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Case Report
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Novel Approach to Apical Chest Tube Placement

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Abstract

Anterior approach to chest tube placement has been reported as a therapeutic option for successful management of apical pneumothorax. Potential complications of this approach include injury to intercostal vessels, lung parenchyma, and Internal Mammary Arteries (IMA), which could pose significant harm to cardiothoracic surgical patient's post-sternotomy, especially in those whom IMA was harvested as graft for CABG. We report a novel approach to apical chest tube placement by inserting a percutaneous pigtail catheter at the junction of the serratus anterior muscle, pectoralis minor muscle, and the axillary fold. This technique allows access to the apical area without the risks associated with classic anterior chest tube placement.

Keywords: Apical pneumothorax; Apico-lateral chest tube; IMA

Case Presentation

A 72-year-old female with history of breast cancer treated with radiation complicated by left-sided pleural adhesions presented to the ICU post uncomplicated orthotopic heart transplantation for routine recovery. She was weaned from postoperative ventilatory support and extubated during the first 24 h after surgery. On postoperative day five, she developed a symptomatic spontaneous left-sided apical pneumothorax (Figure 1). Ultrasound-guided placement of a 14-French apicolateral chest tube in the axillary region successfully resolved the pneumothorax.

Technique

The patient was recumbent in a semi-upright position with her left arm resting above the head to expose the axilla, which was prepped and draped in a sterile fashion. Using ultrasound guidance to identify the junction of the serratus anterior muscle, pectoralis minor muscle, and the axillary fold, access to the pleural cavity between the first and second intercostal spaces was achieved using an angiocath after local infiltration with local anesthetic. Using the modified Selinger technique, a 14-French pigtail catheter was inserted (Figure 2) and attached to a Pleura-vac system for drainage, followed by complete resolution of the pneumothorax.

Discussion

There is currently no consensus on the optimal approach to apical chest tube placement. Standard lateral chest tube placement between the fourth and fifth intercostal space cannot reliably be advanced to the apical position, and in the presence of pleural adhesions, distal chest tube advancement can induce parenchymal injury. Anterior chest tube placement has therefore been promoted as the optimal approach [1,2], and even emergent decompression of pneumothorax has been proposed through this technique. This approach is not technically difficult to perform but carries significant risks [3].

The IMA originates from the subclavian artery and travels along the sternal border bilaterally. The average distance between the IMA and the sternal border is approximately 1.5 cm. Two venous vessels typically accompany each artery, and they often merge at the level of the third rib into a larger confluent vein. Grafting the IMA to the left anterior descending coronary artery is a major quality indicator in CABG surgery and confers superior short- and long-term outcomes when compared to saphenous vein grafts. The presence of an IMA graft should exclude patients from anterior chest tube placement due to potential hemorrhage associated with injuring the IMA and IMV, as shown in multiple studies. Individual variability in the course of the IMA creates difficulty in locating anatomic landmarks; in addition, chest tube entry to the mammary capsule in female patients may lead to additional complications during chest tube placement.

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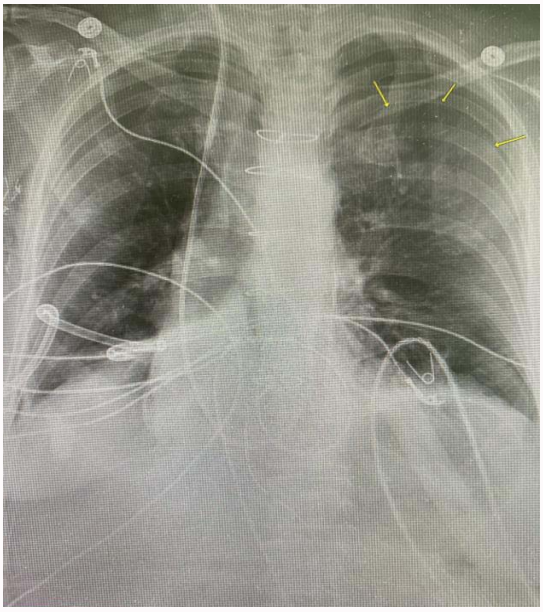

Figure 1: Left sided apical pneumothorax with evidence of left sided pleural adhesions.

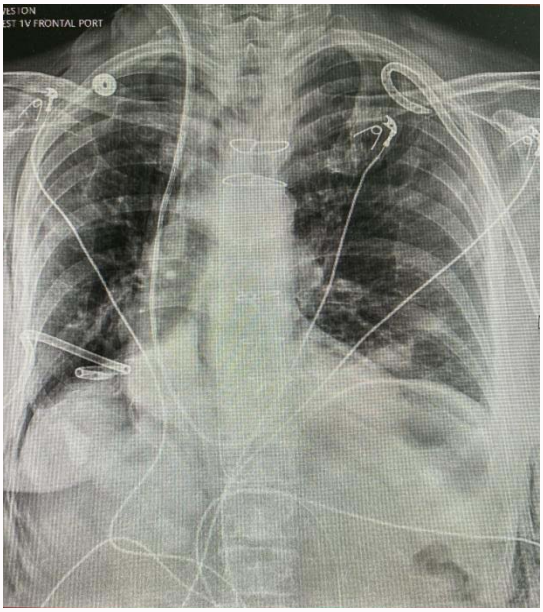

Figure 2: S/p apico-lateral pigtail chest tube placement with compete resolution of the pneumothorax.

In our case, standard chest tube with entry between the fourth and fifth intercostal space would not be optimal due to extensive adhesions post radiation treatment and would potentially lead to lung parenchymal injury. The apico-lateral approach achieved pneumothorax decompression without risk of parenchymal or IMA injury. Use of the 14-French pigtail catheter is accepted widely in the ICU as an alternative to the standard chest tube [4]. Even in trauma, the effectiveness of the 14-French pigtail catheters has not been shown to be inferior to 30- or 32-French chest tubes in the management of hemopneumothorax [5]. Ease and safety of this novel apicolateral approach challenges the use of the standard anterior approach for apical chest tube placement as a superior technique associated with less patient risk.

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