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Original Article

Imaging findings, diagnosis, and clinical outcomes in patients with mycotic aneurysms: single center experience☆

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ABSTRACT

Purpose: To review the presentation, imaging, clinical management, and outcomes in patients with mycotic aneurysm (MA).
Methods: Fifty-five cases in 49 patients (33 men, 16 women, average age: 66.2 years) were identified.
Results: Of 49 patients, only 20% presented with the classic clinical triad of fever, elevated white count, and pain. Computed tomography was the most utilized imaging modality; focal vascular outpouching was the most frequent imaging finding (76%). There was 17% mortality rate within 6 months of diagnosis despite intervention.
Conclusions: Clinical presentation and blood cultures can be nonspecific, highlighting the importance of imaging diagnosis of MA to expedite treatment.

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1. Introduction

Mycotic aneurysm (MA) is a challenging imaging diagnosis despite abnormal laboratory values or suggestive clinical findings. MA is rare, comprising roughly 1% of surgically treated aortic aneurysms [1–3]. However, aortic MA is associated with mortality rates of 15–50% [1–5]. Early recognition is critical to prevent poor outcome [1,2]; clinical suspicion must be high, as imaging interpretation may be key to suggesting diagnosis.

The pathogenesis of MA involves arterial wall degeneration, hastened by infiltration of immune cells secondary to bacterial infection, which may be due to direct inoculation, arterial injury, or contiguous infection [6–8]. Because of this rapid progression, MA typically appears as a saccular outpouching. Other imaging features suggestive of infected aneurysm can include arterial wall irregularity and perivascular soft tissue changes, inflammation, gas, and edema.

Treatment of MA involves intravenous antibiotics and most frequently surgical intervention with bypass grafts [1–3]. Endovascular repair, while controversial, has been used with success [9–11]. Despite available treatments, mortality is high, particularly in the case of aneurysmal rupture [12]. Prognosis is grave when diagnosis is delayed. Given the difficulty in recognizing this clinical entity, this study was intended to review the clinical presentation, imaging findings, and treatment outcome of MAs at our institution.

2. Materials and methods

With institutional review board approval, this Health Insurance Portability and Accountability Act of 1996-compliant study involved a search of the radiology department electronic database for "mycotic aneurysm," excluding cerebral aneurysms. Between 1992 and 2013, this search produced 55 cases of MA present in 49 patients (33 men and 16 women) with an average age of 66.2 years (range: 18–93 years).

Electronic medical records were used to ascertain demographics (age and gender); anatomic location of the aneurysm; microbiology and hematology results; antibiotics administered; invasive procedure performed; radiologic, surgical, and pathological findings; and clinical outcome including mortality.

3. Results

Of the 49 patients, 10 presented with a triad of fever, elevated white blood cell count (WBC), and pain associated with the site of MA; 7 presented with elevated WBC and fever; 9 presented with elevated WBC and pain; 4 presented with fever and pain; 6 presented with elevated

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Table 1
Imaging findings on different imaging modalities

Imaging feature	CT	MRI	Nuclear scan	Conventional arteriography
Saccular outpouching	×	×		×
Perivascular inflammation	×	×	×	
Intramural gas	×			
Rupture	×	×		×
Increase in size	×	×		×

WBC only; 3 presented with fever only; 5 presented with pain only; and 5 had no symptoms directly referable to the MA and were either asymptomatic or had a nonspecific presentation. Thus, only a minority of patients (20%) presented with the classic clinical triad and elevated WBC was the most common sign noted, present in 32 of 49 patients (65%).

Regarding etiology of MA and relevant patient comorbidities, 11 patients (22%) were noted to be immunocompromised. Nine patients (18%) had an infection contiguous to the involved artery; 3 of these had adjacent discitis-osteomyelitis, 3 had pancreatitis, 2 had aortoenteric fistulae, and 1 had an adjacent necrotic lung abscess. Seven patients (14%) were noted to be intravenous drug users. Six patients (12%) had infective endocarditis. Five patients (10%) had concomitant diagnoses of inflammatory bowel disease or diverticulitis without frank abscess formation. Four patients (8%) had prior vascular stent procedures.

A total of 55 MAs occurred in these 49 patients: 3 patients had 2 sites of MA formation, 1 patient had 4 small visceral aneurysms, and the remaining 45 patients had single MAs. Thirty-nine MAs (71%) involved the aorta, including 8 thoracoabdominal, 24 abdominal only, and 7 thoracic only. Of the remaining 15 MAs, 5 involved the common iliac artery, 5 involved hepatic arteries, 2 involved the superior mesenteric artery, 2 involved the internal iliac, 1 involved the external iliac, and 1 involved the splenic artery.

Microbiology workup yielded negative blood cultures in 13 patients (27%). Of the 36 patients with positive blood cultures, staphylococcal species were most frequent, present in 14 patients (29%); streptococcal species were present in 8 patients (16%); *Salmonella* was present in 6 patients (12%); *Escherichia coli*, gram-positive rods and *Enterococcus* were present in 2 patients (4%); and *Haemophilus influenzae* and *Klebsiella* were present in 1 patient (2%).

Imaging was conclusive in 41 of the 55 cases (75%). Computed tomography (CT) alone was considered diagnostic in 26 cases (50%), angiography/aortography alone was diagnostic in 8 cases (15%), found in procedures during the 1990s, CT and angiography together was diagnostic in 3 cases (5%), magnetic resonance imaging (MRI)/magnetic resonance angiography (MRA) alone was diagnostic in 3 cases (5%), and

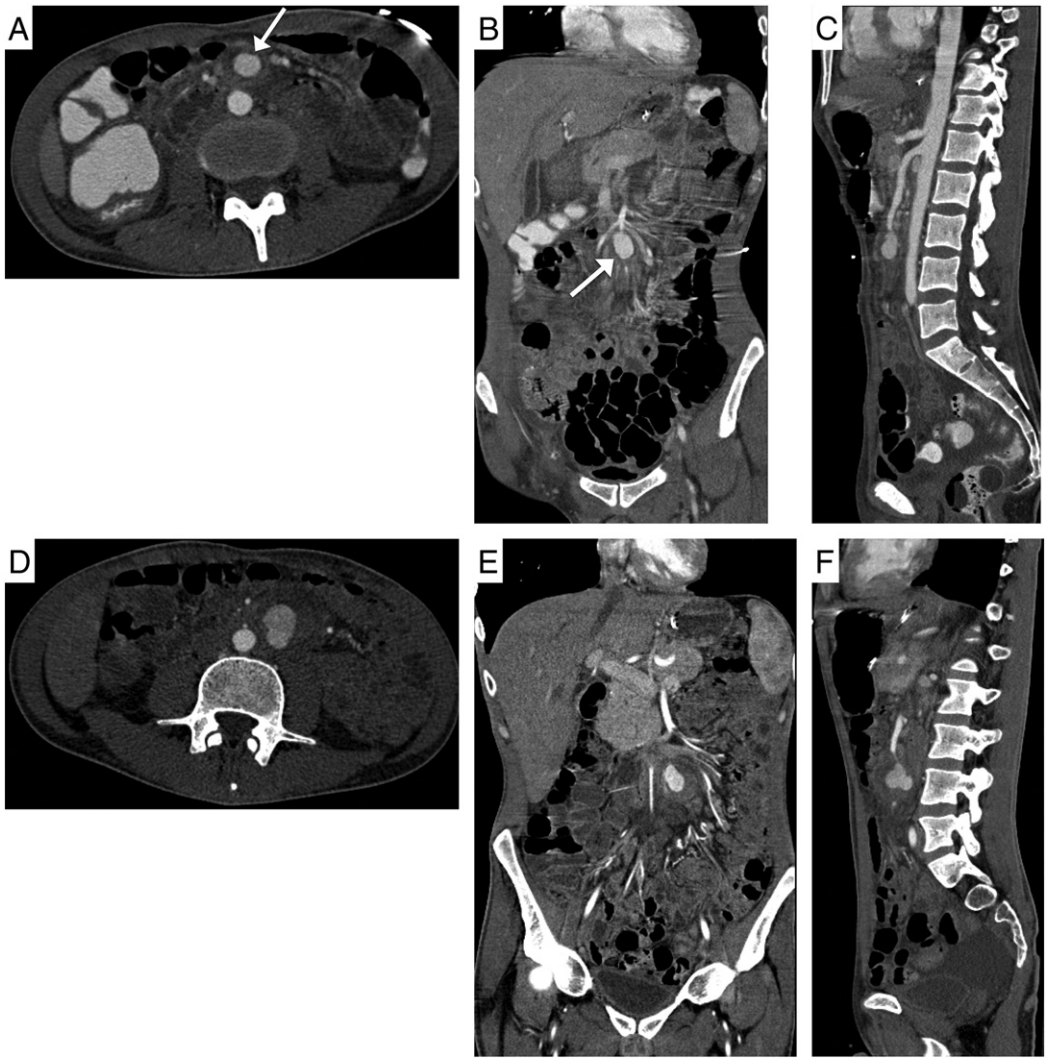

Fig. 1. Rapidly enlarging MA arising from the superior mesenteric artery in an intravenous drug user. Contrast-enhanced axial (A), coronal (B), and sagittal (C) CT images demonstrating a saccular aneurysm (white arrow). A repeat CT study 10 days later reveals progressively enlarging aneurysm in axial (D), coronal (E), and sagittal (F) views.

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