosed by an orthopedician at the time of completion of the baseline questionnaire, but subsequently reported new-onset sciatica with or without LBP in the year before either the 1-year or 2-year follow-up survey. Workers were excluded from the analysis if they had lower extremity trauma, osteoarthritis, or peripheral arterial disease during the follow-up period.

For data analysis, the following factors were initially included: (1) individual characteristics, (2) ergonomic work demands, and (3) work-related psychosocial factors. Individual characteristics included age, sex, obesity (body mass index (BMI) $\geq$ 25 kg/m^2), smoking habits (Brinkmann Index $\geq$ 400), education, hours of sleep, exercise habits, flexibility, experience at current job, working hours per week ($\geq$60 hr per wk of uncontrolled overtime), work shift, employment status, and family history of LBP with disability. Ergonomic work demands included manual handling at work; bending, twisting, lifting, pushing ($\geq$½ of the day as frequent), hours of driving per day, hours of desk work ($\geq$6 hr was determined as static posture), and monotonous work (the presence of feelings of monotony or boredom at work). Psychosocial factors were assessed with the BJSQ. The 5-point Likert scale was reclassified into 2 categories: the "not feeling stressed" category, where low, slightly low, and moderate were combined, and the "feeling stressed" category, where slightly high and high were combined.

The MLHW of Japan defines obesity as a BMI of 25 kg/m^2 or higher[24] whereas the World Health Organization definition of obesity is BMI of 30 kg/m^2 or higher.[25] The Japan Society for the Study of Obesity recommends the lower cutoff point for BMI because it is more appropriate for Japanese

due to low prevalence and mild degree of obesity.[26] For the same reasons, the World Health Organization reported that in some Asian countries including Japan lower cutoff points for BMI may be more appropriate.[27] To assess smoking habits, the Brinkmann Index[28] was calculated on the basis of the total number of cigarettes smoked per day multiplied by duration of smoking in years. A Brinkmann Index value of 400 or higher indicated that a participant was a heavy smoker, whereas a value of less than 400 indicated that a participant was a nonheavy smoker. Participants were defined as flexible if their wrists could reach beyond the knees but the fingertips could not reach the ankles, and not flexible if their wrists could not reach beyond the knees.[29]

In addition to descriptive statistics, the baseline characteristics of the participants who followed-up (the follow-up group) and those who did not follow-up (the non–follow-up group) were compared using the χ^2 test. Next, logistic regression was run to examine the associations between risk factors and new-onset sciatica. Crude and adjusted odds ratios (ORs) and the respective 95% confidence intervals were calculated to assess potential risk factors. Age and sex were included in the model because both are well-established potential confounders. Subsequently, multivariate logistical regression analysis was run and included both the potential confounders and all potential risk factors for sciatica, which were reported at a significant level of $P < 0.1$ according to the initial crude and adjusted ORs. All the factors selected in the final model were statistically significant with a P value of less than 0.05. All tests were 2-tailed. The software package STATA 9.0 (StataCorp LP, College Station, TX) was used for all statistical analyses.

RESULTS

Baseline Characteristics of the Follow-up Group and the Non–Follow-up Group

The baseline questionnaire was distributed to 6140 workers and a response rate of 86.5% was achieved (5310 workers). Of these participants, 3194 workers successfully completed and returned both 1-year and 2-year follow-up questionnaires (a follow-up rate of 60.2%) (Figure 1).

The characteristics of the follow-up group and non–follow-up group at baseline were summarized. With regards to age, 37.7%, 31.1%, and 31.2% of the follow-up groups were aged less than 40; between 40 and 49; and 50 or more, respectively, with respective proportions of 58.5%, 23.7%, and 17.9% for the non–follow-up group. Males accounted for the vast majority of individuals in both the follow-up and non–follow-up groups (80.7% *vs.* 82.4%, respectively). The majority of the follow-up group and the non–follow-up group were not obese (76.4% *vs.* 73.7%, respectively). In respect to the distribution of manual handling at work, 72.6% of the follow-up group did not engage in manual handling at work, 9.9% engaged in manual handling of objects less than 20 kg, 17.6% engaged in manual handling of objects 20 kg or more or worked as a caregiver. The respective values for the non–follow-up group were 65.3%, 13.9%, and 20.7%. The majority of the follow-up group and the non–follow-up group undertook desk work without manual handling. However, in the category of manual handling of objects less than 20 kg, the majority of the follow-up group and non–follow-up group worked in manufacturing/engineering, whereas those who fell into the category of manual handling of objects 20 kg or more were predominantly involved in nursing or worked as caregivers. There were statistically significant differences between the follow-up and non–follow-up groups in age ($P < 0.001$), obesity ($P = 0.013$), and manual handling at work ($P < 0.001$), whereas no significant difference was found in sex (Table 1).

Baseline Characteristics of the Participants for This Study

Of the 3194 participants, 765 who reported no LBP during the preceding year and had no history of sciatica at the time of completing the baseline questionnaire were included in the analyses (Figure 1). In the distribution of age groups, 37.6% were less than 40; 29.6% were between 40 and 49; and 32.8% were 50 or more. The majority were males (n = 661; 88.5%). The number of obese participants was 164 (22.1%). The jobs of 569 participants (78.4%) did not involve manual handling. However, 77 (10.6%) participants manually handled objects

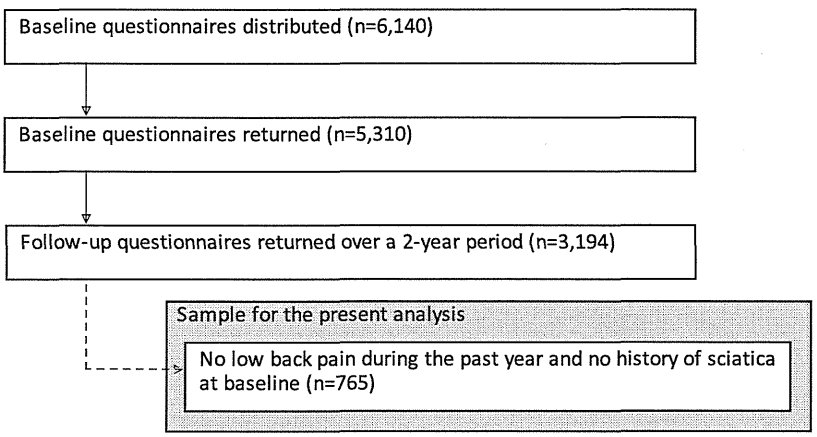

Figure 1. Flow chart of the sample selection for this analysis.

TABLE 1. Comparison of Baseline Characteristics of Follow-up Group and Non–Follow-up Group

Factors	Non–Follow-up (%)	Follow-up (%)	*P**
Age (yr)			
<40	1631 (58.5)	1205 (37.7)	<0.001
40–49	660 (23.7)	993 (31.1)	
≥50	499 (17.9)	996 (31.2)	
Sex			
Male	2417 (82.4)	2577 (80.7)	0.092
Female	517 (17.6)	616 (19.3)	
Obesity			
<BMI 25 kg/m²	2117 (73.7)	2422 (76.4)	0.013
≥BMI 25 kg/m² (obese)	757 (26.3)	747 (23.6)	
Manual handling at work			
No manual handling	1823 (65.3)	2231 (72.6)	<0.001
Manual handling of <20 kg	389 (13.9)	303 (9.9)	
Manual handling of ≥20 kg	578 (20.7)	541 (17.6)	

Totals may not sum to 100% because of rounding.
**Pearson* χ^2.
BMI indicates body mass index.

less than 20 kg, 80 (11.0%) manually handled objects 20 kg or more, or worked as a caregiver.

Incidence of New-Onset Sciatica

Of a total of 765 eligible participants, 141 (18.4%) reported a new episode of sciatica during the 2-year follow-up period (18 missing cases).

Association Between New-Onset Sciatica and Potential Risk Factors

Crude and adjusted ORs for new-onset sciatica and their 95% confidence intervals are shown in Table 2. In crude analyses, age and obesity were significantly associated with new-onset sciatica (ORs of 1.50–1.84) ($P < 0.1$). Similarly, in adjusted analyses, obesity and mental workload in a qualitative aspect were significantly associated with new-onset sciatica after adjusting for age and sex (ORs of 1.39–1.80) ($P < 0.1$). Finally, all of these factors were simultaneously included in the same model to control for the other factors, as well as age and sex. As shown in Table 3, age (≥50 *vs.* <40) and obesity remained statistically significant in the multivariate analysis ($P < 0.05$). The ORs for age and obesity remained similar in both the multivariate analysis and the crude and/or adjusted analyses. A univariate logistic regression analysis was also performed in each age and sex strata to examine whether their effects on obesity and mental workload in a qualitative aspect in relation to new-onset sciatica ($P < 0.05$). As shown in Table 4, obesity in age (≥50) and male sex, and mental workload in age (<40) were statistically significant.

DISCUSSION

It is established that individual and work-related factors predispose the development of new-onset sciatica. However, information on the influence of psychosocial factors is conflicting. In our earlier study using data from the Japan epidemiological research of Occupation-related Back pain study, ergonomic factors (*i.e.*, frequent lifting) and work-related psychosocial factors (*i.e.*, interpersonal stress at workplace, monotonous tasks) were identified as potential risk factors for new-onset of nonspecific LBP with disability in workers who had no LBP during the year before the baseline survey.[30] Conversely, in this study, individual factors were the only identified potential risk factors in workers who reported no history of sciatica as well as no LBP in the year before baseline. Both studies were conducted among asymptomatic workers at baseline, yet the results varied depending upon the presence of pathology.

In this study, age was associated with the risk of developing new-onset sciatica, which is consistent with earlier research.[9] Although age is often used as a control variable in exploratory studies, not as an independent variable, it is appropriate to include age as an independent risk factor when exploring new-onset sciatica. The risk of sciatic pain seems to increase with age as the intervertebral discs and the spinal canal can often degenerate because of morphologic and functional alternations.[9] As a result, posterior disc bulges cause sciatic pain.[31]

Obesity was also found to be a risk factor for new-onset sciatica, which is again consistent with the findings of a previous report.[7] Obesity may increase the mechanical load on the intervertebral discs, but recent research has revealed that obesity may also be associated with neuropathic disorders. It has been found that obesity alters production of adipokines, including leptin and resistin, and locally produced proinflammatory cytokines such as TNF-α and IL-6 induced by obesity leads to a subclinical inflammatory condition of the white adipose tissue (WAT).[32,33] Similarly, animal work has shown that the adipokine, produced mainly by adipocytes, plays an important role not only in metabolic regulation and obesity, but also in the development of neuropathic disorder.[34–36] In addition, Miscio *et al*[37] suggested that peripheral nerve conduction abnormalities, in the lower extremities of nondiabetic obese patients with subclinical peripheral nerve impairment, increased risk for peripheral neuropathy. Thus, it seems reasonable that metabolic dysfunction may hypothetically mediate neuropathic pain including sciatica in humans. Given these earlier findings, obesity may create an environment that could easily trigger new-onset sciatica.

Results of this study implicate that reduction or prevention of obesity may offer important protection against the development of sciatica. The management of overweight and obesity by exercising, weight control, and improving dietary

TABLE 2. Crude and Adjusted Odds Ratios of Baseline Factors for Cases of New-Onset Sciatica

Factors	%	Crude OR	95% CI	*P*	Adjusted OR	95% CI	*P*
Age (yr)							
<40	37.6	1.00					
40–49	29.6	1.50	0.94–2.37	0.087			
≥50	32.8	1.57	1.00–2.46	0.048			
Sex							
Male	88.5	1.00					
Female	11.5	0.90	0.50–1.62	0.718			
Obesity							
<BMI 25 kg/m²	77.9	1.00			1.00		
≥BMI 25 kg/m² (obese)	22.1	1.84	1.23–2.78	0.003	1.80	1.19–2.72	0.005
Height							
<167 cm (female)/<180 cm (male)	94.0	1.00			1.00		
≥167 cm (female)/≥180 cm (male)	6.1	0.78	0.34–1.79	0.564	0.87	0.37–2.00	0.736
Smoking habits							
Nonheavy smoker	71.5	1.00			1.00		
Heavy smoker	28.5	1.35	0.89–2.03	0.157	1.20	0.76–1.88	0.432
Education							
College/university	71.8	1.00			1.00		
High school/junior high school	28.2	0.94	0.62–1.42	0.765	0.85	0.56–1.31	0.468
Hours of sleep							
< 5 hr	3.9	1.00			1.00		
≥ 5 hr	96.1	1.67	0.72–3.85	0.229	1.93	0.82–4.51	0.131
Exercise habits							
≥Once per week	36.6	1.00			1.00		
<Once per week	63.4	0.97	0.66–1.42	0.866	1.03	0.69–1.52	0.899
Flexibility							
Flexible	76.6	1.00			1.00		
Not flexible	23.4	1.05	0.67–1.64	0.846	1.00	0.64–1.58	0.986
Experience in current job							
<5 yr	31.4	1.00			1.00		
≥5 yr	68.6	0.74	0.50–1.08	0.121	0.72	0.49–1.07	0.102
Working hours per week							
<60 hr	85.9	1.00			1.00		
≥60 hr	14.1	0.87	0.51–1.50	0.620	0.94	0.54–1.64	0.829
Work shift							
Regular shift	86.4	1.00			1.00		
Irregular shift	13.6	1.22	0.73–2.04	0.449	1.30	0.77–2.19	0.328

(*Continued*)

TABLE 2. (*Continued*)

Factors	%	Crude OR	95% CI	*P*	Adjusted OR	95% CI	*P*
Employment status							
Full-time	95.9	1.00			1.00		
Others	4.1	1.06	0.43–2.65	0.896	0.98	0.38–2.51	0.958
Manual handling at work							
No manual handling (desk work)	78.4	1.00			1.00		
Manual handling of objects <20 kg	10.6	1.40	0.79–2.47	0.250	1.47	0.83–2.63	0.188
Manual handling of objects ≥20-kg objects or working as a caregiver	11.0	1.24	0.69–2.20	0.473	1.34	0.73–2.46	0.351
Bending							
Not frequent	95.0	1.00			1.00		
Frequent	5.0	1.19	0.53–2.66	0.674	1.22	0.54–2.75	0.639
Twisting							
Not frequent	97.0	1.00			1.00		
Frequent	3.0	0.42	0.10–1.81	0.244	0.41	0.09–1.79	0.235
Lifting							
Not frequent	95.7	1.00			1.00		
Frequent	4.3	0.98	0.40–2.44	0.973	1.02	0.41–2.57	0.960
Pushing							
Not frequent	97.7	1.00			1.00		
Frequent	2.3	1.32	0.42–4.12	0.629	1.34	0.43–4.22	0.616
Hours of driving per day							
<4 hr	92.5	1.00			1.00		
≥4 hr	7.5	1.25	0.64–2.45	0.514	1.30	0.66–2.56	0.456
Hours of desk work							
<6 hr per day	45.7	1.00			1.00		
≥6 hr per day	54.3	1.03	0.72–1.50	0.856	1.03	0.71–1.50	0.866
Mental workload (quantitative aspect)							
Not stressed	59.1	1.00			1.00		
Stressed	40.9	0.88	0.60–1.28	0.488	0.91	0.62–1.34	0.642
Mental workload (qualitative aspect)							
Not stressed	60.0	1.00			1.00		
Stressed	40.1	1.36	0.94–1.97	0.104	1.39	0.96–2.02	0.085
Physical workload							
Not stressed	70.7	1.00			1.00		
Stressed	29.3	1.13	0.76–1.69	0.539	1.21	0.80–1.81	0.364
Interpersonal stress at work							
Not stressed	84.2	1.00			1.00		
Stressed	15.8	1.20	0.74–1.95	0.466	1.31	0.80–2.15	0.285

(*Continued*)

TABLE 2. (*Continued*)

Factors	%	Crude OR	95% CI	*P*	Adjusted OR	95% CI	*P*
Work environmental stress							
Not stressed	78.3	1.00			1.00		
Stressed	21.7	1.18	0.77–1.82	0.449	1.28	0.82–1.99	0.276
Job control							
Controlled	31.2	1.00			1.00		
Not controlled	68.8	1.03	0.70–1.51	0.875	1.04	0.71–1.52	0.856
Utilization of skills and expertise							
Utilization of skills and expertise	83.4	1.00			1.00		
No utilization of skills and expertise	16.6	0.97	0.59–1.59	0.906	0.96	0.58–1.59	0.882
Job fitness							
Feeling fit	79.5	1.00			1.00		
Not feeling fit	20.5	1.36	0.88–2.09	0.163	1.37	0.89–2.11	0.154
Reward to work							
Satisfied	80.4	1.00			1.00		
Not satisfied	19.6	1.13	0.72–1.78	0.583	1.14	0.72–1.79	0.578
Vigor							
Vigorous	89.1	1.00			1.00		
Not vigorous	10.9	1.25	0.72–2.19	0.427	1.26	0.72–2.21	0.425
Anger							
Not angry	76.5	1.00			1.00		
Angry	23.5	1.22	0.80–1.86	0.358	1.30	0.84–1.20	0.233
Fatigue							
No fatigue	77.7	1.00			1.00		
Fatigue	22.3	0.93	0.60–1.45	0.750	0.98	0.62–1.55	0.944
Anxiety							
Not anxious	82.8	1.00			1.00		
Anxious	17.2	1.40	0.88–2.21	0.154	1.45	0.91–2.31	0.113
Depressed mood							
Not feeling depressed	76.9	1.00			1.00		
Depressed	23.1	1.26	0.83–1.93	0.278	1.28	0.84–1.97	0.252
Somatic symptoms							
No somatic symptoms	87.8	1.00			1.00		
Somatic symptoms	12.2	1.47	0.87–2.47	0.148	1.48	0.87–2.49	0.145
Support by supervisors							
Supported	78.5	1.00			1.00		
Not supported	21.5	1.12	0.72–1.73	0.627	1.13	0.73–1.76	0.591
Support by coworkers							
Supported	66.7	1.00			1.00		
Not supported	33.3	0.95	0.64–1.41	0.800	0.93	0.63–1.38	0.719

(*Continued*)

TABLE 2. (*Continued*)

Factors	%	Crude OR	95% CI	*P*	Adjusted OR	95% CI	*P*
Support by family or friends							
Supported	83.6	1.00			1.00		
Not supported	16.4	1.01	0.62–1.66	0.964	1.04	0.63–1.73	0.868
Daily-life satisfaction							
Satisfied	76.4	1.00			1.00		
Not satisfied	23.7	1.04	0.68–1.61	0.844	1.10	0.71–1.70	0.664
Monotonous work							
Not monotonous	84.4	1.00			1.00		
Monotonous	15.6	0.70	0.40–1.21	0.203	0.72	0.41–1.25	0.239
Family history of LBP with disability							
No LBP with disability	86.4	1.00			1.00		
LBP with disability	13.6	1.23	0.73–2.05	0.433	1.27	0.75–2.14	0.368

Data adjusted for age and sex.
Totals may not sum to 100% because of rounding.
BMI indicates body mass index; CI, confidence interval; LBP, low back pain; OR, odds ratio.

intake is encouraged. Despite the small proportion of workers experiencing sciatica during the follow-up period (approximately 18%), economic loss at workplaces because of sciatica cannot be overestimated. Promoting available, accessible, and effective approaches for the management of overweight and obesity may improve overall industrial health by decreasing and preventing obesity and the subsequent risk of cardiovascular disease and diabetes,[38] osteoarthritis,[39] and spine diseases pertaining to obesity.[40]

TABLE 3. Multivariate-Adjusted Odds Ratios for Cases of New-Onset Sciatica

Factors	OR	95% CI	*P*
Age			
<40	1.00		
40–49	1.50	0.93–2.40	0.093
≥50	1.59	1.01–2.52	0.046
Sex			
Male	1.00		
Female	0.99	0.52–1.86	0.969
Obesity			
BMI <25 kg/m²	1.00		
BMI ≥25 kg/m² (obese)	1.77	1.17–2.68	0.007
Mental workload (qualitative aspect)			
Not stressed	1.00		
Stressed	1.40	0.96–2.04	0.082

Data adjusted for age and sex.
CI indicates confidence interval; OR, odds ratio; BMI, body mass index.

Although not significant in multivariate analysis, mental workload in a qualitative aspect approached significance in crude analyses and was statistically significant in adjusted analyses ($P < 0.1$). Manual handling while under mental strain can biomechanically increase spine loads under experimental conditions.[41,42] As a result, the chance for injury, especially disc injury, increases, which may lead to the onset of sciatica. Existing literature on new-onset of sciatica relating to psychosocial factors is still scarce. Moreover, those results often conflict perhaps because different measurements were used to assess psychosocial factors. Further research is needed to elucidate the potential relationship fully between psychosocial factors and cases of new-onset sciatica.

There are some limitations to the study. Generalization of the results is an issue. First, approximately 89% of the study participants were male, and sex was an effect modifier, particularly in males. Although this study indicated that sex can be an effect modifier for obesity and mental workload, the number of females may not be sufficient to investigate effect modification. Further investigation is needed for effect modification in females. Second, there is also a concern that results may not represent workers who left work because of sciatica. Third, results may be influenced by selective drop out because 3194 workers followed-up were entered into the analysis out of 5310 participants. On the basis of the results comparing the baseline characteristics between the follow-up group and non–follow-up group (Table 1), more of the non–follow-up group were younger and engaged in no/less manual handling involved at work than the follow-up group. Although obesity

TABLE 4. Assessment of Effect Modification by Age and Sex on the Association of New-Onset Sciatica

Factor	OR	*P*	95% CI
Obesity (obese *vs.* not obese)			
<40	1.09	0.834	0.47–2.53
40–49	1.38	0.384	0.67–2.82
≥50	3.18	0.001	1.65–6.15
Obesity (obese *vs.* not obese)			
Male	1.93	0.002	1.26–2.95
Female	0.68	0.730	0.08–6.02
Mental workload (stressed *vs.* not stressed)			
<40	1.99	0.043	1.02–3.86
40–49	1.18	0.624	0.61–2.29
≥50	1.16	0.633	0.63–2.16
Mental workload (qualitative aspect) (stressed *vs.* not stressed)			
Male	1.44	0.071	0.97–2.13
Female	0.96	0.950	0.31–3.02

CI indicates confidence interval; OR, odds ratio.

and manual handling at work were statistically significant, the differences were practically small. This is perhaps because the number of both the follow-up and non–follow-up groups was large. Although it was assumed that these differences may not influence interpretation, results of the study may need to be regarded with care. Lastly, this study used the MLHW definition of obesity, unlike the previous literature using the World Health Organization definition of obesity. Although the MLHW definition may be appropriate for obese in Japanese population, not using an internationally-accepted definition of obesity may limit generalizing the findings.

Moreover, this study indicated effect modification by age exists in the association between obesity and new-onset sciatica, and the OR was high especially for those aged 50 or more. This can be explained by degenerated intervertebral discs and spinal canals by age, but further research may be needed for explaining this effect modification. Interpretation of the results regarding age is needed.

Additionally, misclassification at some extent is inevitable. Responses that rely on diagnosis and subjective measurement may be distorted because of the nature of the self-administered questionnaires, whereas retrospective questions may be distorted by recall bias. Future research should consider using both subjective as well as objective measures simultaneously.

Finally, there may be alternative methods for the selection of potential risk factors before conducting multivariate analysis. It should be noted that a more complicated model aside from including well-established potential confounders such as age and sex, may offer a better explanation of the data. Further research is needed to identify a full range of potential risk factors for inclusion in future studies.

CONCLUSION

The aim of this study was to examine risk factors, including psychosocial factors, for the development of sciatica in Japanese workers. In the study, individual factors such as age and obesity were identified as risk factors for the development of new-onset sciatica in previously asymptomatic individuals. Our findings suggest that the management of obesity is key to preventing new-onset sciatica. Japanese occupational health departments should encourage preventative strategies, including exercise, weight control, and control of dietary intake. Further research is needed to assess the effectiveness of obesity management in preventing new-onset sciatica.

➢ Key Points

- ❑ Significant associations between development of new-onset sciatica and age and obesity were found in both univariate and multivariate analyses.
- ❑ The relationship between individual and occupational factors and cases of new-onset sciatica is established, but the involvement of psychosocial factors in its development remains unclear. This study suggests that individual factors (*e.g.*, obesity) are the potential risk factors for new-onset sciatica in previously symptom-free workers.
- ❑ Our results suggest that reducing or preventing obesity may lower the risk of new-onset sciatica. Promoting available, accessible, and effective sources of weight management for workers should be encouraged in industrial health.

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ORIGINAL ARTICLE

An outcome measure for patients with cervical myelopathy: the Japanese Orthopaedic Association Cervical Myelopathy Evaluation Questionnaire (JOACMEQ): an average score of healthy volunteers

Nobuhiro Tanaka · Shin-ichi Konno · Katsushi Takeshita · Mitsuru Fukui · Kazuhisa Takahashi · Kazuhiro Chiba · Masabumi Miyamoto · Morio Matsumoto · Yuichi Kasai · Masahiko Kanamori · Shunji Matsunaga · Noboru Hosono · Tsukasa Kanchiku · Hiroshi Taneichi · Hiroshi Hashizume · Masahiro Kanayama · Takachika Shimizu · Mamoru Kawakami

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Abstract
Background An outcome measure to evaluate the neurological function of patients with cervical myelopathy was proposed by the Japanese Orthopaedic Association (JOA score) and has been widely used in Japan. However, the JOA score does not include patients' satisfaction, disability, handicaps, or general health, which can be affected by cervical myelopathy. In 2007, a new outcome measure, the Japanese Orthopaedic Association Cervical Myelopathy Evaluation Questionnaire (JOACMEQ), which is a self-administered questionnaire, was developed. However, the influence of age and gender on the scores has not been fully examined. The purpose of this study was to establish the standard value of the JOACMEQ by age using healthy volunteers.
Methods This study was conducted in 23 university hospitals and their affiliated hospitals from September to December 2011. The questionnaire included 24 questions for evaluation of physical function of the cervical spine and

The Clinical Outcome Committee of the Japanese Orthopaedic Association.
The Clinical Outcome Committee of the Japanese Society for Spine Surgery and Related Research.

N. Tanaka (✉)
Department of Orthopaedic Surgery, Institute of Biomedical and Health Sciences, Hiroshima University, Kasumi 1-2-3, Minami-ku, Hiroshima 734-8551, Japan
e-mail: nobut@hiroshima-u.ac.jp

S. Konno
Department of Orthopaedic Surgery, School of Medicine, Fukushima Medical University, Fukushima, Japan

K. Takeshita
Department of Orthopaedic Surgery, The University of Tokyo, Tokyo, Japan

M. Fukui
Laboratory of Statistics, Osaka City University Faculty of Medicine, Osaka, Japan

K. Takahashi
Department of Orthopedic Surgery, Graduate School of Medicine, Chiba University, Chiba, Japan

K. Chiba
Department of Orthopaedic Surgery, Kitasato University Kitasato Institute Hospital, Tokyo, Japan

M. Miyamoto
Department of Orthopedic Surgery, Nippon Medical School, Tokyo, Japan

M. Matsumoto
Department of Orthopaedic Surgery, Keio University, Tokyo, Japan

Y. Kasai
Department of Orthopaedic Surgery, Mie University Graduate School of Medicine, Tsu, Mie, Japan

M. Kanamori
Department of Orthopaedic Surgery, Faculty of Medicine, University of Toyama, Toyama, Japan

S. Matsunaga
Department of Orthopaedic Surgery, Imakiire General Hospital, Kagoshima, Japan

N. Hosono
Department of Orthopaedic Surgery, Osaka Kosei-Nenkin Hospital, Osaka, Japan

spinal cord. A total of 1,629 healthy volunteers were recruited for the study. The ages ranged from 20 to 89 years old.
Results The volunteers comprised 798 men and 831 women. In the elderly healthy volunteers, the JOACMEQ scores decreased with age. In general, the scores for cervical spine function and upper/lower extremity function were retained up to the 60s, then decreased in the 70s and 80s. The scores for quality of life were retained up to the 70s; however, the score for bladder function was retained up to the 40s, then declined with age from the 50s to 80s.
Conclusion The standard values of the JOACMEQ by age were established. Differences in the scores were found among different generations. Patients with cervical myelopathy should be evaluated with this new self-administered questionnaire taking into account the standard values according to different ages.

Introduction

The members of the Subcommittee on the Evaluation of Low Back Pain and Cervical Myelopathy, who belong to the Clinical Outcomes Committee of the Japanese Orthopaedic Association, have composed a new self-administered questionnaire, the Japanese Orthopaedic Association Cervical Myelopathy Evaluation Questionnaire (JOACMEQ), as a new outcome measure for patients with cervical myelopathy [1] to solve problems associated with the Japanese Orthopaedic Association score (JOA score), which was established by the Japanese Orthopaedic Association in 1975 [2] and was revised in 1994 [3]. The JOACMEQ provides specific outcome measures including patients' disability, handicaps, and general health, which are necessary to evaluate severity and treatment results in patients with cervical myelopathy. It has been used in many institutions nationwide. However, the influence of age and gender on the scores has not been fully examined, and there is a concern that the age-related decline in scores may influence the evaluation. Therefore, standard values according to age using the data of physically unimpaired persons are needed to validate this new self-administered questionnaire. The purpose of the current study was to establish the standard values of the JOACMEQ according to different ages using the results of healthy volunteers in their 20s up to 80s.

Materials and methods

This study was conducted in 23 university hospitals and their affiliated hospitals from September to December in 2011. A total of 1,644 healthy volunteers were recruited for the study. They were self-supporting and required no medical assistance for orthopedic diseases. Subjects with cognitive impairment who could not understand the questionnaires and those who were under treatment for orthopedic disorders and/or had a history of operation for spinal disorders including the cervical spine were excluded from the study. Medical professionals were also excluded from the subjects. The healthy volunteers were grouped by gender and decade from 20 to 80 years of age. Five healthy individuals within each age group and from both genders were surveyed at each institution. This study was reviewed and approved by the institutional review board of each institution, and all subjects provided informed consent prior to the inclusion to the study.

The questionnaire included 24 questions in five domains, cervical spine function, upper extremity function, lower extremity function, bladder function, and quality of life. Visual analog (VAS) scales were used to evaluate the degree of pain or stiffness in the neck or shoulders, tightness in the chest, pain or numbness in the arms or hands, and pain or numbness from the chest to toes (Table 1). A respondent recalled his or her physical condition during the previous 1 week and circled the number of an answer for each question that best fit his or her condition. If a respondent's condition changed depending on the day or the time, he or she circled the number representing "the worst condition." The JOACMEQ score was calculated as: cervical spine function: Q1-1 × 20 + Q1-2 × 10 + Q1-3 × 15 + Q1-4 × 5 − 50; upper extremity function: (Q1-4 × 5 + Q2-1 × 10 + Q2-2 × 15 + Q2-3 × 5 + Q3-1 × 5 − 40) × 100 ÷ 95; lower extremity function: Q3-1 × 10 + Q3-2 × 10 + Q3-3 × 15 + Q3-4 × 5 + Q3-5 × 5 − 45) × 100 ÷ 110; bladder function: (Q4-1 × 10 +

T. Kanchiku
Department of Orthopaedic Surgery, Yamaguchi University Graduate School of Medicine, Yamaguchi, Japan

H. Taneichi
Department of Orthopaedic Surgery, Dokkyo Medical University School of Medicine, Tochigi, Japan

H. Hashizume
Department of Orthopaedic Surgery, Wakayama Medical University, Kimiidera, Wakayama, Japan

M. Kanayama
The Spine Center, Hakodate Central General Hospital, Hakodate, Hokkaido, Japan

T. Shimizu
Department of Orthopaedic Surgery, Gunma Spine Center, Takasaki, Gunma, Japan

M. Kawakami
Spine Care Center, Wakayama Medical University Kihoku Hospital, Katsuragi-cho, Ito-gun, Wakayama, Japan

Table 1 The JOA Cervical Myelopathy Evaluation Questionnaire (JOACMEQ)

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

Q1-1 While in the sitting position, can you look up at the ceiling by tilting your head upward?

1) Impossible 2) Possible to some degree (with some efforts)

3) Possible without difficulty

Q1-2 Can you drink a glass of water without stopping despite the neck symptoms?

1) Impossible 2) Possible to some degree

3) Possible without difficulty

Q1-3 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?

Table 1 continued

1) Impossible 2) Possible to some degree

3) Possible without difficulty

Q1-4 Can you look at your feet when you go down the stairs?

1) Impossible 2) Possible to some degree

3) Possible without difficulty

Q2-1 Can you fasten the front buttons of your blouse or shirt with both hands?

1) Impossible 2) Possible if I spend time.

3) Possible without difficulty

Q2-2 Can you eat a meal with your dominant hand using a spoon or a fork?

1) Impossible 2) Possible if I spend time.

3) Possible without difficulty

Q2-3 Can you raise your arm? (Answer for the weaker side.)

1) Impossible

2) Possible up to shoulder level

3) Possible though the elbow and/or wrist is a little flexed

4) I can raise it straight upward

Q3-1 Can you walk on a flat surface?

1) Impossible

Table 1 continued

2) Possible but slowly even with support

3) Possible only with the support of a handrail, a cane, or a walker

4) Possible but slowly without any support

5) Possible without difficulty

Q3-2 Can you stand on either leg without the support of your hand? (the need to support yourself)

1) Impossible with either leg

2) Possible on either leg for more than ten seconds

3) Possible on both legs individually for more than ten seconds

Q3-3 Do you have difficulty in going up the stairs?

1) I have great difficulty. 2) I have some difficulty.

3) I have no difficulty.

Q3-4 Do you have difficulty in one of the following motions; bending forward, kneeling or stooping?

1) I have great difficulty. 2) I have some difficulty.

3) I have no difficulty.

Q3-5 Do you have difficulty in walking more than 15 minutes?

1) I have great difficulty. 2) I have some difficulty.

Table 1 continued

3) I have no difficulty.

Q4-1 Do you have urinary incontinence?

1) Always

2) Frequently

3) When retaining urine over a period of more than 2 hours

4) When sneezing or straining

5) No

Q4-2 How often do you go to the bathroom at night?

1) Three times or more 2) Once or twice 3) Rarely

Q4-3 Do you have a feeling of residual urine in your bladder after voiding?

1) Most of the time 2) Sometimes 3) Rarely

Q4-4 Can you initiate (start) your urine stream immediately when you want to void?

1) Usually not 2) Sometimes 3) Most of the time

Q5-1 How is your present health condition?

1) Poor 2) Fair 3) Good 4) Very good 5) Excellent

Q5-2 Have you been unable to do your work or ordinary activities as well as you would like?