Validation and cross-cultural adaptation of the Korean version of the Zurich claudication questionnaire in patients with lumbar spinal stenosis

Ho-Joong Kim, MD\textsuperscript{a}, Young-Kyun Lee, MD\textsuperscript{b}, Dong Ook Kim, MD\textsuperscript{a}, Bong-Soon Chang, MD\textsuperscript{c}, Choon-Ki Lee, MD\textsuperscript{c}, Jin S. Yeom, MD\textsuperscript{a}

\textsuperscript{a}Spine Center and Department of Orthopaedic Surgery, Seoul National University College of Medicine and Seoul National University Bundang Hospital, 166 Gumiro, Bundang-gu, Sungnam, 463-707, Republic of Korea

\textsuperscript{b}Department of Orthopaedic Surgery, Seoul National University Bundang Hospital, Bundang-gu, Seongnam, Republic of Korea

\textsuperscript{c}Department of Orthopaedic Surgery, Seoul National University College of Medicine and Seoul National University Hospital, 101 Daehangno, Jongno-gu, Seoul, 110-744, Republic of Korea

Ho-Joong Kim and Young-Kyun Lee equally contributed to this work.

Address correspondence and reprint requests to:

Jin S. Yeom, MD
Spine Center and Department of Orthopaedic Surgery,
Seoul National University College of Medicine and Seoul National University Bundang Hospital, 166 Gumiro, Bundang-gu,
Sungnam, 463-707, Republic of Korea
Tel: 82-31-787-7195
E-mail: highcervical@gmail.com

The manuscript submitted does not contain information about medical device(s)/drug(s).
No funds were received in support of this work.
No relevant financial activities outside the submitted work.
Abstract

Study design. Linguistic and psychometric validation of a translated questionnaire

Objective. To validate the Korean version of Zurich claudication questionnaire (ZCQ) both linguistically and psychometrically.

Summary of Background Data: The ZCQ is considered as a disease specific and gold standard measure for evaluation of patients with lumbar spinal stenosis (LSS). However, there has been no validated Korean version of the ZCQ.

Methods. The ZCQ was translated forward and backward, culturally adapted by 2 independent translators, and approved by an expert committee. The final version of the Korean ZCQ was added to a routine questionnaire including a visual analog pain scale (VAS) for back and leg pain, the Oswestry disability Index (ODI), and the European Quality of Life-5 dimensions (EQ-5D). Psychometric validation included reliability by internal consistency using Cronbach’s alpha, the test-retest reliability using intraclass correlation coefficient (ICC), and concurrent validity by comparing the Korean ZCQ to VAS for back/leg pain, ODI, and EQ-5D using Pearson correlation.

Results. A total of 109 patients were included in this study. The test-retest intraclass correlation coefficient (ICC) of the ZCQ was shown to have good reliability for all three domains: the ICCs for symptom, function, and satisfaction domains were 0.79, 0.84, and 0.91, respectively. Internal consistency of the Korean ZCQ for the symptom, function, and satisfaction domains was also excellent (Cronbach’s $\alpha = 0.894$, 0.939, and 0.961, respectively). For concurrent validity, all three domains of the Korean ZCQ were significantly correlated with external criteria including VAS for back/leg pain, ODI, and EQ-5D. In the assessment of responsiveness, 21 patients who completed the ZCQ both before and after surgery demonstrated significantly different scores for symptom and disability domains.
Conclusions. The validated Korean version of the ZCQ is a transculturally equivalent, reliable, and valid tool for use in assessing symptoms, function, and satisfaction with treatment in patients with LSS.

Keywords: lumbar spinal stenosis, Zurich claudication questionnaire, Oswestry disability index, Visual analog pain scale, European Quality of Life-5 dimensions, Cross-cultural adaptation, Psychometric validation, Concurrent validation, Internal consistency, test-retest reliability

Level of Evidence: 3
Introduction

Lumbar spinal stenosis (LSS) is a common condition in the elderly, and is defined as narrowing of the lumbar spinal canal, causing back and/or leg pain, neurologic deficits in the legs, and walking intolerance due to neurogenic claudication.\textsuperscript{1-5} Even though the natural history of LSS is essentially benign, improper assessment and treatment of LSS can result in walking intolerance due to pain, decreased physical function, and impaired quality of life.\textsuperscript{6-8}

Therefore, quantitative assessment should be a prerequisite for proper assessment, treatment, and evaluation of treatment for LSS. Various quantitative outcome measures including the visual analog scale (VAS) for pain, the Oswestry disability Index (ODI), the European Quality of Life-5 dimensions (EQ-5D), and the short form (SF)-36 have been widely used for both clinical and research purposes in LSS. However, a limitation of these measures is that they are not specific for LSS. The VAS, ODI, and EQ-5D mainly measure pain, disability for activities of daily living, and quality of life, respectively. Therefore, the currently available questionnaires are limited in their ability to comprehensively assess the severity of LSS symptoms, especially for walking intolerance.

The recently developed Zurich claudication questionnaire (ZCQ), also named the Swiss spinal stenosis measure and the Brigham spinal stenosis questionnaire, is a self-reported, quantitative measure of symptom severity, physical function, and satisfaction with surgery in LSS patients.\textsuperscript{9} The questionnaire is composed of three domains with a Likert-type scale. The ZCQ includes 7 items for symptom severity, scored from 1 to 5, 5 items for functional disability, scored from 1 to 4, and 6 items for satisfaction with treatment, scored from 1 to 4. Higher scores indicate more severe LSS. The ZCQ has good validity and reliability in patients with LSS and is considered the gold standard for evaluating LSS treatment outcomes.\textsuperscript{10}
For international use, the ZCQ has been translated into languages of other countries, including Norway, Switzerland, China, and Japan. However, there has been no translated and validated Korean version of the ZCQ. The purpose of this study was to translate the ZCQ into the Korean language and validate the ZCQ both linguistically and psychometrically.

Materials and Methods

Study design and Participants

The hospital institutional review board approved this study. A total of 121 patients diagnosed with LSS were consecutively assessed for eligibility in this study between November 2016 and January 2017. Inclusion criteria were as follows: 1) age 40 to 80 years and 2) a diagnosis of LSS, with spine surgery for LSS planned or previously performed within 2 years. The diagnostic criteria for LSS were the presence of one or more of the following symptoms in addition to a stenotic lesion greater than grade A on lumbar spine magnetic resonance imaging, according to Schizas grading: walking intolerance due to neurogenic claudication, sensory changes such as pain/numbness/tingling sense in the buttock and/or lower leg, and motor weakness of the lower legs as well as bladder/bowel dysfunction (urinary retention, overflow incontinence, and/or constipation). Patients were excluded for the following conditions: 1) any concurrent serious medical condition such as sepsis or cancer that would cause disability or decrease general health status; 2) peripheral neuropathy; 3) concurrent myelopathic symptoms, including walking and balancing difficulty; 4) acute osteoporotic compression fracture; 5) walking intolerance caused by ankle, knee, and hip joint pain associated with osteoarthritis; 6) a diagnosis of coronary and/or peripheral arterial occlusive disease; and 7) any disorder that interferes with gait. Of the 121 patients, 12 patients were
excluded in this study because 3, 4, and 5 patients had co-current diabetes neuropathy, painful osteoarthritis at knee joint, and osteoporotic compression fracture. Finally, 109 patients were included in this study.

Zurich Claudication Questionnaire (ZCQ)

The ZCQ provides a specific measure of symptoms and function in patients with LSS. It includes three domains, representing symptom severity, physical function, and satisfaction. The 7 questions about symptom severity address overall pain, pain frequency, back pain, leg pain, numbness, weakness, and trunk balance. All but 1 item had 5 categories scored from 1 to 5. Balance disturbance was scored for 3 categories, and was transformed to a 1–3–5 scale. The 5 physical function questions included walking distance and ability to walk for pleasure, shopping, getting around the house or apartment, and from bathroom to bedroom. All but 1 item had 4 categories scored from 1 to 4 (no; yes, but always with pain; yes, but sometimes with pain; yes, comfortably). Walking distance was categorized from 1 to 4 (more than 2 miles, more than 2 blocks but less than 2 miles, more than 50 feet but less than 2 blocks, and less than 50 feet). The score was calculated as the unweighted mean of all answered items in the questionnaire, unless more than 2 items were missing. Questions also asked about patient satisfaction with the overall results of spinal surgery; pain relief after surgery; walking ability after surgery; ability to do housework, yard work, or a job after surgery; strength in the thighs, legs, or feet; and balance or steadiness on the feet. These questions were scored as follows, from 1 to 4: very satisfied, somewhat satisfied, somewhat dissatisfied, and very dissatisfied. The satisfaction score was the unweighted mean of all 6 items if the number of responses exceeded 4.⁹
Translation, Synthesis, Expert Committee Review, Test of the Prefinal Version and Final Questionnaire and Assessments in Patients with LSS

The translation and cross-cultural adaptation of the original English version of the ZCQ were accomplished by following guidelines as described in detail by Beaton et al.\textsuperscript{15} The original English ZCQ was translated into the Korean version by 2 bilingual translators, including 1 native Korean-speaking orthopedic resident and 1 translator, who independently performed the forward translation to the Korean version. After comparing translations by translators and an orthopedics professor, both versions were merged and analyzed in detail until consensus was achieved. The backward translation was performed by 2 independent bilingual English speakers, both of whom were professional translators and did not know the purpose of translation.

All English translations were compared with the original English ZCQ and checked for inconsistencies by an expert committee comprised of the previous 4 translators involved in the process, 2 orthopedic surgeons, and a Korean translation expert. This committee consolidated the original questionnaire, translations, back translations, and corresponding written reports to reach a consensus. The pilot version of ZCQ was created.

The pre-final version of the ZCQ was pilot tested in 30 patients with LSS. After completing the questionnaire, patients were subsequently interviewed for any comments on the questionnaire or understanding the purpose and meaning of each question. A report was then produced after the findings were considered by a committee of the original reviewers who approved the final ZCQ version without any amendment (Appendix).

The final Korean version of the ZCQ was included in a series of questionnaires that was also used to assess pain and disability in patients with LSS. These measures included the VAS for back and leg pain, ODI, and EQ-5D. The patients' assessment was performed.
week before surgery and/or 3 or 6 months after surgery. Furthermore, 20 randomly selected patients completed a second assessment by phone or e-mail within 1 month after the first assessment. During this period, patients took medications for pain if necessary.

Statistical Analysis

For psychometric assessment of the Korean version of the ZCQ, the reliability and validity were evaluated. Responsiveness was also assessed. Test-retest reliability was assessed by comparing replies to the first and second administration of ZCQ. Reliability was examined using the intraclass correlation coefficient (ICC). Coefficients above 0.7 and 0.8 were considered sufficient and good for determining test-retest reliability, respectively. In order to estimate internal consistency, the homogeneity of the items within each domain was evaluated using Cronbach’s alpha coefficients of preoperative responses for the symptom and function domains and of postoperative responses for the satisfaction domain. A Cronbach’s alpha above 0.7, 0.8, or 0.9 was considered acceptable, good, or excellent for internal consistency, respectively. For concurrent validity, Pearson’s correlation was used by comparing the scores of the symptom and function domains and the postoperative replies for the satisfaction domain of ZCQ with the results of the external criteria such as VAS for back and leg pain, ODI, and EQ-5D. The correlation coefficient was interpreted as follows: ± 0.1 was considered weak, ± 0.3 was considered moderate, and ± 0.5 was considered a strong correlation. In the assessment of responsiveness, the changes in the scores for the symptom and function domains were examined in patients who completed the ZCQ both preoperatively and postoperatively, using a paired t-test. In addition, responsiveness was also evaluated by the effect sizes (ES). The ES was calculated by the mean change in scores from before to 3 months after surgery divided by the standard deviation of the scores before surgery. An ES
of 0.8 was considered large. The higher the ES, the greater was the level of sensitivity to detect change. All statistical analyses were performed using SPSS 20.0.0 statistics package (SPSS, Inc., Chicago, IL, U.S.A.). A value of \( P < 0.05 \) was accepted as significant.

**Results**

*Descriptive analysis for participants' characteristics*

A total of 109 patients were analyzed in this study. Of these, 31 participated in the symptom and function domains before surgery, and 78 participated in all three domains, including satisfaction after surgery. Among 109 patients, 21 patients were replied in both preoperative and postoperative states. Table 1 shows demographic and clinical characteristics in the preoperative (\( n = 31 \)) and postoperative (\( n = 78 \)) groups.

Mean scores of the symptom and function domains before surgery were 3.6 ± 0.8 and 2.9 ± 0.6, respectively, while mean scores of the symptom and function domains after surgery were 2.5 ± 0.8 and 1.9 ± 0.7. Mean scores for the satisfaction domain of ZCQ after surgery were 1.9 ± 0.8 (Table 2). ODI and VAS for back and leg pain are also shown in the Table 2.

*Test-Retest Reliability*

For the 20 patients randomly selected who underwent surgery previously, ZCQ was completed twice at an interval of 4 weeks. Test-retest ICCs (3,1) (95% confidence interval) for the Korean ZCQ symptom, function, and satisfaction domains were 0.79 (0.54 – 0.91), 0.84 (0.64 – 0.93), and 0.91 (0.78 – 0.96), respectively, which showed statistically significance (\( P = 0.007, P = 0.003, \) and \( P < 0.001 \), respectively).
**Internal Consistency**

The Cronbach’s $\alpha$ for internal consistency of the Korean ZCQ symptom, function, and satisfaction domains measured the extent to which items on a scale represent a common underlying variable; the result was excellent: 0.894, 0.939, and 0.961, respectively. The corrected item-total correlation showed consistency between each questionnaire score and the combined score of all other questionnaires for all questions; the values were 0.616 – 0.822, 0.747 – 0.893, and 0.839 – 0.931 in the symptom, function, and satisfaction domains of ZCQ, respectively (Figure 1).

**Concurrent Validity and Responsiveness**

Concurrent validity was assessed by comparing the ZCQ scores with the results of ODI, VAS for back and leg pain, and EQ-5D. Three domains of the Korean ZCQ scores showed significant correlations with each other. In addition, all three Korean ZCQ domains were strongly correlated with all external criteria including VAS for back and leg pain, ODI, and EQ-5D (Table 3). Twenty-one patients who completed the ZCQ both before and 1 month after surgery showed significant changes in scores for ZCQ symptom and function domains. The ZCQ symptom and function scores decreased from $3.7 \pm 0.8$ to $2.1 \pm 0.5$ ($P < 0.001$) and from $2.8 \pm 0.5$ to $1.6 \pm 0.8$ ($P < 0.001$), respectively. In addition, the ES was highest in the symptom and function domains of Korean ZCQ, followed by VAS leg pain, EQ-5D, VAS for back pain, and ODI, which were all above 0.8 (Table 4).
Discussion

In this study, the original English ZCQ was translated into a Korean version of ZCQ, and linguistically validated using the method described by Beaton et al.\textsuperscript{15} The present results suggest that the Korean version was not changed structurally from the original version of the ZCQ, and that all questions were maintained. Furthermore, the psychometric validation demonstrated that the Korean ZCQ was a reliable, easily understood, and valid instrument for measuring symptom severity, function, and satisfaction after treatment in Korean patients with LSS.

*Three domains showed sufficient (ICC = 0.79 for symptoms domain) and good (ICC = 0.84 and 0.91 for function and satisfaction) reliability.* These values were compatible with those in the original and other language versions of ZCQ.\textsuperscript{9,11,12} *Two things should be considered for the interpretation of this result.* First, even though LSS is a chronic disease, symptoms can change with treatment and/or activity. Therefore, we randomly selected only patients who underwent surgery previously. Second. *relatively small numbers of patients (n = 20) completed the test-retest. These two things could have influenced the ICC values.*

Similar to the original and other language versions of ZCQ,\textsuperscript{9,11,12} the present Korean ZCQ symptom, function, and satisfaction domains had good or excellent internal consistency (Cronbach’s $\alpha = 0.894$, 0.939, and 0.961, respectively). All questions demonstrated good correlations.

For the concurrent validity, the Korean ZCQ symptom and function domains revealed strong correlations with most of the validated external criteria including VAS for back pain, VAS for leg pain, ODI, and EQ-5D. These findings were consistent with those in previous studies of other language versions of ZCQ, which also demonstrated that pain and function domains showed strong agreement with the pain-specific measurement of VAS,
function-related measures such as the ODI, and the measurement of quality of life (SF-36). The Korean ZCQ satisfaction domain also showed moderate to strong correlation with the above external criteria. All three domains of the Korean ZCQ showed strong correlations with each other, with the highest correlation observed between the symptom and satisfaction domains. Furthermore, symptom and function improvement after surgery was reflected by a decrease in ZCQ scores for symptom and function domains, and was associated with the satisfaction domain.

The Korean ZCQ symptom and function domain demonstrated better responsiveness than other outcome measures, such as VAS, ODI, and EQ-5D. The ES of ZCQ symptom and function domains which represents responsiveness agree with that of other languages. Therefore, the Korean ZCQ symptom and function domains reflect changes in the post-operative condition of LSS in patients with a high degree of sensitivity. Furthermore, this disease-specific questionnaire may enable better communication between the physician and the patient because sharing the responsiveness of the patients with high sensitivity may enhance patient compliance with treatments.

The present study has some limitations. First, only patients who underwent or will undergo spine surgery were included. However, most patients with LSS usually prefer conservative treatment rather than surgery. Therefore, the patients in the present study had severe symptoms and functional disability. Second, relatively small numbers of patients (n=20) were assessed for test reliability. However, this was unlikely to influence the results for validity.

In conclusion, the validated Korean version of ZCQ is a transculturally equivalent, reliable, and valid tool for assessing symptoms, function, and satisfaction with treatment in patients with LSS. Therefore, this version can be adopted use in Korean patients with LSS.
References


Figure legend

**Figure 1.** Internal consistency of ZCQ. Numbers indicate each questionnaire of the ZCQ.

(ZCQ: Zurich claudication questionnaire)
Table 1. Descriptive statistics of the patients with LSS in the study. Values are mean ± SD or n (%)

<table>
<thead>
<tr>
<th></th>
<th>Patients before surgery (31)</th>
<th>Patients after surgery (78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>69.1 ± 10.1</td>
<td>70.4 ± 7.9</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>17 (54.8)</td>
<td>47 (60.3)</td>
</tr>
<tr>
<td>BMI (kg/cm$^2$)</td>
<td>25.4 ± 3.5</td>
<td>26.2 ± 4.5</td>
</tr>
<tr>
<td>Symptom duration (months)</td>
<td>11.4 ± 7.2</td>
<td>NA</td>
</tr>
<tr>
<td>Postoperative period (months)</td>
<td>NA</td>
<td>13.3 ± 10.2</td>
</tr>
<tr>
<td>Diagnosis (n)</td>
<td>Central spinal stenosis; 23</td>
<td>Central spinal stenosis; 53</td>
</tr>
<tr>
<td></td>
<td>Degenerative spondylolisthesis; 5</td>
<td>Degenerative spondylolisthesis; 17</td>
</tr>
<tr>
<td></td>
<td>Lytic spondylolisthesis; 3</td>
<td>Lytic spondylolisthesis; 8</td>
</tr>
<tr>
<td>Operation (n)</td>
<td>NA</td>
<td>Decompression; 42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decompression and fusion; 36</td>
</tr>
</tbody>
</table>

LSS, lumbar spinal stenosis; SD, standard deviation; BMI, body mass index; NA, not applicable; n, numbers
Table 2. ZCQ scores and clinical outcome variables of the patients in the study. Values are mean ± SD.

<table>
<thead>
<tr>
<th></th>
<th>Patients before surgery (31)</th>
<th>Patients after surgery (78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZCQ – symptom</td>
<td>3.6 ± 0.8</td>
<td>2.5 ± 0.8</td>
</tr>
<tr>
<td>ZCQ – function</td>
<td>2.9 ± 0.6</td>
<td>1.9 ± 0.7</td>
</tr>
<tr>
<td>ZCQ – satisfaction</td>
<td>NA</td>
<td>1.9 ± 0.8</td>
</tr>
<tr>
<td>VAS for back pain</td>
<td>5.5 ± 2.4</td>
<td>3.7 ± 2.2</td>
</tr>
<tr>
<td>VAS for leg pain</td>
<td>6.8 ± 2.6</td>
<td>3.2 ± 2.3</td>
</tr>
<tr>
<td>ODI scores</td>
<td>44.7 ± 18.1</td>
<td>30.6 ± 13.9</td>
</tr>
<tr>
<td>EQ-5D</td>
<td>0.274 ± 0.286</td>
<td>0.530 ± 0.277</td>
</tr>
</tbody>
</table>

ZCQ, Zurich claudication questionnaire; SD, standard deviation; NA, not applicable; the European Quality of Life–5 dimensions, EQ-5D
Table 3. Concurrent validity. Pearson correlations coefficient between ZCQ scores and VAS for back and leg pain/ODI/EQ-5D.

<table>
<thead>
<tr>
<th></th>
<th>ZCQ – symptom</th>
<th>ZCQ – function</th>
<th>ZCQ – satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r</td>
<td>P value</td>
<td>r</td>
</tr>
<tr>
<td>ZCQ – symptom</td>
<td></td>
<td>0.836 &lt; 0.001</td>
<td>0.777 &lt; 0.001</td>
</tr>
<tr>
<td>ZCQ – function</td>
<td>0.836 &lt; 0.001</td>
<td></td>
<td>0.625 &lt; 0.001</td>
</tr>
<tr>
<td>ZCQ – satisfaction</td>
<td>0.777 &lt; 0.001</td>
<td>0.625 &lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>VAS for back pain</td>
<td>0.651 &lt; 0.001</td>
<td>0.568 &lt; 0.001</td>
<td>0.595 &lt; 0.001</td>
</tr>
<tr>
<td>VAS for leg pain</td>
<td>0.791 &lt; 0.001</td>
<td>0.712 &lt; 0.001</td>
<td>0.520 &lt; 0.001</td>
</tr>
<tr>
<td>ODI</td>
<td>0.728 &lt; 0.001</td>
<td>0.748 &lt; 0.001</td>
<td>0.525 &lt; 0.001</td>
</tr>
<tr>
<td>EQ-5D</td>
<td>-0.709 &lt; 0.001</td>
<td>-0.704 &lt; 0.001</td>
<td>-0.592 &lt; 0.001</td>
</tr>
</tbody>
</table>

ZCQ, Zurich claudication questionnaire; VAS, Visual analog pain scale; EQ-5D, European Quality of life; R; correlation coefficient
### Table 4. Responsiveness of the outcome scores between preoperative and postoperative states.

<table>
<thead>
<tr>
<th>Changes between preoperative and postoperative outcome scores</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>ZCQ – symptom</td>
<td>1.75</td>
</tr>
<tr>
<td>ZCQ – function</td>
<td>1.18</td>
</tr>
<tr>
<td>VAS for back pain</td>
<td>2.94</td>
</tr>
<tr>
<td>VAS for leg pain</td>
<td>5.44</td>
</tr>
<tr>
<td>ODI</td>
<td>17.67</td>
</tr>
<tr>
<td>EQ-5D</td>
<td>0.38</td>
</tr>
</tbody>
</table>

ZCQ, Zurich Claudication Questionnaire; VAS, Visual Analog Pain Scale; EQ-5D, European Quality of Life; SD, standard deviation; ES, effect size.
최근 한달간 어땠는지 답해주십시오.
허리, 엉치 및 다리로 뻗치는 통증이 평균적으로 어느 정도 입니까?
   1. 없음.
   2. 경미한 정도.
   3. 보통.
   4. 심함.
   5. 매우 심함.
 얼마나 자주 허리, 엉치 및 다리에 통증이 있었습니까?
   1. 1주일에 한번도 안 생기는 경우도 있음
   2. 적어도 1주일에 한번 이상
   3. 매일, 적어도 몇 분 동안 지속됨
   4. 매일, 거의 대부분 시간 동안 통증이 지속됨
   5. 하루 종일, 계속해서 통증이 지속됨
허리 및 엉치의 통증은 어느 정도 입니까?
   1. 없음.
   2. 경미한 정도.
   3. 보통.
   4. 심함.
   5. 매우 심함.
다리 및 발의 통증은 어느 정도 입니까?
   1. 없음.
   2. 경미한 정도.
   3. 보통.
   4. 심함.
   5. 매우 심함.
다리 및 발에 둔한 감각 혹은 저리거나 찡그린 감각은 어느 정도 입니까?
   1. 없음.
   2. 경미한 정도.
   3. 보통.
   4. 심함.
   5. 매우 심함.
다리 및 발에 힘이 빠졌나요?
1. 없음.
2. 경미한 정도.
3. 보통.
4. 심함.
5. 매우 심함.

균형을 잡는데 문제가 있습니까?
1. 아닙니다. 균형 잡는데 문제가 없습니다.
3. 네, 가끔 균형 잡는데 문제가 있어서, 발로 딛고 서기가 힘들 때가 가끔 있습니다.
5. 네, 자주 균형 잡는데 문제가 있어서, 발로 딛고 서기가 힘들 때가 자주 있습니다.
최근 한달간 일상적으로 어땠는지 답해주십시오.

 얼마나 걸을 수 있습니까?

1. 3 km 이상 (40 분 이상) 걸을 수 있습니다.
2. 버스 한 정거장은 걸을 수 있지만 3 km 이상 (40분 이상) 걷기는 힘듭니다.
3. 15 m (미터) 이상 걸을 수는 있으나 버스 한 정거장을 걸기는 힘듭니다.
4. 15 m (미터) 이상 걸을 수 없습니다.

여가시간에 야외나 쇼핑몰을 거니는 것은 어렵습니까?

1. 편하게 걟습니다.
2. 가끔 통증이 있습니다.
3. 항상 통증이 있습니다.
4. 걸어 나가지 않습니다.

장보러 가는 것은 어렵습니까?

1. 편하게 걟습니다.
2. 가끔 통증이 있습니다.
3. 항상 통증이 있습니다.
4. 걸어 나가지 않습니다.

집안에서 걸을 때는 어렵습니까?

1. 편하게 걟습니다.
2. 간혹 통증이 있습니다.
3. 항상 통증이 있습니다.
4. 집안에서 걸지 않습니다.

집에서 화장실 갈 때는 어렵습니까?

1. 편하게 걟습니다.
2. 간혹 통증이 있습니다.
3. 항상 통증이 있습니다.
4. 화장실까지 걸을 수 없습니다.
수술 후 얼마나 만족스러운지 답해주세요.
전반적인 수술 결과가 어떻게습니까?
1. 매우 만족스럽습니다.
2. 약간 만족스럽습니다.
3. 약간 불만족스럽습니다.
4. 매우 불만족스럽습니다.
수술 후 통증 호전 정도가 어떻게습니까?
1. 매우 만족스럽습니다.
2. 약간 만족스럽습니다.
3. 약간 불만족스럽습니다.
4. 매우 불만족스럽습니다.
수술 후 걷는 정도가 어떻게습니까?
1. 매우 만족스럽습니다.
2. 약간 만족스럽습니다.
3. 약간 불만족스럽습니다.
4. 매우 불만족스럽습니다.
수술 후 일상적인 일 (가사일, 업무 등)을 하기의 어렵습니까?
1. 매우 만족스럽습니다.
2. 약간 만족스럽습니다.
3. 약간 불만족스럽습니다.
4. 매우 불만족스럽습니다.
수술 후 하부지, 장딴지 및 발의 힘이 어떻게습니까?
1. 매우 만족스럽습니다.
2. 약간 만족스럽습니다.
3. 약간 불만족스럽습니다.
4. 매우 불만족스럽습니다.
수술 후 균형감각이나 발로 섰을 때 안정감이 어떻게습니까?
1. 매우 만족스럽습니다.
2. 약간 만족스럽습니다.
3. 약간 불만족스럽습니다.
4. 매우 불만족스럽습니다.