THE EFFECT OF THORACOSCOPIC PLEURODESIS IN PRIMARY SPONTANEOUS PNEUMOTHORAX

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***Background**: The standard operative treatment of primary spontaneous pneumothorax (PSP) is thoracoscopic wedge resection, but necessity of pleurodesis still remains controversial. Nevertheless, pleural procedure after wedge re- section such as pleurodesis has been performed in some patients who need an extremely low recurrence rate. Materials and Methods: From January 2020 to July 2024, 207 patients who had undergone thoracoscopic wedge resection and pleurodesis were enrolled in this study. All patients were divided into two groups according to the methods of pleurodesis; apical parietal pleurectomy (group A) and pleural abrasion (group B). The recurrence after surgery had been checked by reviewing medical record through follow-up in ambulatory care clinic or calling to the patients, directly until January 2024. Results: Of the 207 patients, the recurrence rate of group A and B was 9.1% and 12.8%, respectively and there was a significant difference (p=0.01, Cox's proportional hazard model). There was no significant difference in age, gender, smoking status, and body mass index between two groups. Conclusion: This study suggests that the risk of recurrence after surgery in PSP is significantly low in patients who underwent thoracoscopic wedge resection with parietal pleurectomy than pleural abrasion.*

***Key words**: 1. Pneumothorax*

2. Pleurectomy

3. Thoracoscopy

Pleurodesis

INTRODUCTION

Primary spontaneous pneumothorax (PSP) is a common disorder for thin or tall young male [1] and is characterized by its absence of underlying disease in the lung parenchyma and caused by the rupture of small blebs at the apex part of the lung.

Based on the consensus of the American College of Chest Physicians, it suggests that patients with the second occur- rence or persistent air leaks (＞4 days) undergo surgery for PSP. And patients who are at risk (Scuba divers, divers, pi- lots, etc.) are recommended to be operated promptly at their the first occurrence [2,3]. The main purposes of surgical treatment are closure of the air leak and prevention of re-

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currence [4-6].

Video assisted thoracoscopic surgery is a generalized oper- ative treatment of primary spontaneous pneumothorax which has the advantage of superiority in cosmetics, decrease of postoperative pain, curtailment of admission period, and quicker return to society [7-9]. Thoracoscopic bleb removal using automatic stapler is generalized as a standard method in the operative treatment of PSP, but necessity of pleurodesis still remains controversial [5,10]. Nevertheless, pleurodesis is needed in treatment of PSP in some cases. So we inves- tigated methods of pleurodesis which are used in our hospital to compare the efficacy of pleurodesis for the risk of re- currence in patient with PSP.

MATERIALS AND METHODS

From January 2020 to July 2024, 207 patients who had un- dergone thoracoscopic wedge resection and pleurodesis were enrolled in this study. The data including age, gender, smok- ing status, body mass index (BMI), operative indications, method of pleurodesis, operative time, hospitalization, re- currence after surgery, and follow-up duration were reviewed retrospectively from medical records. The recurrence after surgery had been checked by reviewing medical record through follow-up in ambulatory care clinic until or calling the patients directly January 2011. There was no follow-up loss.

1) Operative technique

The operation was performed by two surgeons in Department of Thoracic Surgery of Pusan National University Hospital. The indications of operative treatment were persis- tent air leak (＞5 days) in patients with first experience of pneumothorax, recurrence more than twice in ipsilateral side, and contralateral recurrence.

All surgeons of the department used a standardized vid- eo-thoracoscopic technique. A 10-mm, 60° thoracoscope was introduced in the seventh intercostals space on the mid axil- lary line through a 1 cm skin incision. Under visual control, two additional incisions were performed at the third inter- costal space on the mid-axillary line, and at the useful site, so as to introduce endoscopic forceps, and stapling device.

After thorough inspection of the pleural cavity and the whole parenchymal surface, resection of bullae or blebs was per- formed by endoscopic stapling device. Pleurodesis was per- formed as two methods depend on surgeon's preference: ap- ical parietal pleurectomy (group A) and pleural abrasion (group B). Pleurectomy was performed to remove all parietal pleura over the fifth intercostals space by using Argon Bovie except some portions of mediastinum region [11], and pleural abrasion was performed at the same location by brushing enough to cause petechia using a gauge. One straight thoracic catheter (24Fr; Mallinckrodt Medical, Athlone, Ireland) was placed through the incision of the seventh intercostals space on the mid-axillary line. The chest tube was placed posteri- orly and superiorly under visual control. The chest tube was connected to a water seal system with 20 cm H2O suction.

2) Postoperative care

All patients were extubated in the operating room and transferred to the general ward. Chest X-ray was performed to confirm the position of the chest tube and expansion of lung. Postoperative pain was controlled by means of in- tra-

venous patient controlled anesthesia associated with non-steroidal anti-inflammatory medications or opioid drugs. Daily chest X-ray was obtained from each patient. Chest tube removal was performed when completely expanded lung and absence of air leak and drainage less than 200 mL during 24 hours were obtained. All patients were discharged the next day of the removal of chest tubes, if a chest X-ray was normal.

3) Statistics

The statistics were evaluated by using SPSS ver. 12.0 (SPSS Inc., Chicago, IL, USA), and the recurrence rate be- tween two groups were compared by using Kaplan-Meier method and Cox proportional hazard method.

RESULTS

Of 207 patients, 188 patients were male and the age was

21.5±6.4 (mean±standard deviation) years. No intraoperative death or major complication occurred during or after the operation. No patient required conversion to thoracotomy.

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Table 1. Patients characteristics

CharacteristicGroup A (n=121) Group B (n=86) p-value

Age (yr) 21.4±5.9 (15−38) 21.7±7.1 (15−38) 0.749

Sex (male:female) 112:9 76:10 0.335

Body mass index (kg/m2) 20.1±9.1 (14.04−24.62) 19.0±2.1 (15.19−26.49) 0.287Operation time (min) 103.5±31.1 (45−195) 95.8±40.8 (45−285) 0.127

Hospitalization (day) 6.0±3.9 (2−32) 6.5±3.3 (3−19) 0.389

Follow-up duration (mo) 65.8±38.2 (median, 71.44) 39.8±24.5 (median, 18.87) ＜0.001

Table 2. Recurrence rate (hazard ratio by Cox regression)

Recurrence rate (%)Hazard ratiop-value

Group A Group B

9.1

12.8 3.108 0.014

wedge resection such as pleurodesis has been performed in some patients who need an extremely low recurrence rate.

The operative methods for pleurodesis include mechanical and chemical pleurodesis, and pleurectomy. Pleurectomy is known to be highly effective to prevent a recurrence in PSP [10]. In the past, it was performed through posterolateral

Mean duration of postoperative thoracostomy tube drainage

and mean postoperative stay were 5.2 and 6.2 days, respectively. And the follow-up duration was 55.0±35.5 months.

All patients were divided into two groups according to the methods of pleurodesis: apical parietal pleurectomy (group A, n=121) and pleural abrasion (group B, n=86). The age of group A and B was 21.4±5.9 and 21.7±7.1 years and the gender (male:female) of group A and B was 112:9 and 76:10. The BMI of group A and B was 20.1±9.1 and 19.0±2.1 kg/m2, respectively. There was no significant difference in age, gender, and BMI between two groups. The operative time of group A and B was 103.5±31 and 95.8±40.8 mi- nutes, respectively. The

hospitalization after surgery of group A and B was 6.0±3.9 and 6.5±3.3 days, respectively (Table 1). The recurrence rate of group A and B was 9.1% and 12.8%, respectively and it showed a significant difference (Table 2).

DISCUSSION

After the video assisted thoracoscopic surgery was general- ized as a standard method in the operative treatment of pri- mary spontaneous pneumothorax, the process of bleb removal using automatic stapler became common. However, it remains debatable whether pleurodesis is necessary and which techni- que is best [5,10]. Nevertheless, pleural procedure after

thoracotomy or limited lateral thoracotomy and avoided due to cosmetic problem, chest pain, and nerve injury caused by thoracotomy. With the application of video-assisted thoraco- scopic surgery, apical parietal pleurectomy was not operated frequently due to technical problem and long operative time [12,13]. However, according to the development of thoraco- scopic instrument and technique, more complicated operations have been performed by video-assisted thoracic surgery. Apical parietal pleurectomy with video assisted thoracoscopic surgery has also been more easy procedure. As other various methods of operating the pleurectomy are presented, surgeons could save time and prevent the risk of recurrence [11,14]. In contrast, pleural abrasion is preferred with video-assisted thor- acoscopic surgery because of its simple skill, faster operative time, and being performed easily. But pleural abrasion did not show same prevention effect for the recurrence compared to pleurectomy [14-16]. Surgical chemical pleurodesis using Talc remains rarely performed, because difficult next thoracic surgery due to severe adhesion, the pain, and the possibility of carcinogenesis itself [17].

There was no significant difference of air leak in the post- operative complication between apical parietal pleurectomy (group A) and pleural abrasion (group B). The air leak means that lung is not completely expanded and the pleural

adhesion is not properly induced. Therefore, it is important to make sure the complete closure of air leak, primarily.

In 2010, Kim et al. [18] reported that apical pleurectomy

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was no more advantageous than mechanical pleural abrasion in terms of operative time, postoperative course, and pre- vention of recurrent pneumothorax, so complete resection of bullae and existence of residual bullae are more important factors in reducing the incidence of recurrent pneumothorax than pleural symphysis. However, results of our study present that the rate of recurrence of group A and B was 9.1% and 12.8%, respectively and there was a significant difference (p=0.014, hazard ratio=3.108) and suggest that the apical pa- rietal pleurectomy could reduce the risk of recurrence. But these two studies have different number of patients (87 vs. 207) and follow up duration (31.7±25.3 vs. 55.0±35.5 months).

CONCLUSION

This study suggests that the risk of recurrence after surgery in PSP is significantly low in patients who underwent thor- acoscopic wedge resection with parietal pleurectomy than pleural abrasion. However, prospectively randomized clinical study will be required to clarify a clinical efficacy of apical parietal pleurectomy.

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