

# Long-term Outcomes of Thoracoscopic Anatomic Resections and Systematic Lymphadenectomy for Elderly High-risk Patients with Stage IB Non-small-cell Lung Cancer



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## Background

To evaluate the efficacy and long-term survival outcomes of complete video-assisted thoracoscopic surgery (C-VATS) for the resection of anatomic pulmonary segments and systematic lymphadenectomy in the treatment of elderly and high-risk patients with stage IB for non-small cell lung cancer (NSCLC).

## Methods

242 elderly patients ( $\geq 65$  years), who were operated on by the same operational team, were divided into high-risk group and conventional risk group from August 2008 to December 2010. All patients were diagnosed in stage IB (pT status:  $>2$  to  $\leq 3$ ) NSCLC by biopsy and examination of PET-CT before operation. The high-risk patients were identified with severe cardiopulmonary and other system dysfunctions as follow-up criteria. They were treated with VATS anatomic pulmonary segments and systematic lymphadenectomy. The conventional risk patients with adequate cardiopulmonary reserve were treated with VATS radical lobectomy and systematic lymphadenectomy. The clinical and pathological data were recorded. The total survival, tumour-free survival, recurrence time and character of patients were followed-up. Appropriate statistical analyses involved the  $\chi^2$  test and Kaplan–Meier estimates of total survival and tumour-free survival.

## Results

A total of 242 patients underwent surgical resection during our study period: Anatomic pulmonary segments in 116 patients and lobectomy in 126. The operative time and blood loss of the VATS anatomic pulmonary segments group ( $78.0 \pm 35.0$  min,  $95.6 \pm 30.4$  ml) were significantly less than those of the VATS radical resection group ( $108.0 \pm 25.0$  min,  $165.6 \pm 58.4$  ml). Neither group experienced post-operative death. The overall and tumour-free survival rate of the VATS anatomic pulmonary segments group within five years were 62.07% and 29.31%, and those of the VATS radical resection group were 63.49% and 33.33%; there was no significant difference ( $P > 0.5$ ). The recurrence rates of the VATS anatomic pulmonary segment group and VATS radical resection group were 13.79% and 12.70%; there was no significant difference ( $P > 0.5$ ).

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**Conclusions** Thoracoscopic segmentectomy under anaesthesia and systematic lymphadenectomy is safe and minimally invasive and effective to treat a selected group of patients with stage IB NSCLC.

**Keywords** Video-assisted thoracoscopic surgery (VATS) • Anatomic pulmonary segments • Lobectomy • High risk • NSCLC

## Objective

Lung cancer is a leading cause of cancer-related mortality and a common disease of the elderly. Surgical resection is a conventional treatment for the early stage of lung cancer [2], especially for the early stage non-small-cell lung cancer, and the statistics of National Cancer Institute have shown that the lung cancer mainly occurs in those aged between 75 and 79 and the peak mortality rate is between 75 and 84 years, depending on gender [1]. On the other hand, the technique of video-assisted thoracic surgery (VATS) is a well-established technique in the armamentarium of the thoracic surgeon and currently indicated for a wide spectrum of pulmonary diseases, including primary lung cancer [11,12]. Pulmonary lobectomy combined with systematic lymphadenectomy or sampling is the gold standard for lung cancer for the moment. [1,3,10]

However, many elderly patients usually have severe cardiopulmonary and other system dysfunctions and are unable to tolerate the pulmonary lobectomy. The risk of operation is gradually rising along with the rise of age [4]. Therefore, for those patients with severely compromised pulmonary function, advanced age or other extensive comorbidities who cannot tolerate a full lobectomy, a more limited operation is recommended [14–16]. It could only be a local excision however, for these elderly high-risk patients treated with VATS. And the systematic lymphadenectomy or sampling might be simplified or omitted because of the operative risk. Segmental resection has also been considered for the treatment of patients with primary lung cancer and poor cardiopulmonary function [7].

Some clinical, socioeconomic, and surgeon factors were statistically significantly associated with the choice of surgical resection for early-stage NSCLC [5]. Compared with lobectomy, anatomic pulmonary segments better preserves lung functions while removing small nodules [6]. Nakanura reported that [8], for 411 patients with stage IA NSCLC who were followed-up for five years of research, the five-year survival rate of lung segment resection and lobectomy resection was the same. Trodell L. reported that, there was no statistically significant difference in the treatment of stage IA for non-small cell lung cancer with lung segment resection or lobectomy resection [9]. This confirms the feasibility and efficacy of segment resection in the treatment of stage IA (for diameter < 2 cm of the patients with lung cancer) for non-small cell lung cancer.

Meanwhile, the risk of pulmonary lobectomy for elderly patients is greatly reduced along with the maturity of thoracoscopic lobectomy and lymphadenectomy, and advanced age is no longer a barrier to the VATS radical resection [13].

But there is still not sufficient evidence to support the efficacy and long-term survival rate of lung segment resection in treatment of stage IB NSCLC (for tumour diameter >2 to ≤3 cm) of the patients with lung cancer. Therefore, we designed this study to evaluate the long-term outcomes and efficacy of thoracoscopic anatomic resections and systematic lymphadenectomy for elderly high-risk patients with stage IB NSCLC.

## Methods

### Study Subjects

242 elderly patients (≥65 years) with stage IB NSCLC (pT status: >2 to ≤3) were divided into high-risk group and conventional risk group from August 2009 to December 2010. This study was approved by the Research Ethics Committee of Southern Medical University School and Kaiping Central Hospital. All participants at the Kaiping Central Hospital had signed written informed consents.

Physical examination and routine examination of these patients were performed. Routine check-up included the examinations of pre-operative blood biochemical indexes, PET-CT, chest radiography, chest CT, electrocardiogram, colour Doppler ultrasound of the heart, lung function and arterial blood gases. All patients were diagnosed with stage IB NSCLC by biopsy and examination of positron emission tomography computed tomography (PET-CT) before operation. The conventional risk group received the VAST radical resection and the systematic lymphadenectomy. The high-risk group received the VAST anatomic pulmonary segments and the systematic lymphadenectomy.

The patients were identified as high-risk if one of the following descriptions conformed to the medical history and preliminary results. Otherwise, the patients were put into the conventional risk group. The criteria for high-risk were:

- (1) Pulmonary function test: the percentage ratio of forced expiratory volume in 1 second (FEV1) to predicted value <60% or the absolute value of FEV1 <1.2 L or the percentage ratio of carbon monoxide diffusion capacity (DLCO) to predicted value <60%.
- (2) Arterial blood gas analysis of suction air while rested: PaO<sub>2</sub> ≤60 mmHg or PaCO<sub>2</sub> ≥50 mmHg.
- (3) Included two of the following symptoms: ① Primary hypertension in or above stage II; ② undergoing coronary stenting of myocardial infarction or coronary artery within two years; ③ moderate and increased level of valvular disease; ④ frequent ventricular arrhythmia; ⑤ left ventricular ejection fraction <60%.

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