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A Case of Renal Hemorrhage After Mitral Valvuloplasty for Active Infective Endocarditis with Renal Infarction

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Abstract: A 55-year-old woman with atopic dermatitis was admitted to the hospital with a diagnosis of septic shock. She had multiple cerebral and left renal infarctions. Transesophageal echocardiography revealed a 10 mm mobile verrucous lesion at the mitral valve. Emergency mitral valvuloplasty was performed, and the verrucous lesion was successfully removed. The patient was hemodynamically stable and was admitted to the postoperative intensive care unit (ICU) under ventilatory support. On postoperative day 3, anemia progressed, and on postoperative day 4, the patient went into shock. Emergency embolization was performed for hemostasis, and the patient's circulation improved. This is the first report of a case of renal hemorrhage after surgery for infective endocarditis. This case is valuable for the treatment of this disease in which various complications occur.

Keywords: Infective endocarditis; Embolism; Renal hemorrhage; *Staphylococcus aureus*

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1. Introduction

Patients with infective endocarditis (IE) complicated with embolic events caused by verrucous lesions may have a complicated clinical course in view of the various complications that may arise depending on the site of the embolus. We report a case of left renal hemorrhage after mitral valvuloplasty for a patient with *Staphylococcus aureus* mitral valve endocarditis and systemic embolism.

2. Case

A 55-year-old woman who had been under the care of a local doctor for atopic dermatitis was admitted to the hospital with fever and impaired consciousness two days later for septic shock. Blood culture was positive for *Staphylococcus aureus*, and computed tomography (CT) showed multiple cerebral and renal infarctions. Transesophageal echocardiography revealed a 10-mm mobile verrucous lesion at the mitral valve (**Figure 1**), and a diagnosis of active IE was made. Four days after admission, the patient was transferred to our center for treatment.

The patient had known allergies to metal (details unknown) and cefaclor. On admission, her blood pressure was 110/74 mmHg, heart rate was 77 beats/min, temperature was 37.6°C, respiratory rate was 19 breaths/min, oxygen saturation (SpO_2) was 99% under room air, Glasgow coma scale (GCS) was E3V4M6, and Japan coma scale (JCS) was II–10. She was able to provide her name; otherwise, she was not orientated

to place and time.

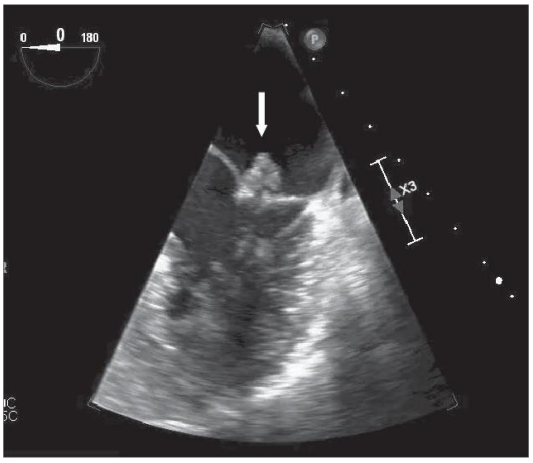

Figure 1. Transesophageal echocardiogram (TEE) showing vegetation (10 × 10 mm in size) attached to the mitral valve (arrow)

Her blood investigations were as follows: white blood cell (WBC) count 14,900/μL, red blood cell (RBC) count 3.89 million/μL, hemoglobin (Hb) 12.3 g/dL, hematocrit (Ht) 36.0%, platelet (Plt) 121,000/μL, activated partial thromboplastin time (aPTT) 28.0 s, international normalized ratio (INR) 0.98, fibrin degradation product (FDP) 8.1 μg/mL, D-dimer 2.9 μg/mL, albumin (Alb) 2.4 g/dL, creatine kinase (CK) 56 U/L, aspartate transaminase (AST) 94 U/L, alanine transaminase (ALT) 163 U/L, lactate dehydrogenase (LDH) 527 U/L, alkaline phosphatase (ALP) 495 U/L, gamma-glutamyl transpeptidase (γ-GTP) 119 U/L, blood urea nitrogen (BUN) 33 mg/dL, creatinine (Cre) 0.88 mg/dL, sodium (Na) 159 mEq/L, potassium (K) 4.3 mEq/L, chloride (Cl) 123 mEq/L, calcium (Ca) 8.5 mg/dL, total bilirubin (T-Bil) 0.8 mg/dL, C-reactive protein (CRP) 10.881 mg/dL, and brain natriuretic peptide (BNP) 116.5 pg/mL.

During her previous admission, her blood investigations were as follows: BUN 23 mg/dL, Na 148 mEq/L, CRP 10.881 mg/dL, and BNP 11.5 pg/mL. Her consciousness disorder was already observed at this point.

On chest radiography, cardiothoracic ratio was 43%, and electrocardiogram showed sinus rhythm, with a heart rate of 89 beats/min. A 10-mm mass adherent to the mitral valve was observed on transthoracic echocardiography. A contrast-enhanced CT scan of the left kidney showed an area of contrast loss, suggesting left renal infarction (**Figure 2**). Magnetic resonance imaging (MRI) of the brain showed scattered high-intensity areas in the cerebral cortex on diffusion-weighted imaging (**Figure 3**).

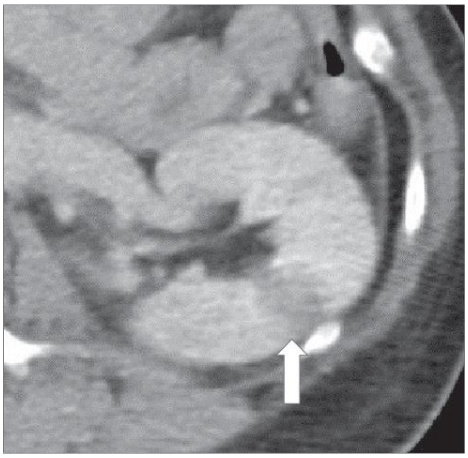

Figure 2. Contrast-enhanced computed tomography of the abdomen showing reduced enhancement of the left kidney (arrow), consistent with infarction

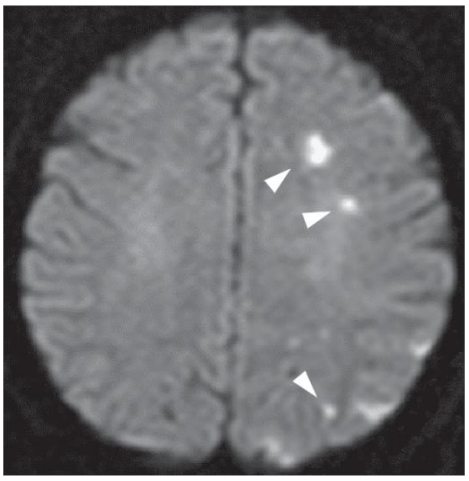

Figure 3. Diffusion-weighted brain magnetic resonance imaging detected multiple acute cerebral infarctions (arrowhead)

Based on the above findings, we concluded that the patient had already developed systemic embolism and had high risk of further embolism due to the large verrucous lesion. Therefore, we decided to perform an emergency surgery. The median sternotomy approach was used, and cardiopulmonary bypass was established by removing venous blood from the superior and inferior vena cava and returning oxygenated blood into the ascending aorta. A longitudinal right lateral left atrial incision was made to gain access to the mitral valve. A verrucous lesion was observed from C1 to P1. The verrucous lesion and valve leaflets were resected from C1 to P1 (**Figure 4**). The valve ring from C1 to A1/P1 was sutured closed, and the apex defect was closed. Since no obvious mitral regurgitation was observed by regurgitation test, the procedure was terminated without any prosthetic valve ring because of the infection and the suspicion of metal allergy. The aortic cross-clamping time was 90 min, and the operative time was 3 h and 40 min.

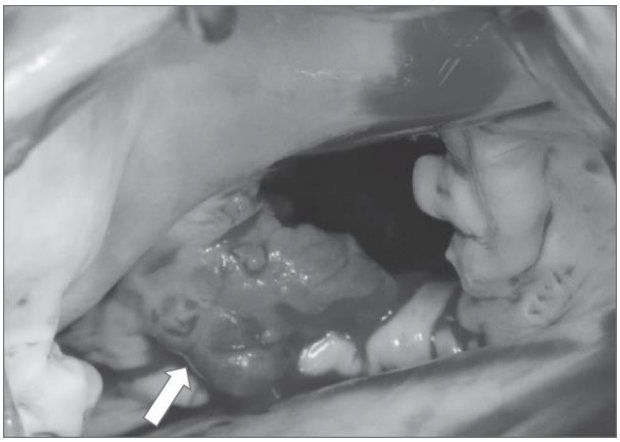

Figure 4. Intraoperative finding showing the vegetation from the anterior commissure to the posterior leaflet of the mitral valve (arrow)

Immediately after surgery, the patient was hemodynamically stable, and she remained on ventilator support due to poor arousal. On postoperative day 2, her Hb and platelet levels decreased and her LDH increased, but the patient was unresponsive to blood transfusion. On postoperative day 4, the patient went into shock, requiring an increase in dose of vasopressors. The left side of her abdomen was noted to be swollen; a contrast-enhanced CT scan revealed massive hematoma in the left retroperitoneum with extravascular leakage of contrast medium (**Figure 5**). An arterial hemorrhage in the left kidney was suspected, and we decided to perform an emergency angiography. Since neither prosthetic valve nor prosthetic valve ring was used, no anticoagulation therapy was initiated.

Figure 5. Contrast-enhanced computed tomography of the abdomen showing massive left renal hematoma with contrast extravasation

Femoral artery puncture was performed for angiography. When the left renal artery was selected for angiography, extravascular leakage of contrast medium was observed from the peripheral end of the superior branch of the left renal artery (**Figure 6A**). The superior branch of the left renal artery was selected for embolization with 20% n-butyl-2-cyanoacrylate (NBCA) to eliminate the contrast leak. The inferior branch of the left renal artery was preserved (**Figure 6B**). The use of NBCA for emergency hemostasis was approved by the Ethics Committee of the hospital.

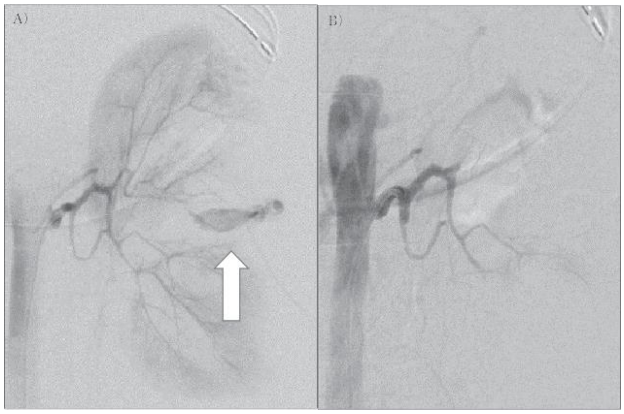

Figure 6. Angiography showing (A) active extravasation from the superior branch of the left renal artery (arrow) and (B) no contrast extravasation from the inferior branch of the left renal artery

Postoperatively, the patient was weaned off the ventilator with improvement in hemodynamic status and level of consciousness. The patient was discharged from the ICU the day after embolization. Two weeks after embolization, CT scan showed that the hematoma was shrinking (**Figure 7**). The patient's renal function did not deteriorate. Antibiotic therapy for IE was continued. Ceftriaxone and clindamycin were administered for a total of 8 weeks after surgery, and the antibiotics were changed to amoxicillin-clavulanic acid following the negative conversion of CRP. On postoperative day 82, the patient was transferred for rehabilitation after establishing that the patient was free of inflammation. The patient was discharged home without any loss of activity of daily living (ADL) and placed under close observation under our department's outpatient clinic. Seven months after surgery, echocardiography revealed moderate mitral stenosis, with a mitral annular area of 1.4 cm^2 and a mean pressure gradient of 4.8 mmHg, without any mitral regurgitation. Postoperative dental examination revealed no abnormalities in the oral cavity that could be the source of infection.

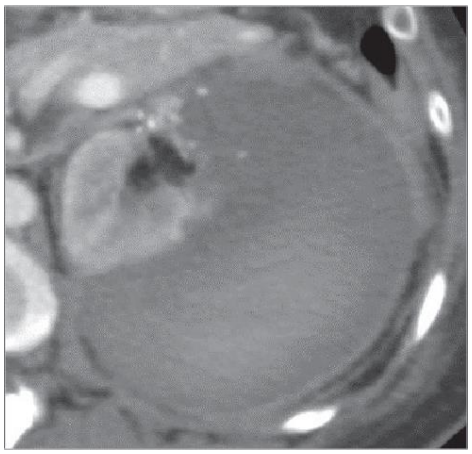

Figure 7. Contrast-enhanced computed tomography of the abdomen showing hematoma with no contrast extravasation

3. Discussion

IE has a wide range of symptoms of which the most common is fever, occurring in 90% of cases [1]. Embolisms occur in about 30% of all cases of IE [2] and may be the first manifestation of IE. Another vascular complication is bacterial aneurysm, commonly cerebral aneurysm, which is widely known to occur in 1%–5% of cases. Cerebral aneurysms are often asymptomatic, even when they expand, but when they rupture, they are fatal [3,4]. Although the frequency is unknown, there have been reports of aneurysms in the mesenteric artery, coronary artery, ulnar artery, gluteal artery, femoral artery, popliteal artery, splenic artery, and renal artery, such as the one described in our case report. Bacterial aneurysms are believed to be caused by bacterial arteritis originating from microemboli, and the inflammation causes the outer membrane to weaken and enlarge [5]. When bleeding occurs as a result of ruptured peripheral aneurysms, catheter embolization is the standard treatment, and the same is true for renal hemorrhage.

There are only a few reports of IE causing renal hemorrhage and thus requiring emergency hemostasis, including one case in Japan [6] and two cases overseas [7,8]. Such cases are considered to be rare. In our case, although the preoperative CT scan showed no obvious aneurysm formation around the kidney, the sudden renal hemorrhage occurring 6 days later suggests that the aneurysm may have formed and expanded rapidly during the perioperative period, leading to rupture. This case should be taken as a lesson for future clinical and surgical treatment of IE.

In another report, a retroperitoneal hematoma was observed around the abdominal aorta in the absence of arterial diameter enlargement or aneurysm [9]. It is possible that the patient had a direct rupture without aneurysm formation. Emergency angiography confirmed extravascular leakage of contrast medium but did not show any clear mass, which may have been obscured by the fact that it had already ruptured. *Staphylococcus aureus* is known as a highly virulent bacterium that often has an acute course. Hence, it is possible that the outer membrane of the bacterial aneurysm may have weakened due to inflammation and ruptured before an aneurysm could form. In a previous report, an autopsy of a patient with intracranial hemorrhage due to IE caused by *Staphylococcus aureus* showed that the arterial wall was destroyed by bacteria without forming any aneurysm [10]. This seems to support the aforementioned hypothesis. Another study has reported that *Staphylococcus aureus* is a risk factor for intracranial hemorrhage in *Staphylococcus aureus* IE (hazard ratio: 2.35) [11], suggesting that the risk of bleeding in other organs increases in *Staphylococcus aureus* IE. None of the three previously reported cases of IE with renal hemorrhage was caused by *Staphylococcus aureus*; this is the first report of a case of renal hemorrhage associated with IE caused by *Staphylococcus aureus*, which may have led to the sudden development of the disease. In addition, the patient underwent surgery using an artificial heart and lung during the acute phase of the disease, and factors such as extracorporeal circulation and systemic heparinization may have had an influence on the

outcome.

Staphylococcus aureus is a common cause of IE, with skin penetration being the most common means leading to IE, accounting for about 40% of cases [12]. In particular, cases of IE due to bacteremia caused by *Staphylococcus aureus* in atopic dermatitis, such as the present case, have been reported [14-16]. The number of patients with atopic dermatitis is estimated to be 450,000 nationwide as of 2014 [17], and since *Staphylococcus aureus* is a common pathogen, many of these patients may develop severe IE. The former is an underlying disease that cardiovascular surgeons should be aware of. In addition, there have been reports of recurrent IE due to the lack of appropriate dermatology treatment in patients with IE complicated by atopic dermatitis [15]; hence, it is important to treat and follow-up patients with atopic dermatitis alongside dermatologists.

In recent years, the importance of preventing mitral stenosis following mitral valvuloplasty has been underlined. In the present case, apex replacement with autologous or bovine pericardium and reconstruction with artificial tendon cords were necessary to ensure adequate mitral valve orifice. However, considering that the patient is 55 years old and had acute stroke, we allowed a certain degree of mitral stenosis and opted for suture closure. This surgical technique is controversial and thus requires close follow-up.

4. Conclusion

We report a case of renal hemorrhage 2 days after surgery for active IE, which was successfully treated with emergency embolization. IE has a wide range of symptoms and complications, and IE caused by *Staphylococcus aureus* may cause sudden bleeding. Therefore, IE must be carefully managed, even during the perioperative period.

Disclosure statement

The authors declare no conflict of interest.

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