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Case Report

Resection of Giant Mycotic Aneurysm in the Tibioperoneal Trunk by Posterior Approach in a Prone Position with Air Tourniquet

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Aneurysms of the tibioperoneal trunk (TPT) with peripheral arterial lesions are extremely rare. We present a case of a 68-year-old man who underwent surgical treatment for a mycotic aneurysm of the TPT. This report highlights the importance of en bloc surgical resection of the mycotic aneurysm and an appropriate approach with an air tourniquet for the prevention of injuries to the adherent tissues.

Keywords: mycotic aneurysm, tibioperoneal trunk, air tourniquet

Introduction

Aneurysmal formation of the tibioperoneal trunk (TPT) is considered much less frequent than the popliteal artery. Also, mycotic peripheral artery aneurysms have become less common due to the widespread use of antibiotics. We present a case of a 68-year-old man who underwent surgical correction of the mycotic aneurysm in the TPT. Herein, we highlight the optimal strategies and treatment options available and administered in the present case.

Case Report

A 68-year-old man was diagnosed with adult Still's disease at the age of 55 and was administered immunosuppressants and steroids. Six years later, the patient underwent minimally invasive mitral valve repair through a right mini-thoracotomy for infective endocarditis. Prior to admission to our institute, he had been hospitalized at another general hospital for 6 months for multiple rib fractures and traumatic pneumothorax caused by a traffic accident. Enhanced whole-body computed tomography (CT) taken at the previous hospital ruled out traumatic lesions, except for the chest lesion.

The patient was also complicated with COVID-19 infection, which promptly exacerbated acute respiratory distress syndrome requiring mechanical ventilation, eventually followed by tracheostomy for his respiratory management. In addition, during incubation, a course of antibiotics and aspirin was administered for the diagnosis of suspicious septic emboli to the brain and bacteremia. The patient was eventually weaned from the tracheostomy. During physical and respiratory rehabilitation, he felt a pulsatile mass around the right calf with persistent pain and numbness. It was then that he was referred to our institute for more detailed investigations. An enhanced CT angiogram (ECTA) revealed a huge pseudoaneurysm (65 × 40 × 30 mm) of the right TPT (**Fig. 1**). Laboratory tests showed white blood cell counts and C-reactive protein (CRP) values of 8600/μL and 4.6 mg/dL, respectively. Preoperative digital subtraction angiography revealed no antegrade flow from the distal end of the aneurysm body into the orifices of the peroneal artery (PA) and posterior tibial artery (PTA) (**Fig. 2**). Both PA and PTA were visualized through bridging collaterals, mainly from the anterior tibial artery (ATA) (**Fig. 3A**). Therefore, surgical resection of the aneurysm was electively scheduled.

The patient was intubated and an air tourniquet was omnidirectionally placed on his right thigh while in a prone position. A gentle S-shaped incision was made from above to below the knee. The popliteal artery (POPA), the popliteal vein (POPV), and the tibial nerve (TN) were identified at the back of the knee and were individually encircled and controlled with vessel tapes. Several arteriovenous fistulas, which were preoperatively undetected, were identified between the POPA and POPV. All were ligated and divided (Fig. S1). The proximal TPT was encircled and controlled with vessel tapes, followed by identification of the proximal aneurysmal body. Due to

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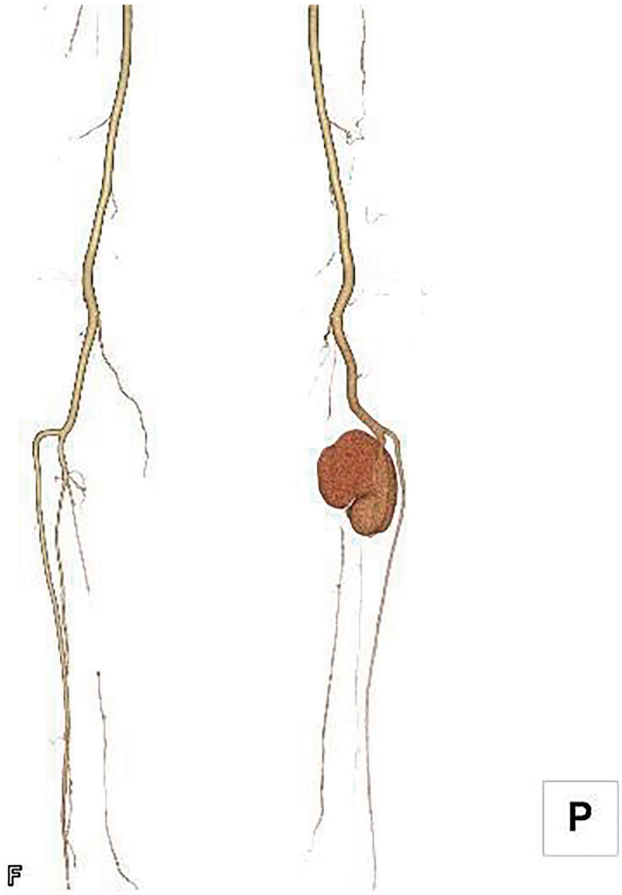

Fig. 1 ECTA on admission revealed a huge pseudoaneurysm of the right TPT, measuring 65 × 40 × 30 mm. ECTA: enhanced computed tomography angiogram; TPT: tibioperoneal trunk

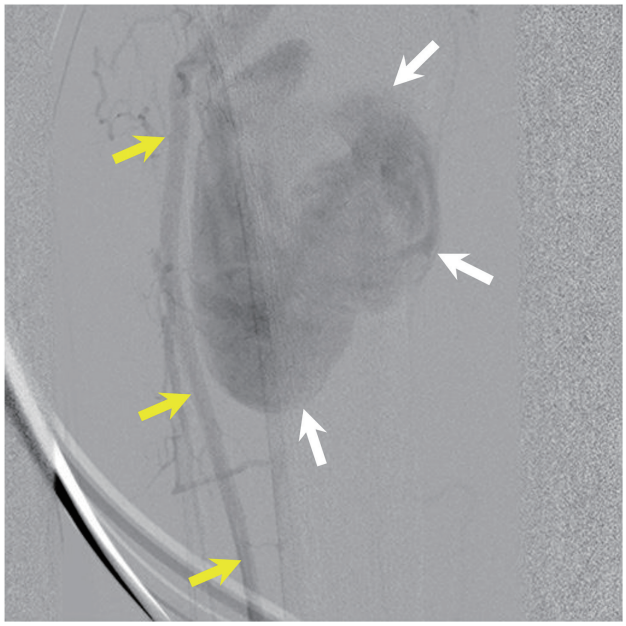

Fig. 2 Angiography from the popliteal artery shows the ATA (yellow arrow) and TPT aneurysm (white arrow). There is no antegrade flow from TPT aneurysm to PA and PTA. ATA: anterior tibial artery; TPT: tibioperoneal trunk; PA: peroneal artery; PTA: posterior tibial artery

dense adhesion between the aneurysmal body and the TN, further manipulations were performed after systemic heparinization. Once the air tourniquet was inflated to 250 mmHg to obtain circulatory arrest (CA) to the right lower extremity (RLE), the aneurysmal sac was longitudinally opened, and the mural thrombus was completely extracted. The whole aneurysmal sac was resected while carefully avoiding injury to the adjacent TN and vessels. The orifices of the PA and PTA were closed by a figure-of-8 suture with a 5-0 polypropylene suture. The proximal TPT was closed by double suture ligations followed by reinforcement with a continuous 5-0 polypropylene suture. The air tourniquet was deflated after every surgical manipulation stated above was completed. The CA to the RLE took 63 minutes in total. Intraoperative angiography demonstrated that the distal PTA and PA were visualized through the bridging collaterals, mainly from the ATA (**Fig. 3B**). The TPT aneurysm itself was not visualized at all on postoperative ECTA (Fig. S2). Pathological findings of the aneurysmal wall included infiltration of inflammatory cells, mainly consisting of neutrophils and necrotic tissue (Fig. S3). Cefazolin was administered on postoperative day 1 (POD1) and discontinued on POD5 based on the microbiological test of the aneurysmal wall being negative. The postoperative clinical course was uneventful, and the patient's right ankle-brachial pressure index remained at 1.17, which was considered satisfactory. The patient was discharged home on the 37th postoperative day.

Discussion

Several treatment options for TPT aneurysms have been reported to date, including surgical resection,[1–3] endovascular approach,[4,5] and hybrid procedure.[6,7] According to Ebaugh's report, simply ligating the inlet and outlet of the aneurysmal body followed by bypass grafting can lead to aneurysm expansion, similar to type II endoleak or endotension as seen in endovascular procedures. Thus, Ebaugh recommends that the aneurysm should be simply excised from the viewpoint of curability.[8] Endovascular approaches, including stent graft (SG) replacement, or embolization with coiling material, have recently been reported.[4,5] However, SG replacement in TPT was not applied in our case because of anatomical limitations and insurance coverage under the present health system in Japan. Also, SG treatment is associated with the possibility of postoperative SG infection and re-expansion

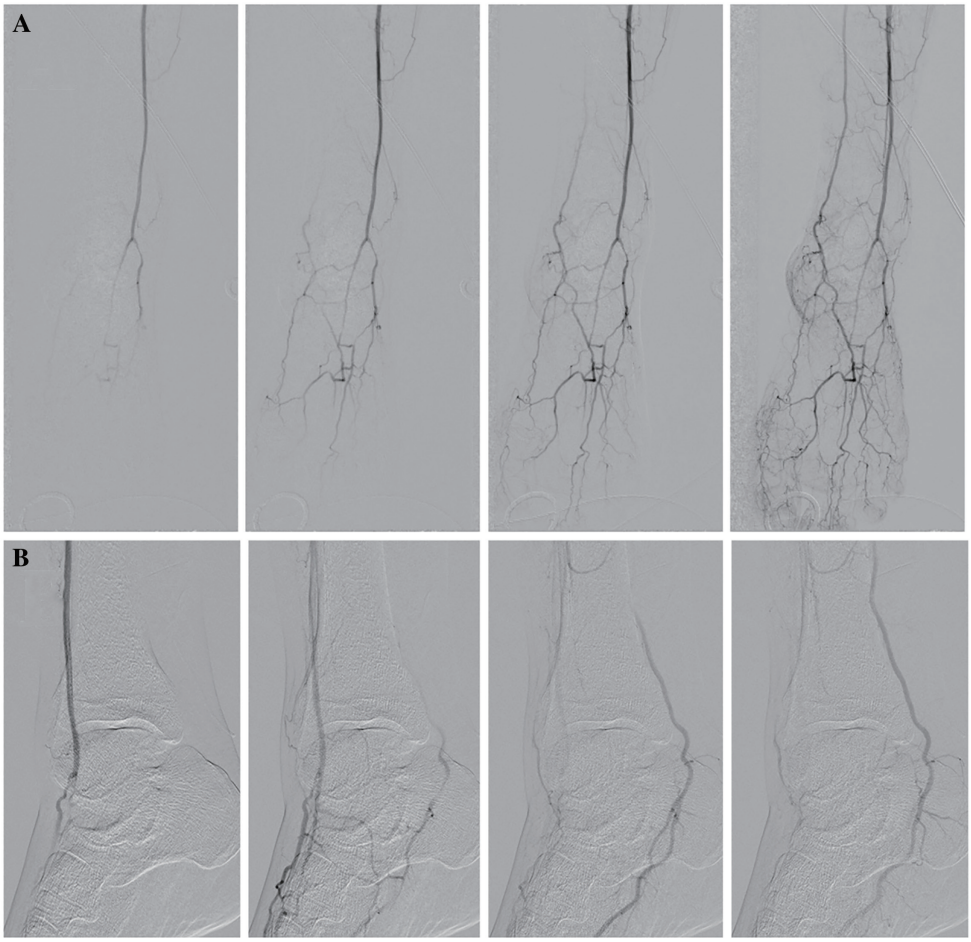

Fig. 3 Preoperatively, both PA and PTA are visualized via bridging collaterals mainly from ATA (**A**). An intraoperative completion angiography demonstrates distally the PTA and PA, visualized through the bridging collaterals mainly from the ATA (**B**). ATA: anterior tibial artery; PA: peroneal artery; PTA: posterior tibial artery

because of persistent endoleak. In fact, intraoperative findings revealed several backflows from the orifices of the branched vessels inside the aneurysmal sac. The same is true for embolization with coils, and complete thrombosis is not guaranteed, especially in the case of a large aneurysm. While the treatment of infected aneurysms with antibiotics can reduce inflammation to some extent, aneurysmal shrinkage cannot be consequently guaranteed. For these reasons, surgical resection of aneurysms containing infected tissues may be the optimal treatment strategy.

There are several approaches for surgical resection of TPT aneurysm, including an anterior approach in the supine position and a posterior approach in the prone position. In the posterior approach, the targeted aneurysm, POPA, POPV, and TN can be identified in the same operative view. We consider the air tourniquet technique to be useful to obtain simple CA to the lower extremity (LE) and safely peel off the adherent tissues. In our institute, the air tourniquet is wrapped around the ipsilateral thigh, while the minimum limb occlusion pressure to obtain the CA to the LE is continuously monitored by the Doppler technique or pulse oximetry. Also, an Esmarch bandage is tightly wrapped around the LE from the periphery to the proximal prior to the inflation of the air tourniquet to prevent deep and superficial venous filling to secure a bloodless field. The advantage of this technique is that peripheral blood flow can be safely interrupted without exposing the target vessels, and the amount of blood in the veins is also squeezed, which allows secure dissections of the adherent tissues under the bloodless field. Notably, unfavorable complications such as peripheral neuropathy and compressed skin damage due to prolonged compression to the thigh should be cautiously kept in mind.[9,10]

LE ischemia due to insufficient antegrade flow from the PA and PTA can be a concern at the time of resection of the TPT aneurysm. Therefore, depending on the individual case of resection of a TPT aneurysm, distal revascularization with the use of the great saphenous vein should be considered.[2,4,5] Preoperative angiography and ECTA showed that the orifices of PTA and PA were occluded,

and intraoperative completion angiography showed adequate blood flow in the PA as well as the PTA to the ankle through the collateral pathway from the ATA. Therefore, in this case, reconstructions of the PA and PTA were considered to be unnecessary.

Conclusion

In the present case, surgical resection of the infected TPT aneurysm was successfully performed. With the application of surgical techniques, including a posterior approach in the prone position and the use of an air tourniquet to prevent injuries to the adjacent tissues around the infected aneurysmal bodies, there were no signs of ipsilateral leg ischemia and peripheral neurological disorder. Careful regular follow-up should be performed, considering the possibility of mycotic aneurysm recurrence due to the long-time use of immunosuppressive agents, as in the present case.

Informed Consent

The patient provided written informed consent for the use of his case details and imaging studies.

Author Contributions

Surgical planning: RI, GC, and AH
Investigation: RI
Manuscript preparation: RI, GC, and AH
Critical review and revision: all authors
Final approval of the article: all authors
Accountability for all aspects of the work: all authors

Disclosure Statement

The authors have no competing interests.

Supplementary Materials

Fig. S1 Intraoperative posterior approach view showing the POPA (blue arrow), POPV (white arrow), and TN (yellow arrow) are taped. Aneurysm is opened and exposes severe adhesion to the surrounding tissue. POPA: the popliteal artery; POPV: the popliteal vein; TN: the tibial nerve

Fig. S2 Postoperative ECTA shows the TPT aneurysm was completely resected. ECTA: enhanced computed tomography angiogram; TPT: tibioperoneal trunk

Fig. S3 Histological findings show fibrous tissue with predominant necrosis (**A**) and infiltration of inflammatory cells (**B**). (H&E stain (**A**), original magnification, ×40; H&E stain (**B**), original maginification, ×200.)

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