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Case Report

A Rare Case of Infective Aneurysm of Mesenteric Artery Due to Infective Endocarditis: Diagnosis and Treatment

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Abstract

The infected aneurysm is a rare disease; antibiotic therapy combined with surgical treatment is the most common treatment currently available after computed tomography (CT) imaging and blood culture confirmation. We herein report a case of a 25-year-old male with infective endocarditis that caused an infective aneurysm of the mesenteric artery. We hope to help with the diagnosis and treatment of similar patients.

Keywords

infection; infective endocarditis; mesenteric artery; pseudoaneurysm; case report

Background

Infected aneurysms is a low incidence disease. Risk factors include atherosclerosis, arterial damage as well as previous infection. Infectious endocarditis accounts for a large proportion of the causes of infectious aneurysms [1]. In the United States, the age-adjusted endocarditis admission rate increased 2.4% annually [2]. Hospital admissions for endocarditis rose from 25,511 in 1998 to 38,976 in 2009 [2]. With the increasing incidence of infective endocarditis, the complication of infective aneurysm is gradually receiving attention [3]. The diagnosis is confirmed based on computed tomography (CT) imaging, blood cultures, or surgical tissue identification [4,5]. Ultrasound may indicate an aneurysm, but it cannot confirm whether it is caused by an infectious cause. Treatment options include antibiotic therapy combined with surgical treatment, antibiotic therapy alone, and endovascular intervention techniques. In existing reports, arterial branching points are the most common site of infectious aneurysms [6]. Infectious aneurysms in intracranial arterial segments are the most common [6]. Among the literature that included 922 cases of infective endocarditis, 2% of patients were diagnosed with infective aneurysms. Infective aneurysms were intracranial in 12 patients (66%), all in the region of the middle cerebral artery, and extracranial in 6 (34%): popliteal arteries (n = 2), ulnar artery, humeral artery, hepatic artery, and coronary artery (1 each). There are few reports of infectious aneurysms occurring in the abdominal aortic branch [7]. The choice of treatment depends on the general underlying conditions of the patient and clinical symptoms [8]. The care checklist was used when writing this case report in **(Supplementary Table1)**.

Case Presentation

A 25-year-old young man presented with a fever (up to 39.0 °C). He underwent anti-inflammatory treatment at the local hospital, but the specific medication used is unknown. Even after three months, the fever persisted and included diarrhea and abdominal pain. Before a fever, the patient has no history of dental or other surgeries, obvious history of trauma prior, or intravenous medication or drug use. An abdominal aorta computed tomography angiography (CTA), which was performed in a local hospital, demonstrated abdominal aorta dissection and splenic infarction. The hospital tried interventional therapy, but the intraoperative angiography did not reveal the dissection. The echocardiogram depicted: a hyperechogenic mass on the aortic valve, considered as vegetations attached to the aortic valve, and severe aortic valve insufficiency (Fig. 1A). Pelvic Computed Tomography (CT) showed: a pelvic space-occupying with a rich blood supply, considered a vascular disease or aneurysm formation (Fig. 1B).

CT angiography of the thoracoabdominal aorta further suggested the formation of a pseudoaneurysm, potentially a branch of the superior mesenteric artery (Fig. 2A). The results of digital subtraction angiography (DSA) also clearly indicate the formation of aneurysms (Fig. 2B).

According to the results of the vascular surgery consultation as well as the physical signs, Echocardiography, and CT imaging, the patient was diagnosed with an aortic valve infective endocarditis, pseudoaneurysm, and splenic infarction. Before antibiotic treatment, the patient's blood culture showed positive oral streptococcus, which further confirmed the diagnosis of Infective endocarditis. Treat-

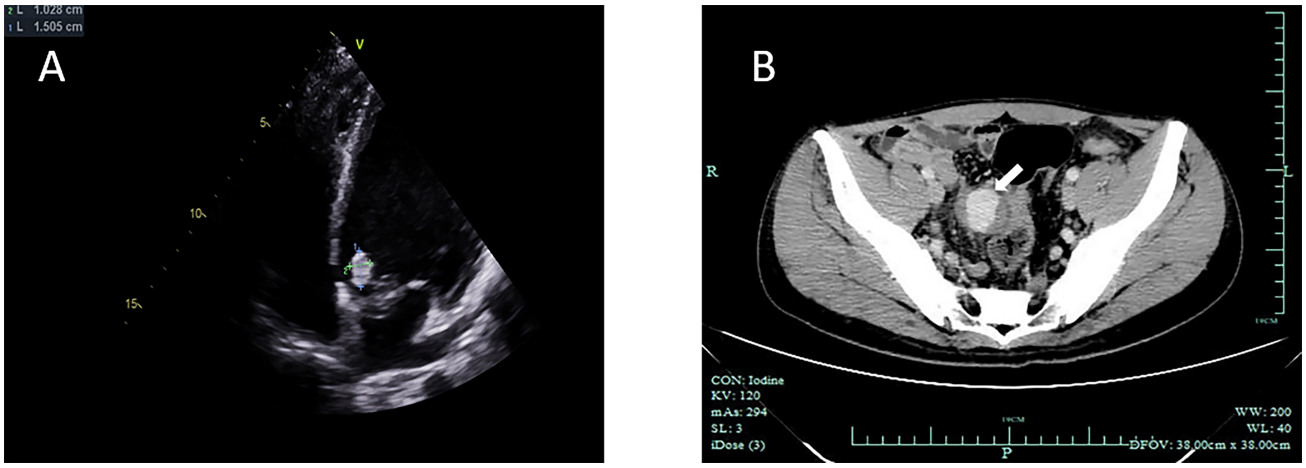

Fig. 1. Cardiac vegetations and pelvic masses. (A) Echocardiography indicates a hyperechoic mass of approximately 1.0 × 1.5 cm on the aortic valve. (B) Pelvic-enhanced computed tomography (CT) displays a low-density shadow of approximately 3.1 cm in the pelvic cavity. The low-density shadow in the center of the enhanced scan was gradually enhanced, and the degree was similar to that of the blood vessels (white arrow).

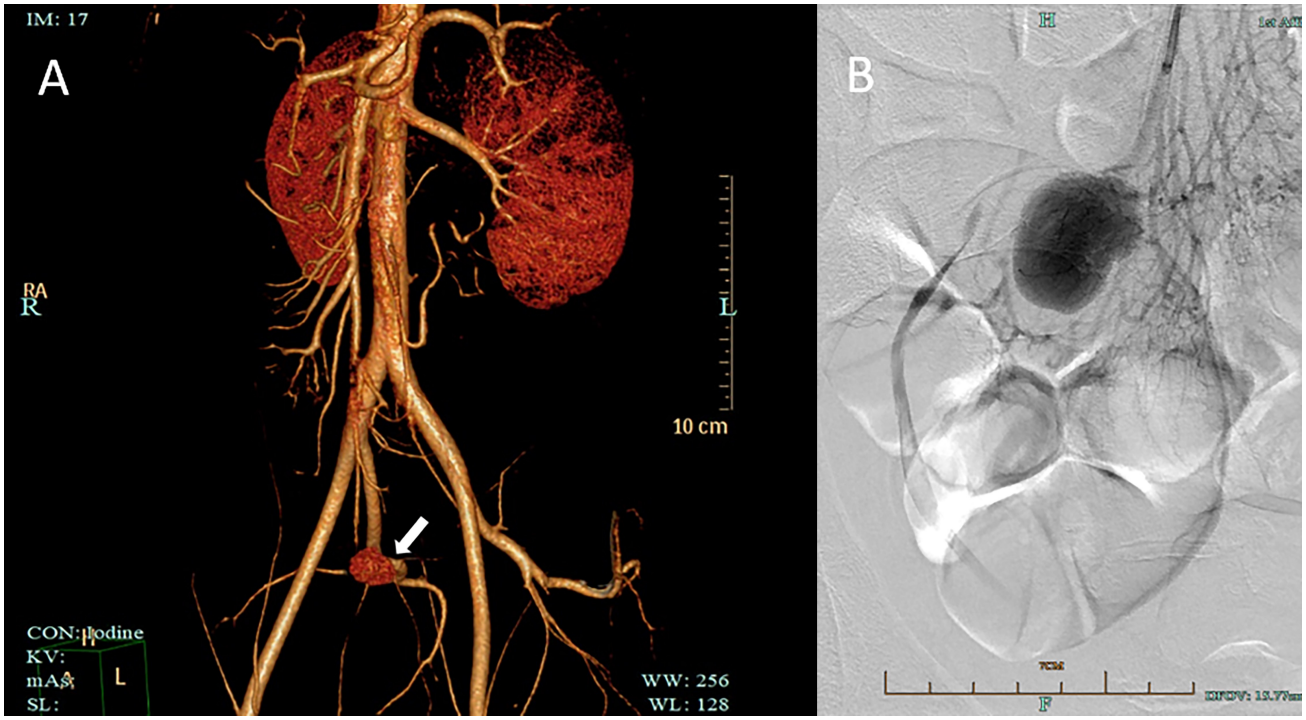

Fig. 2. Vascular related imaging. (A) A three-dimensional reconstruction of the mass-like abnormal density shadow (white arrow), closely related to the pelvic branch of the superior mesenteric artery, and accompanied by splenic infarction. (B) Digital subtraction angiography (DSA) revealed significant accumulation of contrast agent, indicating the formation of an aneurysm.

ment with IV 500 mg daptomycin was given for seven days. Considering that the patient has already developed an infectious pseudoaneurysm and distant embolism, in order to prevent the embolus from falling and causing further cerebral embolism and more severe organ or lower limb infarction, the patient has decided to undergo early surgical treatment. The patient first underwent aortic valve replacement surgery, followed by partial small bowel resection because the patient presented cardiopulmonary instability after anesthesia. During the operation, we discovered a bicuspid aortic valve deformity, and the left and right coronary cusp were fused. The aortic valve was evaluated for severe damage. So we inserted a 27# St Jude Master mechanical aortic valve. Red purulent fluid was seen after the mass incision of the small mesentery (Fig. 3). Considering the pseudoaneurysm caused by the shedding of vegetation, the mass and necrotic small intestine were resected. After the surgery, they received antibiotic treatment of 500 mg qd of

levofloxacin for 24 days and 500 mg qd of daptomycin for 14 days. After receiving antibiotic treatment, no bacterial growth was found in the patient's blood culture, including postoperative vegetative bacterial culture. The patient was discharged from the hospital after a full recovery. After discharge, the patient received long-term oral levofloxacin 500 mg for anti-infection treatment. The coagulation function was monitored in the outpatient clinic after the operation, and the patient returned to normal life during the postoperative follow-up. Within 2 years after the surgery, the patient regularly came to our hospital for cardiac ultrasound examination, indicating good valve function and no obvious vegetation. The patient also did not complain of obvious abdominal pain or fever symptoms.

Fig. 3. Intestinal segments were surgically removed, with red purulent fluid seen after the incision.

Discussion

An infective aneurysm is a rare disease, mostly caused by hematogenous dissemination of infective endocarditis or together with septic emboli [1,9]. Infective aneurysms usually occur in intracranial, visceral, and limb arteries, while intracranial arteries are more frequently involved. Among extracranial vessels, ulnar arteries in extremity arteries, popliteal arteries, and coronary arteries have been reported [6].

Infectious aneurysms with obvious symptoms caused by septic embolus drop embolism are rare in patients with infectious endocarditis. Because the source of septic emboli falls off as endocardial excrescences, in most cases, such as in multiple emboli, they pose greater distress for disease diagnosis and treatment [7].

So far, there are no clear standards or guidelines for the treatment of infectious aneurysms caused by infectious embolism in infective endocarditis. Antibiotic therapy in combination with surgery is the most common treatment. The surgery aims to achieve microbiota-derived control, prevent rupture, and reestablish the blood flow in the surgical area [10]. For patients with asymptomatic embolism, cardiac surgery can be performed first to control the source of microorganisms and wait for the patient's condition to improve before intervening in the blood vessels at the embolic site through open or interventional methods. For patients with similar conditions to our report, simultaneous heart valves combined with abdominal surgery could also be considered. Due to the fact that septic emboli originate from infective endocarditis, they often manifest as multiple emboli, but it is not recommended to manage all embolized vessels in surgical selection. It is often recommended to only treat criminal vessels with obvious symptoms or vessels with serious consequences after delayed treatment, such as aneurysms caused by mesenteric embolism in our case. Preoperative and postoperative antibiotic symptomatic treatment is also essential in diagnosing and treating the disease. In our case, the patient had multiple visceral infarctions, neither of which were managed during the surgery. However, this surgical approach has limitations, such as in patients with renal or important organ vascular infarction, it is necessary to open blood flow as early as possible to restore function. After addressing the source of septic emboli in cardiac surgery and sufficient course of antibiotic treatment, the patient did not have overt manifestations of infection or infarct progression on follow-up. This illustrates that in patients with poor underlying conditions who cannot tolerate surgical management, symptomatic treatment with antibiotics alone is a therapeutic option without an indication for emergency surgery. With the continuous development of interventional methods, endovascular techniques provide an interim safeguard or therapeutic option for patients unable to undergo open surgery [11,12].

Reviewing the diagnosis and treatment process, we found that for infective aneurysms caused by septic embolic drop embolism from infective endocarditis, the diagnosis is based on CT; however, confirmation of the diagnosis is performed with blood pathogen culture [13]. Negative results may be reflected in 30% of blood cultures of patients with suspected infected aneurysms, a condition that can only be confirmed by surgical tissue pathogen identification. In this case, the early detection of fever and abdominal pain did not promptly investigate the heart condition and search for the primary disease, which also delayed the progress of treatment to some extent. Early cardiac ultrasound examination of infective endocarditis can help to use standardized antibiotic treatment plans earlier and avoid the formation of peripheral infectious aneurysms.

The intracranial artery is a common site for infectious aneurysms, and the clinical symptoms of patients occurring in this area vary greatly, mainly depending on the location of the infectious aneurysm. Non-specific symptoms such as dizziness and headache may occur, as well as functional deficiencies pointing to the location such as hemianopsia and cranial neuropathy [14,15]. Intracranial infectious aneurysms are extremely dangerous. In patients with infectious endocarditis, the mortality rate of unruptured infectious aneurysms is 30%, while the mortality rate of ruptured infectious aneurysms is as high as 80% [16]. Therefore, it is necessary to perform intracranial arterial CTA for patients with infectious endocarditis suspected of having intracranial infectious aneurysms. Peripheral infectious aneurysms, especially those born in the abdominal cavity, generally have no clinical symptoms before rupture [6]. When patients with infectious endocarditis experience abdominal pain or fluctuating masses, consideration should be given to the occurrence of infectious aneurysm or vascular infarction. Although this patient developed diarrhea, it did not show a significant amount of bloody diarrhea, so it is not considered that the aneurysm ruptures into the small or large intestine. When symptoms of jaundice and biliary bleeding occur, one should be vigilant for the presence of infectious aneurysms at the hepatic artery.

The question of whether early screening can lead to more treatment options raises new options for further research. In a case report of infective aneurysms of the superior mesenteric artery due to infective endocarditis, three had no abdominal-related symptoms. After the diagnosis of infective endocarditis, a short interval of CT examination earlier suggested a possible infective aneurysm [17,18]. Before the onset of symptoms, patients are treated prophylactically, preventing surgical treatments such as bowel resection. Compared to the three cases reported by Higashiura *et al*. [19], our reported cases have more distal infarctions, indicating a higher likelihood of intracranial or important vascular embolism in this patient. Therefore, we chose open surgery for treatment. Intravascular intervention therapy has indeed brought new treatment options for such patients, but considering that intravascular instrument operation may lead to the spread of pathogenic bacteria, standardized antibiotic treatment and complete evaluation should be conducted before intravascular intervention therapy [20]. Although Díaz *et al*. [21] reported a case of using stents to treat proximal infectious aneurysms of the superior mesenteric artery, it is still unknown whether stent treatment can be performed on distal infectious aneurysms due to anatomical limitations.

We highlight the need to perform the necessary systemic vascular examinations in patients with infective endocarditis. In patients with a history of endocarditis and a chief complaint of abdominal pain and fever, embolism due to septic embolic drop should be included in the differential diagnosis. Early vascular examination is beneficial for improving prognosis in patients with suspected vascular symptoms. Routine CT screening for patients without peripheral or intracranial vascular symptoms may bring certain significance for early diagnosis and treatment. But this still requires the support of large-scale clinical data research.

Availability of Data and Materials

Datasets used and/or analyzed for this study are available from the corresponding author upon appropriate request.

Author Contributions

Conceptualization, SW, LL and SM; data curation, SW and SM; writing—original draft preparation, LL and SM; writing—review and editing, SW and SM. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

Ethics Approval and Consent to Participate

This study is a simple retrospective case analysis and does not require the approval of the Ethics Research Association. The patient has signed the relevant informed consent form.

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Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.59958/hsf.6927.

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