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Giant Azygos Vein Aneurysm Incidentally Detected During Breast Cancer Workup: A Case Report

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ABSTRACT:

Azygos vein aneurysms are extremely rare vascular anomalies of the mediastinum. Most are asymptomatic and incidentally found during imaging. Their rarity, non-specific presentation, and radiologic resemblance to other mediastinal masses make accurate diagnosis challenging. This case adds to the limited literature and emphasizes the value of preoperative imaging in diagnosis and surgical planning.A 54-year-old woman was admitted for evaluation of a left breast mass. She had no cardiopulmonary symptoms. Preoperative contrast-enhanced CT revealed a well-defined, homogeneously enhancing posterior mediastinal mass (8.1 × 3.9 cm) in continuity with the azygos vein. Given the lesion's size and unclear nature, surgical resection was performed via median sternotomy, with careful intraoperative handling to prevent thromboembolism. Pathology confirmed a thrombosed azygos vein aneurysm. Immunohistochemistry was positive for CD31, CD34, ERG, D2-40, calretinin, and WT-1, with a Ki-67 index <1%, consistent with a benign vascular lesion. The patient recovered well without complications. Azygos vein aneurysms, though rare, should be considered in the differential diagnosis of mediastinal masses. Cross-sectional imaging is essential for identifying vascular origin and planning safe resection. Surgical removal is indicated for large or uncertain lesions, particularly when thrombosis is present. Early diagnosis and intervention can prevent complications and offer definitive histological confirmation, especially in patients undergoing oncologic workup.

KEYWORDS:

Azygos Vein Aneurysm, Breast Cancer, surgical resection.

1. Introduction

Mediastinal venous aneurysms (MVAs) are extremely rare vascular abnormalities characterized by focal dilatation of mediastinal veins, most commonly involving the azygos vein or its tributaries [1]. Unlike arterial aneurysms, MVAs are often asymptomatic and are usually discovered incidentally during imaging studies performed for unrelated conditions. When symptoms do occur, they may include chest discomfort, cough, or dyspnea due to mass effect. Although typically benign, MVAs pose a risk of thrombosis, rupture, or embolism, particularly in large or enlarging lesions. Owing to their rarity and nonspecific imaging features, MVAs can be mistaken for other mediastinal masses such as lymphadenopathy, neurogenic tumors, or cysts. Contrast-enhanced computed tomography (CT) or magnetic resonance imaging (MRI) plays a crucial role in diagnosis by demonstrating vascular continuity and enhancement patterns. Management strategies range from conservative monitoring to surgical resection, especially in symptomatic patients or those with uncertain diagnosis [2]. Here, we report a rare case of azygos vein aneurysm discovered incidentally in a patient undergoing evaluation for breast cancer, which was subsequently confirmed intraoperatively and successfully resected.

2. Case Presentation

A 54-year-old female was admitted to the hospital due to a palpable mass in her left breast. She reported no symptoms such as cough, sputum production, chest pain, dyspnea, or dysphagia upon admission. Her appetite, mental status, and exercise tolerance remained normal. She had no history of hypertension,

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diabetes, or chronic bronchitis. The patient was admitted to the Department of Breast Surgery and was diagnosed with invasive carcinoma of the left breast. Preoperative contrast-enhanced chest CT revealed a low-density mass adjacent to the mediastinum in the right thoracic cavity, measuring approximately 8.1 × 3.9 cm (Figure. 1). The lesion had a well-defined margin and smooth borders. Contrast enhancement showed significant and homogeneous enhancement, and the mass was found to communicate with the azygos vein, raising suspicion of a venous aneurysm. The patient subsequently underwent venous aneurysm resection and thrombectomy under extracorporeal circulation without cardioplegic arrest. Upon opening the aneurysmal sac, the inner wall exhibited typical venous endothelial characteristics, and the aneurysmal cavity displayed a honeycomb-like structure with localized thrombus formation at the base (Figure 2). The lesion had a complex anatomical relationship with the azygos arch and adjacent intercostal vessels and received mixed arterial and venous blood flow. Careful dissection and mobilization of the aneurysmal wall were performed intraoperatively. The base of the aneurysm was delivered intraluminally through its neck and subsequently ligated at the neck. After resecting the majority of the aneurysmal wall, the neck was meticulously reinforced to ensure complete closure. Postoperative histopathological examination confirmed the diagnosis of a venous aneurysm. Postoperative recovery was uneventful, and the patient was discharged in good condition.

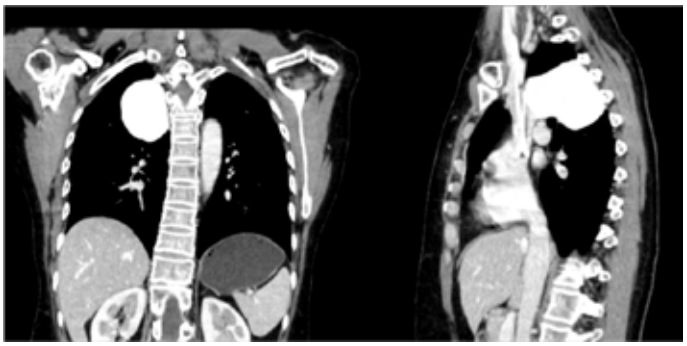

Figure 1: Contrast-enhanced chest CT showed a well-defined low-attenuation mass in the right thoracic cavity adjacent to the mediastinum, showing contrast enhancement and continuity with the azygos vein.

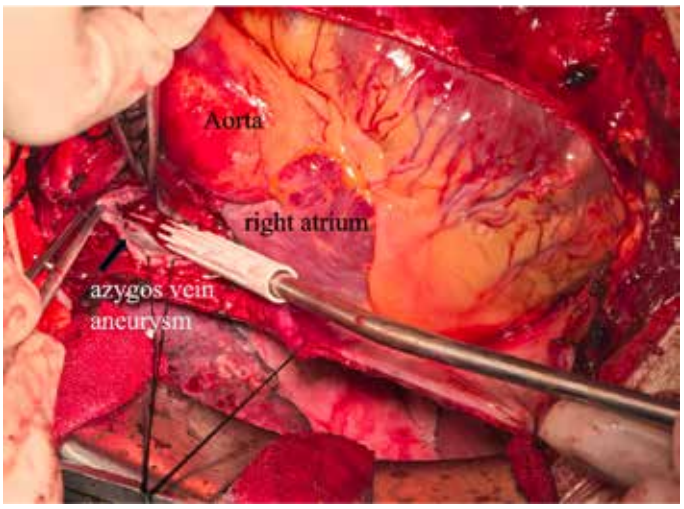

Figure 2: surgical resection of the venous aneurysm: The black arrow in the figure indicates the azygos vein aneurysm, whose inner wall exhibits typical venous endothelial characteristics. Localized thrombus is visible at the base, and the aneurysmal cavity displays a honeycomb-like structure with continuity to the azygos arch and adjacent intercostal vessels.

3. Discussion

Mediastinal venous aneurysms (MVAs), particularly those involving the azygos vein, are exceedingly rare vascular anomalies with unclear pathogenesis. Since their first description, fewer than 50 cases have been reported in the literature [3]. MVAs are typically asymptomatic and are often discovered incidentally during imaging for unrelated conditions, as in the present case. The underlying mechanism remains uncertain and may involve congenital weakness of the venous wall; however, acquired factors such as increased intrathoracic pressure or trauma have also been proposed [4]. Radiologically, MVAs can mimic various mediastinal masses, including lymphadenopathy, neurogenic tumors, pericardial cysts, or malignancies. Nevertheless, contrast-enhanced CT or MRI can help differentiate venous aneurysms by demonstrating vascular characteristics, such as smooth margins and enhancement patterns consistent with blood vessels [4]. In this case, the lesion showed homogeneous enhancement and a clear continuity with the azygos vein, leading to a preoperative suspicion of a venous aneurysm.

Currently, there are no established guidelines for the management of MVAs. However, several case reports and reviews have suggested general indications for surgical intervention [5-8]. These include: (1) diagnostic uncertainty requiring histological clarification to rule out malignancy or other mediastinal tumors; (2) the presence of symptoms such as chest pain, cough, dysphagia,

or superior vena cava compression; (3) large aneurysms (generally >4 cm in diameter) or those demonstrating progressive enlargement; (4) imaging evidence of intraluminal thrombosis, posing a risk of pulmonary embolism; and (5) concurrent oncologic surgery requiring exclusion of mediastinal pathology. In such cases, surgical resection provides not only a definitive diagnosis but also prevents potential complications.

Histopathological analysis of the resected specimen revealed positive immunohistochemical staining for CD31, CD34, and ERG, supporting a vascular endothelial origin. D2-40, calretinin (CR), and WT-1 were also positive, possibly indicating expression related to perivascular mesothelium or lymphatic endothelium, consistent with a complex vascular cystic lesion. The Ki-67 proliferation index was less than 1%, indicating extremely low proliferative activity. Based on morphologic and immunohistochemical features, the final diagnosis was a thrombosed azygos vein aneurysm, a benign vascular malformation (Figure. 3).

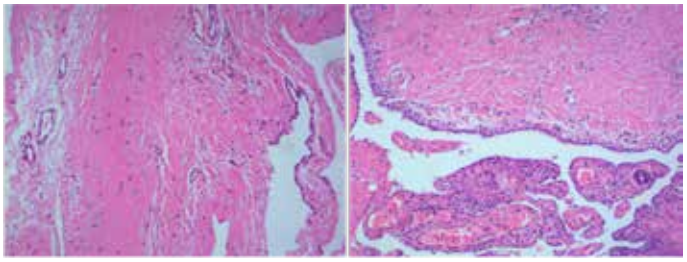

Figure 3: Histopathological features of the venous aneurysm: Hematoxylin and eosin (H&E) staining shows proliferation of fibrous tissue with surface mesothelial cell hyperplasia. Within the cyst wall, numerous proliferative vascular structures are present, some exhibiting thickened walls. These findings support the diagnosis of a venous aneurysm. (Original magnification: ×100)

In the present case, a large azygos vein aneurysm (AVA) was incidentally detected on preoperative imaging and subsequently confirmed intraoperatively, with associated thrombus formation. The lesion was successfully resected under extracorporeal circulation. A review of the literature reveals several comparable cases: Kreibich et al. (2017) reported a symptomatic large AVA treated surgically with favorable outcomes [1]; Kurihara et al. (2012) described an asymptomatic AVA that developed thrombosis during long-term follow-up and was also managed surgically [9]; and Ko et al. (2013) presented a series of 10 idiopathic AVA cases with variable clinical presentations, in which management strategies included surgical resection, endovascular intervention, or conservative observation [10]. Compared with these cases, the current patient exhibited representative features in terms of clinical presentation, radiological findings, and treatment strategy, and highlights the potential for AVAs to be misdiagnosed as mediastinal tumors, thereby prompting surgical exploration. Although standardized treatment guidelines are lacking, cumulative experience suggests that surgical resection remains the mainstay of management for symptomatic cases, those with thrombosis, or when the diagnosis is uncertain. This underscores the importance of accurate preoperative recognition of venous lesions to guide appropriate clinical decision-making.

4. Conclusions

In this case, the aneurysm measured approximately 8 × 4 cm and, although asymptomatic, exceeded the typical threshold for intervention and presented with significant diagnostic uncertainty. Contrast-enhanced CT clearly demonstrated continuity with the azygos vein and homogeneous enhancement, facilitating preoperative suspicion of a vascular anomaly and guiding surgical planning. Intraoperatively, the lesion's anatomical complexity—including its proximity to the azygos arch and intercostal vessels—necessitated careful dissection and vascular flow control to prevent thromboembolism, particularly given the presence of mural thrombosis. This case highlights the diagnostic challenges and operative considerations associated with mediastinal venous aneurysms (MVAs), a rare but clinically relevant entity that may mimic other mediastinal masses. As high-resolution imaging becomes increasingly integrated into oncologic workups, incidental detection of such lesions is expected to rise. Consequently, a growing body of case reports like this one may contribute to the development of consensus-based guidelines for the diagnosis and management of MVAs. Future directions should include the creation of risk stratification tools and refined surgical indications based on lesion size, symptomatology, thrombotic risk, and anatomical complexity. Accurate radiologic-pathologic correlation remains essential for guiding appropriate treatment strategies and avoiding unnecessary interventions.

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