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Case report

Rapid atrial fibrillation following tube thoracostomy insertion

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Abstract

We report a case of trauma patient, whose heart rhythm and rate changed from sinus tachycardia to rapid atrial fibrillation. The change occurred immediately after the insertion of left thoracostomy tube. The patient did not respond to pharmacological treatment. Only when the tube was pulled out, the rhythm returned to sinus. Chest radiogram shows the position of the tube, in close proximity to the cardiac silhouette. © 2003 Elsevier B.V. All rights reserved.

Keywords: Chest trauma; Tube thoracostomy; Rapid atrial fibrillation; Chest X-ray

1. Introduction

Tube thoracostomy is a common procedure, used often in cases of thoracic trauma, after chest surgery, pneumothorax, and in cases of chronic pleural or parenchymal lung diseases [1]. The rate of complications is variable, and the most common are failure and improper placement of the tube [2]. We present an unusual case of rapid atrial fibrillation, induced by a tube thoracostomy. Medical treatment was unsuccessful, only the withdrawal of the chest tube ended the arrhythmia.

2. Case report

A 35-year-old male patient was admitted to our hospital following multiple penetrating injuries, caused by explosion. He also suffered a blast injury and a blunt chest trauma. Initial medical evaluation at the scene revealed a hemodynamically stable, but unconscious patient (Glasgow coma score 8). His past medical history was unremarkable. During the 2 h evacuation, the patient was treated with intravenous fluids. Upon arrival to the emergency room, his heart rate was 110 beats per minute at normal sinus rhythm and the blood pressure 115/50 mmHg. An attempt to mechanically ventilate the patient via face mask failed, due to a

penetrating wound to the larynx, and an emergency tracheostomy was performed. Antero-posterior chest X-ray was done after the procedure and showed bilateral lung contusion. Since mechanical ventilation was difficult, mandating high pressures, a pneumothorax was suspected. A 32 Fr chest tube was inserted to each hemithorax, at the mid-axillary line, fifth and sixth intercostal spaces on the right and left sides, respectively. The blunt dissection technique was used, without a trocar. At about the same time, the patient became hemodynamically unstable and was taken immediately to the operating room, without follow-up chest X-ray. An emergency explorative laparotomy was performed, in which lacerations of the small bowel were found and sutured. Fluid and blood resuscitation was continued in the operating room. Systolic blood pressure was maintained around 100–120 mmHg, and the electrocardiogram showed a rapid atrial fibrillation with ventricular rate of 150–160 beats per minute. Oxygen saturation was 97%, arterial blood gas and electrolytes measurements were: $P_{aO_2} = 122$ mmHg, $P_{aCO_2} = 48$ mmHg, pH = 7.30, bicarbonate = 24 mEq/l, BE = -2, Na = 139 mEq/l, K = 3.9 mEq/l, ionized calcium = 0.89 mmol/l, glucose = 225 mg/dl, hematocrit = 33%.

Digoxin 0.5 mg and verapamil 5 mg were administered intravenously, without any effect either on the heart rate or on rhythm. After laparotomy was completed, the patient was taken for a head CT scan and X-ray films of his chest and extremities. The antero-posterior chest radiograph (Fig. 1) showed the left chest tube to be kinked and its shadow superimpose the cardiac silhouette. Lateral chest radiograph

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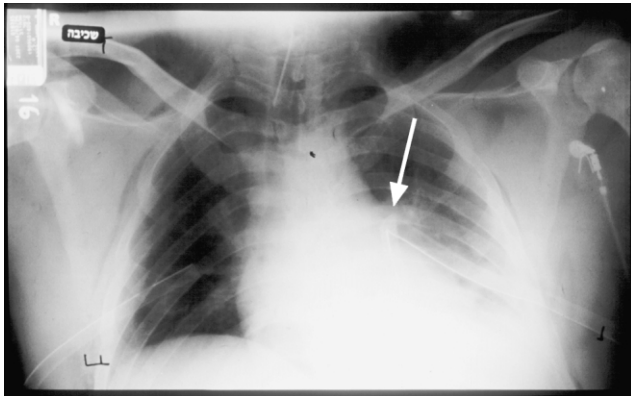


Fig. 1. Antero-posterior chest radiograph showing the left chest tube to be kinked (arrow) and in close proximity to the cardiac silhouette.

was not performed. The chest X-rays showed no shrapnel or foreign bodies. The chest tube was pulled out and the patient's cardiac rhythm immediately returned to normal sinus with a rate of 90 beats per minute. This was more than 2 h after the administration of cardiac drugs. The patient was then taken back to the operating room for insertion of intracranial pressure catheter and open reduction of fractures. At the conclusion of all surgical procedures, he was transferred to the intensive care unit. No recurrent events of atrial fibrillation were recorded. The patient was discharged from the hospital 6 weeks later.

3. Discussion

Thoracostomy tube placement is one of the frequent primary treatment for trauma patients. The complication rate of that procedure varies, and may be up to 25% [3,4]. Failure to place the tube and improper placement are the most common complications, accounting 30% of all complications [2]. Other complications are iatrogenic injury to the lung and vessels, undrained hemothorax or pneumothorax and empyema. Etoch et al. [5] studied retrospectively 426 trauma patients who underwent tube insertion and found that the complication rate was significantly higher when the physician who performed the procedure was not a surgeon. They found that complication rate was higher in patients who needed mechanical ventilation, patients in shock and patients who were admitted to intensive care unit. The patient in our report needed mechanical ventilation and was admitted to intensive care unit, but thoracostomy tube was inserted by a surgeon. The importance of chest radiograph after tube thoracostomy is well known [6]. Sometimes, as was in our case, the patient is unstable and chest X-ray is delayed, and clinical signs guide us until radiographic confirmation is available. In our case, malposition of the thoracostomy tube was diagnosed only after having a chest X-ray, since we did not relate between the arrhythmia and the tube insertion.

Arrhythmia could be a result of mechanical stimulus to

the pericardium or the heart, as often noticed during cardiac or chest surgery. These episodes are self-limited, they are usually reversible as soon as the stimulus ceases and mandate no treatment. Pericardial inflammation or effusion and autonomic imbalance during or after cardiothoracic surgery are also suspected etiologies for the common occurrence of postoperative atrial fibrillation [7]. Although we do not know the exact position of the chest tube in the left hemithorax, we believe that mechanical stimulation of either the pericardium or the atrium, was the cause for the rapid arrhythmia in our patient. This case demonstrates that if the mechanical stimulus that provoked the arrhythmia continues, the pharmacological treatment does not seem to have any effect. In our case report, there are several factors that strongly implicate the chest tube as the cause for arrhythmia: the close association between the chest tube insertion and the beginning of the arrhythmia, immediate termination of the arrhythmia following withdrawal of the chest tube, the sudden hemodynamic instability without major bleeding, no further recurrence of arrhythmia, and the location of the kinked chest tube by chest radiography. The patient had neither penetrating injury to the chest, nor rupture of mediastinal organ. Only one case of arrhythmia following chest tube insertion was reported [8]. In that case, vagus nerve irritation by the chest tube induced bradycardia and cardiac arrest. Like our patient, the patient in that case did not respond to medical treatment.

In conclusion, the rare complication of arrhythmia may occur after emergency tube thoracostomy, due to direct mechanical irritation of the pericardium or the heart by the chest tube. Medical therapy is unexpected to be beneficial in these cases, and refractory arrhythmia should raise the suspicion for an underlying mechanical cause. Follow-up chest radiograph should be performed as soon as possible after emergency tube thoracostomy.

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