

CASE REPORT

Tension pneumothoraces not responding to needle thoracocentesis

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A tension pneumothorax is a life threatening condition in which there is a large rise in intrathoracic pressure on the side of the affected hemithorax. This condition may rapidly lead to death.

Prompt treatment of the condition is required and most of the texts on the treatment of patients with this condition suggest that the pressure is released by the placement of a large bore trocar and cannula through the second intercostal space at the mid-clavicular line on the affected side.¹ This procedure is intended to be diagnostic and temporarily therapeutic, relieving the pressure enough to "buy time" while preparations are made for placement of a chest drain.

We report three cases of tension pneumothorax that were not responsive to needle decompression. We believe that these cases illustrate a potential problem with needle decompression that may lead the less experienced practitioner to doubt their diagnosis with possible dire consequences for the patient.

CASE 1

An 18 year old man was admitted to the emergency department after crashing his car into a shop window. He had been trapped at scene by the displaced steering wheel, which was pressing against his chest. On arrival in the department he was complaining of severe left sided chest pain and difficulty in breathing. The patient was in severe respiratory distress and further examination revealed a resonant left hemithorax with absent breath sounds. A diagnosis of a left sided tension pneumothorax was made and a 14 gauge cannula was placed in the left second intercostal space in the mid-clavicular line. There was a small release of air, which stopped almost immediately, and the patient's condition continued to deteriorate. A scalpel and a pair of clamps was then used to rapidly blunt dissect through the 4th intercostal space in the mid-axillary line to create a thoracostomy. This resulted in a large rush of air and an immediate improvement in the patient's condition. A size 28 French gauge chest tube was placed through the thoracostomy and connected to an underwater seal. The patient made an unremarkable recovery.

CASE 2

A 35 year old woman was admitted to the emergency department with a history of shortness of breath and left sided chest pain of two hours duration. On examination she was conscious and alert and appeared to be in pain. She had a resonant left hemithorax with decreased breath sounds. A chest radiograph revealed a moderate left sided pneumothorax with no evidence of mediastinal shift. Some 1500 ml of air was aspirated with a needle aspiration set (14 gauge cannula) through the second intercostal space. A follow up chest film showed a near complete resolution of the pneumothorax. Symptomatically the patient also felt better. However, about 20 minutes after the aspiration of the pneumothorax the patient's pain returned and she developed severe respiratory distress. She had a resonant left sided hemithorax with absent

breath sounds. Two attempts at immediate needle decompression with a 14 gauge cannula (second intercostal space, mid-clavicular line) were made, both without success. An immediate blunt dissection left thoracostomy (mid-axillary line, 4th intercostal space) was performed with immediate pressure release and rapid resolution of the patient's symptoms. Subsequently a size 28 French gauge chest tube was placed. The patient made an uneventful recovery.

CASE 3

An obese, 58 year old man with known chronic obstructive airways disease presented to the emergency department with severe dyspnoea of acute onset. On arrival he was in extremis with absent breath sounds over the right hemithorax, which was resonant to percussion. He had a sinus tachycardia of 130 beats per minute and a systolic blood pressure of 80 mm Hg. A diagnosis of a right sided pneumothorax (probably under tension) was made and a needle thoracocentesis was performed in the second right intercostal space at the mid-clavicular line using a 14 gauge cannula. Aspiration of air with a syringe confirmed correct positioning in the pleural space but on removal of the syringe there was no audible hiss of escaping air from the cannula. In view of the severity of the patient's condition an immediate thoracostomy was performed in the right second intercostal space at the mid-clavicular line. The anterior approach was considered necessary as, because of his distressed state, the patient was gripping the trolley sides making access to the lateral chest wall impossible. As the parietal pleura was traversed by blunt dissection there was an immediate escape of air under tension and a rapid improvement in the patient's condition. A size 32 French gauge chest tube was subsequently placed through the thoracostomy site and the patient went on to make an uneventful recovery.

DISCUSSION

These three cases show the potential for failure of needle thoracocentesis in the management of a tension pneumothorax. Failure of the procedure may be attributable to a number of factors:

(1) The cannula may be of insufficient length to pass through the full thickness of the patient's chest wall. This has been described previously.²⁻⁴ In all three of the cases we describe the cannulas used were of sufficient length to pass through the full thickness of the chest wall. In two of the three cases there was initial removal of air from the pleural cavity. In the remaining case the chest wall had previously been successfully traversed by an intravenous cannula of the same size and length that was used for the attempted treatment of the tension pneumothorax.

(2) If air leaks from the lung faster than it can escape through the cannula the patient's condition will continue to deteriorate.⁵

(3) Tissue/blood blockage of the lumen of the cannula. All three cannulas used in these cases were examined and no such blockage was found.

(4) The high intrathoracic pressure present in a tension pneumothorax results in compression of the chest wall tissues. This may actually facilitate thoracostomy but may also be sufficient to kink or compress the flexible plastic cannulas, which are normally used for vascular cannulation.

In conclusion, in the cases we have described there was no evidence to suggest that the failure of the cannulas was attributable to plugging of the lumen, inadequate length or insufficient rapidity of air exit. It is possible that the nature of the device used predisposes it to kinking after it has passed through the chest wall and the trocar has been removed. We suggest therefore that in the diagnosis and initial treatment of tension pneumothorax use of a rigid device similar to an intraosseous needle may prove to be more reliable than intravenous cannulas, which, after all were not designed to traverse the thoracic wall. One author recommends using the trocar of a 14 gauge intravenous cannula.⁶ However, we feel that this is probably too sharp to be left in situ.

In the absence of a blunt ended rigid device designed to treat tension pneumothoraces, needle thoracocentesis using large bore intravenous cannulas remains the treatment of choice for the initial management. These cases however show that there is a potential for failure of the procedure. If the procedure has failed and the practitioner strongly suspects the condition is present a further attempt at needle thoracocentesis (in the same or a different site on the chest wall) is not an

unreasonable action. For the more experienced practitioner immediate thoracostomy with subsequent chest drain placement is a rapid and safe alternative.

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