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【 CASE REPORT 】

An Infected Popliteal Aneurysm after Plain Old Balloon Angioplasty

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Abstract:
The case was a 76-year-old man with chronic limb-threatening ischemia. Plain old balloon angioplasty (POBA) was performed on the popliteal artery. Subsequently, he suffered from cellulitis around the POBA site, followed by reocclusion. *Staphylococcus aureus* was detected in a blood culture. After re-revascularization with POBA, both purulent gonitis and an infected popliteal aneurysm were observed to occur. We performed aneurysmectomy and bypass grafting with the saphenous vein and then continued antibiotic therapy. Although treatment consisted of endovascular therapy (EVT) with nothing left behind, management was difficult because of secondary infectious complications. We conclude that prophylactic antibiotics before EVT should be considered in such cases.

Key words: infected popliteal aneurysm, endovascular therapy, complication

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Introduction

Infection is one of the complications of endovascular therapy; however, the exact incidence is unclear. Furthermore, there is currently no consensus regarding the use of prophylactic antibiotics. In this report, we describe a case of an infected popliteal aneurysm which occurred after endovascular therapy (EVT) using plain old balloon angioplasty (POBA) with nothing left behind.

Case Report

A 76-year-old man who had developed diabetes at around 50 years of age and who had undergone maintenance dialysis due to diabetic nephropathy from 63 years of age presented with rest pain, cyanosis, and partial gangrene of his left toes. His left side ankle-brachial index (ABI) value was 0.58, and vascular ultrasound revealed stenosis or occlusion of the popliteal artery and the arteries below the knee. He was admitted to the hospital for angiography and EVT. Angiography showed 90% severe stenotic lesions with calcification in the popliteal artery (Fig. 1A), and in the area below the knee, anterior tibial artery occlusion and posterior tibial artery occlusion were observed. His foot was perfused with the collateral flow via the peroneal artery. Therefore, we made a diagnosis of chronic limb-threatening ischemia and performed EVT with POBA for the popliteal artery and posterior tibial artery (Fig. 1B). Although the guidewire passed through the anterior tibial artery, delivering any devices proved difficult. Thus, we abandoned the revascularization of the anterior tibial artery at this session. No antibiotics were used during the EVT perioperative period. The patient's ABI value improved from 0.54 to 0.83, suggesting that a good flow had been obtained.

However, six days later, he complained of redness and swelling pain in the lower limbs and was diagnosed with cellulitis on computed tomography (CT; Fig. 2). *Staphylococcus aureus* was detected in a blood culture, and treatment with antibiotics, namely cefazolin, was started. After an ad-

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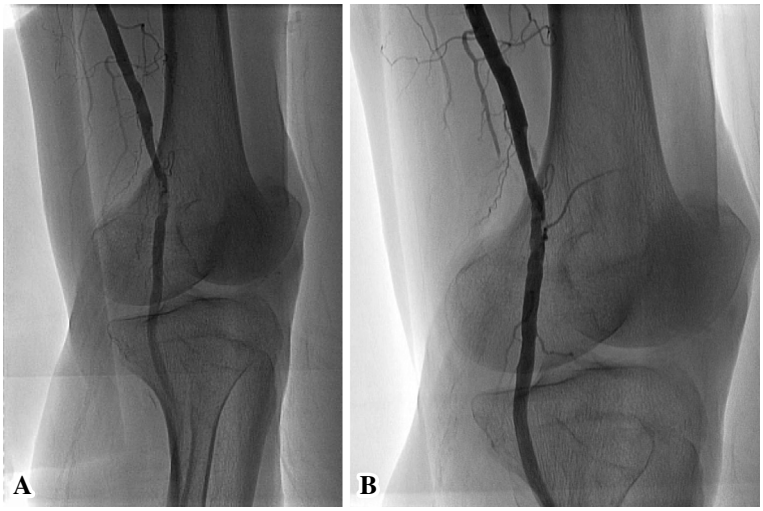

Figure 1. **Angiography before and after the first EVT. (A) A stenotic lesion with calcification was found in the P1 region of the popliteal artery. (B) Expansion was obtained with balloon dilatation.**

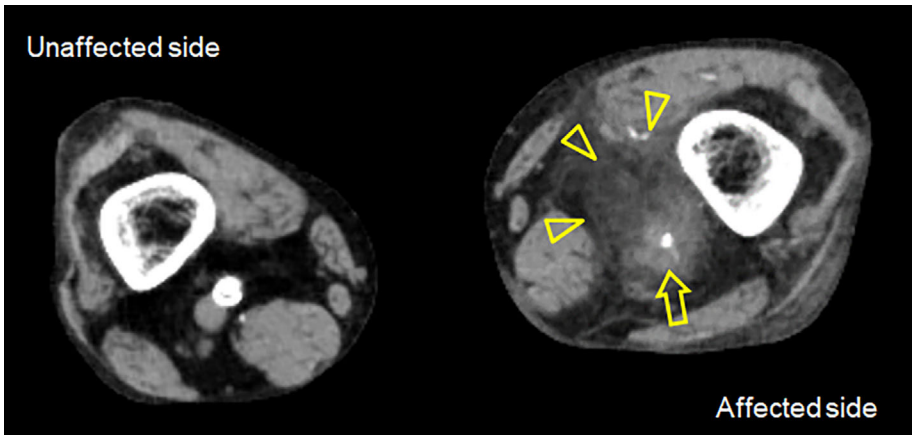

Figure 2. **Plain CT showing a high density of skin and soft tissue around the knee (arrowheads), consistent with cellulitis. The contours of the artery are obscured (arrow).**

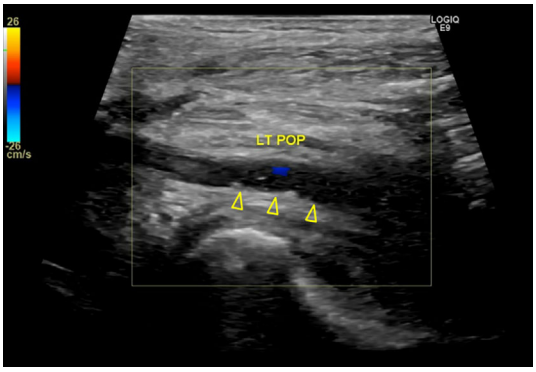

Figure 3. **Vascular ultrasonography before the second EVT. The popliteal artery was occluded and the blood flow had been lost (arrowheads).**

ditional two days, his lower leg turned pale, and he suffered from severe pain. Vascular ultrasonography confirmed occlusion of the popliteal artery (Fig. 3), and emergency re-EVT was performed. The site of the popliteal artery that had been dilated with the balloon was occluded; therefore, we performed revascularization once again with POBA (Fig. 4A, B). Although this session was a treatment for a re-occluded lesion and arterial dissection without any flow limit remained in the final image, we decided that the patient was unsuitable for stent deployment because of an active infection. Fever persisted although the paleness subsided and his pain also improved.

Two weeks later, because the swelling of the knee joint had worsened and a floating patella was observed, we performed joint puncture. We observed a yellow turbid synovial fluid, and *Staphylococcus aureus* was detected. The patient was diagnosed to have purulent gonitis, and synovectomy and drainage were performed. Antibiotic therapy was continued; however, the fever persisted.

Three weeks after the last EVT, follow-up vascular ultrasonography revealed an aneurysm in the popliteal artery with a dilatation diameter of 39 mm (Fig. 5). Because contrast-enhanced CT showed that the arterial wall of the aneurysm was thick with marginal edema, we diagnosed it

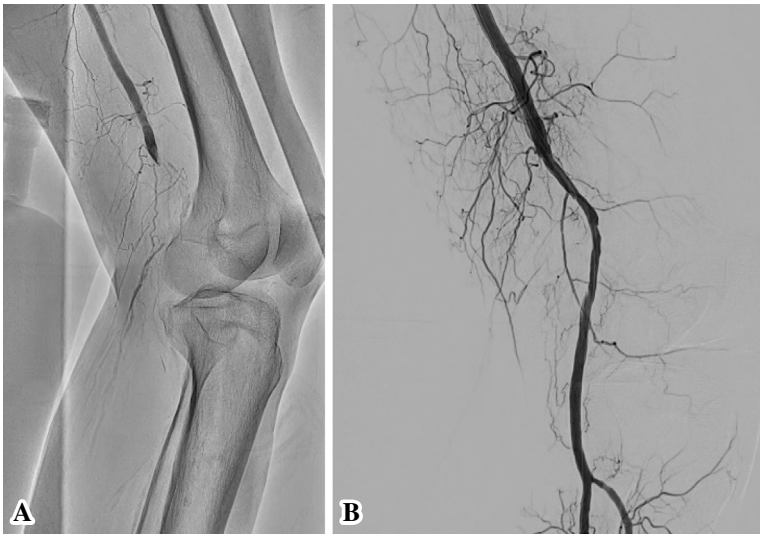

Figure 4. **Angiography before and after the second EVT. (A) The popliteal artery was occluded at the site previously dilated with the balloon. (B) The blood flow had resumed by additional POBA. Although the arterial dissection remained, no slow flow was observed.**

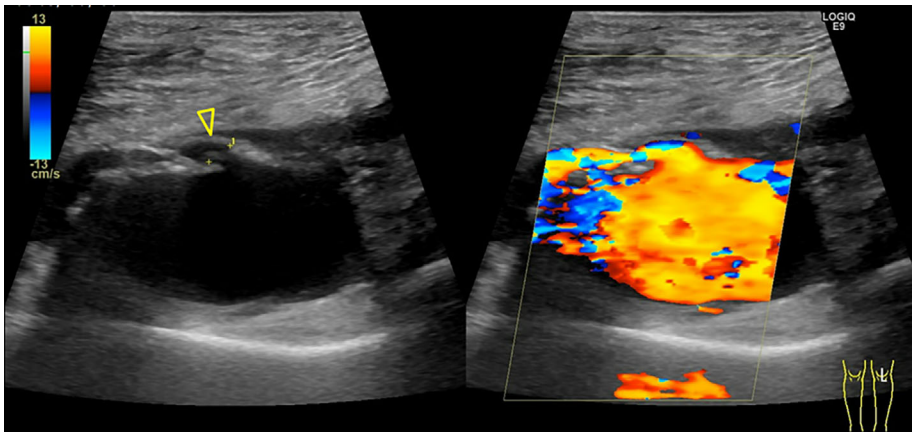

Figure 5. **Follow-up vascular ultrasonography revealed an aneurysm in the popliteal artery with a dilatation diameter of 39 mm. The arrowhead points to the artery that flows into the aneurysm.**

to be an infected aneurysm (Fig. 6A, B). Magnetic resonance imaging (MRI) suggested abscess formation around the aneurysm (Fig. 6C-E). Therefore, we performed aneurysmectomy and bypass grafting with the saphenous vein. Because the tissue was fragile as a result of inflammation, graft anastomosis took a long time, thus leading to ischemia. Moreover, because of the poor flow of the distal vessels, reocclusion was detected on CT two weeks after the operation. However, the infection became controllable, and peripheral circulation was obtained in the collateral circulation. Thus, the patient was followed up clinically with observational therapy. Cefazolin infusion was administered for one month, and thereafter cefaclor was prescribed for six months to avoid any recurrence of infection.

Discussion

The important finding in this case is that infection can occur at the POBA site even without leaving a stent. It was also suggested that vascular vulnerability caused by residual dissection might be a risk for infection. In addition, the lesion first appeared after reocclusion; subsequently, the revascularization treatment had caused the aneurysm, resulting in a dilated infected aneurysm. In this case, it is considered that the infection was caused around the POBA site during the primary EVT procedure followed by cellulitis. Therefore, it is necessary to make efforts to prevent infection due to the EVT procedure, and the administration of prophylactic antibiotics is one way to achieve this.

In comparison to the incidence of access site infection with a vascular closure device (1) or stent (2), there are relatively few case reports of arterial infection at the site of only balloon dilatation. The actual incidence rate, however, is unclear. It is reported that, pathologically, bacteria invade the arterial wall from the injured endothelial site, which eventually destroys the blood vessel wall and leads to the forma-

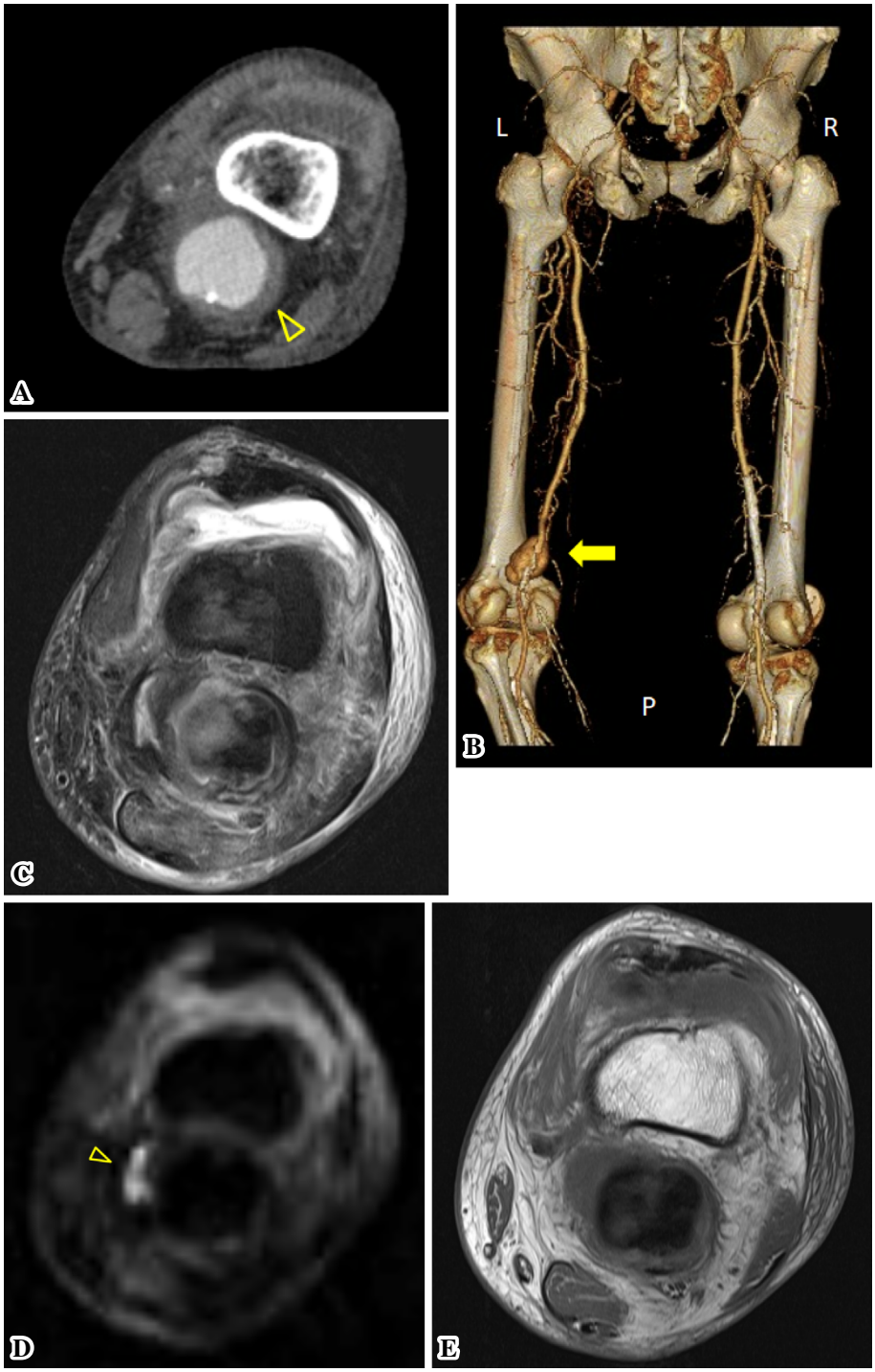

Figure 6. **CT and magnetic resonance imaging (MRI) findings of the infected popliteal aneurysm. (A) Dilatation of the popliteal artery and circumferential thickening of the arterial wall were observed (arrowhead). (B) A three-dimensional construction image of the artery. The arrow points to the popliteal aneurysm. (C) T2-weighted MRI. (D) Diffusion-weighted MRI revealed fluid retention with high signal on the right side of the aneurysm (arrowhead). These findings were consistent with an abscess. (E) A short TI inversion recovery image showed that a high signal was observed in the muscular and subcutaneous layers. These findings suggested the presence of inflammation.**

tion of a pseudoaneurysm, resulting in an arterial rupture (3, 4). Recently, drug-coated balloons (DCBs) have been increasingly used as a finalizing device in EVT for peripheral artery disease. As a result, the number of cases similar to the case reported herein could thus increase. Therefore, caution is needed when treating these patients. Since cellulitis often occurs after EVT (5), it is possible that such an infection may simultaneously spread to the arterial wall. Although the routine use of prophylactic antibiotics is not recommended during EVT, it should be considered in

select cases, for example, for patients with immune deficiencies, when performing difficult procedures, and when treating patients with a prolonged indwelling catheter (6). On the other hand, taking into consideration the seriousness of such events, some facilities are now using antibiotics in all cases (4). However, there is still no consensus on this issue.

In this case, performing EVT under conditions of bacteremia might have contributed to the development of an infectious aneurysm; therefore, further discussion on the indications for second EVT is needed. Since acute arterial occlusion was found immediately after the onset, the risk of myonephropathic metabolic syndrome was considered to be low if recanalization could be performed as soon as possible. Although the patient had bacteremia two days before EVT, he had been systemically administered a sensitive antibiotic from that day. He had not suffered from septic shock. Therefore, we thought it was unlikely that the systemic infection would worsen after performing EVT. Although there are various opinions regarding the optimal treatments for peripheral artery disease, it has been reported that endovascular treatment may act as a bridge until more definitive treatment can be carried out on the infected abdominal aorta lesion (7). Therefore, we decided to perform revascularization therapy with percutaneous balloon angioplasty for the purpose of limb salvage.

In cases demonstrating an infected popliteal aneurysm with an impending rupture, a favorable result is reported with secondary surgical debridement after EVT with stent-graft implantation used as an emergency evacuation therapy (8). However, this present case did not have an impending rupture; therefore, we planned to perform a semi-urgent operation of resection and revascularization to control the infection. Considering the fragility of the arterial wall near the aneurysmal lesion, a long bypass was considered to be effective for avoiding the onset of an anastomotic pseudoaneurysm, to achieve infection control, and to also preserve flow patency. However, in this case, the poor vascular properties on the proximal and distal sides made it difficult to anastomose the bypass graft. After confirmation of the long-term suppression of infection, we will consider performing additional revascularization, including EVT.

In conclusion, we encountered a case of an infected popliteal aneurysm after EVT with POBA. The use of EVT with a “leaving nothing behind” strategy is becoming popular along with the increased use of DCBs. However, infection after EVT is still a concern. Our findings suggest that the use of prophylactic antibiotics should be considered regardless of the procedure because of the possibility of fatal complications. Moreover, EVT under conditions of bacteremia might cause an infectious aneurysm even with antibiotics; thus, careful consideration for its indications and a frequent follow-up are both necessary.

The authors state that they have no Conflict of Interest (COI).

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