Videothoracoscopic approach to recurrence primary spontaneous pneumothorax: using of electrocoagulation in small bulla/blebs

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Abstract

Objective To evaluate the effectiveness of electrocoagulation of bullae/blebs and apical pleurectomy via videothoracoscopic approach.

Methods We reviewed 42 patients who underwent Video-assisted thoracoscopy (VATS) procedure for recurrence primary spontaneous pneumothorax (PSP) from 2000–2006. There were 30 male and 12 female patients with a median age of 30 years. The percentage of pneumothorax was calculated median of 60% (British Thoracic Society Guideline - 2003). Thirty-two (76.2%) bullae/blebs were observed with the median diameter of 15 mm (5–30).

Results Bulla ablation via cauterisation and apical pleurectomy was performed in 32 patients. Ten patients underwent only apical pleurectomy/abrasion because in this group there was not any either bulla or bleb could be found. The median duration of drainage time was 3 days. There was no mortality and complications occurred in five

(11.9%) patients. Only two (4.76%) recurrence occurred during the 52 months (5 to 76) median follow-up period.

Conclusion Videothoracoscopic bulla ablation with apical pleurectomy is a safe method for recurrence PSP. Especially, if the bulla or bleb is smaller than 20 mm the ablation via cauterisation reduces the expenses of VATS procedure by avoiding the use of stapler devices.

Keywords Recurrent pneumothorax · VATS · Electrocoagulation · Prevent

Introduction

Primary spontaneous pneumothorax (PSP) usually occurs at young, healthy adults with the rupture of bullae or blebs in the apical region of lungs, without any underlying lung disease. At the first episode of PSP; clinical observation according to patient's clinical status, simple aspiration, or tube thoracostomy are the frequently used methods. At the first PSP attack, recurrences occur at about 20% of the treated patients and surgical intervention is recommended for the treatment of those patients [1]. The aims of the surgical treatment are to close the site of the air leak, to assure the complete expansion of the lung, and to prevent the possibility of future recurrences [2]. Video-assisted thoracoscopy (VATS) provides excellently exposure of thoracic cavity, has found a widespread utilisation range as an alternative to thoracotomy at the treatment of recurrent PSP [3]. Recommended method of recurrent PSP treatment in patients with bullae/blebs is bulla resection with apical pleurectomy or pleural abrasion. When bullae/bleb is not determined, wedge resection

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with apical pleurectomy or pleural abrasion is the procedure of choice [4]. Endostapler, endoscopic loop technique, laser coagulation, electrocoagulation or a combination of these, are the methods applied in bullae ablation [1].

The aim of our study is, to discuss results of bulla/blebs ablation via electrocoagulation in patients with recurrent PSP with smaller than 20 mm bulla/blebs.

Material and methods

Patient characteristics

Between January 2000 and December 2006, 362 consecutive patients were treated for spontaneous pneumothorax in our clinic. Recurrence was observed in 64 (17.67%) patients. In cases of: (1) There was no high-resolution computerised tomography (HRCT) after treatment for first episode, (2) diameter of bullae was larger than 30 mm, (3) surgical treatment (VATS or thoracotomy) was performed for first episode and (4) general conditions not suitable for VATS, patients were excluded from the study. Forty-two patients were performed VATS. There were 12 females and 30 males, and the median age was 30 (15–57). Complete blood count, blood and urine biochemistry, sputum analysis, chest X-ray, HRCT were routinely performed. Pneumothorax was seen at right side in 26, left side in 16. Pneumothorax percentages were calculated as 60% according to the *British Thoracic Society 2003* guideline criteria. Prior to VATS, tube thoracoscopy were performed in 12 patients because of their clinical condition (several dyspnoea and chest pain).

Operative technique

VATS was performed under general anaesthesia using a double-lumen endotracheal tube in the lateral decubitus position. First port was opened in the fifth intercostal space in the mid-axillary line. Other ports were opened with optical observation. Ten mm incision was used for camera while 20 mm incisions were used for instruments. During VATS, saline solution was used to determine the air leakage with gentle ventilation. Lung was manipulated using endoelevator for examine the apex, hilum and diaphragmatic faces. Using electrocoagulation, bullae/bleb resection and apical pleurectomy was made to who was determined bullae/bleb by optical observation. By the usage of endograsper, bullae was grasped where it emerges from parenchyma; and it was cauterised until completely burns and vanishes. Apical pleurectomy was achieved by removal of pleural tissue down to the 3th rib. Apical pleurectomy and pleural abrasion was made electrocoagulation in cases of no bullae/bleb was determined. Following a careful bleeding and leakage control, 32F chest tube was placed through the lowest trocar port. Negative aspiration was applied with 20 cm H₂O.

Fig. 1 Thorax HRCT shows apical bulla and blebs

Fig. 2 Thoracoscopic view of blebs

Early postoperative care

Patients were observed in the recovery room for first postoperative day and after that they were transferred to clinic. Chest X-ray's were taken daily from the first postoperative day until their chest tubes were removed. Chest tubes of patients with no air leakage and expansion failure were removed. Patients were discharged from hospital that their chest tubes were removed within first day. They were followed up 15 days, 1 month, 3 months, 6 months and 1 year periods; later they were called for check yearly. Chest X-ray's was used as a follow-up tool.

Results

VATS was performed in 42 patients successfully. Conversion to thoracotomy was not need in any of those patients.

During the early years of our practice, we used to use 3 ports for VATS procedure, but after 2002 we used 2 ports for this procedure.

Bullae/bleb was determined at 32 (76.2%) of the patients during VATS. The median bullae diameter was 15 mm (5–30). Bullae diameter was smaller than 20 mm at 29 patients, and it was larger than 20 mm in three patients. Median drainage time was calculated as 3 (2–10) days. Patients, whose chest were removed, were discharged within first days.

In our study, there was no mortality, but some complications occurred in five (11.9%) patients. Expansion failure was observed in three patients and prolonged air leakage (longer than 5 days) in two patients. Those patients, were discharged from hospital without any surgical operation. One patient who has expansion failure at apex was discharged with aseptic space. The space was observed to be completely resorbed within the 7th month.

In postoperative follow-up, patients were called for 15th day, 1 month, 3 months, 6 months, 1 year and then yearly checks. Chest X-ray's were taken at checks. In the follow-up period of median 52 (5–76) months, only 2 (4.76%) recurrences were observed. Recurrences occurred 7 and 23 months after the operation in patients with bullae diameter bigger than 20 mm.

Discussion

Treatment methods for PSP, which is usually found at young, healthy adults are still being discussed. The treatment methods, which are preferred at the first attack of PSP are observation, basic aspiration and tube thoracostomy. However, prolonged air leakage, expansion failure and high-risk jobs such as pilot, diver are the surgical indications at the first PSP attack [4]. PSP recurs at about 20% of the patients in spite of treatment [5, 6]. Common idea for treatment of recurrent PSP is surgical intervention. The aim of surgery is to close the site of the air leak, ensure the complete expansion of lungs and thereby to prevent possible recurrences [5–8]. The common method in the literature is bullae resection with apical pleurectomy or pleural abrasion. Bullae resection is practiced with linear stapler, endoscopic loop technique, laser coagulation, electrocoagulation or a combination of these [2]. In the past, these operations were made by thoracotomy and successful results were attained. However VATS, which has been used in every field of thoracic surgery from the early 1990s, began to be used in recurrent PSP treatment commonly owing to its success results close to thoracotomy [9, 10]. Shortened drainage and hospitalisation period, decreased morbidity, high patient compliance, less postoperative pain, less abnormality at shoulder movement and cosmetic advantages are the superiorities of VATS over thoracotomy [11–13].

In the cases, which were determined to have bullae/bleb during VATS, it became a standard procedure to resect with endostapler. However, it is a dispute whether to make pleurodesis by pleurectomy or pleural abrasion. Ayed and his colleagues practiced bullae resection with apical pleurectomy on 72 PSP patients, who were determined to have bullae/bleb; and after 42 months follow-up period they reported the recurrence rate to be 5.5%. In this study, they reported that bullae resection with apical pleurectomy to be more effective than pleural abrasion at preventing recurrences [1]. Torresini and his colleagues practiced wedge resection with apical pleurectomy using endostapler on 35 patients with PSP among their 70 patients' series; and they reported that recurrence in only one (2.8%) patient within a short-term follow-up, and indicated that pleurectomy was an effective way of preventing recurrences [11]. Conversely, Lang-Landunski and his colleagues reported that wedge resection and abrasion on 182 PSP patients using polyglycolic mesh until they attain a bloody surface all over the pleura; and they reported recurrence at only three (1.6%) patients within long-term follow-up and thereby indicated pleural abrasion is to be an effective way of preventing recurrences [14].

Another method used in bullae resection is bullae abrasion by laser. This method is recommended especially for bullae with diameter smaller than 20 mm. Hazama and his colleagues experienced laser coagulation with bullae abrasion who has smaller than 20 mm bullae on HRCT and during VATS; and they practiced bullae resection using linear endostapler, and laser ablation on bulleous areas near visceral pleura on the patients whose bullae diameters are larger than 20 mm. They reported that laser group is superior in respect of operation time, postoperative pain and complications; additionally, recurrence rates were similar, 3.7% and 3.3%, respectively [15].

Our clinical approach with recurrent PSP is to perform bullae resection with apical pleurectomy using linear endostapler at the cases, which were found to have bullae during VATS or axillary thoracotomy. However, when we find bullae smaller than 20 mm on HRCT or during VATS, we perform bullae ablation using electrocoagulation, without endostapler in order to decrease the cost. We cauterise small bullae until they completely vanish by grasping them with an endograsper from the point they emerge from parenchyma. We cauterise blebs using a 5 mm diameter, ball-shaped cauter. Moreover, in order to prevent recurrences, we add apical pleurectomy.

Sawabata and his colleagues [16] used stapler for bullae resection at their 99 PSP patient series. However, they used cauter at the places where stapler was anatomically unable to reach and the places, which could be dangerous because of their neighbourhood to vascular structures. As a result of this study the ablation of bullae with diameter smaller than 20 mm which stapler is unable to reach or which the neighbour large veins could be done safely using by cauter.

Wakabayashi and his colleagues reported that electrocoagulation is safe and 90% effective at PSP treatment [17].

In our studies, within 53 months of median follow-up period, only two patient (4.76%) showed recurrence after 7 and 23 months until the operation. During VATS, 29 patients' bullae diameter was 20 mm and smaller; only three had bullae diameter larger than of 20 mm. Recurrences occurred in patients with larger than 20 mm bullae diameter.

In conclusion, videothoroscopic surgery is the most suitable method for treatment of recurrent spontaneous pneumothorax, because of less postoperative pain, less analgesic usage, shortened drainage and hospitalisation period, excellent cosmetic advantages and high success rate. Preferring cautery to endostapler in order to decrease operation expense, we performed electrocoagulation bullae ablation and apical pleurectomy on a carefully selected patient group (small bullae and blebs). In our opinion, this method can be performed on selective patient groups, which are determined to have bullae smaller than 20 mm in CT, HRCT or during VATS. Regarding the technique because of the small number of patients, a randomised trial would be appropriate in pneumothorax with small bullae found at VATS.

Conflict of interest The authors do not have any disclosable interest

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