



COMMENTARY ARTICLE

Differentiation between Hemothorax and Pneumothorax in Case of CVC Placement

Running Title: Hemothorax Case of CVC

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ABSTRACT

Hemothorax is collection of blood in the space between the chest wall and the lung (the pleural cavity) and pneumothorax occurs when air leaks into the space between lung and chest wall. When a patient admitted in hospital due to this purpose, in an emergency in the ICU, the first step is to go to the bed side and examine the patient. There are some physical findings that should help to doctor to determine the cause of hypotension and distinguish between hemothorax and pneumothorax. The first finding is tracheal deviation to the right, away from the side where the procedure was performed.

INTRODUCTION

Hemothorax is collection of blood in the space between the chest wall and the lung (the pleural cavity) and pneumothorax occurs when air leaks into the space between lung and chest wall. Coming to the point, how to distinguish between hemothorax and pneumothorax, when a patient admitted in hospital due to this purpose.

In an emergency in the ICU, the first step is to go to the bed side and examine the patient. In this case, there are some physical findings that should help to doctor to determine the cause of hypotension and distinguish between hemothorax and pneumothorax. The first finding is tracheal deviation to the right, away from the side where the procedure was performed. This should immediately raise question for tension physiology as the cause of the acute drop in blood pressure. The change of normal position from the side where the CVC was placed suggests that something is filling the pleural space and pushing the heart and mediastinum into the opposite hemithorax.

The lack of breath sounds never help distinguish between hemothorax and pneumothorax as both would causes absent breath sounds. However, the percussion examination is helpful in distinguish between these two complications. A pneumothorax would be hyperresonant on percussion. Overall, patient's physical exam findings in the setting of a recent CVC placement are consistent with a relatively rapidly accumulating hemothorax with resultant tension physiology.

COMPLICATIONS FOUND IN CENTRAL VENOUS CATHETER PLACEMENT

The first step in working through this clinical scenario is to comprehensively review the problems that can be associated with central line placement in the sub-clavian position.

However, pneumothorax is not the only risk at that time. CVC placement can also result various other problems like vascular injury, most commonly through arterial puncture, which also subsequently cause a hemothorax

Hemothorax and pneumothorax are the two most likely problems in the case presented above. Both are slightly more common with sub-clavian than internal jugular CVC placement, and clinicians can decrease the risk for both problems by using ultrasound during the entire procedure. While the injury resulting in hemothorax and pneumothorax occurs during line placement, it usually takes some time for the patient to clinically remove from these complications. Hemothorax can result in either tension physiology or hypovolemic shock, both of which will take several minutes to hours to occur as blood has to accumulate in the pleural space. Pneumothorax can result in tension physiology as well as though the hemodynamic compromise from this, when a patient is on mechanical ventilation, is usually quicker than with hemothorax. This is due to the positive pressure results in an increasing amount of air in the pleural space over several minutes.

Two other complications to consider at the time of placing a CVC are arrhythmia and air embolism. Arrhythmias are generally caused by the guide wire entering the right ventricle and are usually aborted by pulling back the guide wire. Air embolism may be found once vascular access has been obtained with the introducer needle and steps are under way to place the catheter. Air may be entrained through the needle or through the catheter before capping all of the ports. Symptoms of air embolism start from dyspnea to cardiovascular collapse. Both air embolism and arrhythmias are complications that occur during the placement of the CVC, which was not the case with patient.

Long term risks of CVCs include infection, thrombosis and venous stenosis but as mentioned above if patient's symptoms occurred 2 hours after the procedure, so none of these risks are reasonable concerns.

TREATMENT

The most appropriate step is to intervene on the hemothorax is to try to relieve the tension physiology caused by the rapidly circulating blood. Blood needs to be drained with a large-bore chest tube which is >36 French because it is very likely to clot in a smaller caliber tube. Needle decompression would be the correct treatment for a pneumothorax, but it would not more effectively treat a hemothorax because the caliber of an angiocath would be much too small to effectively drain blood out of the chest. The flow would be so slow that there would be no impact on the tension physiology, even if the doctor tried to aspirate it as quickly as possible. Additionally, the needle is usually placed in the second intercostal space. Given that blood would be in the dependent thoracic zones, it would be not likely to drain from something placed so high in the thoracic cage. Although some patients do eventually need surgical exploration of the pleural space for either ongoing bleeding or not completely evacuated blood, this would not be the best initial step because it would take too much time to get to the operating room.

In almost all medicals, it takes several minutes to obtain a chest radiograph. In patients who are acutely decompensating with tension physiology from a hemothorax, treatment should not be delayed for a chest radiograph. A chest radiograph would help distinguish between pneumothorax and hemothorax, but the physical examination should be sufficient.

In both a hemothorax and a pneumothorax, we would expect to see the mediastinum and cardiac silhouette pushed to the opposite side of the thorax (i.e., away from the blood or air filling the pleural space). In the case of a pneumothorax, we would see a pleural line and a significant portion of the affected hemithorax without lung markings. In contrast, a hemothorax would opacify the entire affected hemithorax.

In many ICUs, a bed side ultrasound would be used to distinguish between these two etiologies. Ultrasound is often rapidly available on the unit, so it could be applied to the left chest. If there was a large anechoic collection between the chest wall and the lung, an effusion would be diagnosed. If instead, there was no lung sliding, pneumothorax would be highly likely. Lung sliding is the visible movement seen as the visceral pleura slides along the parietal pleura.