Justifying Video-Assisted Thoracic Surgery for Spontaneous Hemopneumothorax*

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Study objectives: Video-assisted thoracic surgery (VATS) has gained a prominent role in routine thoracic surgery practice. This study discusses the clinical aspects and utility of VATS in spontaneous hemopneumothorax (SHP).

Patients: Of 363 spontaneous pneumothorax (SP) cases, 24 patients presented with SHP (6.6%). The clinical features, surgical indications, emergency VATS technique, and patient outcomes are discussed.

Results: All 24 patients were male (mean age, 25.3 years). Eleven patients were in hypovolemic shock, and their hemoglobin levels ranged from 6.7 to 12.7 g/dL; therefore, they received fluid resuscitation and blood transfusion. The amount of blood drained through the chest tube varied from 200 to 3,500 mL. Emergency VATS revealed that 5 cases were simple hemothoraces and 19 cases were associated with pneumothorax. The cause of bleeding was identified by thoracoscopy, as from an aberrant vessel (n = 11), torn parietal pleura (n = 4), ruptured vascularized bullae (n = 2), and lung parenchyma (n = 1). Six patients had no evidence of an obvious bleeding site. Bullous lesions were at the apex of the upper lobe in 14 patients, and multiple lobar involvement was seen in 2 patients. All the bullae were resected with endoscopic stapler in eight patients and ligated with a homemade endoloop in eight patients. The mean operation time was 42 min. The mean chest tube removal time was 3.5 days after insertion, and mean postoperative stay was 4.5 days. There is no recurrence of SHP or SP during the follow-up period.

Conclusion: SHP complicated by severe bleeding presents a potentially grave emergency. VATS may be considered as feasible treatment for patients with SHP.

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Key words: endoloop; spontaneous hemopneumothorax; video-assisted thoracic surgery

Abbreviations: SHP = spontaneous hemopneumothorax; SP = spontaneous pneumothorax; VATS = video-assisted thoracic surgery

Spontaneous hemopneumothorax (SHP) is a rare disorder that complicates spontaneous pneumothorax (SP),1–3 and is occasionally considered a surgical emergency. This disease was first recognized in 1928 by Laennec during an autopsy, and was first managed successfully by Whitaker in 1876 with repeated pleural aspirations.4 Elrod and Murphy5 performed the first operative treatment in 1948 with open thoracotomy. The treatment has progressed over the last 5 decades and has reduced the mortality of 33% cited in the earlier report.6

Standard surgery has been managed by axillary or lateral thoracotomy, and control of the bleeder, bullae excision, or pleurodesis is performed. With the advances in endoscopic surgery, the indications for video-assisted thoracic surgery (VATS) have expanded to many kinds of thoracic disorders. We
describe our experience with this thoracoscopic approach in 24 patients to justify the contribution of VATS in SHP.

**Materials and Methods**

**Patient Population**

From 1997 to 2000, 363 patients underwent VATS for SP in Chang Gung Memorial Hospital, Linkou Medical Center, Taiwan. Twenty-four of these patients presented with SHP and were subsequently treated by VATS. All the patients were male and were between 16 years and 42 years old (mean, 25.3 years). Inclusion criteria of our patients with SHP were as follows: (1) an otherwise healthy individual without any history or any underlying disease, (2) chest radiograph (Fig 1, top left, A) showing an SP associated with air-fluid level, and (3) the absence of natural or iatrogenic trauma to the lung or pleural space within 48 h of the tube thoracostomy. The surgical indications were as follows: (1) hemodynamic instability after disease onset, (2) persistent chest tube blood drainage > 100 mL/h, and (3) persistent air leakage beyond 7 days or failure of the lung reexpansion despite the proper functioning chest tube with suction drainage. All 24 patients underwent VATS on an emergency basis with corrected hemodynamic condition.

**Surgical Technique**

All the patients were anesthetized by using single-lung ventilation technique with double-lumen endotracheal tube. The patient was positioned as for the conventional thoracotomy. The initial trocar (11 mm) was introduced into the pleural cavity through the previously created chest tube hole. The thoracoscope was introduced through the trocar, and the entire thoracic cavity was carefully examined with meticulous attention. Another two ports were created at the sites where the topographic location of the lesion was accessible. Blood clots were evacuated by using the conventional wall sucker and ring forceps. Bleeding sites were cauterized or controlled directly with the application of a hemoclip. (Fig 1, top right, B). Bleeding sources such as torn vascularized adhesive visceral pleura or bullae (Fig 1, bottom left, C) were excised with endoscopic stapler (Endo-GIA; United States Surgical Corporation, Norwalk, CT) or ligated at their base (Fig 1, bottom right, D) with a homemade endoloop. Careful hemostasis was secured. The pleura was abraded with a sterile mesh over the entire apical surface of parietal pleura. Then, lung was allowed to inflate and carefully tested for air leaks under water. At the end of the procedure, a chest tube was inserted under direct vision of the thoracoscope and properly placed. Prophylactic antibiotics were administered for 3 days.

**Results**

All the patients were male and were between 16 years and 42 years of age (mean, 25.3 years). All the patients had the initial symptoms of sudden onset of severe chest pain or dyspnea. Chest radiography showed an air-fluid level. After chest tube insertion, the gush of air and/or blood could confirm the clinical symptoms of SHP. Eleven of these patients
presented with hypovolemic shock (systolic BP < 90 mm Hg) and were stabilized with fluid resuscitation or blood transfusion. Seven of 11 patients received a 500- to 1,000-mL blood transfusion (mean, 857 mL), and hemoglobin ranged from 6.7 to 12.7g/dL (mean, 9.3 g/dL) before surgical intervention. The amount of blood in the pleural cavity varied from 200 to 3,500 mL (mean, 1,126.5 mL). Emergency VATS without open thoracotomy was performed in all the patients. Two patients had left-sided simple hemothorax, and nine patients had left hemopneumothorax. Three patients had right-sided simple hemothorax, and 10 patients had right hemopneumothorax. Blood clots were evacuated from the pleural cavity. The cause of bleeding was identified as from an aberrant vessel (n = 11), torn parietal pleura (n = 4), ruptured vascularized bullae (n = 2), or lung parenchyma (n = 1). However, no obvious bleeder was found in six patients. None of the 24 patients displayed prior pneumothorax history. Blebs or bullae were positively identified in 16 patients (66.7%). The bullae were resected with an endoscopic stapler (n = 8) or ligated with homemade endoloop (n = 8). The bullous lesions were at the apex or confined to the upper lobe in 14 patients, and multiple lobes were involved in 2 patients. The mean operation time was 42 min (range, 26 to 72 min).

The postoperative course for these patients was uneventful. The mean time for chest tube removal was 3.5 days (range, 1 to 7 days), and the mean postoperative stay was 4.5 days (range, 2 to 14 days). No patient had recurrence of SHP or SP during the follow-up.

**Discussion**

SHP is sometimes considered a surgical emergency. Aggressive fluid resuscitation or blood transfusion followed by surgical intervention may be indicated in addition to chest tube insertion. The cardinal symptoms are chest pain, dyspnea, anemia, and occasionally shock due to massive intrapleural tension generally followed by the chest pain. Sporadic literature has suggested that conservative treatment with chest tube insertion is sufficient if bleeding persists for < 24 h. However, if the lung cannot be reexpanded well after tube thoracostomy procedure, the collapsed lung might lose its local tamponade ability. This condition could lead to substantial blood loss and more complications.

We believed that with the help of VATS, an effective and earlier hemostasis could be secured, air leak could be corrected, and finally an appropriate drainage system could be established. Hence, the aggressive surgical treatment may be necessary in patients with SHP, especially for definitive diagnosis and appropriate treatment for patients with an unstable hemodynamic condition, and furthermore to prevent complications such as empyema and fibrothorax.

A long and painful surgical incision is the classic standard approach for the intrathoracic lesion. However, the incision pain, poor cosmetic outcome, and possible respiratory impairment are occasionally troublesome. With the rapidly expanding and improving of thoracoscopy, VATS was employed not only to diagnose the chest lesions but was also used in the treatment of various thoracic diseases. Our experience led us to believe that the minimal-access approach to treat SHP is a good alternative. The benefits of VATS have encouraged us to employ for this potentially life-threatening disease.

From the accumulating literature and our data, it is suggested that SP is the most ubiquitous mechanism of SHP. It is also explained why this kind of disease predominates in male patients. Following pneumothorax with collapsed lung, pleural adhesions may tear vascularized bulla or congenital aberrant vessels between the lung surface and the parietal pleura. It was demonstrated that the aberrant vessel has little investing musculature for adequate constriction, and bleeding is not proportional to the actual vessel size. Furthermore, the vascularization originating from pleural adhesion has fewer muscle fiber than normal, thus tend not to retract adequately. Pathophysiologically, it can lead to bleeding from the parietal pleura if the adhesions are torn from the lung surface. Systemic BP in the vessels combined with the negative intrapleural pressure might also aggravate and prolong the bleeding, resulting in massive blood loss into the pleural space.

Thoracoscopic exploration revealed no bullae in eight patients (33.3%). However, we could visualize the abnormal parenchymal changes with aberrant vascularization as well as fibrotic scarring of the apex, which may contain imperceptible underlying subpleural vesicles. A bulla may also have ruptured before in this area, and it may thus be a likely region for the bulla to recur. Loop ligation was also applied in this situation to prevent such a recurrence.

Our results suggest that SHP complicated by bleeding presents as a potentially grave condition. If bleeding persists, surgical intervention is necessary to control the hemorrhage, to evacuate residual blood and clots, and to resect the bleeding lung parenchymal lesion. VATS may thus be considered as an initial and feasible treatment procedure for patients with SHP.
REFERENCES
5 Elrod PD, Murphy JD. Spontaneous hemopneumothorax treated by decortication [abstract]. J Thorac Surg 1948; 17:401
16 Muraguchi T, Tsukioka K, Hirata S, et al. Spontaneous hemopneumothorax with aberrant vessels found to be the cause of bleeding report of two cases. Surg Today 1993; 23:1119–1123