Lung Cancer in Octogenarians: Factors Affecting Morbidity and Mortality After Pulmonary Resection

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Background. **Predictors of morbidity and mortality after pulmonary resection for lung cancer in patients 80 years of age or older are unknown.**

Methods. **The medical records of all patients 80 years of age or older who had pulmonary resection for lung cancer from January 1985 through September 2004 were reviewed.**

Results. **There were 379 patients (248 men, 131 women). Median age was 82 years (range, 80 to 95 years). Pneumonectomy was performed in 25 patients (6.6%), bilobectomy in 7 (1.8%), lobectomy in 240 (63.3%), segmentectomy in 29 (7.7%), and wedge excision in 78 (20.6%). The cancer was squamous cell carcinoma in 143 patients (37.7%), adenocarcinoma in 166 (43.8%), bronchoalveolar cell carcinoma in 47 (12.4%), and other in 23 (6.1%). Complications occurred in 182 patients (48.0%). These included atrial fibrillation in 75 patients, pneumonia in 27, and retained secretions requiring bronchoscopy in 37. Morbidity predictors were male sex (odds ratio [OR], 1.6), hemoptysis (OR, 2.3), and previous stroke (OR, 3.8). Asymptomatic patients had a significantly decreased probability of complications (OR, 0.56). Operative mortality was 6.3% (24 of 379); significant predictors were congestive heart failure (OR, 6.0) and prior myocardial infarction (OR, 4.3). Factors not associated with mortality included previous myocardial revascularization, renal insufficiency (creatinine >1.5 mg/dL), and diabetes mellitus.**

Conclusions. **Pulmonary resection for lung cancer in octogenarians is feasible. Congestive heart failure and myocardial infarction, however, correlated with a significant increase in mortality. Prior myocardial revascularization, renal insufficiency, and diabetes were not associated with increased morbidity and mortality.**

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Individuals 80 years of age or older in the United States are the fastest growing segment of the population [1]. Accompanying this aging population will be an increase in the number of octogenarians with lung cancer, and pulmonary resection undoubtedly will become a more frequent clinical scenario. Appropriate patient selection is necessary to keep morbidity and mortality low, as advanced age is known to be associated with increased comorbidities.

Several recent surgical series have confirmed that long-term survival can be achieved in a significant proportion of octogenarians who undergo curative pulmonary resection for cancer [2–9]. However, considerable variation in outcome has been reported, with operative mortality ranging from zero to 16% [5, 8, 10]. This discrepancy highlights the importance of careful patient selection and the need for better understanding of the factors that increase the risk of pulmonary resection. The aim of this study is to define predictors of early morbidity and mortality after pulmonary resection for lung cancer in patients 80 years of age or older.

Material and Methods

From January 1985 through September 2004, 379 patients 80 years of age or older underwent pulmonary resection for non–small cell lung cancer (NSCLC) at Mayo Clinic in Rochester, MN. The medical records were analyzed for age, sex, comorbidities, presenting signs and symptoms, smoking history, preoperative pulmonary function tests, extent of resection, tumor histology, pathologic stage, complications, and outcomes. To analyze the association of forced expiratory volume in 1 second (FEV_1) with morbidity and mortality, patients were subdivided into three groups: FEV_1 less than 40% predicted, FEV_1 40% to

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70% predicted, and FEV_1 greater than 70% predicted. Operative mortality was defined as death within 30 days of the procedure or during the same hospital admission. This study was approved by the Mayo Clinic College of Medicine's Institutional Review Board on September 14, 2004, with waiver of informed consent and waiver of Health Insurance Portability and Accountability Act.

The association between risk factors and the end points of morbidity and operative mortality were evaluated with univariate analysis. Descriptive statistics for discrete variables are presented as frequencies and percentages. Medians and ranges are used for description of continuous measures. Logistic regression analyses were used to assess the associations between potential risk factors and the dichotomous outcomes of morbidity and operative mortality as defined above. Continuous potential risk factors were converted to categorical indicator variables for inclusion in the logistic regression analyses. Results are presented as odds ratio (OR) and 95% confidence intervals (CI). Probability values less than 0.05 are considered statistically significant.

There were 248 men (65%) and 131 women (35%). Median age at the time of pulmonary resection was 82 years (range, 80 to 95 years). One hundred twenty-five patients (32.5%) were symptomatic, and included cough in 43 (11.4%) patients, hemoptysis in 30 (7.9%), dyspnea in 23 (6.1%), chest pain in 18 (4.7%), weight loss in 8 (2.1%), and generalized muscle weakness in 1 (0.3%). Diagnosis in the remaining 254 patients (67.0%) was obtained through the identification of a pulmonary abnormality on chest roentgenogram obtained during routine examination or evaluation for other medical conditions.

A history of cigarette smoking was present in 71% of patients. Median pack-years were 30 and ranged from 1 to 180. The median FEV_1 was 1.79 L (range, 0.49 to 3.6 L), and the median FEV_1 percent predicted was 72% (range, 25% to 143%). The median diffusing capacity of carbon monoxide was 15.4 L (range, 7 to 29 L), and the median diffusing capacity of carbon monoxide percent predicted was 73% (range, 38% to 134%). Preoperative FEV_1 was less than 40% predicted in 19 patients, between 40% and 70% predicted in 129 (34.0%), and greater than 70% in 173 (45.6%). Preoperative FEV_1 was unavailable in 58 patients (15.3%). Comorbidities are shown in Table 1. One hundred twenty-seven patients (33.5%) had at least one cardiovascular comorbidity, and 73 (19.3%) had either an FEV_1 less than 50% predicted or a diffusion capacity of carbon monoxide less than 60% predicted.

Table 1. Comorbidities

Comorbidity	Number of Patients (%)
Previous malignancy	80 (21%)
Renal insufficiency (creatinine >1.5 mg/dL)	39 (11%)
Prior coronary artery bypass	34 (9%)
Prior myocardial infarction >6 months	32 (9%)
Congestive heart failure	29 (8%)
Diabetes mellitus	28 (8%)
Stroke	21 (6%)
Corticosteroid usage	14 (4%)
Percutaneous coronary intervention or stent	9 (2%)
Alcohol consumption >3 drinks/day	4 (1%)

Table 2. Complications

Complication	Number of Patients (%)
Atrial fibrillation	75 (21%)
Retained secretions requiring bronchoscopy	37 (10%)
Pneumonia	27 (7%)
New home oxygen requirement	26 (7%)
Air leak >5 days	26 (7%)
Postoperative mechanical ventilation	23 (6%)
Myocardial infarction	13 (4%)
Recurrent laryngeal nerve injury	7 (2%)
Pulmonary edema	6 (2%)
Stroke	4 (1%)
Chylothorax	4 (1%)
Reoperation for bleeding	3 (1%)
ARDS	2 (1%)
Empyema	1 (1%)
Other	45 (13%)

ARDS = adult respiratory distress syndrome.

Pneumonectomy was performed in 25 patients (6.6%), bilobectomy in 7 (1.8%), lobectomy in 240 (63.3%), segmentectomy in 29 (7.7%), and a wedge excision in 78 (20.6%). Complete mediastinal lymph node dissection was performed in 354 patients (93.4%). Video-assisted thoracoscopic resection was performed in 35 patients (9.2%). Seventy-seven patients (20.3%) underwent pulmonary resection from 1985 to 1989, 75 (19.8%) from 1990 to 1994, 104 (27.4%) from 1995 to 1999, and 123 (32.5%) from 2000 to 2004.

The cancer was a squamous cell carcinoma in 143 patients (37.7%), adenocarcinoma in 166 (43.8%), bronchoalveolar cell carcinoma in 47 (12.4%), and other in 23 (6.1%). Pathologic stage was IA in 135 patients (35.7%), IB in 119 (31.4%), IIA in 9 (2.4%), IIB in 43 (11.3%), IIIA in 48 (12.7%), IIIB in 18 (4.7%), and IV in 7 (1.8%).

Results

Complications (Table 2) occurred in 182 patients (48.0%), with atrial fibrillation and retained secretions requiring bronchoscopy being the most common. Twenty-four patients died (operative mortality, 6.3%). Cause of death was cardiac in 8 patients, respiratory failure in 4, sepsis in 2, and stroke in 1. The remaining 9 patients died elsewhere after hospital dismissal without an exact cause of death being documented.

Follow-up was complete in 363 patients (95.8%) and ranged from 2 to 13.7 years (median, 2.3 years). One hundred fourteen patients are currently alive and 249 have died. Cause of death was cancer related in 92