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Lobar lung resection in elderly patients with non-small cell lung carcinoma: impact of cardiac comorbidity on surgical outcome

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Summary

PRINCIPLES: The aim of this study was to evaluate the impact of cardiac comorbidity on the perioperative morbidity and mortality after lobar lung resection for lung cancer in patients aged 70 years and older.
METHODS: The medical records of all 68 patients ≥70 years, who underwent lobar lung resection for non-small cell lung cancer (NSCLC) from 2003 to 2011 at our department, were reviewed retrospectively. Twenty-two patients with a mean age of 76.3 years had cardiac comorbidities (Group A) including previous cardiac operations in 4 patients, previous myocardial infarction in 5 patients, previous coronary stent insertion in 3 patients, medically treated coronary artery disease in 10 patients and medically treated valvular heart disease in 2 patients whereas 46 patients (mean age = 74.5 years) had no previous cardiac history (Group B).
RESULTS: There were no significant differences in postoperative morbidity (13.6% in Group A vs. 17.4% in Group B) between both groups. No in-hospital mortality was observed in both groups.
CONCLUSION: In our experience lobar lung resections for NSCLC in elderly patients with cardiac comorbidity seem to be a safe therapy option for this increasing subpopulation. Though, our retrospective data with the small number of study objects require further confirmation in larger prospective trials.

Key words: *Non-small cell lung carcinoma; elderly; lung resections; cardiac comorbidity*

Introduction

The cardiovascular comorbidity in patients with NSCLC is reported to be up to 23% [1]. While ischaemic heart disease is the leading cause of death in western countries [2], NSCLC is the leading cause of malignancy-related mortality in this population [3]. It is estimated that 577,190 persons in the United States will die from cancer in 2012, more than 1,500 deaths per day. And 27.8% of these deaths will be caused by NSCLC. These cancer statistics also show that the probability developing NSCLC until the age of 59 years is only about 0.91% whereas it increases dramatically up to 6.69% in elderly people aged 70 years and older [4]. On the other hand, for persons aged 70 years, the lifetime risk of developing ischaemic heart disease is 34.9% for men and 24.2% for women [5]. The incidence of both diseases diagnosed in the elderly people is rising due to the increasing life expectancy. Cardiac comorbidity is reported not to be a risk factor for morbidity and mortality following surgery for NSCLC [6], whereas its impact on surgical outcome in this increasing subpopulation remains unclear.
Objective: The aim of this study was to evaluate the impact of cardiac comorbidity on operative morbidity and mortality in patients aged 70 years or older with NSCLC undergoing lobar lung resection.

Materials and methods

We retrospectively reviewed all patients aged 70 years or older with NSCLC who underwent lobar lung resection between 2002 and 2011 at our institution, the Cardiothoracic and Vascular Surgery Department of a University Hospital. Twenty-two patients with a mean age of 76.3 years had cardiac comorbidities (Group A) including ischaemic heart disease and valvular heart disease whereas 46 patients (mean age = 74.5 years) had no previous cardiac history (Group B). Analysed demographic and clinical variables included age, gender, pulmonary function and concomitant diseases.
The eligibility criteria for lung resection were defined by ERS/ESTS clinical guidelines on fitness for radical therapy in lung cancer patients [7]. The preoperative cardiac evaluation of the patients in Group A was performed according to ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery [8]. Patients with a history of valvular heart disease in this group had preoperative echocardiography showing no abnormalitites. All patients in Group A with history of ischaemic heart disease underwent stress echocardiography prior to lung resection showing no indication for further invasive cardiac evaluation thus any coronary intervention. Patients in Group B without any history of angina and without any physical findings consistent with valvular heart disease

needed no further cardiac evaluation except the routine preoperative electrocardiography.

Operations were performed under general anaesthesia through lateral thoracotomy completed with hilar and mediastinal lymphadenectomy.

Pulmonary resections included lobectomy and bilobectomy whereas patients with segmentectomy, wedge resection and pneumonectomy were excluded. Staging was re-evaluated according to the seventh edition of the TNM classification [9]. Histologic typing was carried out according to the World Health Organization histologic classification [10].

Morbidity was defined as any postoperative event, such as pneumonia, major bleeding requiring reoperation, prolonged air leak with postoperative chest tube drainage >7 days, wound infection, or pleural effusion requiring renewed drainage. Operative mortality was defined as in-hospital mortality.

Statistical analysis was performed using Fisher's exact test for categorical data and t-test for continuous data. A two-tailed *P*-value of <0.05 was considered to be statistically significant.

Results

Demographics and clinical data

The details of patients' preoperative characteristics are shown in table 1. There were no significant differences in patient demographics and extracardiac comorbidity between both groups. The mean age in Group A was 76.3 years whereas in Group B it was 74.5 years. There was also no significant difference between both groups regarding the incidence of COPD. Cardiac history of patients in Group A is described in table 2. Seventeen patients in this group showed history of ischaemic heart disease whereas 5 patients had valvular heart disease.

Surgical data

Twenty-one patients in Group A underwent a lobectomy whereas in 1 patient a bilobectomy was indicated. This distribution was similar in Group B (table 3).

Histology and staging

Analyses of histological findings (table 4) and clinical stages (table 5) showed no significant differences between both groups.

Operative morbidity and mortality

All patients were extubated in the operating room. Mean length of hospital stay in Group A was 10.2 days and in Group B 11 days (p = NS). The mean overall morbidity in Group A was 13.6% whereas it was 17.4% in Group B (p = NS). There were also no significant differences regarding each single complication (table 6). We had no in-hospital mortality in both groups.

Discussion

Our data support that cardiac comorbidity seems not to be a risk factor for operative morbidity and mortality in elderly patients ≥70 years with NSCLC undergoing lobar lung resection.

Demographic projections from German Federal Statistical Office indicate that by the year 2050 the number of citizens over 70 years will increase to 26.6% of the total population in Germany [11]. Due to expected similar trend in western

Table 1: Patient characteristics and preoperative comorbidities.

Variable	Group A (n = 22)	Group B (n = 46)	*P*-value
Female	3 (13.6%)	12 (26.1%)	NS
Mean age (range)	76.3 (70 – 84)	74.5 (70 – 89)	NS
Mean FeV1 (%)	73.3	78.7	NS
Ischaemic heart disease	19	0	<0.0001
Valvular heart disease	8	0	<0.0001
Arterial hypertension	9	22	NS
Diabetes mellitus	8	11	NS
Peripheral vascular disease	3	3	NS
COPD	7	20	NS
Abdominal aortic aneurysm	3	2	NS
Previous other malignomas	9	19	NS
Previous cardiac operations	4	0	0.009
Previous operations due to other malignomas	6	9	NS

Group A = with cardiac comorbidity; Group B = without cardiac comorbidity; NS = not significant; FeV1 = forced expiratory volume in 1 s; COPD = chronic obstructive pulmonary disease.

Table 2: Cardiac history in Group A.

Cardiac event	Patient no.	Mean interval to pulmonary resection (months)
Coronary revascularisation	1	13
Valve repair/replacement	3	42.3 (range 17 – 84)
Myocardial infarction	5	32 (range 14 – 58)
Coronary stenting	3	30.7 (range 22 – 46)
Medically treated CAD	10	–
Medically treated VHD	2	–

CAD = coronary artery disease; VHD = valvular heart disease.

countries, elderly patients presenting cardiac diseases and NSCLC coincidentally, will also be increasing markedly as these diseases are currently worldwide the leading cause of death [2] and of malignancy-related mortality [3] respectively. So the following question will remain to be answered: can lobar lung resection, recently the mainstay of treatment for early-stage NSCLC, be offered to elderly patients with NSCLC and cardiac comorbidity without any adverse impact on postoperative outcome? In our retrospective analysis we could answer this question with yes.

In a large retrospective study with 1,073 patients, Takamochi et al. also reported that ischaemic heart disease is not a risk factor for morbidity after pulmonary resection for lung cancer in elderly patients, but operative procedures in this series included not only lobar lung resections but also resections less than lobectomy [12]. This is a limiting factor to find an answer for our previous question in this study, as it is known that the extent of pulmonary resection per se is a risk factor for operative morbidity in elderly patients [13].

Another large retrospective study with 1,067 patients, reported by Mishra et al. [6], confirmed that cardiac comorbidity is not a risk factor for mortality and morbidity following surgery for NSCLC. But its impact in elderly patients after lobar lung resection also remained unclear in this study, as the data have not been analysed according to age groups and resections included wedge resections as well.

Pagni et al. [14] reported in their retrospective study with 385 patients aged 70 years and older, that positive cardiac history does not correlate with increased operative risk after pulmonary resections also including segmental and wedge resections besides major resections.

There are further retrospective studies [15, 16] showing cardiac comorbidity not to be a significant prognostic factor of survival after pulmonary resections for NSCLC without analysing its impact in elderly patients after lobar lung resections.

However, there are also many authors reporting on negative impact of cardiac comorbidity on postoperative outcome after pulmonary resection in patients with NSCLC [17–19] so that this issue remains to be investigated in further studies.

In our opinion, it is crucial that such patients with previous cardiac history should undergo careful preoperative cardiac evaluation including dobutamine stress echocardiography and cardiac catheterisation if necessary to exclude any need of actual cardiac intervention prior to pulmonary resection.

Study limitations

The main limitation of our study is its retrospective nature as a single-institution study with a small sample size which

Table 3: Type of pulmonary resection.

Pulmonary resection	**Group A (n = 22)**	**Group B (n = 46)**	***P*-value**
Lobectomy	21	40	NS
Bilobectomy	1	6	NS

Group A = with cardiac comorbidity; Group B = without cardiac comorbidity; NS = not significant.

Table 4: Histological findings.

Histology	**Group A (n = 22)**	**Group B (n = 46)**	***P*-value**
Adenocarcinoma	1	3	NS
Squamous cell carcinoma	21	42	NS
Adenosquamous cell carcinoma	0	1	NS

Group A = with cardiac comorbidity; Group B = without cardiac comorbidity; NS = not significant.

Table 5: Clinical stages.

Stage	**Group A (n = 22)**	**Group B (n = 46)**	***P*-value**
I A	8	19	NS
I B	5	13	NS
II A	5	8	NS
II B	1	2	NS
III A	3	4	NS

Group A = with cardiac comorbidity; Group B = without cardiac comorbidity; NS = not significant.

Table 6: Perioperative events.

Variable	Group A (n = 22)	Group B (n = 46)	*P*-value
Overall morbidity (%)	13.6	17.4	NS
Pneumonia	1	5	NS
Prolonged air leak	1	0	NS
Pleural effusion	1	0	NS
Reoperation due to bleeding	0	2	NS
Wound infection	0	1	NS
In-hospital mortality	0	0	NS

Group A = with cardiac comorbidity; Group B = without cardiac comorbidity; NS = not significant.

also limits the generalisability of our data although all of elderly patients who underwent lobar lung resection during the time period of interest were included in this study and the preoperative cardiopulmonary assessment was carried out within international guidelines described before. Therefore, our findings need to be confirmed in large, prospective randomised multicentre trials.

Conclusions

In our experience, we suggest that lobar lung resections for NSCLC can be performed safely in elderly patients with cardiac comorbidity without any adverse impact on postoperative outcome.

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Figures (large format)