Case report - Pulmonary
Non-operative management of tube thoracostomy induced pulmonary artery injury

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Abstract

Tube thoracostomy insertion is a common procedure in the management of air and fluid collections in the pleural space. Pulmonary artery injury is a rare but serious complication following intercostal catheterisation. This complication is usually managed surgically. We report a case of successful non-operative management of a pulmonary artery injury after tube thoracostomy.

Keywords: Tube thoracostomy; Pulmonary artery injury; Non-operative management

1. Introduction

Tube thoracostomy is considered safe in the management of the majority of thoracic conditions. Major thoracic vessel injury is rare, but nevertheless has been previously reported in the literature [1, 2]. These complications are usually managed surgically, but we report a case of pulmonary artery injury caused by an intercostal catheter which was managed non-operatively.

2. Clinical details

A 74-year-old male presented to the emergency department with septic shock from right lower lobe pneumonia on the background of severe chronic obstructive airway disease. He required intubation and intensive care unit (ICU) admission. Chest X-ray confirmed pneumonia and a mild–moderate para pneumatic effusion. It was decided to drain the effusion in order to help his respiratory function. An ultrasound examination of the pleural space was not performed in advance of the drainage procedure.

A 20 F blunt non-trocar intercostal catheter was inserted into the 3rd right intercostal space in the anterior axillary line by blunt dissection. The insertion was noted to be difficult due to marked pleural thickening. Immediately after placement fresh blood was drained through the catheter. The catheter was clamped after it drained 1600 ml. The patient became hypotensive and was resuscitated with packed red cell and platelet transfusions. Chest X-ray showed the tip of the catheter passing across the midline. A major thoracic vessel injury was suspected and a chest CT-scan confirmed the catheter to be in the right pulmonary artery (Fig. 1).

The patient was transferred to our unit the following day and was haemodynamically stable. On review of his chest CT-scan, it appeared that there were features consistent with a chronic fibrothorax with significant volume loss on the affected side, pleural thickening and widespread pleural adhesions. In view of his severe chronic lung disease and the likely trapped lung, it was decided to trial a slow withdrawal of the catheter with surgical backup if required. The catheter was withdrawn 2–3 cm every day until it was completely removed on the fourth day. During this period his vital signs were within acceptable limits. He was extubated on the fifth day. He was started on warfarin for emboli noted in the pulmonary artery on the post-catheter removal CT-scan. The catheter tract appeared well sealed and there was no suspicion of ongoing intra-pulmonary haemorrhage. At six weeks a repeat follow-up CT-scan showed a healed tract in the right lung (Fig. 2). The patient subsequently remained on warfarin for six months.

3. Discussion

Tube thoracostomy insertion is a common procedure in the management of air and fluid collections in the pleural space. The procedure is considered safe but serious complications are encountered even in the hands of experienced personnel. Complications include injury to chest wall vessels and to major cardiac and intrathoracic vascular structures [3]. A serious complication rate is reported at around 2–3% [4].

Most major pulmonary vascular injury has been reported due to the use of trocar-based thoracostomy tubes [1, 5]. The blunt chest wall dissection technique which is widely

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used is by no means innocuous. Bleeding complications have been seen in patients with dense adhesions in the pleural space and in the post-pneumonectomy state. In the latter situation pulmonary vascular injury has been suspected if the tip of the catheter lies beyond midline [3].

In our case the catheter had traversed the trapped and diseased lung probably at the site of pleural adhesion into the right pulmonary artery in spite of using blunt dissection to introduce the catheter. The patient was fortunate to have this complication recognised early and resuscitation was rapid as he was already in the ICU.

The non-operative approach to management of this situation was chosen owing to the trapped lung making a surgical approach quite hazardous and likely to result in further bleeding and lung injury. We anticipated that the dense pleural adhesions around the entire lung and positive pressure ventilation would assist in limiting the spread of any intra-pulmonary haematoma. We were pleased that gradual catheter removal over several days allowed progressive clot formation and sealing of the catheter tract.

Pulmonary artery injury is very rare but a serious complication of tube thoracostomy. The literature has reported few cases, but all have required surgical intervention. Because of our patient’s underlying lung disease he was managed by a trial of catheter removal with a backup plan for surgical intervention should that be required. He was fortunate not to require surgical intervention. This case once again emphasises the importance of determining the location of the pleural space and the lung edge prior to insertion of a thoracostomy tube.

References


eComment: Management options of tube thoracostomy-induced pulmonary artery injury

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Sundaramurthy et al. [1] describe an interesting mode of treatment of tube thoracostomy-induced pulmonary artery perforation. It is generally recognized that the blunt dissection method of chest tube insertion is safer but certainly not innocuous as their report shows. Pulmonary artery injury in such a setting is uncommon but appears to occur more frequently in the presence of pleural adhesions [2, 3]; the tube penetrates the lung parenchyma and perforates a branch pulmonary artery as it is advanced medially. Immediate return of frank blood via the tube leads to a suspicion of major vessel injury. Hemostasis is controlled by clamping the tube and leaving it in situ as a temporizing measure. Definitive management from the available case reports has essentially been surgical. The report of Sundaramurthy et al. [1] is unique in this respect. Interestingly, theirs is not the first report of such an injury in an ill elderly patient with chronic obstructive pulmonary disease, pleural space adhesions and pleural infection; the report of Kao et al. [3] is somewhat similar but differs in the management approach.

Surgical management is technically demanding considering the pleural adhesions and the patient’s co-morbidities. The general aim of surgical treatment is to repair the pulmonary artery injury but when this is not feasible, a pneumonectomy may be performed [3, 4]. Delay in instituting surgical treatment risks pulmonary arterial thrombosis and clot propagation. Elevated right ventricular after load and pulmonary infarction become important concerns subsequently. Barring the technical difficulties, surgical treatment probably provides the most secure means of achieving hemostasis.

Non-operative management as described by Sundaramurthy et al. [1] is based on the occlusion of the pulmonary artery perforation by the clamped chest tube and the formation of a clot in the tract as the tube is gradually withdrawn. The concern with this approach is the unpredictability of hemostasis and the likelihood of thrombosis of the pulmonary artery with clot propagation. Leaving the tube in place for four days as the authors describe may well lead to significant vascular occlusion of the involved pulmonary artery vascular bed. In the event that such an approach fails to secure hemostasis upon tube withdrawal, one is forced to undertake an emergency thoracotomy in a patient who has been...
rendered hemodynamically unstable. The wide applicability of this non-operative management option remains to be seen.

References


