



# Salmonella Bacteremia Causing Mycotic Pseudoaneurysm of Right Common Iliac Artery Complicated by Septic Caval Thrombosis

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## Abstract

Mycotic pseudoaneurysm (MPA) is a blind, saccular outpouching of the arterial lumen of infective origin. MPA is a rare life-threatening condition and if not treated early, has a 67% mortality rate due to sepsis and hemorrhage. Major predisposing factors are diabetes mellitus, chronic renal failure, malignancy, steroids, and intravenous drug use. Imaging modalities include Doppler ultrasound, contrast-enhanced computed tomography, and digital subtraction angiography. We report a unique case of Salmonella bacteremia-related MPA of the right common iliac artery complicated by septic inferior vena cava (IVC) thrombosis in a patient with uncontrolled diabetes. Such trans-compartmental involvement of IVC has hitherto not been described in the literature and hence makes for interesting documentation. This case ponders upon the aggressiveness of the invasive nontyphoidal Salmonella infection pathogen and the need for early imaging of suspicious patients to reduce morbidity and mortality.

## Keywords

- ▶ pseudoaneurysm
- ▶ thrombosis
- ▶ computed tomography

## Introduction

Mycotic pseudoaneurysm (MPA) is a rare life-threatening condition with potential complications like sepsis, aneurysmal rupture, and death.<sup>1</sup> Contrast-enhanced computed tomography (CECT) plays a crucial role in its early diagnosis.<sup>1</sup> We report a unique case of common iliac artery (CIA) MPA with hitherto undescribed complication

of septic inferior vena cava (IVC) thrombosis. This case ponders upon the unusual pathogenesis of IVC thrombus, aggressiveness of the pathogen, and the need for early imaging to reduce morbidity and mortality. We also highlight two specific imaging findings of septic thrombus, namely, “enhancing venous wall sign” and “thrombus with air inclusion sign” not reported in literature till date.

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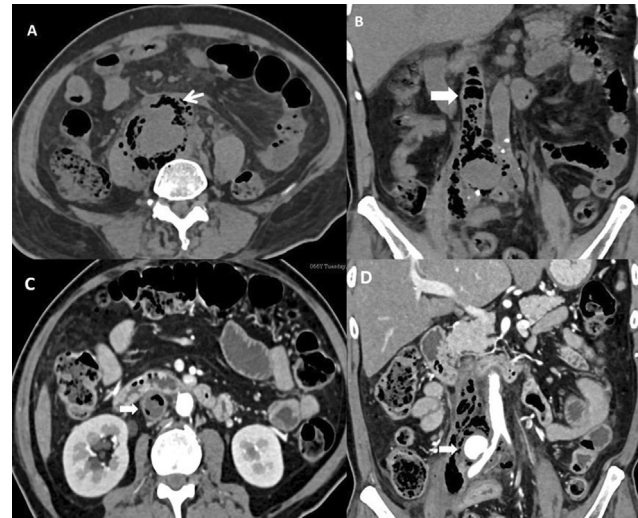
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## Case History

A 66-year-old male was admitted to our emergency department with recurrent low-grade fever for 20 days in addition to bilateral leg swelling, progressive generalized weakness, and loss of appetite. A known diabetic on oral hypoglycemic drugs, he was initially treated with antibiotics at a primary care hospital. Upon admission, he had mild pyrexia (temperature 100.2°F), tachycardia (102 beats per minutes), hypotension (blood pressure of 89/50 mm Hg), and pallor. His initial blood workup showed hemoglobin of 9.4 g/dL, sodium: 122 mmol/L, potassium: 4.3 mmol/L, urea: 84 mg/dL, and creatinine: 1.6 mg/dL. The preliminary ultrasonography was not contributory. The plain CT abdomen showed a large, retroperitoneal collection with air foci at the level of aortic bifurcation and around the proximal common iliac vessels. Erosion of the IVC walls with luminal extension of air foci was evident even on plain CT. The CECT confirmed a large complex MPA arising from the proximal right CIA (RCIA) with a contained leak. The aneurysm and the associated inflammatory changes clearly eroded the adjacent caval walls with significant wall thickening and enhancement—representing phlebitis. A mixture of air and thrombus is seen completely filling and distending the long column of infrarenal IVC—indicating septic or suppurative thrombus within (► Fig. 1A–D). Paravertebral, psoas muscle abscesses, and early abdominal wall collateral veins were also visualized. Note is made on atherosclerotic plaques in the aorta and common iliac arteries.

Emergency opinion of the vascular surgery team was in favor of open debridement, aneurysm repair, and vascular reconstruction. As the patient refused major surgery, he was managed conservatively with broad-spectrum antibiotics (piperacillin/tazobactam), heparin and insulin. The blood cultures grew *Salmonella enterica*. The postulated pathogenesis is *Salmonella* bacteremia-induced seedling of the atherosclerotic plaques in CIA causing arteritis and pseudoaneurysm formation. Secondary retroperitoneal suppuration and IVC erosion resulted in iliac arteriocaval fistulization

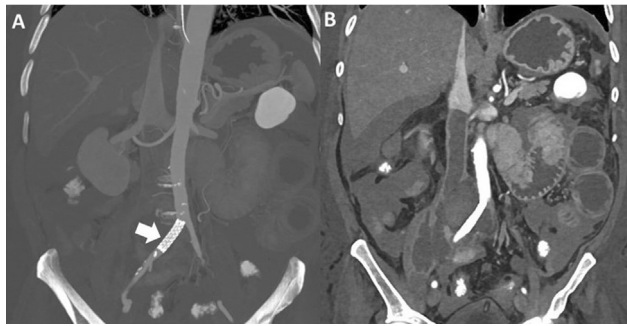


**Fig. 1** Day 1, nonenhanced computed tomography (CT): (A) Axial section shows ill-defined, mixture of soft tissue density and air pockets (arrow) within the inferior vena cava (IVC). (B) Coronal image shows mixed soft tissue lesion at the level of the aortic bifurcation with air foci. There is an extension of a long column of air pockets and soft tissue density within the IVC lumen “thrombus with air inclusion sign” (arrow). Contrast-enhanced CT: (C) Axial section more clearly shows occlusive thrombus distending the IVC with air inclusion, enhancing IVC walls “enhancing venous wall sign” (arrow) in the axial section representing septic thrombophlebitis. (D) Coronal section shows irregular outpouching (arrows) from the right common iliac artery (RCIA) suggestive of mycotic pseudoaneurysm (MPA) with small daughter blebs (small arrows).

and septic caval thrombosis. The repeat CECT done 2 days later, on account of further hemodynamic deterioration showed (► Fig. 2A–C) dramatic interval increase in size of MPA with multiple new daughter blebs suggestive of increase in contained leak. Emergency endovascular stenting of RCIA (► Fig. 3A) was done, following which the patient’s condition stabilized and he made a gradual recovery. The check CT during discharge showed disease regression (► Fig. 3B).



**Fig. 2** Contrast-enhanced computed tomography (CT) on day 3 of admission. (A) Axial section and (B) sagittal section show increase in size of the daughter blebs or contained leak (long arrow), perianeurysmal inflammatory soft tissue (small arrow). Also note the extension of the inflammatory soft tissue into the psoas muscles, prevertebral soft tissues, with a mixture of air (curved arrow). (C) Coronal section shows a persistent long column of inferior vena cava (IVC) thrombus with air pockets within (arrow).



**Fig. 3** On day 5 of admission, following endovascular stent placement. Contrast-enhanced computed tomography (CECT) abdomen (A) coronal section shows the metallic stent in situ (arrows). (B) Coronal section shows resolution of the air pockets within the inferior vena cava (IVC) thrombus, after 5 days of intravenous antibiotics.

## Discussion

MPA is an infectious, irregular outpouching of the arterial lumen, limited by inflammatory pseudo-wall.<sup>1</sup> The most frequent causative is *Staphylococci* followed by *Salmonella*.<sup>2</sup> *Salmonella* serotypes can be classified into typhoidal and nontyphoidal *Salmonella* (NTS). While NTS infections mostly present as self-limiting gastroenteritis, rarely 5% of people develop invasive bacteremia, termed invasive NTS (iNTS) infection with the dreaded complication of infectious endarteritis.<sup>3</sup> NTS infections predominantly affect the elderly immunosuppressed males over 60 years with diabetes, chronic renal failure, and steroid use.<sup>4,5</sup> CECT has superseded digital subtraction angiography and Doppler ultrasound as a noninvasive, sensitive modality of choice in the assessment of pseudoaneurysms. CECT can picture arteritis with early changes like eccentrically thickened wall, luminal irregularity, and features of aneurysm formation like interrupted intimal calcification or wall discontinuity. With intravenous contrast, direct visualization of the opacified aneurysmal outpouching can be seen in the arterial phase of CT. Gas in the perianeurysmal soft tissue could be considered as a very specific sign for infected MPA. CECT in addition can look for complications like aneurysmal thrombosis, secondary daughter blebs, or contained leaks, and extent of periaortic soft tissue involvement including paravertebral or psoas abscesses and discitis.<sup>1,5</sup> More importantly, pre-procedural assessment of aneurysm size, parent vessel dimensions, for endovascular stenting can be done reliably only with CT.

In our case, complicated by caval thrombus, the IVC wall enhancement “enhancing venous wall sign,” indicates phlebitis (–Fig. 1C); the air pockets within the caval thrombus “thrombus with air inclusion sign” (–Fig. 1B)—reflects the septic nature of the thrombus, not seen in sterile causes. To our knowledge, similar presentations are seldom reported in literature. Definitive treatment for MPA includes open resection of infected arterial segment, local debridement, in situ reconstructions, extra-anatomic bypass grafts, or endovascular stenting.

Caval thrombosis is treated by thrombolysis, thrombectomy, or segmental excision.<sup>5–7</sup> Advances in surgical and endovascular techniques with concomitant medical therapy have significantly reduced the mortality associated with iNTS infections.

## Conclusion

In *Salmonella* bacteremia with hemodynamic instability, early CECT is recommended to rule out MPA and its associated complications. In addition to other novel sites described in literature like cerebral veins and saphenous vein, we add transcompartmental involvement of the IVC with septic thrombophlebitis as one another unique complication.<sup>8,9</sup>

### Ethical Approval (Animals)

This article does not contain any studies with animals performed by any of the author(s).

### Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

### Informed Consent

Informed consent was obtained from individual participant included in the study.

### Authors' Contributions

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work: S.S., D.E., S.R.S., S.K., S.S.M., M.B.M. Drafting the work or revising it critically for important intellectual content: S.S., D.E., S.R.S., S.K., S.S.M., M.B.M. Final approval of the version to be published: S.S., D.E., S.R.S., S.K., S.S.M., M.B.M. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: S.S., D.E., S.R.S., S.K., S.S.M., M.B.M.

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### Conflict of Interest

Authors declare that they have no conflict of interest.

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