

A conservative surgical approach for management of iatrogenic pulmonary artery perforation

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Abstract

Accidental malposition of a chest tube in the pulmonary artery is a potentially fatal complication. Here we describe a 66 year-old obese woman with prior cardiac transplantation, intubated for respiratory failure and felt to have a large left pleural effusion. A chest tube was inserted using a trocar tube, and resulted in near-exsanguinating hemorrhage immediately, with development of hypovolemic shock. Prompt clamping of the tube proved life-saving, and CT scan confirmed placement of the tube in the main pulmonary artery. Initial stabilization, followed by a planned surgical approach, resulted in successful removal of the tube.

Keywords: Hemorrhage, pulmonary artery, thoracostomy

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Introduction

Tube thoracostomy is a commonly performed procedure. Perforation of organs and major blood vessels, including the pulmonary artery, has been reported rarely. Surgical intervention is almost universally required for successful management. Here we describe a case of pulmonary artery cannulation following tube thoracostomy in a patient who was successfully managed with surgical removal of chest tube.

Case Report

A morbidly obese 66yr old white female with history of hypertension, diabetes, ischemic cardiomyopathy eventually leading to cardiac transplantation 11 years earlier and end stage dialysis-dependent renal disease, required admission to Intensive care unit for worsening respiratory failure and hypotension. She had formerly been a smoker, and was morbidly obese with obstructive sleep apnea. In addition she had been maintained on chronic immunosuppressant therapy

following cardiac transplantation. She was intubated and started on mechanical ventilation. Hypotension and peripheral edema worsened and laboratory values revealed marked anemia, with initial hemoglobin of 8.8gm/dl and a creatinine of 4.8mg/dl. She was treated on the lines of septic shock and hemodialysis was started for renal failure. Eventual blood cultures showed gram negative septicemia. Chest X-ray showed pulmonary vascular congestion and a probable left pleural effusion. Although she slowly improved hemodynamically; she could not be weaned off the ventilator. Given the suspicion of a significant left pleural effusion, consultation was obtained for chest tube drainage. A 28 French trocar tube was inserted, and immediately yielded massive drainage of frank blood. Her hemoglobin dropped from 8.8 to 5gm/dl. The chest tube was clamped promptly and she was resuscitated with multiple units of blood transfusion, blood pressure was stabilized. A Chest x-ray [Figure 1] showed a chest tube near the midline. Breath sounds were still audible over both hemithoraces. CT scan of the chest [Figures 2a and b] showed presence of the chest tube in left main pulmonary artery. Atelectasis and consolidation of the left lung were also evident. Contrast injection through the chest tube confirmed its presence in the left main pulmonary artery [Figure 3]. Plans were made for surgical removal of the tube, possibly requiring cardiopulmonary bypass. It was noteworthy that each

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Figure 1: The chest x-ray with the chest tube through the left hemithorax near the midline

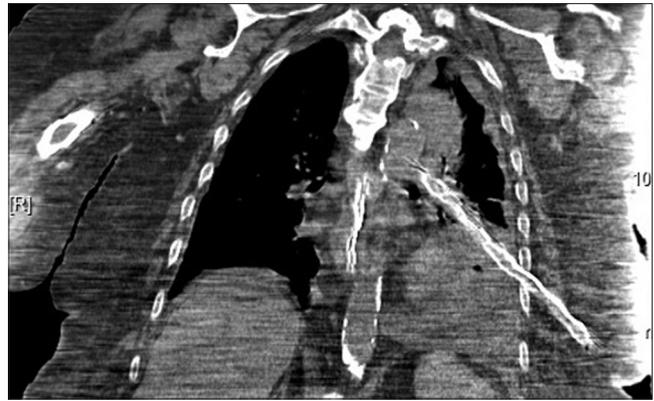


Figure 2a: The frontal CT scan of the chest with the chest tube piercing the left hemithorax

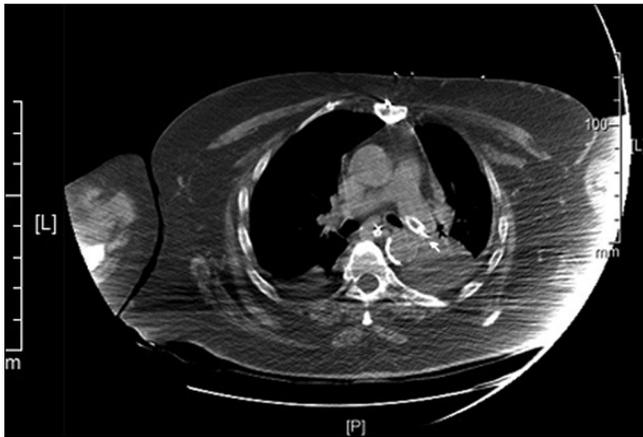


Figure 2b: Cross-sectional CT scan of the chest with the chest tube (yellow arrow) in the main pulmonary artery

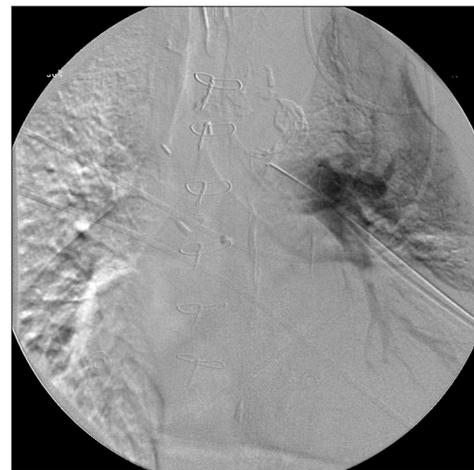


Figure 3: (retrograde) contrast injection through the chest tube delineating the left main pulmonary artery

attempt to unclamp the chest tube resulted in frank hemorrhage through the tube. Preparations were made and the patient was taken to the operating room. Pump standby was used. The patient was then prepared, with multiple monitoring lines placed, and was placed in semi-right lateral decubitus position. A left lateral thoracotomy was performed, with the chest tube still in place. Dense adhesions of the left lung to the chest wall were encountered. Although initially consideration was given to dissection around the lung to obtain vascular control of the hilum, this did not seem feasible, given dense adhesions and consolidation of the left lung. Therefore, purse string sutures of Prolene were placed around the entrance of the tube into the lateral portion of the lower lobe of the left lung. The tube was then quickly withdrawn while the purse string sutures, placed on the lung tissue were tied, and hemorrhage controlled. Bleeding from the orotracheal tube, which had been positioned in the right main stem bronchus, was noted and required suctioning. This seemed to be

controlled with limited suctioning. Postoperatively the patient was followed in the Intensive care unit with continued intubation of the right main stem bronchus so as to facilitate the healing of traumatized and eventually repaired left lung. Chest X-rays initially showed consolidation and atelectasis of the left lung; however no further bleeding was noted. Gradually the orotracheal airway was pulled with slow re-aeration of left lung. Eventually, the patient was weaned from the ventilator, and was successfully extubated without further evidence of bleeding.

Discussion

Tube thoracostomy is one of the most commonly performed procedures in the critical care unit. Placement of both non-trocar and trocar-contained tubes is usually easily and safely done. The complications reported ranges from damage to adjacent organs and structures such as heart, great vessels, intercostal vessels and nerves.^[1] Pulmonary artery perforation is extremely rare and so far only six cases have been

reported.^[2-7] Typically the complication has been reported in elderly individuals with pneumonia and with chronic obstructive pulmonary disease (COPD).^[2,3] Our patient had a history of smoking and sleep apnea but no documented COPD. She did have multiple comorbidities including a history of cardiac transplantation and dialysis dependent renal failure. Bozzani *et al*, reported a case in a patient with aorto-bronchial fistula repair associated with a descending thoracic aortic aneurysm.^[4] The clinical manifestation of pulmonary artery cannulation or perforation is sudden massive hemorrhage after placement of the thoracostomy tube. The method of chest tube insertion (blunt dissection vs trocar insertion) is important to avoid major post-operative complications. Although injuries of major vessels have been reported after the insertion of chest tube by the blunt dissection technique,^[3] they are almost always due to trocar insertion of the chest tube.^[1,2,5] Many thoracic surgeons in fact prefer and recommend blunt dissection technique. With this technique the pleural space can first be inspected and palpated with the finger, the tube then simply advanced in the proper position, without the risk of injuring the intra-thoracic structures. A thickened fibrotic pleura is thought to increase the chance of accidental malposition of chest tube.^[6,8] The treatment of this rare complication should be prompt and the aim is control of bleeding and repair of pulmonary artery perforation. There is risk of thrombus formation within the pulmonary artery and pulmonary infarction in case of delay in management.^[8] Pneumonectomy has been employed in most cases for control of bleeding.^[2,4,6,7] Only one case has reported non-surgical management with removal of the chest tube on the 4th day after pulmonary artery perforation.^[3] The chest tube tract being sealed off by clot formation. We

also managed the patient with a 'conservative' surgical approach, with chest tube removal supported by purse string sutures enabling control of hemorrhage

Pulmonary artery perforation is an extremely rare complication of chest tube insertion requiring prompt recognition and urgent intervention. If bleeding and airway problems can be immediately controlled, then further treatment planning can be done. We report such an approach with conservative surgery, without resection of the lung, as one option for eventual tube removal.

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