

Factors associated with the complications after lung surgery in the patients with early stage lung cancer: a preliminary study for preoperative pulmonary rehabilitation

Abstract

Patients with early stage lung cancer including stage I, II, and IIIA consider lung surgery as a treatment. Postoperative pulmonary complications, such as pneumonia, atelectasis, worsened gas exchange, bronchoconstriction, thromboembolic disease and respiratory failure, sometimes occur and they lead to admission of intensive care unit (ICU) and increased length of hospital stay. There have been previous studies discussing the effect of preoperative pulmonary rehabilitation in thoracic surgeries, and it is widely known that preoperative pulmonary rehabilitation could benefit the outcomes of thoracic surgery. However, there are only few studies discussing the parameters affecting surgical complications. The purpose of this study was to investigate factors associated with the complications after lung surgery in the patients with early stage lung cancer, to help decide the patients who need preoperative pulmonary rehabilitation. Medical record of patients with lung cancer of stage I who received operation in our hospital from March to June 2018 were reviewed, and the result of pulmonary function test ($B=-2.03$, $p=0.00$) and type of operation ($B=-2.50$, $p=0.02$) were shown to influence the length of hospital stay. According to the results, we conclude that these factors should be considered when deciding the need of preoperative pulmonary rehabilitation to reduce complications of the lung surgery.

Keywords: complication, early stage lung cancer

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Abbreviations: ICU, intensive care unit; COPD, chronic obstructive pulmonary disease; FEV₁, forced expiratory volume in 1 s; 6MWT, 6-minute walk test

Introduction

Patients with early stage lung cancer including stage I, II, and IIIA consider lung surgery as a treatment. Patients usually discharge after surgery without any complications, however, postoperative pulmonary complications, such as pneumonia, atelectasis, worsened gas exchange, bronchoconstriction, thromboembolic disease and respiratory failure, sometimes occur and they lead to admission of intensive care unit (ICU) and increased length of hospital stay.

There have been previous studies discussing the effect of preoperative pulmonary rehabilitation in thoracic surgeries. Attila Vagvolgyi et al.¹ showed that improvements in exercise capacity and quality of life were seen following perioperative pulmonary rehabilitation both before and after thoracic surgery. Natasa Mujovic et al.² showed that preoperative pulmonary rehabilitation significantly enhanced clinical status of the patients with chronic obstructive pulmonary disease (COPD) before lung cancer resection by increasing exercise tolerance. Therefore, it is widely known that preoperative pulmonary rehabilitation could benefit the outcomes of thoracic surgery.

However, there are only few studies discussing the parameters affecting surgical complications. Attila Vagvolgyi et al.³ discussed that kilometers travelled via cycle ergometer at the onset of the preoperative rehabilitation, gender, forced expiratory volume in 1 s (FEV₁) after preoperative rehabilitation, extent of the operation and 6-minute walk test (6MWT) before preoperative rehabilitation could predict

severe complications correctly in 72.5% of the patients with COPD who underwent thoracic surgery. Yutian LAI et al.⁴ demonstrated that preoperative COPD and WBC count were independent risk factors for postoperative cardio-pulmonary complications in the patients who underwent lobectomy for stage I non-small cell lung cancer. Masataka Irie et al.⁵ discussed risk factors for short-term outcomes after thoracoscopic lobectomy for lung cancer: the percent predicted diffusing capacity of the lung for carbon monoxide, quadriceps muscle strength, pathologic stage, COPD, 6MWT and pathologic stage. However, there are still lack of data and there is no clear criteria of patients for preoperative pulmonary rehabilitation so far. Identification of more predictive factors of complications can help making preoperative risk stratification more precisely. Therefore, the purpose of this study was to investigate factors associated with the complications after lung surgery in the patients with early stage lung cancer, to help decide the patients who need preoperative pulmonary rehabilitation.

Medical record of patients with lung cancer of stage I who received operation in our hospital from March to June 2018 was reviewed and results are listed below:

- i. Twenty eight patients with lung cancer of stage I were enrolled: the mean age was 64.4 ± 8.6 years; there were 11 (39%) males and 17 (61%) females; 15 (54%) and 4 (14%) patients had hypertension and diabetes mellitus respectively; 18 (64%) patients had normal pulmonary function test, 6 (22%) patients had obstructive lung disease, 2 (7%) patients had restrictive lung disease, and 2 (7%) patients had mixed type of lung disease; there were 5 (18%) current smokers, 9 (32%) ex-smokers, and 14 (50%) non-smokers; all of the cancer was primary lung cancer; 19 (68%) patients received lobectomy, 8 (28%) patients received

segmentectomy, and 1 (4%) patient received wedge resection.

- ii. After surgery, 20 (71%) patients were admitted to the ICU, however, there were no patients who needed mechanical ventilation or postoperative consult for increased secretion.
- iii. Mean length of hospital stay was 10.5 ± 6.4 days.
- iv. The result of pulmonary function test ($B = -2.03$, $p = 0.00$) and type of operation ($B = -2.50$, $p = 0.02$) were shown to influence the length of hospital stay when investigated by multivariate linear regression analysis, stepwise method.

Conclusion

In this sense, we conclude that the length of hospital stay was affected by the result of pulmonary function test and type of operation in the patients with early stage lung cancer. This study included only small number of patients, and further study is needed to generalize the result. However, it suggests that the result of pulmonary function test and type of operation should be considered when deciding the need of preoperative pulmonary rehabilitation to reduce complications of the lung surgery.

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Conflict of interest

Author declares that there is no conflict of interest.

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