The extent of lung parenchyma resection significantly impacts long-term quality of life in patients with Non Small Cell Lung Cancer

Tobias Schulte, Bodo Schniewind, Peter Dohrmann, Thomas Küchler and Roland Kurdow

*Chest*; Prepublished online August 8, 2008; DOI 10.1378/chest.08-1114

The online version of this article, along with updated information and services can be found online on the World Wide Web at: [http://www.chestjournal.org/content/early/2008/08/08/chest.08-1114](http://www.chestjournal.org/content/early/2008/08/08/chest.08-1114)
The extent of lung parenchyma resection significantly impacts long-term quality of life in patients with Non Small Cell Lung Cancer

Tobias Schulte, MD \(^1\) *  \hspace{1cm} \text{TobiasSchulte@uksh-kiel.de} (corresponding author)

Bodo Schniewind, MD \(^1\) *  \hspace{1cm} \text{schniewind@surgery.uni-kiel.de}

Peter Dohrmann, Prof. \(^1\)  \hspace{1cm} \text{peter.dohrmann@uksh-kiel.de}

Thomas Küchler, Prof. \(^1\)  \hspace{1cm} \text{thomas.kuechler@uksh-kiel.de}

Roland Kurdow, MD \(^1\)  \hspace{1cm} \text{roland.kurdow@uksh-kiel.de}

\(^1\)Department of General and Thoracic Surgery

University Hospital Schleswig Holstein

Campus Kiel

Arnold-Heller-Str.7

24105 Kiel/Germany

Dr. Schulte has no conflicts of interest to disclose

Dr. Schniewind has no conflicts of interest to disclose

Prof. Dr. Dohrmann has no conflicts of interest to disclose

Prof. Dr. Küchler has no conflicts of interest to disclose

Dr. Kurdow has no conflicts of interest to disclose

*: The authors TS and BS contributed equally to this work.
Abstract

**Background:** Secondary to clinical outcome, health-related quality of life (QOL) after resection of NSCLC is of particular interest. However, few studies have explored QOL following lung resection.

**Methods:** Between January 1998 and December 2004, a total of 159 patients with NSCLC underwent surgical resection and were enrolled in this prospective study. QOL and clinical data were assessed prior to resection and for up to 24 months after surgery by applying the EORTC QLQ C-30 questionnaire and the lung-specific questionnaire, QLQ-LC13. QOL was calculated and the QOL following bi-/lobectomy was compared with QOL after pneumonectomy.

**Results:** Overall, the 5 year survival rate was 42%. Mean survival of the pneumonectomy group was slightly lower than that of the bi-/lobectomy group, although the difference was not statistically significant (p=0.058). The rate of complications was not significantly different between the two groups. After a postoperative drop, most QOL indicators remained near baseline for up to 24 months, with the exception of physical function (p<0.001), pain (p=0.034), and dyspnoea (p<0.001), which remained significantly impaired. QOL was significantly better (difference >10 points) after bi-/lobectomy than after pneumonectomy. However, differences were statistically significant only with regards to physical function (at 3 months), social function (at 3 and 6 months), role function (at 3, 6 and 12 months), global health (at 3 and 6 months), and pain (at 6 months).

**Conclusions:** Patients who underwent lung resection for NSCLC failed to make a complete recovery after 24 months. Patients who underwent pneumonectomy had significantly worse QOL values and a decreased tendency to recover, compared with patients who underwent bi-
lobectomy. Therefore, major lung resection has a much more serious impact on the QOL of affected patients than does major visceral surgery.
Keywords: lung cancer, quality of life (QOL), pneumonectomy, lobectomy, EORTC QLQ, NSCLC, surgery
Abbreviation list:

c.i. confidence interval

EORTC QLQ C-30 European Organization for Research and Treatment of Cancer Core questionnaire

EORTC QLQ L-13 European Organization for Research and Treatment of Cancer Lung specific module questionnaire

NSCLC Non Small Cell Lung Cancer

QOL Quality of Life

SF-36 Short-Form 36 Health Survey
Introduction

Lung cancer remains the most common cause of cancer-related death. The incidence of lung cancer has stabilized in males but continues to rise in females. The prognosis for non-small cell lung cancer (NSCLC) is poor, with an overall 5 year survival rate of 15%. Surgery remains the treatment of choice for early-stage disease (stages I and II). However, locally advanced but surgically resectable disease (stage IIIA) is best treated with a combined modality therapy that includes neoadjuvant induction chemotherapy or chemoradiotherapy followed by surgery. Patients with lung cancer can present with a primary tumor, regional spread, or even metastatic disease. Not only do patients’ symptoms vary at the time of diagnosis, but patients also differ in terms of clinical condition and physical and mental status. The possibility of a cure encourages patients to seek surgery, without attention to the potential for postoperative physical, emotional, and functional disabilities. McManus argued that concerns regarding quality of life should not deprive patients of the opportunity for curative surgery. The success of a surgery is assessed in terms of postoperative morbidity and mortality, whereas oncologic outcomes are typically assessed in terms of survival rates. Secondary to clinical outcome, health-related quality of life (QOL) after resection of NSCLC is of particular interest as it reveals the impacts of resection on daily life. Although QOL analyses have attracted considerable attention over the past decade, only a handful of studies have assessed QOL following lung resection and many analyses have been limited by small population sizes, cross-sectional study designs, retrospective data analyses, and non-validated tools for assessing QOL.

Thus, we have performed a prospective, longitudinal study that assesses QOL prior to resection, as well as 24 months after resection, using the QLQ C-30 questionnaire European Organization for Research and Treatment of Cancer (EORTC) and an additional lung-specific
questionnaire (QLQ-LC13). Morbidity, mortality, and oncologic outcomes were analyzed. The overall QOL for all patients was determined and QOL values for patients who underwent low-volume parenchymal resection (lobectomy) were compared with those who underwent high-volume parenchymal resection (pneumonectomy).
Methods

Patient populations and surgical procedure

The study population included 159 consecutive patients who were treated for NSCLC at the Department of General and Thoracic Surgery, University Hospital of Schleswig Holstein, Campus Kiel, between May 1998 and December 2004. Informed consent was obtained from each patient and the study protocol was approved by the local ethics committee. QOL, clinical outcome, and survival were assessed before and after surgery. The overall number of surgical resections was performed by 4 specialized surgeons independent of the procedure. The surgical approach in all patients was a posterolateral thoracotomy. No video-assisted procedures and sleeve resections were introduced into this study. Pneumonectomy was performed when the main bronchus was infiltrated by tumor cells and tumor infiltration was too extended for tumor free resection margins by sleeve resection. Eight patients in the bi-/lobectomy group underwent bilobectomy. Next to the lung resection all patients underwent a radical systematic mediastinal lymphadenectomy. Postoperative complications were noted prospectively. ‘Major complications’ were defined as death in the hospital, operative revision, recurrent paresis of the laryngeal nerve or the phrenic nerve, atelectasis following intervention, bronchus stump leakage, or other complications that extended the hospital stay by more than 14 days after the operation.

Assessment of health-related QOL

Health-related QOL was assessed using a cancer-specific, 30 item core questionnaire (QLQ-C30) developed by the European Organization for Research and Treatment of Cancer (EORTC). The EORTC QLQ-C30 includes five functional scales (physical, role, cognitive, emotional, and social), three symptom-related scales (fatigue, pain, nausea and vomiting), one scale to assess global health and general QOL, several questions regarding additional
symptoms that are commonly reported by patients with cancer (dyspnoea, loss of appetite, insomnia, constipation, and diarrhea) and questions regarding the perceived financial impact of the disease\(^4\). Response categories for most questions span four levels, ranging from ‘not at all’ to ‘very much’. Response categories for questions regarding general physical condition and overall QOL span seven levels, ranging from ‘very poor’ to ‘excellent’. In general, high scores reflect high response levels. The EORTC QLQ is modular in design, with the core questionnaire (C30) accompanied by additional disease- or treatment-specific sections. The EORTC QLQ-LC 13 questionnaire is specifically geared towards patients with lung cancer, because it encompasses multi- and single-item measures of symptoms associated with the disease (coughing, haemoptysis, dyspnoea, and pain) as well as the possible side effects of chemotherapy and radiotherapy (hair loss, neuropathy, sore mouth, and pain)\(^5\).

Questionnaires were distributed to patients before operations (to obtain baseline values), before discharge from the hospital, and at various intervals after surgery (at 3, 6, 12 and 24 months). Each patient completed at least one questionnaire; thus, a cross-sectional analysis was conducted in which the population of patients who provided QOL data before surgery was compared with the population who provided QOL data following surgery.

**Statistical analyses**

Data were analyzed using SPSS for Windows, version 11.0 (SPSS, Chicago, IL). Distributions and frequencies of medical data were compared using the Chi-squared test. The EORTC QLQ-C30 core questionnaire and the lung cancer module scales were scored according to the EORTC-QLQ-C30 scoring manual\(^6\) and raw scores were linearly transformed, yielding a range of 0 to 100. Scales were calculated if at least half of the items had been completed by the patient. QOL data were analyzed using non-parametric methods.
because the data were not normally distributed. However, as reference values were available only as mean scores, data were also plotted as means with standard deviations. The two study groups were compared by QOL analyses using the Mann-Whitney U test. Survival curves were calculated according to the Kaplan-Meier method. Differences in survival were assessed using the log-rank test. Cox regression analysis was conducted to adjust survival curves by tumor stage. Global P values lower than 0.05 were considered statistically significant and mean differences of at least 10 points on the QOL scales were considered clinically relevant.

**Results**

Descriptions of the patients and procedures are shown in Table 1. Of the 159 patients included in the study, 131 underwent lobectomy or bilobectomy, whereas 28 underwent pneumonectomy. The procedures were performed to treat squamous cell carcinoma in 75 patients, adenocarcinoma in 65 patients, large-cell carcinoma in 15 patients, and other malignancies in 4 patients. Postoperative complications are listed in Table 2. The patient response rate (following distribution of the QOL questionnaire) is shown in Table 3.

**Overall survival**

During the 8 year study period, 78 of the 159 patients died. The overall mean survival time was 43 months (37.11-48.0 months; 95% confidence interval [c.i.]), whereas the overall 5 year survival rate was 42% (Fig. 1). When disease status was taken into account, the mean survival times were 54 months (46.48-61.39 months, 95% c.i.) for patients with stage I cancer and 33 months (25.76-40.63, 95% c.i.) for patients with stages IIa/b or III cancer (Fig. 2 A). The 5 year survival rates were 61% for patients with stage I cancer and 26% for patients with stage IIa/b and stage III cancer (Fig. 2 A). Thus, patients with stage I disease had significantly longer survival times (P<0.001).
The mean survival time of patients who underwent resection for adenocarcinoma was 47 months (37.97-55.64 months, 95% c.i.) whereas the mean survival time following resection of a squamous cell carcinoma was 40 months (13.11-67.35 months, 95% c.i.). The overall 5 year survival times were 47% for patients with squamous cell carcinoma and 50% for patients with adenocarcinoma (P= 0.928) (Fig. 2 B). The mean survival time following lobectomy was 45 months (39.12 -51.18, 95% c.i.), whereas patients who underwent pneumonectomy had mean survival times of 31 months (19.91-41.94, 95% c.i.)(P=0.058) (Fig. 2 C).

Overall QOL

The questionnaires (i.e., the core questionnaire and the module) consisted of 9 psychometric scales and 28 single-item scales. Selected scales are shown in Figures 3-6. To allow for comparison with a healthy cohort, reference QOL values from a previous analysis of an age-matched healthy population 8 are shown.

After discharge from the hospital all functional scales (with the exception of social function) dropped significantly below baseline values (Fig. 3 A/B). Slight increases were observed in the functional scales 3 and 6 months after surgery, although these values did not reach preoperative levels. With the exception of global health (P=0.631), most functional scales failed to reach preoperative levels by the end of the 24-month observation period. Comparison of functional scores before operation and after 24 months revealed a statistically significant decrease in physical function (P<0.001). However, there were no significant differences in role function (P=0.055) or social function (P=0.074).

A similar pattern was observed with regards to symptom-related scales. Symptoms were high immediately after discharge, but failed to return to baseline by 24 months (Fig. 3 C). A
statistically significant decrease in QOL was observed with regards to the lung module-specific symptoms, dyspnoea (P<0.001) and pain (P=0.034).

**QOL after bi-/lobectomy versus pneumonectomy**

Patients who underwent bi-/lobectomy reported better outcomes on the EORTC QLQ-C30 functional scale than did patients who underwent pneumonectomy (Figs. 4-6). After surgery, both groups experienced a decrease in each of the functional scales. Three months after surgery, a decreased QOL with regards to role function (P<0.001) was more apparent in patients who underwent pneumonectomy than in patients who underwent lobectomy. This difference was reduced by the following month; however, a statistically significant difference between the two groups remained until 12 months after surgery (P=0.01). Physical function was lowest 3 months after surgery, although significant differences were observed between the two groups (P=0.004). Global health was lowest at the time of discharge, with significant differences observed between the groups (P=0.013). Twenty-four months after surgery, the QOL of the lobectomy group was comparable with that of a healthy, age-matched population (Fig. 5 B). However, not all of the QOL functional scales recovered to preoperative levels by 12 to 24 months. Mean QOL was more than 10 points higher in the lobectomy group, a difference that is generally regarded as clinically, albeit not statistically, significant.

Results of the QOL symptom scales generally reflected the trends observed for the functional scales. After pneumonectomy, patients suffered more from pain, dyspnoea and coughing. As previously mentioned, there were significant increases in postoperative symptoms such as pain and dyspnoea. Scores from both scales peaked at approximately 3 months after surgery. Patients who underwent pneumonectomy experienced significantly more pain at six months than did patients who underwent lobectomy (P=0.024). Twenty-four months after surgery,
patients who underwent pneumonectomy reported higher scores for coughing, pain and dyspnoea than did patients in the lobectomy group (Figs. 6/7). Similar to results observed with the functional scales, differences in the two groups were clinically significant but not statistically significant.
Discussion

Surgery remains the treatment of choice for early stage NSCLC. Secondary to morbidity and mortality, analysis of QOL is an important measure of the outcome of surgical interventions for malignant disease. In a review of previous QOL-related studies, Montazeri et al. concluded that the use of a specific lung-cancer questionnaire (the EORTC QLQ-LC13) in conjunction with a core questionnaire (the EORTC QLQ-C30) most accurately reflected the QOL of patients with lung cancer.

This prospective study examined the QOL of patients prior to major lung resection, and for a period of 24 months following surgery. To evaluate QOL following minor versus major surgery, subjects were divided into two groups. One group consisted of patients who underwent minor lung parenchymal resection (lobectomy or bilobectomy) whereas the second group consisted of patients who underwent major parenchymal resection (pneumonectomy). The overall 5 year survival rates for these subjects were comparable with values in other reports and there have been no substantial changes in survival over the last two decades.

As expected, QOL decreased significantly after surgery in both groups. The lowest QOL scores were observed immediately after discharge from the hospital, and were followed by a period of slow recovery. In contrast to other reports, neither group experienced a return to preoperative QOL, even after 24 months.

Zieren et al. used the EORTC questionnaire to assess QOL in 72 patients after curative resection of NSCLC. A group of 52 patients was retrospectively assessed 12 months after surgery, when 10 patients with tumor recurrence were excluded from the study owing to a
decrease in QOL. A second group consisted of 20 patients who were prospectively assessed. Although the authors concluded that QOL was restored within 3 to 6 months of surgery in disease-free patients, the significance of this study is impaired by its design. Win et al.\textsuperscript{13} used the EORTC QLQ c30, with the additional lung module LC 13, to evaluate QOL after lung resection in 110 patients with lung cancer. The authors concluded that QOL returned to baseline within 6 months of surgery. Similar to other studies, the authors assessed QOL for only 6 months after surgery. In the present study, however, lung-specific symptoms scales such as dyspnoea decreased significantly after 24 months. Pain also increased significantly during this time. Handy et al.\textsuperscript{14} used the Short-Form 36 Health Survey (SF-36) questionnaire to assess the QOL of 139 patients who underwent resection for lung cancer. The authors found that pain was the dominant symptom reported 6 months after surgery. In the present study, we observed similar results on the functional and symptom-related scales. For example, physical function significantly decreased 24 months after surgery. Even though variations in role function and social function were not statistically significant between the two groups, the mean values differed by more than 10 points, suggesting a clinically relevant decrease \textsuperscript{7}.

To evaluate the impacts of the degree of resection on long-term QOL, subjects were divided into those who underwent lobectomy or bilobectomy (131) and those who underwent pneumonectomy (28). QOL did not recover to preoperative levels in either group, even by 24 months. Additionally, the pneumonectomy group showed a significant stronger increase of QoL scores in the global health item in the early course of the disease at discharge from the hospital compared to the bi-/lobectomy group. This effect was amplified by a significant higher rate of postoperative complications in the pneumonectomy group as stated in table 2 and its impact on QoL. A similar trend in patients who underwent pneumonectomy was observed in a study by Balduyck et al.\textsuperscript{15} The authors used the EORTC questionnaire to assess
QOL after major lung resection in 100 patients over a 12-month period. Patients who underwent pneumonectomy did not experience a return to baseline values with regards to physical function, role function, and pain, consistent with the results of this study. In addition, patients who underwent lobectomy did not approach baseline QOL values until 3 months after surgery. These findings further support the results of the current study.

In contrast to previous studies, which assessed QOL after major visceral operations (e.g., pancreaticoduodenectomy or esophageal resection), and found significant decreases in QOL immediately after discharge, followed by a slow period of recovery to preoperative levels, the current study demonstrated that patients who undergo resection for lung cancer experience permanent and irreversible reductions in QOL. These findings should be taken into consideration when counseling patients with lung cancer prior to surgery.

It is particularly interesting to note that global health was the only QOL parameter to return to preoperative levels. This could reflect a so-called “response shift,” wherein patients adapt their standards and perceptions relative to their expectations and rate their personal situations better than would otherwise be expected, based on the parameters of QOL measurement.

The present study has a few methodological limitations. Namely, multivariate analysis was not possible because of the comparatively small cohort size. In addition, incomplete data introduce the possibility that the study population may not reflect the entire cohort of patients with lung cancer. Incomplete data because of death or disease progression may have biased the results of this study and overemphasized the positive effects of treatment.

In summary, our study suggests that patients who undergo lung resection for NSCLC do not completely recover, even by 24 months after surgery, in contrast to patients who undergo major visceral operations such as pancreaticoduodenectomy or esophageal resection. Three
months after surgery, patients who undergo pneumonectomy and lobectomy experience significant worse QOL than do other patients. Patients who undergo pneumonectomy continue to experience a decrease in QOL at 24 months, whereas patients who undergo lobectomy experience QOL values similar to baseline at approximately 3 months after surgery.
References


Figure legend

**Figure 1**: Kaplan-Meier survival analysis of all patients who underwent lung resection for non small cell lung cancer.

**Figure 2**: A Comparison of survival after resection for stage I disease with stage IIa/b and III  
B Comparison of survival after resection of squamous cell carcinoma and adenocarcinoma  
C Comparison of survival after lobectomy and pneumonectomy

**Figure 3**: Results of quality of life analysis in all 159 patients for  
A three functional scales  
B global health and  
C three items of the lung specific module. Results are shown pre operatively, at discharge and 3, 6, 12 and 24 month after surgery. P-values are shown to compare pre-operative QOL levels and levels at discharge as well as pre-operative levels and QOL levels 24 month after surgery.

**Figure 4**: Comparison of quality of life after lobectomy and pneumonectomy. Quality of life of an age-matched reference group is indicated as a dotted line. (*) p-value < 0.05, (**) p-value < 0.001 (only available for EORTC QLQ C-30)

**Figure 5**: Comparison of quality of life after lobectomy and pneumonectomy. Quality of life of an age-matched reference group is indicated as a dotted line. (*) p-value < 0.05, (**) p-value < 0.001 (only available for EORTC QLQ C-30)

**Figure 6**: Comparison of quality of life after lobectomy and pneumonectomy. Quality of life of an age-matched reference group is indicated as a dotted line. (*) p-value < 0.05, (**) p-value < 0.001 (only available for EORTC QLQ C-30)
### Table 1- Patient characteristics.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total (n = 159)</th>
<th>Lobectomy and Bilobectomy (n = 131)</th>
<th>Pneumonectomy (n = 28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male/Female</td>
<td>120/39</td>
<td>96/35</td>
<td>24/4</td>
</tr>
<tr>
<td>Mean Age (SD)</td>
<td>63.0 (9.8)</td>
<td>63.6 (9.9)</td>
<td>60.7 (9.2)</td>
</tr>
<tr>
<td>Mean Time in Hospital (SD)</td>
<td>15.2 (8.0)</td>
<td>14.1 (7.0)</td>
<td>20.1 (10.4)</td>
</tr>
<tr>
<td>Stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ia/b, Ila/b (%)</td>
<td>119 (75)</td>
<td>107 (90)</td>
<td>12 (10)</td>
</tr>
<tr>
<td>IIIa/b, IV (%)</td>
<td>40 (25)</td>
<td>24 (60)</td>
<td>16 (40)</td>
</tr>
<tr>
<td>Histologic Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squamous (%)</td>
<td>75 (47.2)</td>
<td>60 (45.8)</td>
<td>15 (53.6)</td>
</tr>
<tr>
<td>Adeno (%)</td>
<td>65 (40.9)</td>
<td>55 (42)</td>
<td>10 (35.7)</td>
</tr>
<tr>
<td>Large Cell (%)</td>
<td>15 (9.4)</td>
<td>12 (9.2)</td>
<td>3 (10.7)</td>
</tr>
<tr>
<td>Other (%)</td>
<td>4 (2.5)</td>
<td>4 (3.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Condition</td>
<td>Total (n = 159)</td>
<td>Lobectomy and Bilobectomy (n = 131)</td>
<td>Pneumonectomy (n = 28)</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------</td>
<td>-------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Haemothoracs (%)</td>
<td>1 (0.6)</td>
<td>0 (0)</td>
<td>1 (3.6)</td>
</tr>
<tr>
<td>Wound Healing Disorder</td>
<td>2 (1.3)</td>
<td>0 (0)</td>
<td>2 (7.1)</td>
</tr>
<tr>
<td>Pleural Empyema (%)</td>
<td>1 (0.6)</td>
<td>1 (0.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Prolonged Parenchyma Fistula (%)</td>
<td>8 (5.0)</td>
<td>7 (5.3)</td>
<td>1 (3.6)</td>
</tr>
<tr>
<td>Bronchial Stump Suture Leakage (%)</td>
<td>1 (0.6)</td>
<td>1 (0.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Pneumonia (%)</td>
<td>14 (8.8)</td>
<td>9 (6.9)</td>
<td>5 (17.9)</td>
</tr>
<tr>
<td>Atelectasis (%)</td>
<td>12 (7.5)</td>
<td>11 (8.4)</td>
<td>1 (3.6)</td>
</tr>
<tr>
<td>Long-Term Respiratory Therapy (%)</td>
<td>2 (1.3)</td>
<td>1 (0.8)</td>
<td>1 (3.6)</td>
</tr>
<tr>
<td>Cardiac Complication (%)</td>
<td>10 (6.3)</td>
<td>6 (4.6)</td>
<td>4 (14.3)</td>
</tr>
<tr>
<td>Pneumothorax (%)</td>
<td>2 (1.3)</td>
<td>1 (0.8)</td>
<td>1 (3.6)</td>
</tr>
<tr>
<td>Septicemia (%)</td>
<td>1 (0.6)</td>
<td>0 (0)</td>
<td>1 (3.6)</td>
</tr>
<tr>
<td>Recurrent Laryngeal Nerve Paresis (%)</td>
<td>1 (0.6)</td>
<td>1 (0.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Minor Complications (%)</td>
<td>20 (12.6)</td>
<td>16 (12.2)</td>
<td>4 (14.3)</td>
</tr>
<tr>
<td>Major Complications (%)</td>
<td>25 (15.7)</td>
<td>17 (13.0)</td>
<td>8 (28.6)</td>
</tr>
<tr>
<td>No Complications (%)</td>
<td>114 (71.7)</td>
<td>98 (74.8)</td>
<td>16 (57.1)</td>
</tr>
</tbody>
</table>
Table 3- Response rates (i.e., QOL questionnaire return rates) for all patients (n=159) who underwent lung resection.

<table>
<thead>
<tr>
<th>Time of Assessment</th>
<th>Compliance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>120 of 159 (75.5)</td>
</tr>
<tr>
<td>At Discharge</td>
<td>91 of 159 (57.2)</td>
</tr>
<tr>
<td>3 Months After Surgery</td>
<td>151 of 158 (95.0)</td>
</tr>
<tr>
<td>6 Months After Surgery</td>
<td>135 of 138 (97.8)</td>
</tr>
<tr>
<td>12 Months After Surgery</td>
<td>111 of 120 (92.5)</td>
</tr>
<tr>
<td>24 Months After Surgery</td>
<td>70 of 96 (72.9)</td>
</tr>
</tbody>
</table>
Kaplan-Meier survival analysis of all patients who underwent lung resection for non small cell lung cancer.
A Comparison of survival after resection for stage I disease with stage IIa/b and III B
Comparison of survival after resection of squamous cell carcinoma and adenocarcinoma C
Comparison of survival after lobectomy and pneumonectomy
Results of quality of life analysis in all 159 patients for A three functional scales B global health and C three items of the lung specific module. Results are shown pre operatively, at discharge and 3, 6, 12 and 24 month after surgery. P-values are shown to compare pre-operative QOL levels and levels at discharge as well as pre-operative levels and QOL levels 24 month after surgery.
Comparison of quality of life after lobectomy and pneumonectomy. Quality of life of an age-matched reference group is indicated as a dotted line. (*) p-value < 0.05, (**) p-value < 0.001 (only available for EORTC QLQ C-30)
Comparison of quality of life after lobectomy and pneumonectomy. Quality of life of an age-matched reference group is indicated as a dotted line. (*) p-value < 0.05, (**) p-value < 0.001 (only available for EORTC QLQ C-30)
Comparison of quality of life after lobectomy and pneumonectomy. Quality of life of an age-matched reference group is indicated as a dotted line. (*) p-value < 0.05, (**) p-value < 0.001 (only available for EORTC QLQ C-30)
The extent of lung parenchyma resection significantly impacts long-term quality of life in patients with Non Small Cell Lung Cancer

Tobias Schulte, Bodo Schniewind, Peter Dohrmann, Thomas Küchler and Roland Kurdow

Chest; Prepublished online August 8, 2008; DOI 10.1378/chest.08-1114

This information is current as of January 27, 2009

Updated Information & Services
Updated Information and services, including high-resolution figures, can be found at:
http://www.chestjournal.org/content/early/2008/08/08/chest.08-1114

Open Access
Freely available online through CHEST open access option

Permissions & Licensing
Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
http://chestjournal.org/misc/reprints.shtml

Reprints
Information about ordering reprints can be found online:
http://chestjournal.org/misc/reprints.shtml

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Images in PowerPoint format
Figures that appear in CHEST articles can be downloaded for teaching purposes in PowerPoint slide format. See any online article figure for directions.

Advance online articles have been peer reviewed and accepted for publication but have not yet appeared in the paper journal (edited, typeset versions may be posted when available prior to final publication). Advance online articles are citable and establish publication priority; they are indexed by PubMed from initial publication. Citations to Advance online articles must include the digital object identifier (DOIs) and date of initial publication.