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Case Report

Idiopathic tension mediastinal emphysema cured by video-assisted thoracic surgery: a case report

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Abstract: Mediastinal emphysema is a status of gas retention in mediastinum, usually caused by airway system injury or esophagus rupture. Healthy people without trauma and basic disease emerging unexplained mediastinal emphysema are called idiopathic mediastinal emphysema. While tension pneumomediastinum is an exceptional and potentially lethal condition, the increased intramediastinal pressure with a severe oppression of heart, vena cava and pulmonary vein leads to impaired central venous return through the cavae system, restricted right heart diastolic filling, and collapse of the cardiac chambers, resulting in reduced stroke volume, cardiac output and dysaemia. This young people-prone disease was initially reported by Hamman in 1939 and usually has a good prognosis so that no special treatments were needed. In this study, however, we presented a young boy with idiopathic tension mediastinal emphysema combined with dysaemia and respiratory failure. Fortunately, he was finally successful treated by VATS after heteropathy and incision on suprasternal fossae.

Keywords: Tension mediastinal emphysema, idiopathic, video-assisted thoracic surgery

Case report

A 16-year-old otherwise healthy strong boy was transferred to our emergency department because of pectoralgia and shortness of breath for one day without obvious inducement, and deteriorated after labor work complained with cough. From the physical examination we found the young patient had a little cervical and chest subcutaneous emphysema, a small amount of rales in bilateral lung by auscultation. A chest CT scan was immediately given to the patient, which shew extensive pneumomediastinum and little subcutaneous emphysema without pneumothorax and pleural effusion (**Figure 1A**).

After hospitalization, vital signs monitoring and symptomatic supportive treatment were given, but he still had a significant tachycardia, hypoxia, dysphoria and sense of impending death, even we used sedative drugs. Blood air analysis told us he had already existed a respiratory failure. Considering the emphysema had a severe oppression of heart, vena cava and pulmonary vein causing the dysaemia, which called tension mediastinal emphysema, we incised on the suprasternal fossae to reduce tension and effluent gas, but still invalid, the patient perceived more dyspnea and restlessly, the chest X ray shew a lot of emphysema again as before.

In our clinical practices, we had never seen such severe dyspnea caused by mediastinal emphysema, even in the literatures before. So we could only make a new attempt, done the video-assisted thoracic surgery. From the operation, we found extensive accumulation of gas under the unabroken visceral and mediastinal pleural, particularly the pleural around anterior mediastinum, pericardial and pulmonary vessels, there was even a small amount of pleural effusion occurred. We incised the visceral and mediastinal pleural containing gas to reduce tension, even we cut open the posterior mediastinal pleural to expose and exam the lower esophagus, carina and bilateral bronchus (**Figure 2**). There was no obvious leakage in the test of water when expanded the lung. So we could initially remove the possible of esophagus and large airway injury which was confirmed by postoperative bronchoscopy and esophagogram. The boy recovered a stable heart rate

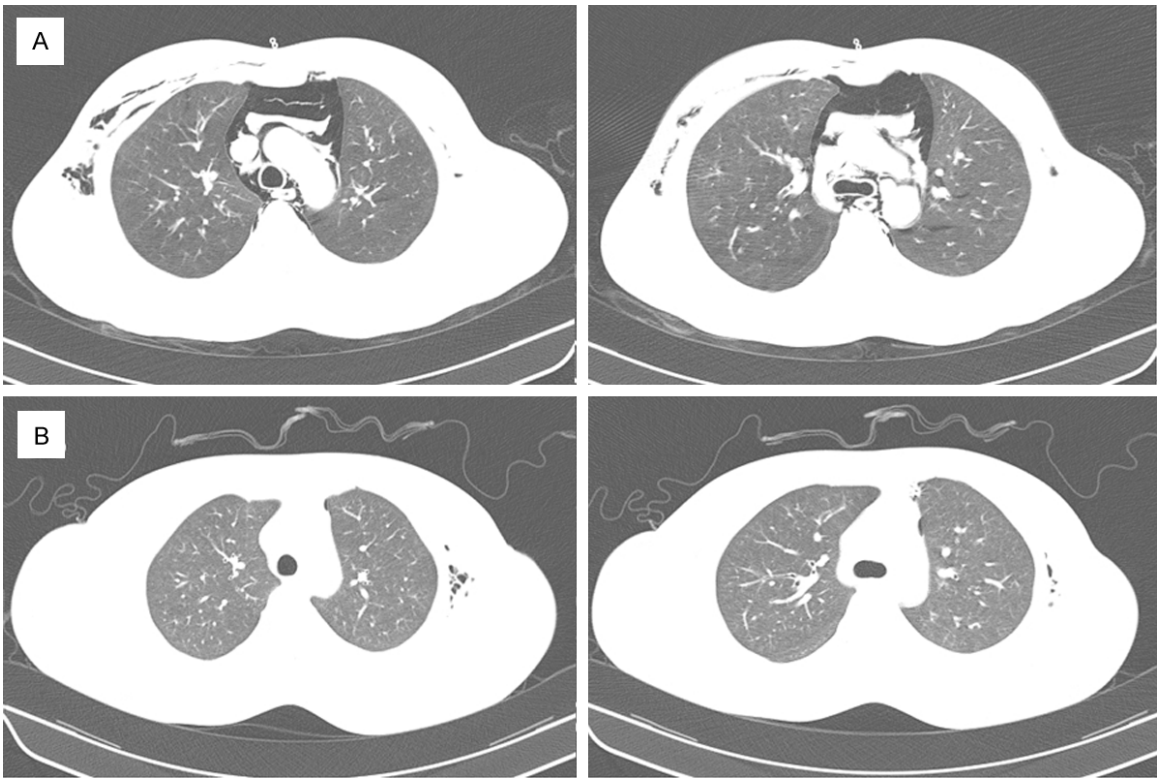

Figure 1. Chest CT of the patient. A. Preoperative chest CT (aortic arch level and carina level) showed extensive pneumomediastinum and little subcutaneous emphysema without pneumothorax and pleural effusion. B. Pneumomediastinum almost disappeared on chest CT five days after operation (aortic arch level and carina level).

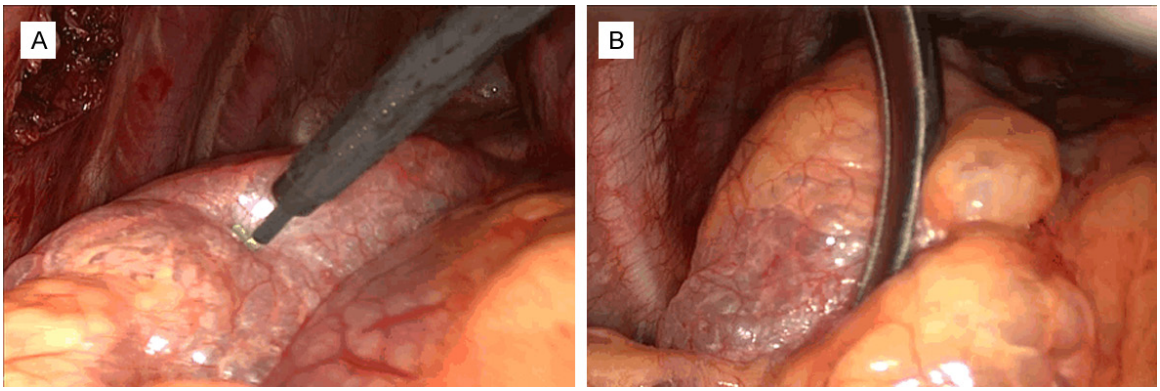

Figure 2. Intraoperative conditions of the patient. A. Emphysema around anterior mediastinum. B. Emphysema around pericardial.

immediately after the incision, and successfully removed trachea intubation one hour after the operation with stable vital signs, the symptoms were obviously relieved too. Blood gas analysis also indicated that respiratory failure disappeared. Heteropathy and anti-inflamation therapy were given with continuous drainage simultaneously, relevant inspections during this period further provided evidences for the diagnosis of idiopathic mediastinal emphysema. A week later, the patient was discharged without obvious discomfort and emphysema (**Figure 1B**).

Discussion

There are many theories about the mechanism of idiopathic mediastinal emphysema, Macklin

effect is the most famous theory recognized by people, which presents that the alveolar pressure increases with high pressure of airway, the rupture of congenital fragile alveolar wall causes pulmonary vascular sheath to be stripped, then the air entering into the hilus along pulmonary vessels forms pneumomediastinum [1]. Reports show that although idiopathic mediastinal emphysema rarely causes abnormal vital signs, but it can be combined with the emergence of mediastinitis, especially the tension mediastinal emphysema need to deal with in time [2].

Usually idiopathic mediastinal emphysema has no specific symptoms. The symptoms such as substernal discomfort, chest pain, dyspnea, consciously subcutaneous emphysema, neck pain and so on are according to the extent and causes of emphysema, but respiratory failure is very rare [3]. This boy rapidly developed from chest pain and dyspnea to respiratory failure, the main reason we think is due to the larger tension within the mediastinum and visceral pleural even after suprasternal incision and drainage. Mediastinal emphysema can be diagnosed by the combination of physical examination and auxiliary examination, especially the chest CT scan, because almost all of the emphysema patients can be diagnosed by CT examination.

Most of the idiopathic mediastinal emphysema can be cured by heteropathy from literatures, even a handful of tension mediastinal emphysema need tracheotomy and mediastinal drainage. Patients often have a good prognosis within 7 days [4]. For this patient, we did the treatment above, but failed to achieve the effect of schedule, so we made a new attempt, incised the mediastinal and visceral pleural to reduce the pressure by VATS in order to achieve effective continuous drainage, and it also achieved a satisfactory result.

In recent years, with the rapid development of VATS, especially the single-port thoracoscopy [5], we believe VATS can be applied to patients with severe tension pneumomediastinum gradually replace the mediastinal drainage and suprasternal fossae incision. The reasons are as follows, through the operation we can not only incise the mediastinal and visceral pleural to adequate drainage, but also exam the bronchi and esophagus to exclude secondary mediastinal emphysema at the same time. Once found in the presence of bronchial and esophageal injury, we can do early treatment to prevent serious complications. At the same time, compared with the suprasternal fossae incision, the single-port VATS incision on chest is more subtle, so the beauty effect is better for young people. Therefore, we think for serious tension mediastinal emphysema, especially the patients with respiratory and circulatory disorders, early VATS can provide more benefits compared with previous treatment measures.

Disclosure of conflict of interest

None.

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