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Case Report

Image-guided aspiration of a cystic mediastinal teratoma: A case report and literature review ☆

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ABSTRACT

A 51-year-old male presented to our tertiary referral hospital with progressive shortness of breath and orthopnea. A computed tomography (CT) of the chest was performed that showed a large cystic middle mediastinal mass. Magnetic resonance imaging (MRI) of the chest demonstrated a large, well-circumscribed, T2-hyperintense cystic middle mediastinal mass resulting in significant compression of the trachea, brachiocephalic artery, superior vena cava, and azygos vein. The patient subsequently developed a right hemispheric stroke due to compression of the brachiocephalic artery and was too clinically unstable to undergo or definitive operative management of the mediastinal cyst. Percutaneous CT-guided aspiration of the cystic middle mediastinal mass was performed, with successful decompression resulting transient improvement in mass-effect on the surrounding mediastinal structures. Six days after successful aspiration of the mass, the patient underwent attempted bronchoscopy for management of tracheobronchial secretions which was complicated by massive pulmonary hemorrhage leading to cardiopulmonary arrest and death. An autospy was conducted, revealing pathological finding consistent with a mature cystic teratoma.

Introduction

Mediastinal masses are typically asymptomatic in adults, and when present symptoms are commonly secondary to mass effect on the adjacent mediastinal structures. The differential diagnosis of a cystic mediastinal mass is broad and includes mature cystic teratoma, foregut duplication cyst, pericardial cyst, thymic cyst, meningocele, and lymphangioma [1]. Solid mediastinal tumors such as thymoma, lymphoma and metastatic carcinoma may undergo cystic degeneration, and are usually characterized by mixed solid and cystic components [2]. Of the cystic mediastinal masses, foregut duplication cysts are the most common and represent congenital malformations resulting from malrotation of the tracheobronchial tree, foregut, or primitive spinal cord during the

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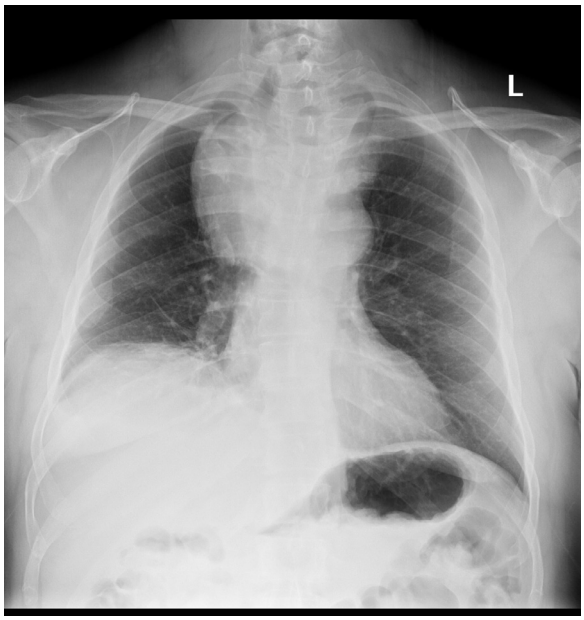

Fig. 1 – Chest radiograph on presentation showing large middle mediastinal mass.

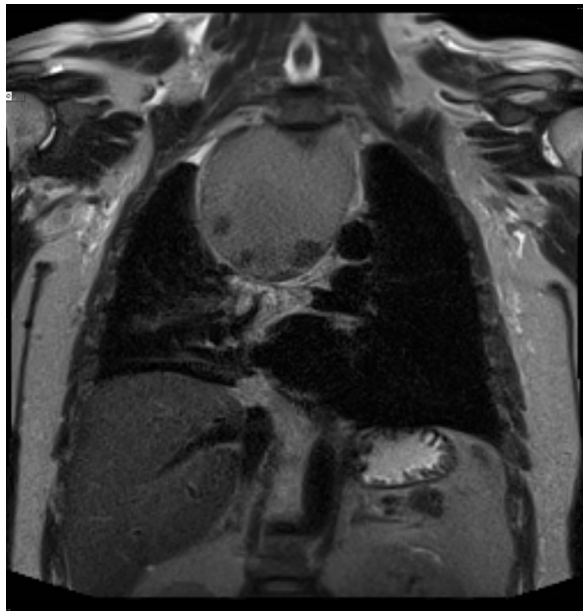

Fig. 2 – Coronal MRI Chest T2-weighted turbo-spin echo sequence with large cystic middle mediastinal mass with multiple tumefactive internal components.

first trimester of embryonic development, resulting in bronchogenic cyst, esophageal duplication cyst, and neurenteric cyst, respectively [2,3]. We present a case of a large cystic middle mediastinal mass causing significant compression of the trachea, esophagus, and mediastinal vessels including the brachiocephalic artery, as well as a successful attempt to decompress the lesion with CT-guided percutaneous aspiration.

Case report

A 51-year-old male with past medical history of hypertension originally presented with 2 weeks of dyspnea and orthopnea and 1 week of neck swelling. A chest radiographed was obtained which demonstrated a large upper mediastinal mass (Fig. 1). Subsequently a CT Chest was obtained to better evaluate the mass, which demonstrated a large middle mediastinal mass resulting in compression of the trachea, esophagus, and great vessels. The patient experienced subsequent progressive respiratory distress and was ultimately intubated for airway protection. Biopsy of the middle mediastinal mass was planned via an endoscopic approach, however, was delayed when the patient experienced rapid neurological decline. CT Head showed a large right hemispheric stroke secondary to brachiocephalic and common carotid artery compression. Neurosurgery was consulted and right decompressive craniectomy was performed.

Once the patient was stabilized, MRI Chest (Figs. 2 and 3) was performed which demonstrated an 11.7 cm well-circumscribed, non-enhancing predominately T2-hyerintense mass centered in the middle mediastinum with extension into the superior mediastinum, with layering tumefactive foci of T2-hypointensity most likely representing proteinaceous and hemorrhagic contents. Significant mass effect on the surrounding mediastinal structures was redemonstrated, with anteriolateral displacement of the trachea and compression of vascular structures including the brachiocephalic artery and superior vena cava, azygos vein and left brachiocephalic vein.

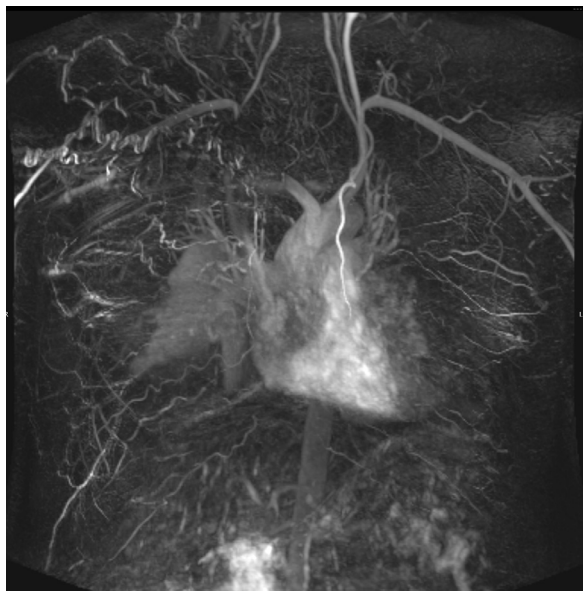

Fig. 3 – Coronal MRA Chest MIP image showing extensive venous collaterals, likely secondary to chronic mass effect on the superior vena cava. Partially seen is a tapered occlusion of the brachiocephalic artery, which likely contributed to patient's large right hemispheric stroke.

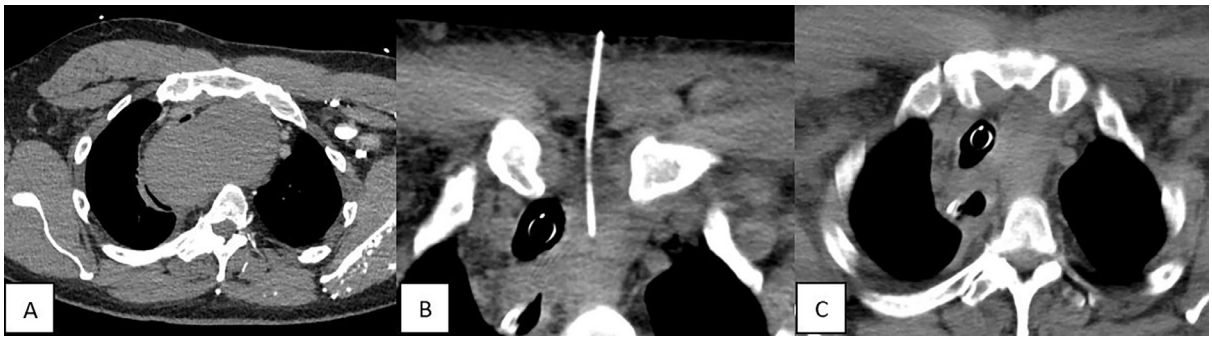

Fig. 4 – Axial pre-procedural CT Chest showing large cystic middle mediastinal mass with compression of surrounding mediastinal vasculature (A), intra-procedural CT showing percutaneous aspiration of the cystic mediastinal mass with an 18-guage catheter (B), and post-procedural CT showing near-complete decompression of the cystic mass, with improving tracheal deviation (C).

Aspiration of the cystic mediastinal mass was desired for both tissue diagnosis and decompression of the cystic mass. However, endoscopic ultrasound with aspiration was deferred due to the patient's clinical deterioration. Cardiothoracic Surgery likewise deemed the patient too unstable for definitive operative management. Interventional Radiology was consulted, and approximately 1 week after presentation a CT-guided percutaneous aspiration (Figs. 4A-C) of the middle mediastinal mass was performed with 400 cc of dark brown fluid aspirated and sent for flow cytometry. Post-procedure CT showed near-complete decompression of the cystic mass, with decreased mass effect on the surrounding mediastinal structures. Flow cytometry results were consistent with red blood cells and acellular proteinaceous debris and were negative for malignancy. The patient was monitored for signs of subsequent mediastinitis and experienced a mildly increased leukocytosis in the following days but remained afebrile.

Six days after successful aspiration of the cystic mediastinal mass, the patient underwent attempted bronchoscopy for management of tracheobronchial secretions which was complicated by massive pulmonary hemorrhage leading to cardiopulmonary arrest. Return of spontaneous circulation was achieved, however the patient had persistent endobronchial bleeding and worsening metabolic acidosis and underwent a subsequent cardiac arrest and was pronounced deceased shortly after. Autopsy was performed, which definitively identified the mediastinal mass as a mature cystic teratoma containing predominately brown liquid and gelatinous contents, with solid foci of thyroid tissue, squamous nests, and skeletal muscle. Of note, the teratoma was found to be tightly adhered to the trachea, and focal rupture of the mass into the trachea was identified, which was likely the etiology of the patient's ultimate endobronchial hemorrhage.

Discussion

Mature cystic teratoma's comprises 10%-15% of all mediastinal masses and 75% of mediastinal germ cell tumors [4]. By definition teratomas contain all 3 embryological layers including endoderm, mesoderm and ectoderm. Like most mediastinal masses, these cysts are usually asymptomatic until they grow large enough to cause compression on adjacent mediastinal structures. CT is the modality of choice for characterizing the nature and location of the lesion, as well as its relationship to surrounding structures [5,6].

The typical appearance of a mature cystic teratoma on imaging is a cystic mass with a clear capsule, usually containing sebaceous fluid, and is often unilocular (88%) but can be multilocular (10%). These teratomas typically feature fat components (93%), calcifications (56%) like teeth or bone, and sometimes floating hair or soft tissue masses (11%). In this case, no calcium was found, but when present, it is best identified on CT. The presence of intratumoral fat (either as sebum or macroscopic fat) is the most specific indicator of a mature teratoma.

On CT imaging, mature cystic teratomas conventionally present as well-defined, thick-walled structures with internal hypoattenuating cystic components consistent with water density [4,7]. When proteinaceous material or blood products are present, cysts may be higher in attenuation. Mature cystic teratomas can also have heterogenous internal components due to presence of fat, soft tissue, or calcification [8]. Smooth, homogeneously attenuating teratomas are more likely to be benign, whereas teratomas with enhancing internal components are more likely to contain malignant tissue. Mature teratomas are well-differentiated from the surrounding mediastinal tissues, whereas immature teratomas are poorly differentiated and may be more prone to malignant degeneration [5].

MRI also can play a critical role in diagnosing mature cystic teratomas. Mediastinal masses often lack distinguishing characteristics on CT, especially when cystic lesions contain hemorrhagic products which may increase their attenuation. MRI has been shown to be a reliable and accurate modality for excluding malignancy in cystic mediastinal masses. Standard MRI characterization of mediastinal cystic lesions involves T2-weighted, diffusion-weighted, and pre-and post-contrast T1-weighted sequences with fat saturation [6]. T2-weighted sequences can verify the cystic nature of the mass, whereas dynamic and subtraction imaging with pre-and post-contrast

T1-weighted sequences can evaluate enhancing soft tissue components within the mass. In- and opposed-phase chemical shift gradient recall echo sequences can be useful in determining the presence of microscopic intracellular fat, which may be seen in mature cystic teratomas as signal intensity dropout on opposed phase GRE sequences [6,8].

Unilocular, non-lobulated T2-hyperintense lesions without wall thickening or enhancing nodular components are typical of a benign etiology; however, up to 33% of probable benign cysts have been shown to have high signal intensity on T1-precontrast images, likely secondary to the presence of proteinaceous or hemorrhagic products [9]. No additional follow up is needed for definite or probable benign cysts characterized by MRI, Although follow up imaging is warranted for indeterminate lesions that exhibit eccentric enhancing wall thickening or nodular enhancement on postcontrast sequences [6].

Conventional treatment of most mediastinal masses including mature cystic teratomas involves open or thoracoscopic resection for symptomatic management and definitive pathologic diagnosis and relies on correctly identifying and resecting the entire cystic tract to prevent recurrence [10–12]. More recently, minimally-invasive robotic-assisted resection techniques have been described [12]. Percutaneous biopsy and aspiration of cystic mediastinal masses is usually avoided due to the risk of infection and mediastinitis, which has been reported to be as high as 14% [4,13].

In the case of our patient, aspiration of the cystic middle mediastinal mass was originally planned via an endoscopic approach. However, the patient's clinical deterioration including a large right hemispheric stroke delayed endoscopic aspiration. In this setting, we elected to attempt percutaneous aspiration of the cystic component of the lesion to both obtain a sample for flow cytometry, and to decompress the mass in hopes of alleviating mass-effect on the surrounding mediastinal vasculature, which was likely the etiology of the patient's right hemispheric stroke. The CT-guided percutaneous aspiration with a flexible 18-gauge catheter was technically successful, and the mass was almost completely decompressed with approximately 400 cc dark brown fluid removed. Although the flow cytometry showed only non-specific proteinaceous debris, the decompression of the mass did allow for a brief improvement in the patient's clinical status, without signs of resulting mediastinitis. However, it should be noted that the fluid within the cystic mediastinal mass did reaccumulate approximately 1 week following aspiration.

Literature review revealed a paucity of studies describing percutaneous aspiration of mediastinal mature cystic teratomas in adults. One case of percutaneous aspiration in a pediatric patient was described, with serial percutaneous aspiration of an anterior mediastinal cystic teratoma resulting in significant improvement in respiratory distress which was used as a Bridging therapy prior to definitive operative management [14]. An additional single case of fine-needle aspiration of a mature cystic teratoma of the cecum was described in an adult patient for diagnostic purposes prior to surgical resection. In the case of our patient, serial aspiration as a bridge to definitive therapy may have been necessary given the rapidly reaccumulating fluid following the initial drainage; however, the patient died from complications unrelated to the mediastinal cyst aspiration before repeat aspiration could be attempted.

Conclusion

In summary, large cystic mediastinal masses such as mature cystic teratomas can cause significant morbidity and mortality secondary to compression of surrounding mediastinal structures and can sometimes result in severe cardiopulmonary compromise. While CT is usually the first-line imaging modality of choice, MRI can provide valuable information regarding the malignant potential of the lesion. Image-guided percutaneous aspiration of cystic mediastinal masses can provide short-term symptomatic relief of mass-effect symptoms and assist in obtaining tissue samples to aid in diagnosis and can be a valuable adjunct therapy prior to definitive management with open versus thoracoscopic resection.

Patient consent

Informed written consent was obtained from the patient.

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