Influence of gender on quality of life after lung surgery

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Abstract

Background: Possible differences in quality of life between men and women after lung surgery needs further study. Methods: We performed a prospective, population-based cohort study to analyse health-related quality of life before and 6 months after lung surgery. The aim of the study was to compare the changes in quality of life in men and women undergoing lung surgery. The main outcome measures were fractional change in the physical and mental component summary scores of Short Form-36. Results: A baseline Short Form-36 questionnaire was completed by 130 men and 119 women. Baseline characteristics and operative data were comparable between groups. The response rate at 6 months was 82% in men and 86% in women (p = 0.47). Prior to surgery, similar impairments were found in the mental domain compared to a matched reference population in both men (42.3 vs 51.5, p < 0.001) and women (36.4 vs 49.8, p < 0.001). At 6 months, the physical domain was significantly worse than preoperatively in both men (45.2 vs 40.5, p < 0.001) and women (46.1 vs 39.5, p < 0.001). There was no significant difference in the fractional change in the physical (−14% vs −13%, p = 0.85) or mental (1.3% vs 11%, p = 0.09) component summary scores between men and women. Conclusions: We found no evidence for a sex-associated difference in quality of life after lung surgery. Both men and women experience significant impairment in both physical and mental aspects of quality of life 6 months after lung surgery compared with the normal population.

Keywords: Lung cancer surgery; Quality of life; Thoracotomy

1. Introduction

Quality of life following lung cancer surgery returns to preoperative level after 3–6 months, according to some studies [1,2]. Postoperative quality of life is, however, generally worsened with disease recurrence [3], and preoperative levels have been shown to be lower in patients undergoing surgery for lung cancer, prior studies have demonstrated significantly better postoperative early outcome in women than in men [5] and a better 5-year survival as well [6–8]. Not only survival, but also symptoms may differ between men and women. In a study investigating post-thoracotomy pain, women reported suffering more pain than men both during hospital stay, and more importantly, during almost 1 year of follow-up [9]. Prior studies investigating quality of life following lung surgery have not specifically addressed the question of whether or not there is a difference between men and women regarding the post-operative quality of life. Because clinical and experimental research indicates substantial sex-associated differences in pain responses [10–12], it is possible that differences regarding quality of life after surgical procedures may also exist. We performed a prospective, population-based, cohort study to investigate health-related quality of life before and 6 months after lung surgery. In a previous report, we compared the changes in health-related quality of life in patients undergoing lobectomy or pneumonectomy for lung cancer in a subset of the present patient population [13]. The aim of the present study was to compare the changes in health-related quality of life in men and women following lung surgery in the complete patient cohort.

2. Patients and methods

The study was approved by the regional Human Research Ethics Committee, Stockholm, Sweden (Dnr: 2006/359-31/3). Informed consent was obtained from all patients.

2.1. Patients and outcome measures

From April 2006 to April 2008, 249 patients scheduled for lung surgery at the Karolinska University Hospital were included, and all completed the baseline Medical Outcome
2.4. Statistical analyses

Continuous variables are reported as mean and standard deviation. Comparisons between the groups were performed with the Fisher’s exact test for categorical variables and the Mann–Whitney U test for continuous variables. Intra-group comparisons were performed with the Wilcoxon signed-rank test. Quantile regression was used to analyse the 10th, 25th, 50th, 75th and 90th percentiles in the primary outcome measures. Quantile regression aims at fully examining the effect of independent variables on the entire distribution of the dependent variable, in this case the ΔPCS% and ΔMCS%, not just the mean value as in ordinary linear regression. Standard errors for the regression coefficients were obtained by generating 1000 bootstrap samples. A two-tailed p value of 0.05 was used to indicate statistical significance. Statistical analyses were performed using SPSS 16.0 (SPSS, Chicago, IL, USA) and STATA 10.1 (Stata Corp., College Station, TX, USA).

3. Results

Of the 249 patients included in the study, there were 130 men and 119 women, and all completed a baseline SF-36 questionnaire. Baseline patient characteristics are shown in Table 1. During the first 6 months of follow-up, 14 patients (12 men and 2 women, \( p = 0.01 \)) died. Among the surviving patients, 37 patients (21 men and 16 women, \( p = 0.47 \)) did not complete a follow-up SF-36 questionnaire 6 months after surgery, despite two reminders. The overall response rate (as a percent of surviving participants) at 6 months was 84% (82% in men and 86% in women, \( p = 0.47 \)). Thus, a total of 198 patients (97 men and 101 women) were available for analysis of the primary outcome measures.

Operative and postoperative details are shown in Table 2. In 14 patients, the operation was performed using video-assisted thoracoscopic surgery, and in all other patients, a muscle-sparing posterolateral thoracotomy was performed. Postoperative management included thoracic epidural analgesia.

Tumour stage and histopathology are shown in Table 3.

### Table 1
Preoperative characteristics in patients undergoing lung surgery.

<table>
<thead>
<tr>
<th></th>
<th>Men (( n = 130 ))</th>
<th>Women (( n = 119 ))</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>63.1 (12.6)</td>
<td>64.6 (10.7)</td>
<td>0.69</td>
</tr>
<tr>
<td><strong>Body mass index (kg/m²)</strong></td>
<td>25.3 (3.77)</td>
<td>25.0 (4.33)</td>
<td>0.61</td>
</tr>
<tr>
<td><strong>Ischaemic heart disease</strong></td>
<td>12 (9.2)</td>
<td>8 (6.7)</td>
<td>0.49</td>
</tr>
<tr>
<td><strong>Hypertension</strong></td>
<td>36 (28)</td>
<td>40 (34)</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>Congestive heart disease</strong></td>
<td>2 (1.5)</td>
<td>1 (0.8)</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Diabetes mellitus</strong></td>
<td>9 (6.9)</td>
<td>10 (8.4)</td>
<td>0.81</td>
</tr>
<tr>
<td><strong>Peripheral vascular disease</strong></td>
<td>8 (6.2)</td>
<td>3 (2.5)</td>
<td>0.22</td>
</tr>
<tr>
<td><strong>Cerebrovascular disease</strong></td>
<td>4 (3.1)</td>
<td>4 (3.4)</td>
<td>1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Smoking status</th>
<th>Mean (SD)</th>
<th>Mean (SD)</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current smoker</td>
<td>39 (32)</td>
<td>49 (45)</td>
<td>0.06</td>
</tr>
<tr>
<td>Former smoker</td>
<td>64 (52)</td>
<td>40 (37)</td>
<td>0.02</td>
</tr>
<tr>
<td>Never smoker</td>
<td>18 (15)</td>
<td>19 (17)</td>
<td>0.72</td>
</tr>
</tbody>
</table>

| Haemoglobin (g/dl)     | 140 (15)  | 133 (11)  | <0.001|
| Albumin (mg/dl)        | 37 (4)    | 37 (4)    | 0.21  |
| FeV1% \( (ml/min•m²) \)| 94 (30)   | 84 (26)   | 0.007 |
| eGFR (ml/min)          | 80 (17)   | 84 (18)   | 0.09  |

FEV1%: forced expiratory volume in 1 second (percent of expected) and eGFR: estimated glomerular filtration rate.
score (45.2 vs 45.3, \( p = 0.82 \)), but there was a significantly lower MCS score (42.3 vs 51.5, \( p < 0.001 \)). In women there was a significantly higher PCS score (46.1 vs 43.5, \( p = 0.01 \)), and a significantly lower MCS score (36.4 vs 49.8, \( p < 0.001 \)) in the study group at baseline, compared with the reference population.

Both men and women seemed to suffer an equivalent decline of the mental aspect of health-related quality of life prior to surgery when compared to an age- and gender-matched reference population. The physical domain was approximately comparable with that of the normal population in both men and women. Thus, there was no evidence of a gender difference in quality of life in patients awaiting lung surgery.

3.2. Quality of life 6 months after surgery

The SF-36 subscale and summary scores in men and women before and 6 months after surgery are shown in Table 4 together with scores from an age- and gender-matched reference population.

Among men, there was a significant decrease in the physical functioning, physical role functioning, bodily pain and general health scores 6 months after surgery. The changes in the other four subscales were small in magnitude and not significant. The PCS score was significantly lower than preoperative score (45.2 vs 40.5, \( p < 0.001 \)) and also significantly lower than the reference group (40.5 vs 45.3, \( p < 0.001 \)). The MCS score was slightly, but not significantly, increased compared with preoperative score (42.3 vs 44.8, \( p = 0.24 \)), but significantly lower than the reference group (44.8 vs 51.5, \( p < 0.001 \)).

In women, there was a significant decrease in the physical functioning, physical role functioning, bodily pain, general health and mental health scores 6 months after surgery. The changes in the remaining three subscales were not significant. The PCS score was significantly lower than preoperative score (46.1 vs 39.5, \( p < 0.001 \)) and also significantly lower than the reference group (39.5 vs 43.5, \( p = 0.004 \)). The MCS score had increased significantly compared to preoperative level (36.4 vs 42.3, \( p = 0.001 \)), but were still significantly lower than the reference group (42.3 vs 49.8, \( p < 0.001 \)).

3.3. Changes in quality of life

Changes in the physical and mental component scores and the primary outcome measures are shown in Table 5. There was no significant difference in the main outcome measures between men and women (\( \Delta \text{PCS}; -14\% \text{ vs } -13\%, p = 0.85 \) and \( \Delta \text{MCS}; 1.3\% \text{ vs } 11\%, p = 0.09 \)).

Furthermore, we used quantile regression to estimate the effect of gender at various percentiles of the \( \Delta \text{PCS} \) and \( \Delta \text{MCS} \) distributions (Table 6). There was no evidence of a significant gender effect in any of the percentiles analysed.

4. Discussion

In this prospective, population-based, cohort study, conducted to investigate health-related quality of life before...
and 6 months after lung surgery, we found no evidence of a significant difference between men and women regarding changes in physical or mental health-related quality of life. We found that both men and women had worse mental aspect of quality of life before surgery compared to an age- and gender-matched reference population. However, the physical aspect of quality of life was approximately equivalent to the reference population. However, the physical aspect of quality of life was significantly lower compared with the reference population. However, the physical aspect of quality of life was significantly lower compared with the reference population. However, the physical aspect of quality of life was significantly lower compared with the reference population. However, the physical aspect of quality of life was significantly lower compared with the reference population. However, the physical aspect of quality of life was significantly lower compared with the reference population. However, the physical aspect of quality of life was significantly lower compared with the reference population. However, the physical aspect of quality of life was significantly lower compared with the reference population.

Because it is possible that gender may differentially affect the primary outcome measures across the full distribution of changes in quality of life, we explored this in our data using quantile regression (Table 6). In other words, a gender effect may exist, for example, only among patients who deteriorated the worst. By only investigating the differences between groups across the mean or median of the outcome variable, such a result would remain undetected. Our data did not provide any evidence of significant differences between sexes in any of the percentiles analysed, further strengthening our conclusion that the changes in quality of life 6 months following lung surgery was not different between men and women.

This prospective, population-based, cohort study, designed to investigate health-related quality of life before and after lung surgery, met two important requirements necessary to effectively and appropriately analyse differences between sexes: (1) approximately equal number of men and women included in the study and (2) use of a quality-of-life instrument capable of norm-based comparisons for the reason that the groups cannot be compared directly because men and women of the same age group have different reference points. Moreover, in our study, baseline characteristics were comparable between the groups, simplifying the statistical analysis. Since men and women were well balanced regarding baseline and operative characteristics (Tables 1 and 2), we only performed exploratory multivariable analysis. We added the following independent

### Table 5
Changes in physical and mental health-related quality of life after lung surgery.

<table>
<thead>
<tr>
<th></th>
<th>Men (n = 97)</th>
<th>Women (n = 101)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCS</td>
<td>Median 49.3 (11)</td>
<td>45.3 (11)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MCS 1.3</td>
<td>51.0 (7.0)</td>
<td>50.5 (7.0)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

MCS: mental component summary; PCS: physical component summary; and CI: confidence interval.

ΔPCS = PCSpostoperative - PCSpreoperative; ΔMCS = MCSpostoperative - MCSpreoperative; ΔMCS% = ΔMCS / (MCSpreoperative) × 100; and ΔMCS% = ΔMCS / (MCSpreoperative) × 100.
variables to a quantile regression model to control for differences between men and women: renal function, haemoglobin value and smoking status. Our results remained unchanged after multivariable adjustment.

In a study including 139 patients (59% men), SF-36 was used to collect information on quality of life after surgery for lung cancer [4]. They found significant impairment in four out of the eight SF-36 subscale scores when the study group was compared with age-matched, healthy control subjects from the general population prior to surgery. After 6 months, the impairment persisted, and the authors found that no differences existed for preoperative or postoperative SF-36 scores relative to gender. Another study included 156 patients, predominantly men, and used the composite scale scores of the SF-36 for investigation of quality of life before and 3 months after lung cancer surgery [1]. A comparison between men (n = 123) and women (n = 33) regarding both the physical and the mental composite scale scores at 3 months after surgery revealed no differences between sexes. These findings must be interpreted cautiously; although important contributions to the field, none of the studies [1,4] was designed with the primary purpose to investigate the possible differences between men and women regarding postoperative quality of life.

Health-related quality of life after pneumonectomy was reported in 31 patients (22 men and 9 women) by two instruments: the 15D and the Mahler’s Baseline Dyspnea Index [18]. The authors found a significantly lower score on the dimensions of breathing, discomfort and symptoms in female patients. The study was however limited by the small sample size [18].

4.1. Limitations of the study

Patients were not completely consecutive because, for various reasons, not all patients scheduled for surgery could be screened for study inclusion. However, we are confident that the risk of introducing bias for this reason was low. Another limitation is the use of a single instrument for quality-of-life assessment. However, the inclusion of multiple quality-of-life questionnaires might reduce the response rate, and our choice of quality-of-life instrument allowed us to make norm-based comparisons. In this study, other major life events apart from having surgery may have occurred during the time between the assessments. Such events may have a potential impact on health-related quality of life, but it is reasonable to assume that these affect both sexes equally. Despite these limitations, the available data are sufficient to allow us to conclude that at least there were no clinically significant differences in health-related quality of life between men and women 6 months after lung surgery.

5. Conclusions

We found that both men and women had worse mental aspect of quality of life before surgery compared with a matched reference population. Six months after surgery, the physical and mental health-related quality of life was significantly lower compared with the reference population in both men and women. The changes in quality of life were not different between men and women.

Acknowledgement

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References