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Transcaval biopsy of a mediastinal mass compressing the superior vena cava

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Abstract

Imaging-guided percutaneous chest biopsy is a commonly performed procedure and considered the minimally invasive gold standard for histopathological investigation of thoracic masses. Recognized complications include pneumothorax, air embolism, and seeding of the biopsy tract. We describe a novel approach to diagnostic sampling of a mediastinal mass in a critically unwell patient using a transjugular hepatic biopsy needle. Transcaval mediastinal biopsy may represent a safer alternative to percutaneous biopsy of mediastinal masses in critically unwell patients.

Introduction

Mediastinal masses may be caused by a range of neoplastic and non-neoplastic pathologies including: carcinoma, lymphoma, teratoma, paraganglioma, cyst, ganglioneuroma, leiomyoma, sarcoid, and liposarcoma [1]. Computed tomography (CT) is used to characterize mediastinal masses and their relationship to the surrounding viscera [1]. However, imaging modalities do not always differentiate between neoplastic and non-neoplastic mediastinal lesions and the gold standard for obtaining tissue diagnosis is percutaneous biopsy [2]. Reported complications include pneumothorax, air embolism, biopsy tract seeding, and death. Incidence of pneumothorax may be as high as 20% [2]. If biopsy requires more than two layers of pleura to be crossed (thus increasing pneumothorax risk), or the patient is dyspnoeic, a transvenous approach may be safer and better tolerated. We describe a novel transcaval approach in a patient with a mediastinal mass causing compression of her thrombosed superior vena cava (SVC), using a transjugular hepatic biopsy needle.

Case Report

A 66-year-old woman was admitted with acute on chronic back pain, dyspnoea, SVC syndrome, and hypercalcaemia with a background of Hodgkin's lymphoma treated 20 years ago. Chest CT demonstrated a right mediastinal mass (31 × 45 mm) with compression of and thrombus within the SVC (Fig. 1) showing an 8-mm right middle lobe nodule and pathological fractures of multiple vertebral bodies.

Given the patient's critical condition, resolution of the SVC syndrome and diagnostic tissue sampling of the mediastinal mass was considered urgent. Percutaneous biopsy of the mass would have required crossing two layers of pleura with a high chance of pneumothorax. This was considered too dangerous given the patient's severe dyspnoea. Therefore, transcaval biopsy of the mass following mechanical thrombectomy of the SVC thrombus was undertaken.

The procedure was performed with the patient sitting up at 45 degrees. Through a right common femoral vein puncture, a 5-French Davies catheter (Cook, USA) and stiff straight glide wire (Terumo, Japan) were advanced through the known area of thrombus. The SVC venogram confirmed significant thrombus in the distal right brachiocephalic vein and proximal SVC. Mechanical thrombectomy was performed by suctioning thrombus through a 9-French MPA1 guide catheter (Cordis, USA). Post-thrombectomy SVC venogram demonstrated no further

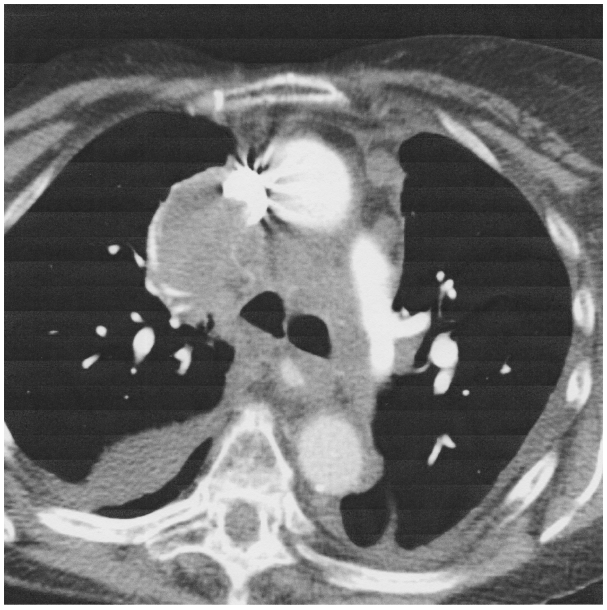

Figure 1. Axial computed tomography pulmonary angiogram demonstrating compression of the superior vena cava by a mediastinal mass.

thrombus. Through a 10-French sheath (Cook, USA), a Labs 200 19-gauge transjugular liver biopsy needle (Cook, USA) was then advanced into the SVC and six core biopsies were obtained transcavally from the mediastinal mass (Fig. 2). These were submitted for histological analysis and flow cytometry. Post-biopsy imaging demonstrated no immediate complications and the procedure was well tolerated. Tissue sample quality was excellent. Histopathology confirmed lung adenocarcinoma.

Discussion

Imaging-guided percutaneous biopsy techniques are safe and efficacious in the sampling of mediastinal masses [2]. Biopsy techniques include core and fine needle aspiration (FNA). Studies have demonstrated high diagnostic yield (77%) with CT-guided percutaneous core needle biopsy [3]. Ultrasound-guided endoscopic biopsy, parasternal anterior mediastinotomy, video-assisted thoracoscopic surgery, and open surgical procedures are other methods used to obtain tissue samples from the mediastinum.

Percutaneous FNA biopsies can be used where samples are required from lesions that are deeper in the mediastinum. Although FNA biopsy is highly sensitive and specific for metastatic disease and useful for cystic masses and germ cell tumours [4], the main disadvantage is the difficulty in obtaining diagnosis based on a few aspirated cells.

Percutaneous core biopsies allow more tissue to be obtained allowing further pathological investigations. Increased tissue is fundamental to treatment modality as

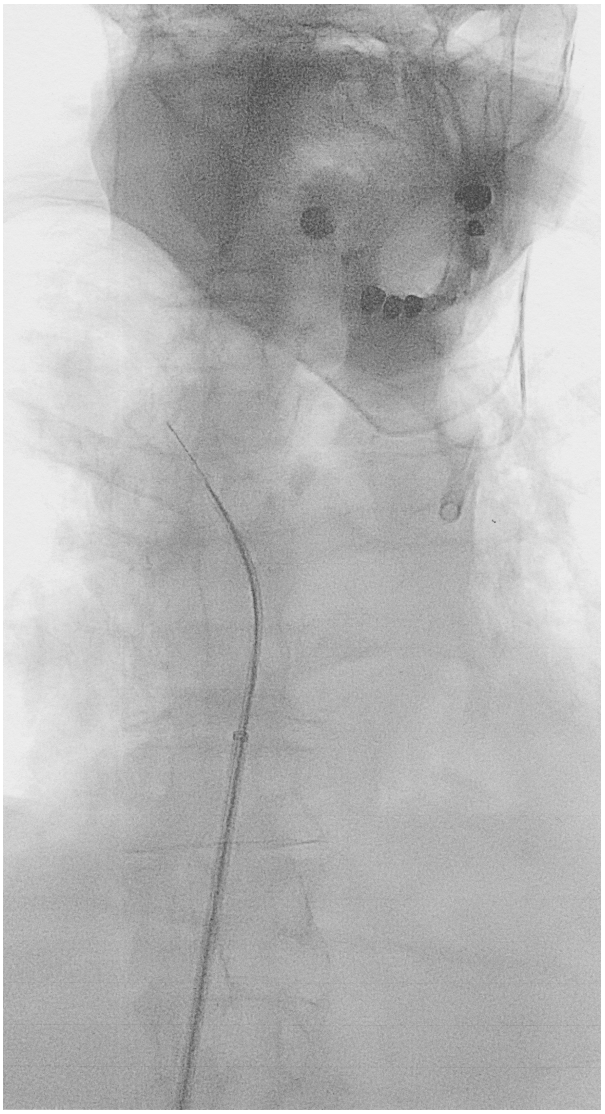

Figure 2. Core biopsy of the mediastinal mass with a transjugular hepatic biopsy needle.

histological subtype of tumours can be more readily determined [4]. However, they are less tolerated due to larger gauge needles.

Transcaval sampling offers several advantages over percutaneous biopsy in the appropriate patient. First, reduced pain allows for multiple biopsies, increasing the likelihood of reliable histopathological diagnosis. Second, severity of inadvertent bleeding is minimized due to the connection to the venous system. Third, the transvenous approach reduces pneumothorax risk as only one layer of pleura is crossed. In the severely dyspnoeic patient, the biopsy can be performed with the patient sitting at 45 degrees.

Tumour seeding risk is important to consider in any biopsy technique. There is no reported literature on

transcaval sampling of mediastinal masses to evaluate risk. Withdrawal of tissue samples within the Cook transjugular liver biopsy needle may reduce the risk of tract seeding. Other complications associated with transcaval sampling of mediastinal masses include: aortic puncture, pneumothorax, pericardial perforation, and SVC rupture with subsequent haemothorax. Real-time imaging techniques and experienced proceduralists minimize the risk. Contraindications to transcaval sampling include severe coagulopathy and severe thrombocytopenia.

Transcaval biopsy of a mediastinal mass in a pericaval location is safe and efficacious in obtaining adequate tissue samples in a patient otherwise unsuitable for percutaneous or surgical biopsy. Combining the technique with intravascular ultrasound may allow for the technique to be extended to sample vascular and retroperitoneal masses.

Disclosure Statements

No conflict of interest declared.
Appropriate written informed consent was obtained for publication of this case report and accompanying images.

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