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Case Report

CASE REPORT

Successful limb salvage by endovascular treatment for critical limb ischemia subsequent to acute limb ischemia

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Abstract

Recently, there have been increasing opportunities to treat patients with peripheral arterial disease. Of those patients, both pathological conditions, such as acute limb ischemia (ALI) and chronic critical limb ischemia (CLI), are closely associated with high risks of major amputation, disability and death. We encountered a very rare case of CLI subsequent to ALI. An 83-year-old male showed the sudden onset of ALI, probably due to thromboembolism from an abdominal aortic aneurysm during an operation for gastric cancer. The patient was referred to another hospital for Fogarty thrombectomy. About 1 month after ALI onset, necrosis of the left first toe gradually progressed. On angiography of the left lower limb, we noted occlusions of both anterior and posterior tibial arteries. Then, we successfully conducted balloon angioplasty for the below-the-knee arteries. Thereby, favorable blood flow was achieved, which led to successful wound healing without amputations.

INTRODUCTION

With the advents of societal aging and increasing morbidity due to lifestyle-related diseases, there have been more opportunities to treat patients complicated with peripheral arterial disease (PAD). Of those patients, both pathological conditions, such as acute limb ischemia (ALI) and chronic critical limb ischemia (CLI), are closely associated with dismal prognoses: high risks of major amputation, disability and death. A revascularization procedure, such as endovascular treatment (EVT) or a surgical approach, has been established as an essential method for limb salvage of those patients.

CASE REPORT

An 83-year-old male who had no medical history of atrial fibrillation underwent gastrectomy and lymphadenectomy around the abdominal aorta for advanced gastric cancer in our hospital. Soon after the operation, the patient complained of pain at rest in both lower extremities. Both legs looked pale and popliteal arteries were not palpable on either side. Contrast enhanced computed tomography showed an abdominal aortic aneurysm (AAA) with mural thrombi just above the iliac bifurcation (Fig. 1A) and obstructed popliteal arteries on both sides (Fig. 1B and C). ALI, probably due to thromboembolism from AAA, was thought to have been caused by the procedure of lymphadenectomy during surgery. The patient was referred to another hospital for Fogarty thrombectomy because vascular surgeons were not available at our hospital.

After Fogarty thrombectomy, the patient returned to our hospital for postoperative management. Because reperfusion in infrapopliteal arteries after Fogarty thrombectomy resulted in suboptimal one, we continued systemic heparinization for

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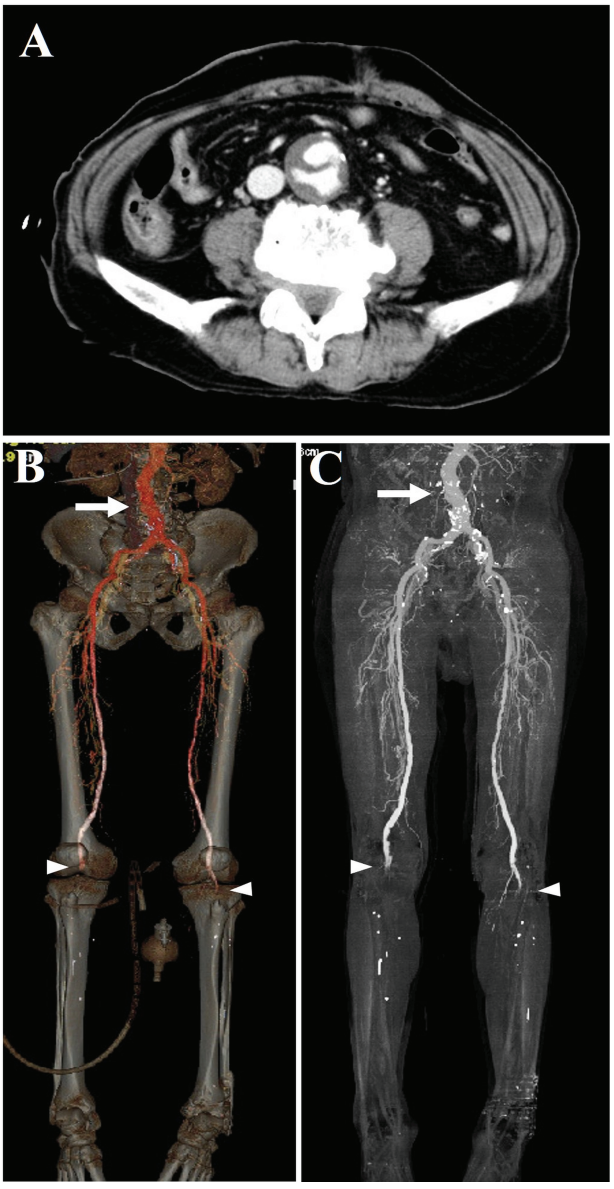

Figure 1: (**A**) Contrast-enhanced computed tomography showing AAA with mural thrombi just above the iliac bifurcation. (**B** and **C**) Occluded popliteal arteries on both sides (arrowheads). Arrows indicate AAA, a possible embolic source.

targeting the activated prothrombin time twice as long as the normal limits. About 1 month after ALI onset, necrosis of the first toe, which corresponded to the grade of Rutherford class 5, gradually progressed (Fig. 2A and B). His ankle brachial pressure index was 0.66 on the left side and skin perfusion pressure was 43 mmHg at the left dorsum of the foot. The WIfI classification of the left lower extremity was Wound 2 Ischemia 1 Foot Infection 0, which corresponded to Stage 3 [1]. CLI was strongly suspected, and we noted occlusions of the anterior tibial artery (ATA) and posterior tibial artery (PTA) on angiography of the left lower limb (Fig. 2C). Following the angiography, we conducted balloon angioplasty for the left PTA (Fig. 3A), ATA (Fig. 3B) and pedal arch (Fig. 3C). Thereby, satisfactory blood flow as far as the digital arteries was achieved (Fig. 4A, arrows). Favorable wound blush of the first toe was also clearly visualized (Fig. 4B, arrows), which made us to decide the interruption of systemic heparinization. Three months later, we achieved successful wound healing of the first toe (Fig. 4C) without any amputations.

DISCUSSION

In this modern era, the pathological entity of PAD has become more common in daily practice. The Oxford Vascular Study (OXVASC), a comprehensive population-based study of all acute vascular events, revealed the incidence, outcome, risk factors, premorbid preventive treatment and long-term prognosis associated with all acute PAD events in patients requiring medical attention in Oxfordshire, UK. Of all 92 728 patients (10-year average), 202 were incident CLI events (22 per 100 000 per year) and 93 were incident ALI events (10 per 100 000 per year). Notably, only three had an incident CLI event during follow-up after an incident ALI event, which means CLI subsequent to ALI is a very rare pathological entity [2].

ALI refers to a sudden decrease or absence of perfusion in the lower limbs. The etiology is widely divided into embolism and thrombosis with various comorbidities, and characteristic physical findings include the 5Ps: pain, pallor, pulselessness, paralysis and polar temperature. The amputation rate of ALI patients is reportedly 10–30% at 30 days, and the life prognosis is also poor unless treated promptly and appropriately [3]. There are several treatment options such as surgical treatment (thrombectomy and bypass surgery), EVT (catheter-directed thrombolysis, percutaneous thrombus aspiration, crushing thrombi by balloon inflation and stent deployment) and hybrid treatment that combines both therapies [4]. Surgical treatment using the Fogarty catheter rather than EVT is preferable for removing massive thrombi in ALI cases. On the other hand, there are some cases in which additional EVT is needed for treating the remaining thrombi, and insufficient treatments to remove thrombi or co-existing atherosclerotic lesions in lower extremities may result in CLI in the chronic phase. In our case, residual occlusion in both the ATA and PTA after thrombectomy using the Fogarty catheter led to necrosis of the first toe in the chronic phase.

CLI is usually accompanied by atherosclerotic stenoses or occlusions in multiple segments of arteries in the lower extremities and represents the end stage of PAD. This pathology usually has a more than 2-week disease duration and is characterized by findings such as ischemic rest pain, wounds or gangrene [5]. CLI is associated with dismal prognoses: a high risk of major amputation, disability and death. A total of 30% of CLI patients have been reported to undergo major amputation of the lower extremities, and 25% of those cases are fatal within 1 year. One of the most important therapeutic goals for such CLI patients is limb salvage, and limb ischemia is one of the most critical risk factors that hamper wound healing [6]. Reconstructing direct blood flow by angioplasty based on the angiosome concept in CLI patients with isolated infrapopliteal lesions is clinically important for limb salvage. However, vascular reconstruction of a specific source artery for ischemic wounds is not always easy to perform due to technical obstacles and lesion severity [7]. Moreover, several studies reported that the existence of pedal artery disease results in impaired wound healing [8]. Therefore, adjunctive revascularization for pedal artery disease might become a salvage procedure for CLI [9]. Based on these discussions, we conducted complete revascularization in one stage and could obtain favorable wound blush of the first toe, which successfully resulted in wound healing [10].

Figure 2: Necrosis of the first toe (**A** and **B**) in the chronic stage. (**C**) An angiographic image showing occlusions of both ATA and PTA.

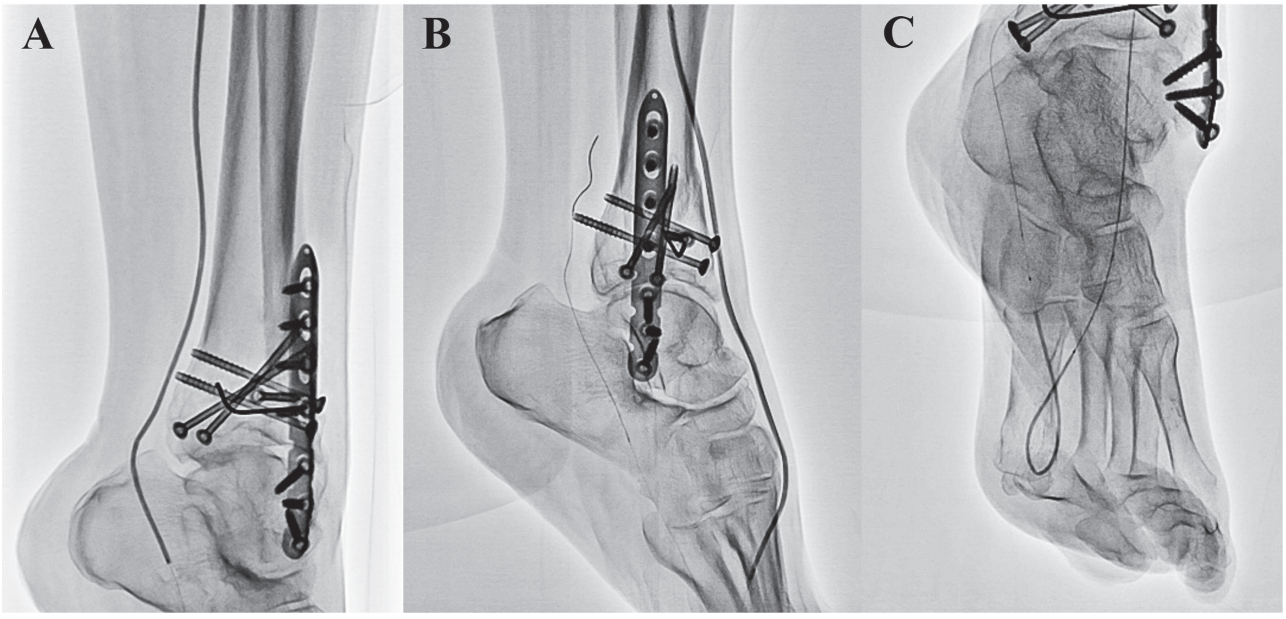

Figure 3: Balloon angioplasty of the left PTA (**A**), ATA (**B**) and pedal arch (**C**).

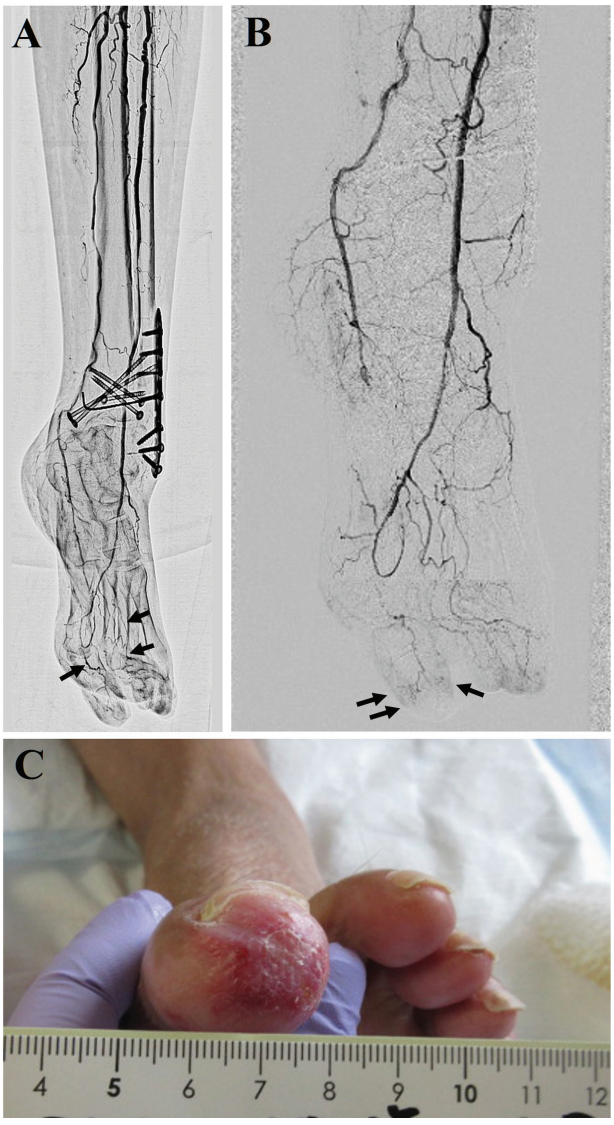

Figure 4: (**A**) A final angiographic image of the left lower limb showing favorable blood flow in the digital arteries (arrows). (**B**) Satisfactory wound blush of the necrotic first toe (arrows). Successful wound healing of the first toe (**C**).

Here, we encountered a rare PAD case with CLI subsequent to ALI. The recent improvements of catheter devices and procedural techniques related to EVT enabled us to safely recanalize the complex vascular lesions of the lower extremities. Of course, surgical treatment is one of the most promising procedures for ALI or CLI patients with complex vascular lesions. However, an EVT strategy is one of the favorable treatment options for those patients who are contraindicated for surgical treatments.

CONFLICT OF INTEREST STATEMENT

None declared.

FUNDING

None.

ETHICAL APPROVAL

None required.

CONSENT

Informed written consent was taken from the patient.

GUARANTOR

T.N. is the guarantor of this work.

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