Results of pulmonary resection for lung cancer in Norway, patients older than 70 years*

Hans Rostad, Anne Naalsund, Trond-Eirik Strand, Randi Jacobsen, Olaug Talleraas, Jarle Norstein

Cancer Registry of Norway, Montebello, 0310 Oslo, Norway
Department of Respiratory Medicine, Rikshospitalet, Oslo, Norway

Received 2 September 2004; received in revised form 7 November 2004; accepted 10 November 2004; Available online 16 December 2004

Abstract

Objective: Surgical resection for lung cancer is the mainstay of curative treatment, but studies regarding postoperative results and long-term outcome have differed. The purpose of the present study was to assess the early and long-term results of surgical resection in patients more than 70 years of age. Methods: In Norway all clinical and pathologic departments submit reports on cancer patients to the Cancer Registry of Norway. This investigation included all patients more than 70 years of age resected for lung cancer in the time period 1993–2000. For results of long-time follow-up only patients operated on between 1993 and 1998 were included. Results: A total of 763 patients (541 men) were identified aged 71–87 years. Postoperative mortality rate was 9%, highest after bilobectomy and pneumonectomy. The most commonly reported causes of postoperative death were pneumonia and cardiac complications. The majority of patients had tumor categorized as clinical stage (cStage) Ia and Ib. More than 100 in each of these groups proved to have more advanced disease postoperatively (pStage). The 5-year relative survival rate was significantly better in patients with disease in pStage I compared to higher stages. Women had a significantly better 5-year survival rate compared to men, 62.8 and 35.7%, respectively. Conclusions: Lung cancer surgery appears to be a relatively safe procedure even in the elderly. There is a high postoperative mortality after bilobectomy and pneumonectomy. However, when old people survive the postoperative period the long-term prognosis seems favorable.

Keywords: Lung cancer; Elderly; Surgical resection

1. Introduction

The incidence of lung cancer in the elderly continues to increase in Norway. This disease is among the most common malignancies with more than 2000 new cases reported yearly in Norway and is now the leading cause of cancer death both in this country and in the Western world. The prognosis is very poor with a 5-year relative survival of about 10%.

Surgical resection is the mainstay of curative treatment with a favorable survival even in the elderly [1-4]. High age does not seem to be a risk factor on its own in patients undergoing operative treatment for lung cancer, but short and long term results vary in different studies [5-7].

This study was undertaken to assess the early and long-term results of surgical resection in patients more than 70 years of age.

* The results of this work have been presented orally and as a poster at the 8th International Conference on Geriatric Oncology: Cancer in the Elderly, Rome, Italy, November 21-22, 2003.

Corresponding author. Tel.: +47 22 45 1300; fax: +47 22 45 13 70.
E-mail address: hans.rostad@kreftregisteret.no (H. Rostad).

2. Materials and methods

The investigation included all patients more than 70 years of age resected for lung cancer in Norway in the time period 1993-2000.

Notification of all forms of cancer in Norway is mandatory and regulated by law. All clinical and pathologic departments submit reports on cancer patients to the Cancer Registry. The Registry also has a law-regulated authority to collect supplemental information as needed regarding diagnosis, treatment and outcome for all cancer patients from the hospitals in charge. Furthermore, the Registry receives death certificates from the Central Bureau of Statistics regarding all patients having cancer as the cause of death.

All reports of lung cancer in patients older than 70 years who had been operated during the time interval were reviewed. The tumors were classified either on the basis of the reports or as a result of case histories and clinical information from hospitals in charge.

In order to calculate 5-year relative survival rate only patients diagnosed between 1993 and 1998 were included in survival analysis.
2.1. Statistics

Comparisons between categorical data were done with the Chi square and Fisher’s Exact test. Relative survival was calculated with survival probabilities of the general Norwegian population as reference. Differences in relative survival between subgroups were regarded statistically significant when confidence intervals did not overlap.

3. Results

A total of 763 patients were identified, 541 men and 222 women, median age 74 years (range 71–87 years). There were more than twice as many males compared to females. A total of 748 patients had non-small cell lung cancer (NSCLC) while 15 had small cell lung cancer (SCLC). A higher proportion of men underwent pneumonectomy compared to women. Table 1 gives the number of each subset of patients for the different procedures.

Nine percent of the patients died within 30 days following operation (Table 2). The postoperative mortality was high after pneumonectomy in all age groups reflecting the risk of this procedure in the elderly. Male patients undergoing bilobectomy and pneumonectomy had a significantly higher mortality than women, 25 and 7.5%, respectively ($P = 0.046$).

The most frequent causes of postoperative death were pneumonia and cardiac complications which are reflected by the high frequency of preoperative poor lung function and cardiac disease (Table 3). Four patients were found dead in bed after having been moved from the postoperative care unit. Only 26 patients (37%) were autopsied.

The majority of patients had tumors categorized as clinical stage (cStage) Ia and Ib (Table 4). The diagnostic precision compared to pathological stage (pStage) was 64.4% (491 of 763 patients). About 120 patients in stage Ia and about 150 in stage Ib proved to have more advanced disease postoperatively because of unexpected finding of tumor involvement in hilar nodes in the resection specimen.

pStage IIIa denotes in these cases involvement of ipsilateral mediastinal nodes, while pStage IIIb indicates tumor invasion into vital mediastinal structures (T4). Tumor involvement of contralateral nodes, a situation which is also designated as stage IIib, was obviously not observed during thoracotomy. A tendency towards a lower pathological pStage (Ia and Ib) among women, 76% compared to 67% in men was observed.

Histopathology of the resected specimen revealed a predominance of squamous cell carcinoma in males while a higher proportion of females was found to have adenocarcinomas ($P < 0.001$) (Table 5).

In 32 cases tumor cells infiltrated the resection margin while such infiltration could not be excluded in 21 more

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Surgical procedure and sex (males M, females F), 1993–2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Lobectomy</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>71–75</td>
<td>189</td>
</tr>
<tr>
<td>76–80</td>
<td>107</td>
</tr>
<tr>
<td>&gt;80</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Postoperative mortality (30 days after surgery), 1993–2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Lobectomy</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>71–75</td>
<td>15</td>
</tr>
<tr>
<td>76–80</td>
<td>9</td>
</tr>
<tr>
<td>&gt;80</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Preoperative risk factors and causes of postoperative deaths, 1993–2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causes</td>
<td>Preoperative risk factors</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Respiratory failure/pneumonia</td>
<td>8</td>
</tr>
<tr>
<td>Cardiac</td>
<td>-</td>
</tr>
<tr>
<td>Hemorrhage (per and postoperative)</td>
<td>-</td>
</tr>
<tr>
<td>Cerebrovascular accident</td>
<td>-</td>
</tr>
<tr>
<td>Multiple organ failure</td>
<td>-</td>
</tr>
<tr>
<td>Pulmonary embolus</td>
<td>-</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>3</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
</tr>
</tbody>
</table>
patients. In the remaining 710 cases resection margin was free.

3.1. Survival

The overall 5-year relative survival rate of the series for patients diagnosed between 1993 and 1998 (N=536) was 43.7%. This result was more favorable in patients less than 70 years in the same population and period (unpublished data). The univariate analysis identified differences in sex, age, stage and histology as statistically significant for 5-year relative survival (Table 6). Compared to the other histologic subtypes the survival rate was rather poor for patients with small cell lung cancer.

In the period 1993-1998 the resection margin was free in 494 patients while tumor invasion was found in 23. This means malignant tumor tissue in the resection margin, carcinoma in situ or node invasion close to the resection margin. Five-year relative survival in these groups was 44.1 and 34.9%, respectively. In 19 cases tumor invasion of the resection margin was not conclusively described.

At the end of year 2000, 426 of the 763 operated patients were dead. The main cause of death was lung cancer (N=365). Other important causes were cancer in other organs and cardiac disease.

4. Discussion

Our investigation indicates that the elderly patients should be considered for surgical treatment provided the tumor is technically resectable. In a recent publication we reported a postoperative mortality rate of less than 4% in patients under 71 years who underwent surgical resection in the same period in contrast to 9% in this current series [8].

However, the long-time survival seems quite favorable even in the elderly [9-12].

Some authors report a postoperative mortality of 0-3.7% even in the octogenarians [13-15]. Pneumonectomy in this group of patients has been shown to be associated with an increased rate of postoperative complications and mortality [3,4,16]. Therefore, appropriate selection and meticulous peri- and postoperative care are paramount to minimize risks in patients who require pneumonectomy. This is reflected by the fact that the majority of the postoperative deaths were caused by respiratory failure/pneumonia and cardiac complications. In five patients cause of death was unknown, and four of them were found dead in bed. Improved facilities for postoperative care might have improved this situation.

There is a pronounced difference with regard to postoperative mortality between the sexes. Men underwent more major procedures (bilobectomy and pneumonectomy), a finding which is also reported by others [17,18]. This may be due to centrally located squamous cell carcinoma in men while more females develop adenocarcinomas located in the lung periphery [19,20,21]. Furthermore, for some reason malignant disease may be diagnosed at an earlier stage in women [22].

The discrepancy between cStage and pStage in our series may indicate insufficient preoperative evaluation. On the other hand, hilar node invasion may be difficult to discover preoperatively applying CT technique. However, to distinguish between stages I and II preoperatively is not important since surgery is the treatment of choice for both categories.
To diagnose patients with cancer infiltration in mediastinal nodes preoperatively is essential since these patients in most centres usually will be regarded as being technically inoperable. It may well be that some of the 66 patients who postoperatively were found to have disease in stage III due to mediastinal node involvement could have been diagnosed preoperatively by means of mediastinoscopy, a procedure which up to now unfortunately has been performed too rarely in our country [23].

Thoracotomy resulting in exploration and not resection might in some cases have been avoided if tumor invasion into mediastinal structures had been diagnosed preoperatively by MR Imaging. This investigation was not available in most hospitals at the time of diagnosis.

In the elderly, an extensive preoperative evaluation for precise staging is necessary to avoid futile thoracotomies. On the other hand, in order to offer as many patients as possible surgical treatment of lung cancer a certain number of exploratory thoracotomies has to be accepted.

A previous Norwegian study investigating why only 16-17% of patients with lung cancer were offered surgery, demonstrated that for elderly patients the selection process for operation was practiced differently, depending on where in the country the patients were living [23]. Some were refused surgery because of high age alone, having no other known risk factors, while others were undergoing extensive preoperative investigations including coronary angiography. At the moment new guidelines on this matter have been prepared, and will be published during springtime 2005. These underline the fact that treatment for clinically stages I and II disease can be as effective in patients over 70 years of age as in younger patients.

Women had a better 5-year survival rate than men. This is not completely understood, but there is evidence suggesting that the growth of lung cancer cells may in part be dependent on reproductive hormones [21]. Other factors may be higher prevalence of cardiovascular comorbidity in men and higher proportion of pneumoectomies because of more centrally located squamous cell cancer compared to peripheral adenocarcinomas in women.

The poor survival rate in the few patients with SCLC is remarkable. However, in a recent publication from the same population the survival in resected patients at all ages with SCLC was far better than those groups with other treatment modalities [24].

5. Conclusion

Lung cancer surgery is a relatively safe procedure also in elderly patients. The postoperative mortality following pneumoectomy is high, and this operation should only be performed in selected patients with acceptable heart-lung function. When old people survive the postoperative period the long-term prognosis seems as favorable as for younger patients.

References

[23] Rostad H, Naalsund A, Jacobsen R, Strand TE, Scott H, Strøm EH, Stroem EH, Naalsund A, Norstein J. Is the treatment for clinically stages I and II disease can be as effective in patients over 70 years of age as in younger patients.

5. Conclusion

Lung cancer surgery is a relatively safe procedure also in elderly patients. The postoperative mortality following pneumoectomy is high, and this operation should only be performed in selected patients with acceptable heart-lung function. When old people survive the postoperative period the long-term prognosis seems as favorable as for younger patients.