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Azygos Vein Aneurysm with Thrombosis and *Aspergillus fumigatus* Diagnosed Using Bronchoscopy: Case Report

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Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Funds Collection G

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Patient: Female, 86-year-old
Final Diagnosis: *Aspergillus fumigatus* infection • azygos vein aneurysm with thrombosis
Symptoms: Acute respiratory failure • paresthesia
Medication: —
Clinical Procedure: Bronchoscopy
Specialty: Critical Care Medicine • General and Internal Medicine • Pulmonology

Objective: Unusual clinical course

Background: The venous system of the posterior thoracic wall merges into a single trunk called the azygos vein, located in the posterior mediastinum, before draining into the superior vena cava. An aneurysm in the azygos vein is extremely rare. Such aneurysms are discovered as incidental radiology findings or while investigating a mediastinal mass. Visualization via bronchoscopy is atypical.

Case Report: An 86-year-old female patient presented to the Emergency Department with a 5-day complaint of dyspnea and chest pain. She was admitted because of worsening condition leading to respiratory failure and paresthesias. She underwent endotracheal intubation and invasive mechanical ventilatory support. A chest X-ray showed a thickened mediastinum, tortuous thoracic aorta, and bilateral perihilar infiltrate with right predominance. Bronchoscopy revealed bleeding along the right bronchus and a blue protrusion coated with white material at the entrance of the main right bronchus. A pulmonary computed tomography angiography confirmed the presence of an azygos vein dilatation. Culture of bronchoalveolar lavage revealed *Aspergillus fumigatus*.

Conclusions: Bronchoscopy as a diagnostic method allows clinicians to verify the state and permeability of the airways during investigation of azygos vein aneurysms, which are rare entities but should be considered in the differential diagnosis of mediastinal masses and may be complicated by fungal pathogens such as *Aspergillus fumigatus* mostly in immunocompromised patients.

MeSH Keywords: Aneurysm, Infected • *Aspergillus fumigates* • Azygos Vein

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/923401

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Background

The azygos vein is a venous trunk that originates at the lumbar vertebrae L1–L2 level and joins into the superior vena cava after arching over the right pulmonary hilum. Right intercostal veins drain directly into the azygos vein, whereas the left intercostal veins drain into the hemiazygos and accessory hemiazygos veins that join the azygos as it ascends through the posterior mediastinum [1].

An azygos vein aneurysm (AVA) is an uncommon cause of a mediastinal mass. It is a rare finding, with approximately 40 cases reported. It is often described as a saccular, fusiform, or oval mass that varies between 2.5 and 5 cm in diameter. It has been hypothesized that AVAs have a congenital origin given that in most published cases the aneurysm was located at a critical point of anatomical weakness, which corresponds to the union between two embryological vessels: the right supracardinal vein (azygos vein) and the right anterior cardinal vein (superior vena cava) [2,3].

In the past, venography was used as a diagnostic method. However, computed tomography (CT) and magnetic resonance imaging (MRI) are currently the noninvasive methods of choice for evaluation of vascular abnormalities and can help rule out other entities that cause azygos vein dilation [4,5].

In the following case, a patient with respiratory failure and an AVA, infected with *Aspergillus fumigatus*, was observed for the first time through bronchoscopy.

Case Report

An 86-year-old female patient entered the emergency department (ED) with moderate dyspnea and chest pain. The patient did not tolerate a decubitus position during examination. Past medical history included arterial hypertension (controlled with losartan 100 mg and atenolol 50 mg) and diabetes mellitus type II (DM) (controlled with metformin 850 mg). She had no previous history of hemoptysis. Glycosylated hemoglobin was 7.8% (range 4.0–6.4%). Further interrogation revealed that the patient had parrots (Psittacidae) as pets for at least 10 years.

At the time of admission, the patient was oriented and had a Glasgow score of 15/15. Physical examination showed general pallor and jugular vein engorgement. She had normal S1 and S2 heart sounds, with regular rhythm, although tachycardic. Vesicular murmur was abolished in both bases.

Chest radiography showed a discrete thickening of the pulmonary vascular tissue, thickened mediastinum, bilateral infiltrates with right predominance, and an alveolar interstitial pattern with reinforcement of the fissures.

While in the ED, her condition declined with worsening acute respiratory failure and new-onset paresthesias. She underwent endotracheal intubation and was transferred to the intensive care unit.

She had minor coagulation alteration with an international normalized ratio of 0.99 (normal range, 1 to 1.5 times the control value in seconds), a prothrombin time of 11.9 s (normal range 11 to 13.5 s), and a thromboplastin time of 25.9 s (normal range 30 to 40 s). She had leukocytosis of 17 300 mm^3 (normal range 4400 to 11 300 mm^3), red blood cell count of $4.23\times10^6/mm^3$ (normal range 4.3 to $5.9\times10^6/mm^3$), hemoglobin of 13.2 g/dL (normal range 12 to 16 g/dL), hematocrit of 39.6% (normal range 42% to 50%), monocytes of 0.69/mm^3 (normal range 0 to 0.8/mm^3), neutrophils of 8.1/mm^3 (normal range 1.8 to 7.7/mm^3), lymphocytes of 7.84/mm^3 (normal range 1.0 to 4.8/mm^3), basophils of 0.05/mm^3 (normal range 0 to 0.2/mm^3), and platelets of 198 000/mm^3 (normal range 150 000 to 450 000/mm^3). Renal function was compromised, with a blood urea nitrogen of 26 mg/dL (normal range 7 to 21 mg/dL) and creatinine of 1.9 mg/dL (normal range 0.7 to 1.2 mg/dL). Arterial blood gas revealed severe acidosis, with a pH of 7.00, pCO_2 of 60 mmHg, HCO_3^- of 15 mmol/L, pO_2 of 70 mmHg, and EB+6 SO_2 of 92%. Electrolyte analysis revealed sodium at138 mEq/L (normal range 135 to 145 mEq/L), an elevated potassium of 5.0 mEq/L (normal range 3.5 to 4.5 mEq/L), and chlorine at 105 mEq/L (normal range 98 to 110 mEq/L).

The CT scan of the chest showed a radiopaque image located in the upper segment of the right basal area, with areas of bilateral condensation and small adjacent bilateral pleural effusions (Figure 1).

An electrocardiogram showed atrial fibrillation with rapid ventricular rate. Mechanical ventilation was supplied with intermittent positive pressure ventilation assist (IPPV-Assist/control) (Drager evita 2 dura manufactured by Drägerwerk AG & Co). Ventilation was set up to fraction of inspired O_2 (FiO_2) of 35%, tidal volume (TV) of 510 mL, inspiratory time of 1.2 s, respiratory rate of 14 breaths/min, flow of 45 L/min, and positive end expiratory pressure (PEEP) of 5 cm of H_2O. The patient's acute physiology and chronic health disease classification system II score was 32. In addition, antibiotic therapy with ampicillin sulbactam and clarithromycin, vasopressor support, and sedation were provided.

The patient's condition continued to decline without clinical response to antibiotic treatment. Therefore, it was decided to perform a bronchoscopy to obtain cultures and identify a causal agent. Bronchoscopy revealed blood clots at the carina and

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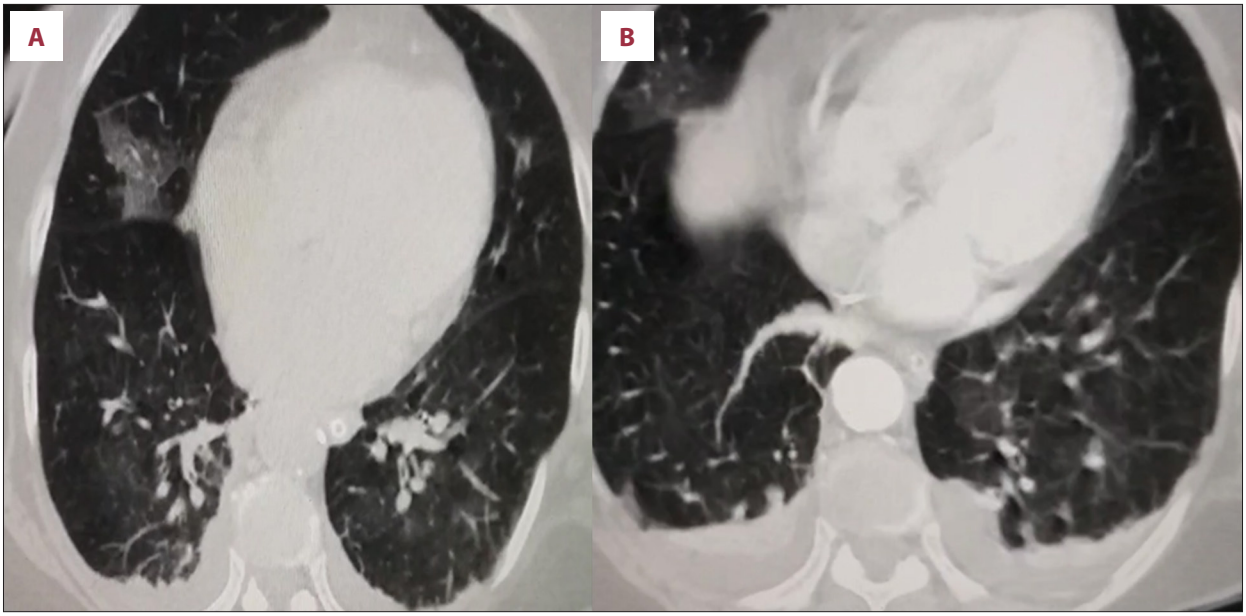

Figure 1. (**A, B**) Axial section radiopaque image located in the upper segment of the right basal area, with areas of bilateral condensation and small adjacent bilateral pleural effusions.

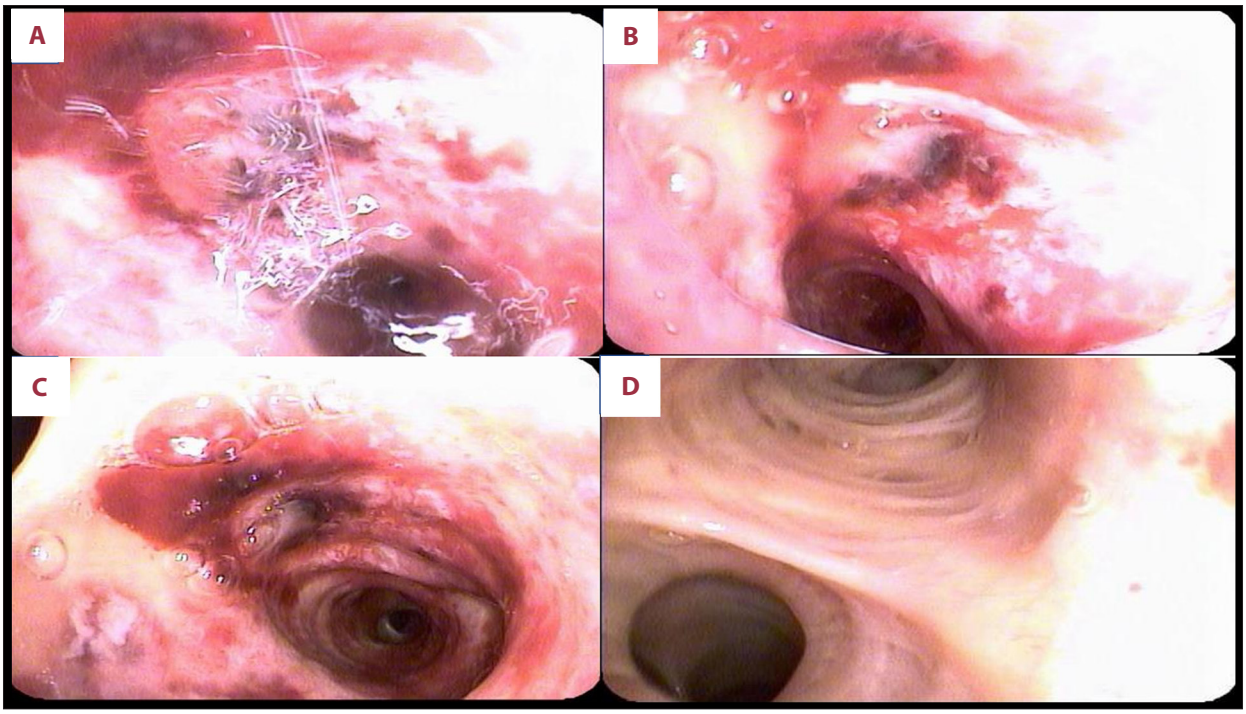

Figure 2. (**A–D**) Bronchoscopy in which a diffuse hemorrhagic stipple is observed with anacareous plates, bloody mucus secretions and blood clots, presence of an azygos vein aneurysm.

right main bronchus. In the top lobe of the right lung, whitish-colored plates adhering to the bronchial wall were observed. There was also friable mucosa, blood clots without active bleeding, bronchial hyperreactivity, restructuring of the bronchial walls, decreased bronchial function, and a blue protrusion at the right main bronchus. Samples were extracted for culture and antibiogram. Additionally, bronchoalveolar lavage (BAL) was performed to investigate for mycobacteria (polymerase chain reaction) and fungi (Figure 2). The findings during bronchoscopy prompted further investigation to characterize the apparent mass. The differential diagnosis included lymphadenopathy, neurogenic tumors, and vascular defects

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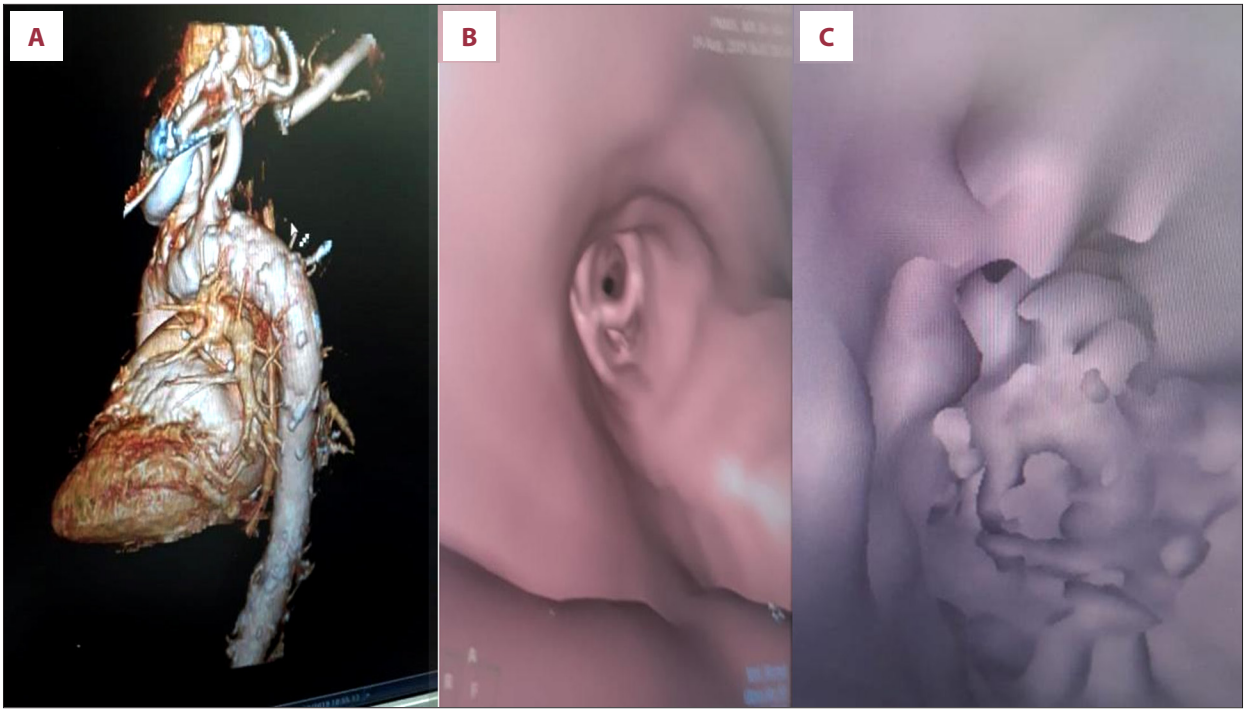

Figure 3. (**A**) Computed tomography angiography with venous and arterial phase and three-dimensional reconstruction: azygos vein aneurysm is observed. Virtual tomographic image of bronchoscopy (**B, C**).

including azygos vein aneurysm. A CT angiography with venous and arterial phase and three-dimensional reconstruction was performed immediately after bronchoscopy (Figure 3), which showed the presence of azygos vein dilatation consistent with the protrusion observed during bronchoscopy.

The culture of the BAL showed the presence of *A. fumigatus*. Intravenous liposomal amphotericin B at a daily dose of 3 mg/kg and itraconazole (200 mg once a day) were added. The patient showed improvement in clinical and hemodynamic parameters. The patient was weaned off the respirator to bilevel positive airway pressure; however, because of poor adaptation she was again placed in IPPV mode with the following parameters: FiO_2 45%, TV 400 mL, inspiratory time 0.85 s, respiratory rate 20 breaths/min, PEEP 5 cm of H_2O, flow 45 L/min.

The patient's hemodynamics were unstable with sustained hypertension; blood pressure was 184/77 mmHg and heart rate was 112 beats/min. Intravenous beta blockers were unavailable at that time in our hospital center so digoxin 0.50 mg was prescribed in a single dose, thus reducing the patient's heart rate that remained at 110/min with a 1 mL/kg per hour diuresis rate. Digoxin was discontinued once the patient maintained sinus rhythm and continued with beta blocker carvedilol at a dose of 6.25 mg/day. By day 5, the patient rapidly progressed to high-response atrial fibrillation with a heart rate of 180 beats/min. Unfortunately, the patient underwent cardiac arrest and died. No lung or bronchial biopsy was performed, and postmortem autopsy was declined.

Discussion

We report a case of AVA with mycological implantation of *A. fumigatus* as visualized by fiber bronchoscopy. AVAs are uncommon and occasionally diagnosed by accident; they can be mistaken for a mediastinal mass or tumor arising from the accessory pleura [3].

AVAs are often asymptomatic. However, complications such as thrombosis, rupture, or compression of adjacent organs have been described, although clinical symptoms are usually unspecific [6]. CT and MRI scans are effective diagnostic tools. However, there are few reports on the use of bronchoscopy as a diagnostic method, making this an exceptional case. Bronchoscopy is the gold standard to identify and extract foreign bodies within the airway. However, with the help of virtual bronchoscopy or CT-generated bronchoscopy, the location of the foreign body can be determined before any invasive intervention is needed. Additionally, because it is noninvasive, it can be performed to check the patency of airways, increasing its advantages [7,8].

The onset of AVAs can be idiopathic, acquired, or traumatic. In this case, it is uncertain if the vein wall had previous or even

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congenital defects. If present, these defects could favor the establishment of *Aspergillus* conidia. The absence of previous respiratory symptoms and the acute onset of dyspnea in the patient suggests an acute *Aspergillus* infection [9,10]. Additionally, the infection was further aggravated by the immunosuppressive effects of inadequately managed DM. The case describes the incidental bronchoscopy visualization of azygos vein dilation superimposed by *Aspergillus* lung infection.

Aspergillus fumigatus is one of the most ubiquitous airborne saprophytic fungi [11]. Humans and animals constantly inhale numerous conidia of this fungus. The conidia are normally eliminated in the immunocompetent host by innate immune mechanisms; however, immunocompromised hosts can present serious invasive infections. For example, our patient bred birds and lived with a parrot at home, from which the spores may have spread [12].

Once the suspicion of *Aspergillus* is established, treatment should be started as soon as possible. Voriconazole, amphotericin B, and isavuconazole are the most effective treatments [13]. The efficacy of these antifungals could have been limited because of the development of a collective structure of adherent microorganisms coated with a protective layer secreted by the microorganisms themselves (biofilms). Studies have shown that the use of new combined therapeutics could be effective against adaptive resistance to antifungal agents of *A. fumigatus* biofilms [13].

To date, there are no guidelines or reviews on the optimal treatment strategy for AVA, but interventional or surgical treatment should strongly be considered in cases with clinical symptoms such as pulmonary embolism or pulmonary arterial hypertension, thrombus formation within the AVA in patients with oral anticoagulation, or patients with a contraindication to oral anticoagulants [14].

Surgical excision of the aneurysm-debridation of infected tissue or replacement with graft is standard of care [14]. However, this was not possible because of the patient's age and hemodynamic conditions.

To date there are no data describing the presence of an AVA associated with *Aspergillus* infection or a bronchoscopy visualization of an AVA.

Conclusions

We emphasize bronchoscopy as a diagnostic method that allows clinicians to verify the state and permeability of the airways. AVAs, which are rare entities, should be considered in the differential diagnosis of mediastinal masses, and may be complicated by fungal pathogens such as *A. fumigatus*, mostly in immunocompromised patients.

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