Acute Management of Massive Spontaneous Hemopneumothorax: Beyond Thoracotomy with Thoracoscopy

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Spontaneous hemopneumothorax is commonly seen clinically, but in concomitant with massive hemothorax causing hemorrhagic shock which is not often seen. A 42 year-old man, without traumatic or lung disease history, presented to emergency department with sudden onset of chest pain and dyspnea. Chest radiographs supported the diagnosis of left spontaneous hydropneumothorax, and hemothorax was confirmed after tube thoracostomy was performed immediately. However, sustained bleeding and hypovolemic shock developed 3 hours later in spite of aggressive fluid and blood resuscitation. Emergent surgical exploration with video-assisted minithoracotomy was performed. Which treated the patient successfully without complications or recurrence during ten months follow-up. We report this case with literature review to emphasize the importance of treatment of spontaneous hemopneumothorax.

Key words: spontaneous hemopneumothorax, minithoracotomy, video-assisted thoracoscopic surgery

Introduction

Spontaneous pneumothorax is a familiar clinical situation. Most patients behave stable and tube thoracostomy is sufficient and effective treatment without further or emergent operation. Unusual, the patient with spontaneous hemopneumothorax (SHP), is a rare disorder, which associated with 1-12% of all spontaneous pneumothorax (1). The patient can deteriorate quickly due to hemodynamic instability as a result of continuous blood loss and hypovolemic shock. Surgical intervention is often required in the management of SHP for survival. Video-assisted thoracic surgery (VATS) has been used successfully in the management of spontaneous pneumothorax with advantage of less tissue trauma and less postoperative pain when compared to the traditional thoracotomy approach (2). More recently, VATS had been increasingly used for the management of SHP with favorable results as well. We report our experience on successful hemostasis of a massive SHP by minithoracotomy with simultaneous video-assisted thoracoscopic surgery.

Case Report

A 42 year-old man was sent to our emergency department due to sudden onset of left chest pain and dyspnea. There was no history of recent trauma or previous lung disease. On examination, he was found to be tachycardia and pale, reduced breath-
Dr. could make sure of that the patient didn’t have active bleeding at that moment. The thoracostomy tube was connected to an underwater sealed system with low pressure suction (-15 cm of water). Repeated chest radiographs (Fig. 2) showed the lung to be expanded well and the fluid to be drained. However, during the following 3 hours, after chest intubation, about 1500 mL of fresh blood were drained and the patient developed hypotension at ward. After aggressive fluid resuscitation and blood transfusion, the patient was found to be unstable in hemodynamically.

Video-assisted thoracoscopic surgery was performed under aggressive resuscitation to keep the patient in normotensive status. After removal of 600 mL of blood clot from the left pleural cavity, a pulsatile point with active bleeding was found just on the surface of the left subclavian artery. The bleeding came from a tiny aberrant branch of left subclavian artery. (Fig. 3). The bleeder was traced to be a torn vascular adhesion at the apex of the lung, which was the component of the apical bleb. Minithoracotomy was performed for better access of checking bleeding point. The bleeding point was controlled by delicate suture ligation without injury to left subclavian artery, and the apical bleb was wedge resected. The post-operative recovery was uneventful, no further bleeding, and the lung expanded well. The final histopathological analysis confirmed the presence of the bleb with emphysematous change. No recurrence of spontaneous hemothorax or pneumothorax was found after a ten-month follow-up.

Discussion

Although spontaneous pneumothorax (SP) is frequently associated with a limited amount of blood in the pleural cavity, most of their clinical course is simple and smooth. In contrast, small part of them with hemopneumothorax is potentially life-threatening. Ohmori et al. defined spontaneous hemopneumothorax (SHP) as a condition in which more than 400 mL of blood had accumulated in the pleural cavity in association with spontaneous pneumothorax. There are three possible mechanisms of bleeding in SHP described in the previous literature. First, the source of bleeding can be from a small non-contractile vessel in an area of torn apical vascular adhesion band between parietal and visceral pleura. Second, hemorrhage can result from a ruptured of well-vascularized bulla and underlying lung parenchyma. Third, bleeding can result from torn congenital aberrant vessels between the parietal pleura and the bulla. The aberrant vessels are usually thin-wall and do not contract adequately due to the lack of muscular fibers as the lung collapses. Once the lung collapses after rupture of the bulla or bleb and there is no adequate pressure to tamponade the source of bleeding, even a small caliber vessel can massively bleed into the pleural cavity and lead to profound blood loss and hypovolemic shock. In the series of Hwong et al., the source of bleeding can be identified in 53% of SHP, with the most common cause from a torn vascular adhesion band at the apical parietal pleura accounting for three-quarters of SHP. In another series, Wu et al. could identify the source of bleeding in 75% of SHP, and 50% were from an aberrant vessel. In our case, the bleeding point was traced to be a torn vascular adhesion between the parietal pleura and the apical bleb. The pleural adhesion might be the result of previous episode of pneumothorax after rupture of apical bleb or inflammatory reaction of the pleura.

The clinical presentation of SHP is similar to that of SP. Because SP is more common in clinical setting, there is a potential for overlooking SHP. Hsu et al. found that dyspnea occurred more frequently in the patients group with SHP and this symptom may alert the physician to the possible diagnosis of SHP. Chest radiographs remain
Fig. 1 Plain chest radiograph on arrival showing left hemopneumothorax

Fig. 2 Chest radiograph after tube thoracostomy showing well expansion of the lung and drainage of the fluid

Fig. 3 Thoracoscope showing one pusatile bleeder (arrow) just located on the left subclavian artery (A) and was controlled by prolene suture ligature
the most useful investigation in the diagnosis of SHP. The radiological finding of pneumothorax associated with ipsilateral air-fluid level in the chest radiographs is the most important indicator of SHP\(^{(1)}\). However, Hwong et al. found that chest radiographs on arrival to emergency department, in 10% of SHP showed only pneumothorax, with radiological evidence of hemothorax after tube thoracostomy and bleeding from the vascular adhesions was later confirmed intraoperatively\(^{(4)}\). The possible reason of failure detection of SHP by initial chest radiographs can be due to the film being taken too early, supine rather than erect position film, or possible of delayed hemorrhage from vascular adhesion band.

The therapeutic policy depends primarily on the patient’s condition, the amount of blood loss and air leak\(^{(9)}\). The goals of initial treatment include adequate fluid or blood resuscitation, hemostasis and reexpansion of the lung. De Perrot et al. have reported a conservative approach with tube thoracostomy alone in the selected group of SHP patients while bleeding subsided in 24 hours\(^{(10)}\). Kakaris et al. have reported that 16 of 71 patients with SHP underwent conservative treatment with tube thoracostomy alone\(^{(9)}\). Besides, in the series of Haciibrahimoglu et al., conservative treatment is adequate in 7 of 9 patients with SHP if bleeding persists for less than 24 hours after tube thoracostomy\(^{(11)}\). Chest tube drainage alone is accepted as initial and possible successful treatment for SHP from the previous literature\(^{(9,11)}\), however, the conservative treatment may lead to the formation of a pleural thickening with restrictive lung function and possible require further delayed decortications\(^{(7)}\). It should be kept in mind that SHP may be dramatic and life threatening, which may require emergent surgical management sometimes.

The surgical indications for SHP included emergent operations for continuous blood loss (>100 mL/hour), hypovolemic shock and elective operations for persistent air leak, impaired lung expansion, clot empyema or recurrent pneumothorax\(^{(8)}\). Surgical management of SHP has two major advantages includes (1) the establishment of hemostasis and the removal of coagulated blood clot from the pleural cavity to prevent fibrothorax or trapped lung, and (2) the sealing of air leaks from the lung surface by resection of areas with emphysematous bulla or blebs\(^{(11)}\).

Traditional standard thoracotomy usually results in the wound pain, poor cosmetic outcome and possible postoperative respiratory impairment\(^{(8)}\). With the rapid development and improvement of thoracoscopy, VATS has been used successfully in the management of SHP with favorable results and lead to less tissue trauma, less postoperative pain, and faster recovery with shorter postoperative hospital stay when compared with traditional thoracotomy approach\(^{(4,5,8)}\). However, in the management of massive SHP by emergent VATS, it may be difficult to remove the massive blood clot effectively through the trocar wound with the suction apparatus or the ring forceps\(^{(12)}\). Removal of the copious blood and clot in the pleural cavity piece-by-piece is a time-consuming procedure and may be contraindicated in patients with hemodynamic instability\(^{(4)}\). Minithoracotomy with simultaneous video-assisted thoracic surgery (MT + VATS) may be an alternative to remove the blood clot effectively and quickly provide the adequate operative field under the guide of the thoracoscope well operated\(^{(12)}\). Besides, surgical instruments can easily enter the thoracic cavity via minithoracotomy wound to check bleeding accurately by the help of thoracoscopic technique as well. Hsiao et al. reported the successful use of minithoracotomy with simultaneous video-assisted thoracic surgery (MT + VATS) in 8 of 12 patients with SHP\(^{(12)}\). MT + VATS significantly shortened the surgical duration to remove the coagulated blood and led to no significant difference in postoperative wound
pain, hospital stay or chest drainage days when comparing with the VATS\(^{12}\). Hsiao et al. suggested that MT + VATS could be the initial choice for the management of SHP, especially for the patients with massive blood clot in the pleural cavity, because of clot removal was easier and bleeding control is more rapid\(^{12}\).

In summary, spontaneous hemopneumothorax may result in profuse bleeding and hypovolemic shock and is potentially life-threatening. Emergent surgical intervention is necessary rather than tube thoracostomy only. Minithoracotomy with simultaneous video-assisted thoracic surgery can effectively identify the bleeding source and provide rapid hemostasis. Surgical timing, patient’s hemodynamics, and the endoscopic experiences of the surgeon can help the operation be done successfully.

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**References**

緊急處置大量自發性血氣胸：
超越傳統開胸法的胸腔鏡手術

史兆明

自發性血氣胸有時會造成大量失血甚至休克，因此有潛在致命的危險性。我們報告一位42歲的男性
病患因為胸痛和呼吸困難被送到急診室，胸部X光片疑似出現左側自發性氣胸併血胸，經緊急置入胸管
引流證實。住院後三個小時內胸管持續引流出大量鮮血，即使接受積極的輸液及輸血治療，病患仍然出
現低血容量休克，因此我們緊急安排手術探查出血位置。術中我們在胸腔鏡輔助下以迷你開胸手術有效
地移出胸腔內大量血塊，迅速地找到出血位置並進行止血以穩定病患的生命徵象，同時也將破裂的肺泡
切除以封住漏氣的肺部。病患術後的恢復相當順利，在十個月的門診追蹤內未發現氣胸復發。同時回顧
目前文獻上對於自發性血氣胸的治療方式加以討論。

關鍵詞：自發性血氣胸，迷你開胸手術，胸腔鏡輔助開胸手術