Health-related quality of life in patients before and after surgery for a herniated lumbar disc

K.-Å. Jansson, G. Németh, F. Granath, B. Jönsson, P. Blomqvist
From the Karolinska Institutet, Stockholm, Sweden

We investigated the pre-operative and one-year post-operative health-related quality of life (HRQOL) outcome by using a Euroqol (EQ-5D) questionnaire in 263 patients who had undergone surgery for herniation of a lumbar disc. Data from the National Swedish Register for lumbar spinal surgery between 2001 and 2002 were used and, in addition, a comparison between our cohort and a Swedish EQ-5D population survey was performed. We analysed the pre- and post-operative quality of life data, age, gender, smoking habits, pain and walking capacity.

The mean age of the patients was 42 years (20 to 66); 155 (59%) were men and 69 (26%) smoked. Pre-operatively, 72 (17%) could walk at least 1 km compared with 200 (76%) post-operatively.

The mean EQ-5D score improved from 0.29 to 0.70, and the HRQOL improved in 195 (74%) of the patients. The pre-operative score did not influence the post-operative score. In most patients, all five EQ-5D dimensions improved, but did not reach the level reported by an age- and gender-matched population sample (mean difference 0.17). Predictors for poor outcome were smoking, a short pre-operative walking distance, and a long history of back pain.

Surgery for herniation of a lumbar disc is the most common spinal operation;1 the mean annual operation rate in Sweden was 24 operations per 100 000 inhabitants during the past decade. Health-related quality of life (HRQOL) refers to those dimensions of life which may be affected by a disease and its treatment. Several generic and disease-specific instruments are available to measure HRQOL. Generic tools, one of which is the Euroqol (EQ-5D), have several advantages.2,3 They are tested and validated in different populations, diseases, settings and languages which enable comparisons of HRQOL. No studies have reported the quality of life according to the EQ-5D in patients who have undergone treatment for herniation of a lumbar disc.

Our aim therefore was to report the HRQOL outcome pre-operatively and at one year after operation using the EQ-5D instrument in a series of patients who had surgery for herniation of a lumbar disc and also to make a comparison between this cohort and a Swedish EQ-5D population survey.

Patients and Methods

Study population. From the Swedish National Register for lumbar spinal surgery,4 we included in the study 343 patients who had undergone a primary operation for herniation of a disc between April 2001 and June 2002 and who had completed the EQ-5D questionnaire. One year after operation, 263 patients (77%) from 20 spinal units responded to the follow-up questionnaire. Analyses of the five EQ-5D dimensions were performed on 245 patients (71%) with uniquely identifiable dimensions. We also compared patients who were older than 20 years of age (n = 237) with a Swedish population survey of 3069 persons in order to assess the EQ-5D.5,6

The 80 patients (23%) who did not complete the 12-month follow-up questionnaire were defined as non-responders.7 We performed a drop-out analysis of this group, evaluating gender, age, type of surgery, pre-operative EQ-5D data and associated factors. These patients were also compared with a 13-year Swedish national study of all patients who had lumbar disc surgery based upon the inpatient register.1

Outcomes. Data were collected of the patients’ characteristics. HRQOL data were obtained by the EQ-5D, a patient self-administered questionnaire.2,3 The EQ-5D has five dimensions: mobility, self care, usual activities, pain or discomfort and anxiety or depression. Each dimension is divided into three categories: no
problem, some (moderate) problem and major (severe) problem, creating 243 \((3^5 + 2)\) health states, in addition to death and unconsciousness. These health states have been ranged as EQ-5D index scores in a large UK population sample from 0.00 (worst possible health state, i.e. death) to 1.00 (best possible health state). Some states were considered to be worse than death and were given negative values.

Statistical analysis. We performed a multivariate analysis of the pre-operative scores by an analysis of variance (ANOVA), with age, gender, smoking status, type of surgery, duration of leg and back pain, intensity of leg pain (measured by a visual analogue scale), and pre-operative walking distance as covariates. Intensity of leg pain was used as a continuous variable and all other variables were categorised as in Table I. The post-operative score at 12 months was analysed by the same variables, but the pre-operative score was introduced as a continuous covariate. The final models included all the significant variables (i.e. \(p < 0.05\)) after a backward selection.

We calculated the observed and expected fraction of patients reporting moderate or severe problems in the five different dimensions. The relative differences pre- and post-operatively compared with the population survey were calculated by ten-year age and gender distribution. The corresponding confidence intervals (CI) were calculated based upon the binomial distribution of the observed frequencies. The statistical uncertainty in the expected values was not taken into account.

**Results**

Health-related quality of life (EQ-5D). The study cohort consisted of 263 patients with a mean age of 42.5 years (Table I). There had been leg pain for longer than three months in 212 patients (84%), the mean duration being 11.2 months. The mean pre-operative EQ-5D score improved from 0.29 to 0.70 and the mean EQ-VAS from 46.8 to 70.4. The difference was 0.41 (95% CI 0.36 to 0.46) for the EQ-5D score. Older patients had only slightly lower scores. Pre-operatively, the EQ-5D score had a bimodal distribution around 0.1 and 0.7 (Fig. 1a). One year later, most patients had scores between 0.7 and 1.0 (Fig. 1b), and four major groups of patients had emerged (Fig. 2). A total of 195 patients (74%, 95% CI 68 to 79) experienced an improvement \(\geq 0.1\) in their EQ-5D score and a small group of 18 patients (6.8%, 95% CI 4.4 to 10.6) reported a deterioration \(\geq 0.1\) in their EQ-5D scores.

A detailed analysis of the five EQ-5D dimensions, comparing the severity of problems perceived before surgery with that one year later, showed that most patients had improved (Table II).
Mobility. Pre-operatively, 198 patients (75%) had moderate or severe problems. One year later, 131 (66%) of these patients reported no impaired mobility.

Self-care. Pre-operatively, 73 patients (30%) reported problems with self-care. Of these, 51 (70%) had no problems after operation.

Usual activities. A total of 213 patients (87%) had problems in performing their usual activities before surgery; 160 (75%) improved after operation.

Pain/discomfort. Severe pain was reported by 119 patients (49%) before surgery. One year later, 104 patients (87%) with severe pain had improved.

Anxiety/depression. Before surgery, 153 (58%) reported moderate or severe anxiety. Twelve months later, 90 of them (59%) still felt the same.

The EQ-5D dimension values for patients with a moderate or severe problem before and at 12 months after surgery were compared with those for a Swedish population EQ-5D survey (Fig. 3). Most patients reported an improvement but did not reach the level reported by the population sample. The mean difference 12 months after surgery was 0.17 (95% CI 0.13 to 0.21) lower.

Before the operation, the relative risk of having moderate or severe problems in the five dimensions was between 2.3 and 22.7 times higher than expected compared with the reference population. One year later these risks had decreased to between 1.4 and 7.1 (Table III).

Associated factors and EQ-5D

Smokers. Pre-operatively, the mean scores were similar but smokers experienced lower scores at 12 months than non-smokers, with EQ-5D values of 0.57 and 0.75, respectively (Table I). In addition, a higher proportion of smokers had not improved at all by the follow-up at 12 months (Fig. 2).

Duration of leg pain. Patients with leg pain for less than six months scored a mean of 0.08 higher post-operatively than those with pain for longer periods.

Duration of back pain. Patients with back pain for less than six months improved by a mean of 0.09 more than those with back pain for longer.
patients (24%) still had difficulty in walking ≥ 1 km with a marked increase in the mean EQ-5D score from 0.26 to 0.72. However, 63 (age- and sex-specific mean scores).

Table II. Pre- and post-operative distribution of the EQ-5D dimensions (n = 245); for mobility by number and percentage

<table>
<thead>
<tr>
<th>Pre-op†</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility</td>
<td>45 (18.4)</td>
<td>2 (0.8)</td>
<td>0 (0.0)</td>
<td>47 (19.2)</td>
</tr>
<tr>
<td></td>
<td>119 (48.6)</td>
<td>66 (26.9)</td>
<td>0 (0.0)</td>
<td>185 (75.5)</td>
</tr>
<tr>
<td></td>
<td>13 (5.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>13 (5.3)</td>
</tr>
<tr>
<td>Total</td>
<td>177 (72.2)</td>
<td>68 (27.8)</td>
<td>0 (0.0)</td>
<td>245 (100.0)</td>
</tr>
</tbody>
</table>

| Self-care| 152 (62.2) | 9 (3.7) | 1 (0.4) | 172 (70.2) |
| Usual activities| 162 (66.2) | 9 (3.7) | 1 (0.4) | 172 (70.2) |
| Pain/discomfort| 0 (0) | 1 (0.4) | 0 (0.0) | 1 (0.4) |
| Anxiety/depression| 38 (15.5) | 15 (6.1) | 3 (1.2) | 92 (37.6) |
| Total   | 154 (62.2) | 69 (28.1) | 22 (9.9) | 245 (100.0) |

† patients who improved
‡ patients who deteriorated

Walking ability. A total of 200 patients (76%) improved their ability to walk ≥ 1 km with a marked increase in the mean EQ-5D score from 0.26 to 0.72. However, 63 patients (24%) still had difficulty in walking ≥ 1 km. Their mean HRQOL changed only from 0.26 to 0.36.

Multivariate analyses. The bimodal distribution of the pre-operative EQ-5D scores (Fig. 1) could be explained by the pre-operative variables of walking distance, duration and intensity of leg pain. Patients with a walking distance < 1 km had scores which were 0.16 (SEM 0.040, p < 0.0001) units lower than those who could walk ≥ 1 km. Those who had experienced leg pain for more than six months before surgery scored 0.14 (SEM 0.035, p < 0.0001) units lower than those with pain for less than this. Finally, smokers scored 0.16 (SEM 0.04, p = 0.0003) units lower than non-smokers.

Our analysis of the post-operative score at 12 months by covariance modelling included the same variables as in the analysis of the pre-operative score, together with the pre-operative score. We found that the pre-operative score did not influence the score at 12 months. Significant predictors for poorer quality of life 12 months after surgery were a short pre-operative walking distance, smoking and a long duration of back pain. Patients with a pre-operative walking distance of less than 1 km scored 0.16 (SEM 0.04, p 0.008) units lower than those who could walk > 1 km. Those who had suffered from back pain for more than six months before surgery scored 0.11 (SEM 0.04, p = 0.008) units lower than those with pain for less than this. Finally, smokers scored 0.16 (SEM 0.04, p = 0.0003) units lower than non-smokers.
Discussion

Our study has shown that most patients who undergo surgery for herniation of a disc experience an improved health-related quality of life. Our patients increased their mean EQ-5D score from 0.29 to 0.70 one year after surgery. Pre-operative scores did not influence the post-operative HRQOL. Predictors for a lower post-operative score, experienced by 7% of patients, were smoking, a reduced pre-operative walking distance and a long history of back pain. Ongoing randomised clinical trials of pre- and post-operative smoking cessation are important in order to clarify this risk and the impact of surgery.\(^{10,11}\) Chronic low back pain has been related to a lower HRQOL and we can confirm that.\(^5\)

Our study has several limitations. It is a prospective follow-up study, not a prospective, randomised controlled trial comparing surgery with non-operative treatment. However, surgery for herniation of a lumbar disc is an accepted intervention.\(^12\) Our study was based upon only 263 patients which may be compared with 2120 operations for disc herniation annually in Sweden.\(^13\) All data were retrieved from the National Swedish Register for lumbar spinal surgery and there is no information about patients, comorbidities or therapies other than back surgery. The register only posts one follow-up questionnaire to the patients and no reminders, which led to a loss of 80 (23%) of those initially included in our study. In our drop-out analysis we found no differences in the pre-operative EQ-5D scores or the EQ-VAS values between responders and non-responders. However, responders tended to be older, more often smokers, and experienced leg pain for more than six months. Consequently, the responders had more risk factors, suggesting that our results are a conservative interpretation. In addition, when we compared our patients with a national Swedish study of 27,576 patients, we found no major differences in the distribution of gender or age, and the re-operation rates were similar.\(^1\) We, thus, consider our study to be representative of surgery for herniation of a disc in Swedish patients.

The pre-operative EQ-5D score did not influence the post-operative HRQOL. Other, more specific prognostic predictors may have to be used before a patient is considered for surgery for disc herniation.\(^1\)

Most patients reported improvement in all five dimensions of the EQ-5D. The greatest improvements were seen in the patients’ mobility (walking ability) and self-care (washing and dressing). A total of 213 (87%) had moderate or severe problems with their usual activities, one of the highest rates reported in the literature.\(^6\) After surgery, 22 patients (10%) still reported severe problems. There was a considerable improvement in pain or discomfort and only 27 (11%) still reported severe problems. This is encouraging since 212 patients (84%) had reported having pain for more than three months before surgery. Patients with severe chronic pain may need additional therapy after surgery. Often a multidisciplinary pain analysis and psychological intervention have also to be included.\(^14-16\) Anxiety or depression was common and 153 (58%) patients reported moderate or major problems. This may be compared with patients suffering from stroke in whom this proportion is 31% or those with depression who have a rate of 82%.\(^5\) Almost one-third of the patients in our study felt less anxiety or depression after surgery but 21 (10%) reported worse symptoms. In patients with low scores for anxiety/depression, surgery alone was probably insufficient. Cognitive functions, negative coping strategies as well as affective symptoms must be analysed and treated.\(^17,20\)

Despite the finding that most patients had an improved quality of life, the mean pre-operative EQ-5D score of 0.29 is among the lowest reported in the literature to date. A large population-based EQ-5D survey in Sweden has recently been published\(^5\) in which patients with low back pain scored a mean of 0.55, patients with stroke a mean of 0.43 and those with depression a mean of 0.38.

We conclude that most patients who underwent surgery for disc herniation felt an improved quality of life one year after the operation. Smoking was the most important risk factor in those patients who did not improve or who experienced a reduced quality of life. The results of our study can be used as part of the pre-operative consent in order to increase a patient’s awareness and co-operation and to facilitate rehabilitation. The doctor and patient will have a broader, and perhaps more realistic, view of the prognosis before they share the decision about surgical intervention.

Supplementary Material

Table III. Patients with moderate or severe problems reported pre- and post-operatively compared with the Swedish population survey

<table>
<thead>
<tr>
<th>EQ-5D dimension</th>
<th>Moderate or severe problems (%)</th>
<th>Relative risk (95% confidence interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-operatively</td>
<td>12 months post-operatively</td>
</tr>
<tr>
<td>Mobility</td>
<td>83</td>
<td>28</td>
</tr>
<tr>
<td>Self care</td>
<td>30</td>
<td>9</td>
</tr>
<tr>
<td>Usual activities</td>
<td>88</td>
<td>38</td>
</tr>
<tr>
<td>Pain/discomfort</td>
<td>100</td>
<td>68</td>
</tr>
<tr>
<td>Anxiety/depression</td>
<td>63</td>
<td>38</td>
</tr>
</tbody>
</table>

* the expected percentages were calculated by the gender- and age-specific proportions of the Swedish population survey applied to the patients’ pre-operative gender and age
herniation is available with the electronic version of this article on our website at www.jbjs.org.uk

We acknowledge the Swedish Society of Spinal Surgeons for providing access and support to their data.

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.

References


