Case report - Pulmonary
Pulmonary artery perforation by a tube thoracostomy
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Abstract
A 74-year-old woman was hospitalized in another institution because of a left-sided empyema and bronchopneumonia. A trocar-type chest tube was inserted. Upon withdrawal of the trocar, blood was seen flowing from the draining system and she developed hypotension. The patient was then transferred to our hospital and a diagnosis of pulmonary artery perforation was made. The patient was treated successfully with left pneumonectomy. Pulmonary artery perforation following chest tube placement is a rare and serious complication. When blood is seen following chest tube insertion a pulmonary artery perforation should be considered.

Keywords: Pulmonary artery perforation; Chest tube; Tube thoracostomy; Complication; Trocar method

1. Introduction
Insertion of the chest tube into the pleural space is standard therapy for a variety of pleural abnormalities, and is generally considered to be a safe procedure [1]. Nevertheless, various thoracic complications may occur and have been documented in the literature [1]. We report on a case in which a thoracic tube was accidentally introduced into the pulmonary artery.

2. Case report
A 74-year-old woman was admitted to her local hospital with complaints of cough and sputum. Her past history was unremarkable. At the time of presentation, a chest roentgenogram and a chest CT scan demonstrated left sided pulmonary empyema and bronchopneumonia. The patient was referred to the medical ward for further treatment. The physician inserted a 23-gauge needle into her chest. After a small amount of yellow fluid was removed, the physician inserted a 20 F trocar-type chest tube at the fifth intercostal space in the anterior axillary line. This was achieved with difficulty due to hard pleural adhesions because of empyema. Upon placement of the chest tube, approximately 1500 ml of pulsating blood were immediately withdrawn. Suddenly, the patient became severely hypotensive, and draining was stopped immediately. A chest roentgenogram taken post-chest tube placement demonstrated the chest tube in the heart curving along the chest wall (Fig. 1). An immediate drop in the patient’s hemoglobin level was noted and managed with a blood transfusion. The patient was then transferred to our institution under the suspicion of cardiac puncture. A chest CT scan showed the chest tube in the central part of the pulmonary trunk (Fig. 2). A diagnosis of pulmonary injury and pulmonary artery perforation caused by the chest tube insertion was made, and soon after she was transferred to the operation room.

The antero-lateral thoracotomy through the fourth intercostal space was performed. There were well-developed fibrous adhesions between the visceral and parietal pleura over the left lower lobe and portions of the upper lobe. There was only a small amount of blood in the pleural cavity. We bluntly dissected the lung from the chest wall adhesions, and found that the chest tube was inserted into the left upper lobe with the thickened parietal pleura and it extended through the peripheral pulmonary artery to the central part of the pulmonary trunk. We dissected the left main pulmonary artery and we were able to ligate the left pulmonary artery after slight extubation of the chest tube. Then we performed left pneumonectomy. The thoracic cavity was irrigated with a saline solution of 6000 ml, and a new chest tube was inserted.

There was an oblique perforation, 4×4 mm in size, on the lateral aspect of the upper lobe, after removal of the chest drain. This perforation extended linearly through the peripheral pulmonary artery, and the tract was filled with a blood clot. There were slight empyema in the pleural space and acute bronchopneumonia in the upper and lower lobes. Postoperative therapy with broad-spectrum antibiotics was started. The patient had an uneventful postoperative period, and discharged home 14 days later.

3. Discussion
Thoracostomy is an invasive procedure that is often life-saving, but by no means innocuous. Many complications of
tube thoracostomy have been described among which are diaphragm or lung lacerations, damage to intra-abdominal organs, and intercostals artery bleeding [1]. The risk of lung perforation during tube thoracostomy is related to several factors, probably the most important being the method used for the insertion. With the trocar method, a pointed metal rod extends inside the tube and projects slightly from its tip. In this technique, the tube and trocar are inserted directly through the chest wall. With blunt dissection, a passage is made through the chest wall by the use of a Kelley clamp. The trocar method is more dangerous than the blunt dissection method from the point of view of lung perforation [2]. In our case, well-developed pleural adhesions prevented the entry of the trocar into the pleural space, and forceful insertion beyond the chest wall led to puncture of the lung and the pulmonary artery. This case clearly demonstrates that extreme caution is warranted when tube thoracostomy is carried out in patients with hard pleural adhesions. The physician in this local hospital should have asked an experienced surgeon to place a chest tube. Our experience is similar to Kragligen et al. [3] who reported pulmonary artery perforation by blind placement of a trocar-type chest tube into the postpneumonectomy space. There was a report of pulmonary artery pseudoaneurysm after trocar tube thoracostomy [4]. Pulmonary artery perforation following chest tube insertion is a rare and serious complication. The majority of patients with empyema are generally treated with antibiotics and drainage of empyema by closed thoracostomy. When the patient was transferred to our institution, we planned for the immediate thoracostomy under the suspicion of cardiac puncture. However, a chest CT scan was performed to get more detailed information, and the scan showed pulmonary artery perforation. A primary repair of the pulmonary artery may have been possible to occlude the perforation. But, we were afraid that the pulmonary artery without blood flow caused by the accident may have produced the infarct in the terminal of the pulmonary artery, and we performed left pneumonectomy instead of a primary repair of the pulmonary artery. We did not cover the bronchial stump with a tissue flap, however, we irrigated the thoracic cavity with the saline solution of 6000 ml to prevent a post-pneumonectomy empyema. Recognition of a chest drain-related pulmonary artery perforation is important in order to give appropriate feedback to the responsible physician.

References