Use of Multimodality Imaging in Diagnosing Invasive Fungal Diseases of the Heart

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Invasive fungal diseases of the heart are rare, frequently fatal causes of cardiac masses. On imaging, they are difficult to distinguish from other entities, such as thrombi or tumors. The combined use of multiple imaging modalities can aid in diagnosis when integrated with clinical data.[1] However, no imaging findings are pathognomonic for invasive fungal disease. We report 4 cases of invasive fungal disease of the heart. Two patients had undergone solid organ transplantation, another had myelodysplastic syndrome, and one was an intravenous drug user. Two patients had invasive aspergillosis, one with valvular endocarditis and another with an intramyocardial abscess, whereas 2 patients had mucormycosis and candidiasis, respectively. Although fungal infections do not have robust central perfusion on cardiac magnetic resonance imaging (a feature of many malignant masses), they often demonstrate delayed peripheral enhancement around the mass, a nonspecific feature suggestive of an infectious cause.[2]

Case 1: Aspergillus Mitral Valve Endocarditis

A 26-year-old woman with cystic fibrosis, status-post bilateral lung transplantation presented with skin lesions and a positive Galactomannan assay concerning for disseminated aspergillosis. She developed new thalamic strokes suggestive of a potential cardioembolic source. Skin biopsies confirmed infection with *Aspergillus fumigatus* (Figure 1). Imaging is shown. She subsequently underwent mitral valve debridement, resection, and replacement. Pathology of the mitral valve revealed *Aspergillus*. She had been on treatment for months with voriconazole and micafungin. Despite salvage therapy with posaconazole, she developed an embolic intracerebral hemorrhage and expired.

Case 2: Isolated Pulmonary Valve Mucor Endocarditis

A 60-year-old woman with transfusion-dependent myelodysplastic syndrome with secondary hemochromatosis complicated by iron overload cardiomyopathy presented with malaise, fatigue, and shortness of breath. Echocardiography demonstrated an enlarging cardiac mass concerning for thrombus in the region of the pulmonic valve extending into the main pulmonary artery (Figure 2). The patient underwent pulmonary embolectomy and pulmonic valve debridement. She was treated with liposomal amphotericin B followed by isavuconazole. Shortly, thereafter, she expired from sepsis.

Case 3: An Intramyocardial Aspergillus Abscess in a Post-Transplant Patient

A 65-year-old female presented with chest pain and dyspnea after cardiac transplantation. Various imaging modalities are shown in Figure 3 and demonstrated a right atrial mass. She developed tamponade physiology from compression of her right heart. She underwent debulking of the abscess but had worsening respiratory failure and circulatory collapse.

Case 4: Tricuspid Valve Candida Endocarditis in an Intravenous Drug User

A 33-year-old man with history of intravenous drug use and a past history of enterococcal endocarditis requiring mechanical aortic and bioprosthetic tricuspid valve replacements presented with fevers and a new harsh systolic murmur in the tricuspid position. Echocardiography demonstrated a vegetation on the tricuspid valve (Figure 4). The course was complicated by septic pulmonary emboli with negative blood cultures. Because of severe tricuspid stenosis and extension of the vegetation into the right ventricle, the patient underwent reoperation tricuspid valve replacement with permanent epicardial pacemaker lead placement.

Disclosures

None.

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KEY WORDS: aspergillosis ■ candidiasis ■ chest pain ■ dyspnea ■ Mucor

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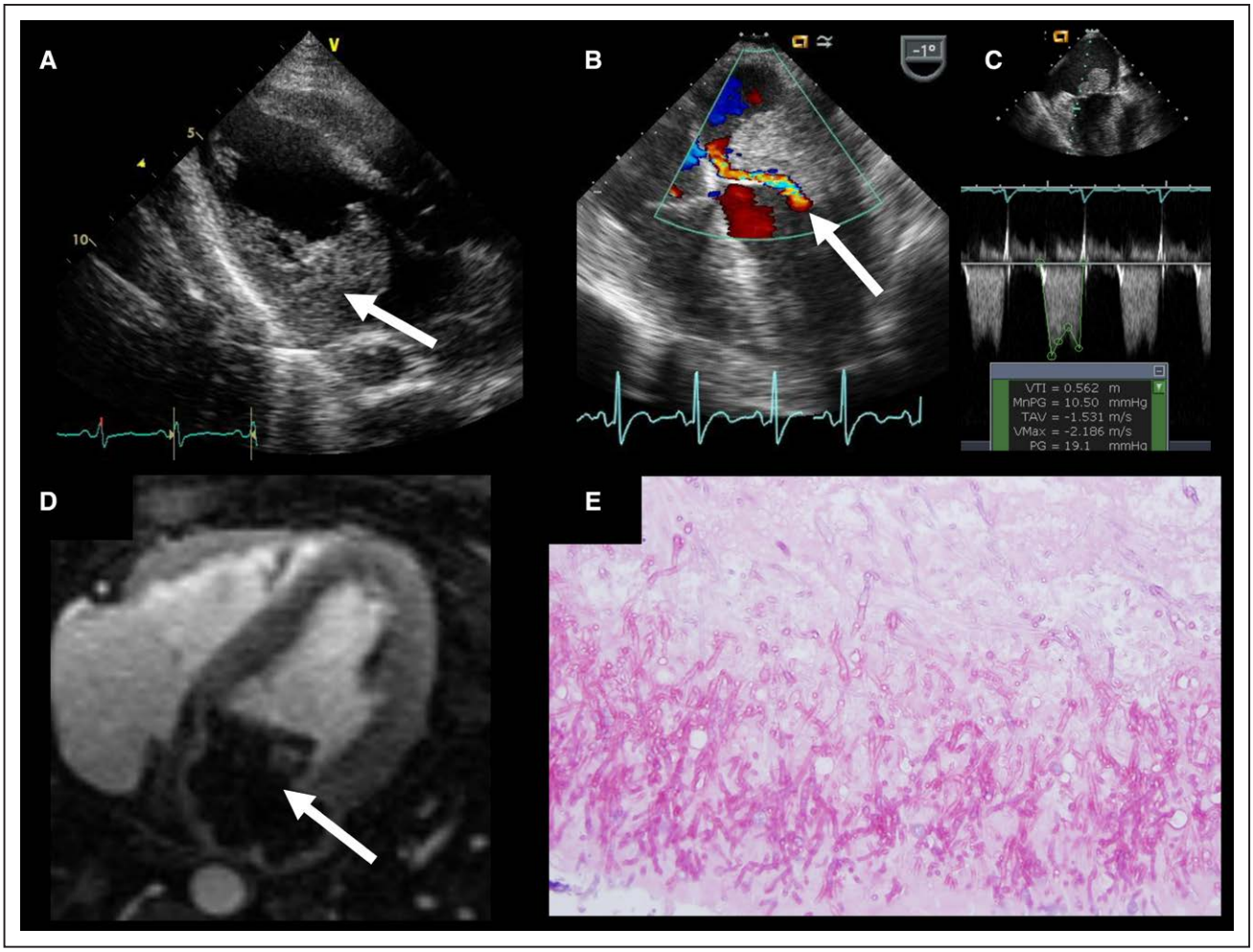

Figure 1. Parasternal long-axis view on transthoracic echocardiography (**A**) showed a mobile echogenic mass (arrow) on the posterior mitral valve concerning for endocarditis. Transesophageal echocardiography with Doppler studies demonstrated high velocity flow through the mitral valve secondary to inflow obstruction from the mass (**B, C**). Cardiac magnetic resonance imaging demonstrated a nonenhancing mobile mass in the left atrium with mild peripheral enhancement (**D**). Pathology of the mitral valve revealed acute fungal endocarditis with septated, acute-angle branching hyphal forms consistent with Aspergillus. Extensive valve tissue destruction was also present (**E**).

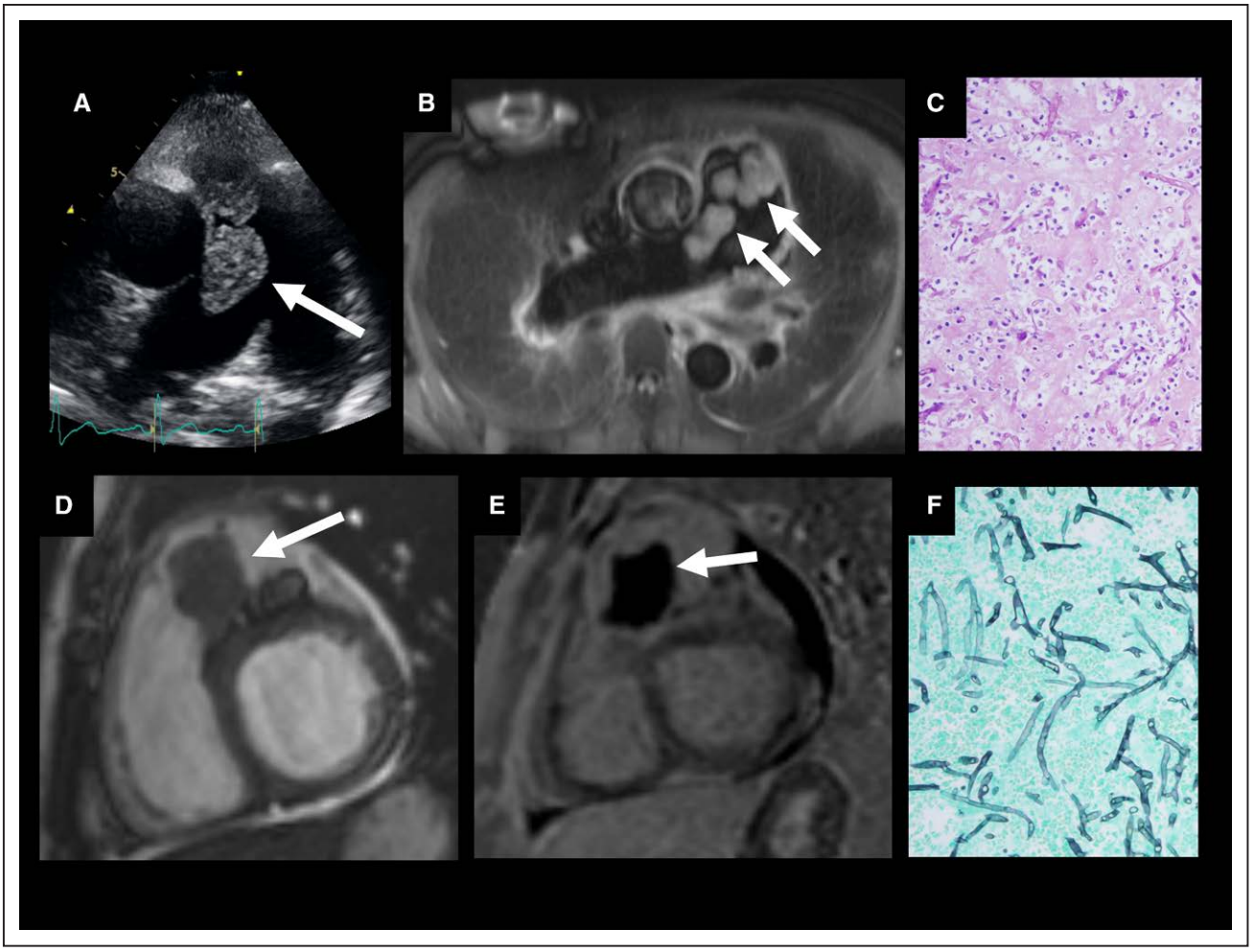

Figure 2. Transthoracic echocardiography showed an enlarging cardiac mass concerning for thrombus in the region of the pulmonic valve extending into the main pulmonary artery (**A**). Cardiac magnetic resonance imaging subsequently showed a large multilobulated mass in the main pulmonary artery (**B, D**). The mass did not demonstrate any late gadolinium enhancement, making it suspicious for thrombus (**E**). Pathology of the mass after valve debridement revealed large, broad ribbon-like, pauciseptate fungal forms with narrow angle to 90° branching consistent with Mucor. The fungal forms were mixed with fibrin in the pulmonary thrombus (**C, F**).

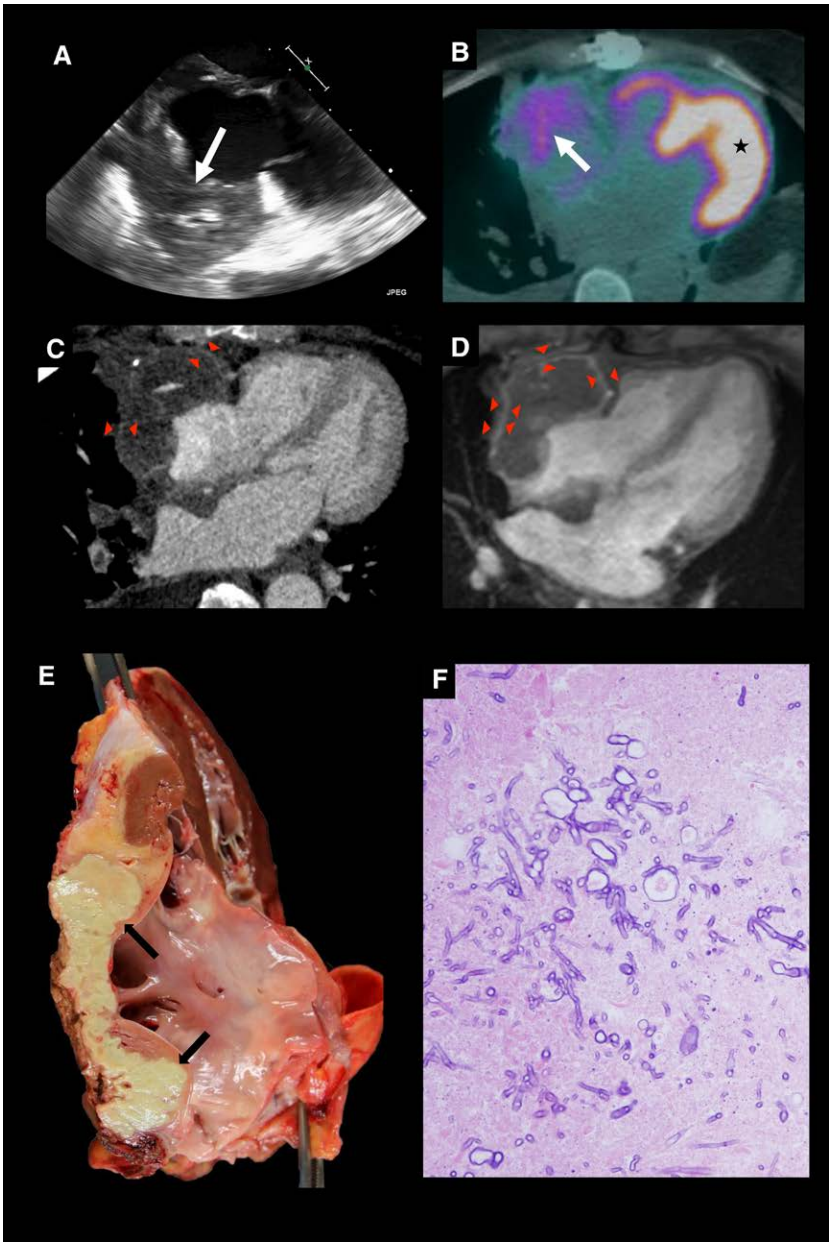

Figure 3. Transesophageal echocardiography revealed a large fixed mural mass in the right atrium (**A**). Positron emission tomography showed a mildly fluorodeoxyglucose-avid mass involving the right middle lobe inseparable from the right atrium (**B**). Bronchoalveolar lavage cultured Paecilomyces, which was treated with isavuconazole. Subsequent cardiac computed tomography showed an enlarging mediastinal mass protruding into the right atrium with heterogenous peripheral enhancement concerning for infected tissue (**C**). Similarly, cardiac magnetic resonance imaging showed a rim-enhancing cavitary mass compressing the right atrium, extending into the right atrial wall (**D**). Autopsy revealed a large pericardial abscess with extension into the mediastinum and right-sided pleura (**E**) with postmortem histopathology revealing numerous septated hyphal forms with dichotomous 45° angle branching confirming invasive Aspergillus despite 4 mo of antifungal treatment and persistently negative Galactomannan (**F**).

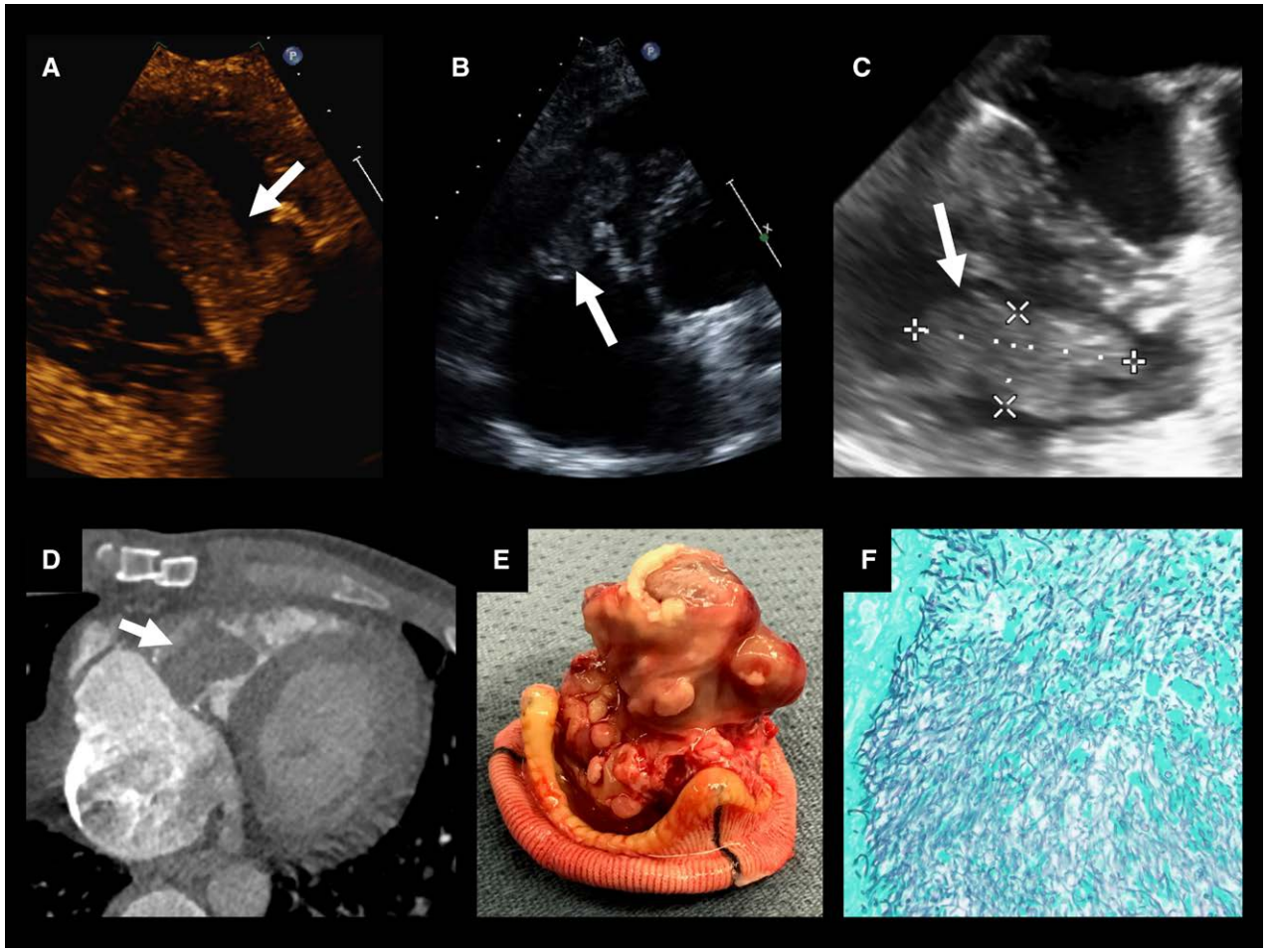

Figure 4. Transthoracic echocardiography revealed a large mobile echodensity on the tricuspid valve resulting in prosthetic valve stenosis (**A**). Transesophageal echocardiography confirmed the large vegetation on the bioprosthetic tricuspid valve (**B, C**). Computed tomography of the chest revealed a large mass attached to the tricuspid valve, extending throughout the right ventricle and obscuring the prosthetic valve (**D**). Intraoperatively, the tricuspid valve was grossly infected (**E**). Pathology revealed robust overgrowth of fungal forms of unicellular budding yeast and pseudohyphae, consistent with Candida. Molecular diagnostic testing confirmed *Candida albicans* (**F**).

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