



# Management of Intersegmental Plane on Pulmonary Segmentectomy Concerning Postoperative Complications

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**Background.** For primary lung cancer, anatomic pulmonary segmentectomy may have a functional advantage over lobectomy; however, persistent air leak or delayed pneumothorax after segmentectomy is prevalent and increases surgical morbidity. To prevent pulmonary complications after pulmonary segmentectomy, we used 2 methods for the involved intersegmental plane: coverage using polyglycolic acid mesh and fibrin glue (mesh cover) or closing it by suturing the pleural edge (pleural suture). We aimed to compare postoperative pulmonary function and complications between the 2 groups.

**Methods.** A total of 133 patients who underwent pulmonary segmentectomy for stage IA non-small cell lung cancer were analyzed retrospectively. A pulmonary function test, including vital capacity and forced expiratory volume in 1 second, was performed preoperatively and at 1 and 6 months postoperatively. Propensity score analysis generated 2 matched pairs of 46 patients in the pleural suture and mesh cover groups.

**Results.** In each group, there was no significant difference in the recovery rate of vital capacity and forced expiratory volume in 1 second at 1 and 6 months postoperatively. Compared with the pleural suture group, the mesh cover group had higher incidence of prolonged air leak (8.7% versus 0%;  $p = 0.042$ ), delayed pneumothorax (10.9% versus 2.2%;  $p = 0.051$ ). On logistic regression analysis, management of intersegmental plane by either mesh cover or pleural suture was the only independent factor related to pulmonary complications (prolonged air leak or delayed pneumothorax) after pulmonary segmentectomy (odds ratio: 5.26,  $p = 0.047$ ; odds ratio: 13.39,  $p = 0.018$ , respectively).

**Conclusions.** Pleural suturing of the involved intersegmental plane during pulmonary segmentectomy appeared to be an acceptable method to reduce postoperative pulmonary complications.

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Although lobectomy and systematic lymph node dissection are considered the standard surgical procedure for any primary non-small cell lung cancer (NSCLC) [1], an increasing body of evidence has recently demonstrated that segmentectomy for small-sized, stage I lung cancer can yield outcomes that are equivalent to lobectomy [2–4]. Furthermore, several studies suggested that the frequency of local recurrence after sublobar resection was the same as that after lobectomy, when the indication was limited to stage IA tumors up to 2 cm and when segmentectomy, not wedge resection, was predominantly used as the less extensive resection [2, 4]. This has led to a resurgence of interest in the use of anatomic segmentectomy. In addition, segmentectomy has anatomic and functional advantages over lobectomy because some lung segments that would be removed by lobectomy could be preserved with segmentectomy.

Several reports have shown the superiority of segmentectomy over lobectomy for preserving postoperative pulmonary function [3, 5, 6].

Sparing the intersegmental vein has been considered important to preserve venous drainage of residual segments after anatomical segmentectomy. Electrocautery has been shown to be useful for dissecting the intersegmental plane, especially for resected segments that were central in location [7, 8]. However, opening the intersegmental plane causes postoperative air leak. To prevent air leak from the intersegmental plane, closure of the pleural edge of the preserved segments would be useful, but it would shrink the preserved segments and result in insufficient reexpansion. As another method to prevent air leak, coverage of the opened intersegmental plane with polyglycolic acid (PGA) mesh and fibrin glue has been reported [7]. Yoshimoto and colleagues [7] have previously compared these 2 methods, mainly in terms of postoperative pulmonary function; however, the incidence of postoperative complications was not clearly evaluated. With the widespread use of pulmonary segmentectomy, both early (ie, prolonged air leak) and late

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(ie, delayed pneumothorax occurring after discharge) complications have been encountered occasionally, and previous report demonstrated the incident of delayed pneumothorax was 18% [9]. However, evaluation of delayed pneumothorax after pulmonary segmentectomy was not clearly examined in detail.

The aim of this retrospective study was to compare pulmonary function and complications after pulmonary segmentectomy between pleural suture and mesh cover, and to determine the predictors of pulmonary complications after pulmonary segmentectomy by logistic regression analysis.

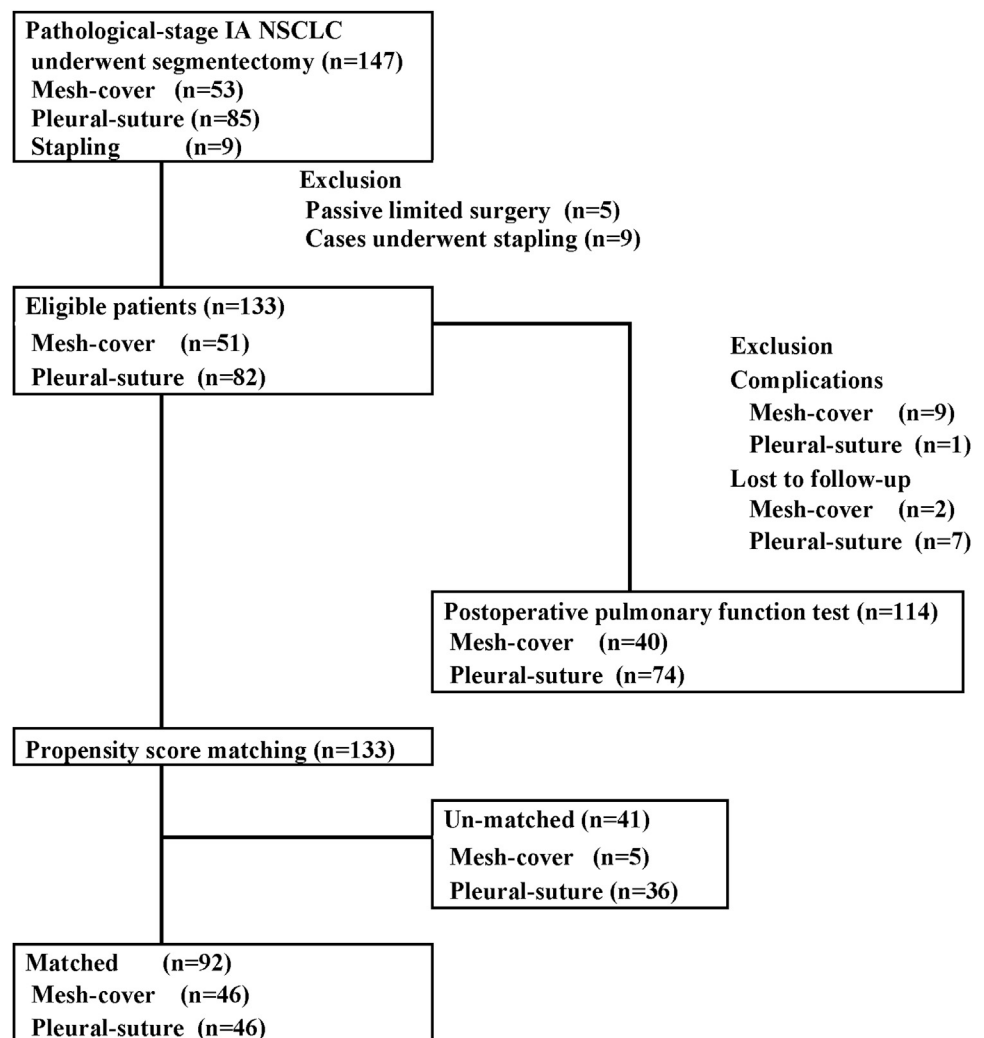
## Patients and Methods

### Patients

Informed consent was obtained from all patients after discussion of the general risks and benefits of pulmonary segmentectomy for lung cancer. This retrospective analysis was approved by our Institutional Review

Board. The medical records of 147 patients who underwent pulmonary segmentectomy for pathologic stage IA NSCLC between September 2008 and January 2016 at our institute were retrospectively reviewed. Segmentectomy was generally performed for patients in clinical stage IA with tumors up to 2 cm (T1a) or with computed tomography (CT) findings of ground-glass shadows, which might indicate an underlying minimally invasive adenocarcinoma. Patients in whom pulmonary function tests were performed at both 1 and 6 months after surgery were enrolled in the present study. All patients were given complete preoperative pulmonary evaluation. The cases of segmentectomy as passive limited surgery, defined patients are at high risk for perioperative morbidity and mortality due to comorbid conditions who considered being unsuitable for standard lobectomy, or segmentectomy underwent mechanical stapling were excluded in this study. No patients received preoperative chemotherapy or radiation. Smoking was stopped in all patients for at least 4 weeks

Fig 1. Diagram for patient selections. (NSCLC = non-small cell lung cancer.)



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