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# Multi-stage endovascular treatment of iatrogenic, distal, acute lower limb ischaemia in a patient with penetrating aortic ulcer

## Wieloetapowe, wewnątrznaczyniowe leczenie ostrego, jatrogennego niedokrwienia kończyny dolnej u pacjenta z penetrującym owrzodzeniem aorty

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### Abstract

**Introduction.** Acute limb ischaemia (ALI) is a potentially treatable disease of the arteries. ALI can be caused by many factors. A rare cause of ALI is embolisation due to a penetrating aortic ulcer (PAU). The endovascular approach has made progress as an alternative treatment for ALI. However, using only one method of treatment may not be enough to salvage the limb.

**Case report.** We present a case of an iatrogenic, intraoperative embolisation of the lower limb arteries after left external iliac artery (EIA) stenting in a patient with a potential source of embolisation from a PAU. In the treatment process, we performed an elective percutaneous transluminal angioplasty, left EIA stenting, and emergency intra-arterial thrombolysis. The patient was discharged from the clinic in a good condition and without limb ischaemia. After one month, an aortic stent graft was implanted to supply abdominal aortic aneurysm with PAU. Control angiography of computed tomography of the abdominal aorta and lower limb arteries was performed, and a correct stent graft and stent patency in left EIA was demonstrated.

**Conclusions.** Endovascular treatment of acute limb ischaemia may require the use of different techniques to solve the problem, especially in complicated cases. Catheter directed thrombolysis is an effective method of treatment in an iatrogenic, distal embolisation. Stent graft implantation seems to be an effective method of eliminating emboli sourced from the aortic ulcer.

Key words: acute limb ischaemia, penetrating aortic ulcer, percutaneous transluminal angioplasty, intra-arterial thrombolysis

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## Introduction

Acute limb ischaemia (ALI) is a potentially treatable disease of the arteries that can be caused by many factors [1–5]. A rare cause of ALI is a penetrating aortic ulcer (PAU) [6].

## Case report

We present the case report of a patient with a left external iliac artery (left EIA) occlusion who was treated endovascularly, complicated by an iatrogenic peripheral embolism

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**Table 1.** Patient characteristics

| Parameter | Value |
|---|---|
| Sex | Male |
| Age [years] | 73 |
| Weight [kg] | 90 |
| Height [m] | 1.75 |
| BMI [kg/m$^2$] | 29.4 |
| ABI | 0.3 |
| Fountain Classification | III |
| BP [mm Hg] | 140/80 |
| HR [beats/min] | 100–120 (AF) |
| $SpO_2$ [%] | 92 |
| **Comorbidities** | |
| Hypertension | 180/100–140/75 mm Hg — poorly controlled |
| Ischaemic heart disease | Myocardial infarction 2 × |
| Paroxysmal atrial fibrillation | Rivaroxaban 20 mg per day |
| COPD | Moderate obturation: $FEV_1$ 50–80%; in Medical Research Council questionnaire — due to dyspnoea the patient walks more slowly than his peers or at his own pace on flat terrain, must stop to get breath |
| Interstitial lung fibrosis | Idiopathic pulmonary fibrosis (IPF) |
| DVT | 2015 — posterior tibial and sagittal veins in the right lower limb<br>Recanalisation in control US in 2016 |
| AAA — PAU | Ulceration on posterior aortic wall |

BMI — body mass index; ABI — ankle/brachial index; BP — blood pressure; HR — heart rate; AF — atrial fibrillation; $SpO_2$ — oxygen saturation via pulse oximetry; COPD — chronic obstructive pulmonary disease; $FEV_1$ — forced expiratory volume in 1 second; DVT — deep vein thrombosis; AAA — abdominal aortic aneurysm; PAU — penetrating aortic ulcer

treated with intra-arterial thrombolysis and with a PAU covered by an aortic stent graft.

A 73-year old man was admitted to the Department due to a two-day history of resting pains in the left leg (Table 1). Doppler ultrasound (DUS) revealed critical left EIA stenosis, patent common femoral artery (CFA), and all distal arteries of the limb. The patient was qualified for endovascular treatment.

We used access via the right CFA and the cross-over technique for catheterisation of the left common iliac artery (CIA). Arteriography showed left EIA occlusion. Unfractionated heparin (UFH) was administered intravenously in a dose of 0.5 mg/kg. The occlusion was forced by a Roadrunner®, 0.035 inch guidewire (Cook Medical). PTA was performed using a Passeo-35 balloon, 7 × 100 mm (Biotronic). The balloon catheter was expanded with no significant resistance, which could suggest the presence of an intra-arterial thrombus. Due to the significant residual stenosis, an Epic™ 8 × 80 mm stent (Boston Scientific) was implanted with postdilatation using a Passeo-35 balloon 7 × 100 mm (Biotronic). The control arteriography showed patent left EIA and the disturbed inflow to the proximal superficial femoral artery (SFA) suggested the presence of a thrombus in SFA ostium. PTA SFA was performed with a MUSTANG™, 6 × 150 mm balloon (Boston Scientific) maintaining a short time to balloon expansion. In subsequent arteriographies, we discovered dislocation of the thrombus had shifted through SFA to PA and to the tibioperoneal trunk (Figure 1). We decided to establish a catheter for intra-arterial thrombolysis, using a Cragg-McNamara 5 Fr. 135/20 cm (Medtronic). Alteplase (Actilyse, Boehringer-Ingelheim) infusion, 1 mg/hour was administered. Unfractionated heparin (UFH) was given to the sheath (500 units/hour) simultaneously. The fibrinogen and APTT levels were set every six hours. The next day, control arteriography was performed. Due to the presence of a thrombus in the tibioperoneal trunk, the catheter was moved peripherally. The next day, arteriography did confirm the correct image of the arteries of the left lower limb (Figure 2). Rivaroxaban (1 × 20 mg), atorvastatin (1 × 20 mg) and acetylsalicylic acid (ASA) (1 × 75 mg) were reintroduced, and the patient was discharged home in a good condition.

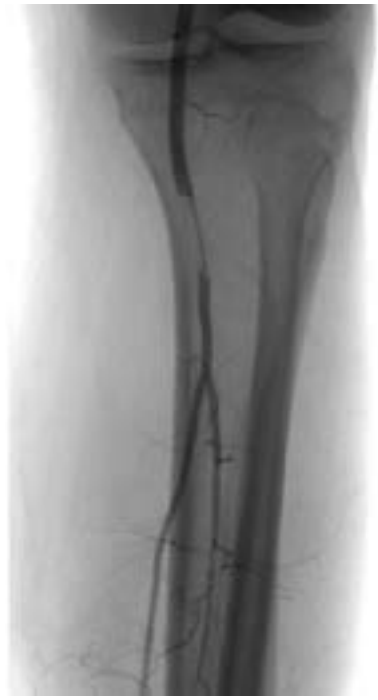

**Figure 1.** Near-occlusion of the tibioperoneal trunk

After one month, the PAU was repaired by implantation of an aortic stent graft — Endurant II (Medtronic), meaning that the second potential source of emboli had been

**Figure 2.** Control arteriography after intra-arterial thrombolysis

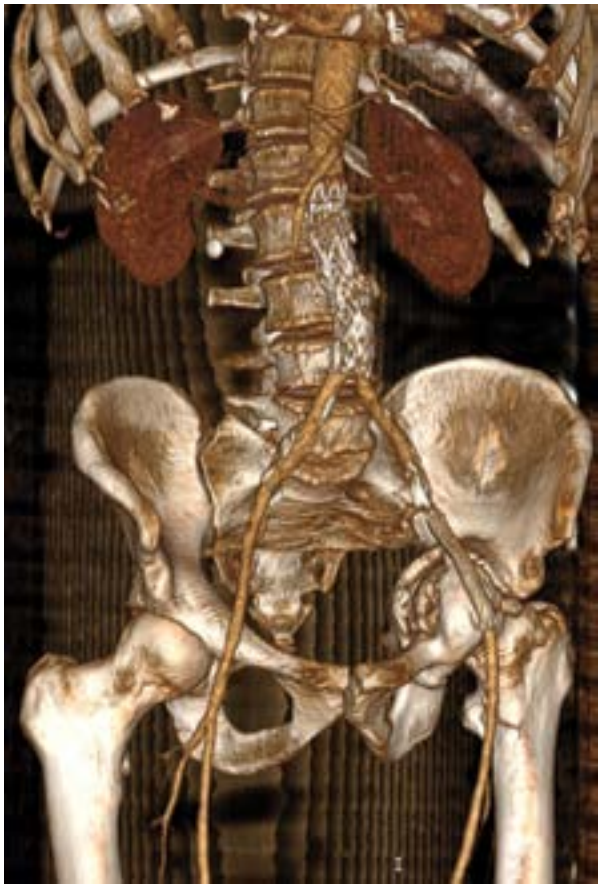

**Figure 3.** Control computed tomography angiography after stent graft implantation

eliminated. The perioperative and postoperative periods were uncomplicated.

## Results

The DUS was performed postoperatively after one, three and 12 months. After five months, a control computed tomography angiography (CTA) of the abdominal aorta and lower limb arteries was performed (Figure 3). A correct patency of stent graft and stent in left EIA was found. To date, there have been no symptoms of limb ischaemia. Last ankle/brachial index (ABI) = 1.0. Follow-up period is 17 months.

## Discussion

Delaying the start of treatment can be catastrophic for a patient with acute limb ischaemia, with reported amputation rates of up to 25% and in-hospital mortality of up to 15% [7]. Angioplasty of a fresh thrombus can be considered as useless or even as a mistake, but if an arterial occlusion occurs, its presence is never known to the surgeon. The real mistake is to overlook the thrombus dislocation. When deciding on a treatment method, risk factors resulting from chronic diseases, and the experience of the surgeon, must be taken into account [8]. Treatment of intraoperative complications may require the use of different techniques. In our presented case, two of the three stages of treatment used off label techniques: thrombolysis using Alteplase (without registration in acute limb ischaemia), and stent graft implantation in a small diameter aneurysm. Without such procedures, it would not have been possible to save the limb and protect it in the long term. The choice of treatment was based on 'good medical practice' [9, 10].

## Conclusions

Endovascular treatment of acute limb ischaemia may require the use of different techniques to solve the problem, especially in complicated cases. Catheter-directed thrombolysis is an effective method of treatment in an iatrogenic, distal embolisation. Stent graft implantation seems to be an effective method of eliminating emboli sourced from an aortic ulcer.

## Conflict(s) of interest

The authors declare no conflict of interest.

## Streszczenie

**Wstęp.** Ostre niedokrwienie kończyn (ALI) jest jedną z najbardziej niebezpiecznych, ale potencjalnie wyleczalnych chorób spowodowanych zaburzeniami drożności tętnic. Przyczyną ALI może być ostry zakrzep, zator, uraz (w tym jatrogenny) lub rozwarstwienie. Rzadką przyczyną jest zatorowość spowodowana przez penetrujące owrzodzenie aorty (PAU). Metody wewnątrznaczyniowe i techniki otwarte w leczeniu ALI stosuje się zależnie od dostępności tętnic i drożności na obwodzie. Zastosowanie tylko jednej metody leczenia może nie wystarczyć do uratowania kończyny.

**Opis przypadku.** Zaprezentowano przypadek jatrogennej, śródoperacyjnej zatorowości tętnic kończyny dolnej po stentowaniu lewej tętnicy biodrowej zewnętrznej (EIA) z prawdopodobnym źródłem materiału zatorowego pochodzącym z PAU. Wykonano planową przezskórną angioplastykę wieńcową z posadowieniem stentu w lewej EIA oraz trombolizę dotętniczą w trybie pilnym. Pacjenta wypisano z kliniki w dobrym stanie ogólnym, bez cech niedokrwienia kończyny. Po miesiącu implantowano stentgraft, wyłączając PAU. Kontrolna angiografia tomografii komputerowej aorty brzusznej oraz tętnic lewej kończyny dolnej wykazała prawidłowy przepływ przez stentgraft, przez stent w lewej EIA oraz przez tętnice kończyn dolnych.

**Wnioski.** Wewnątrznaczyniowe leczenie ALI może wymagać zastosowania różnych technik, zwłaszcza w skomplikowanych przypadkach. Tromboliza dotętnicza jest skuteczną metodą leczenia jatrogennej, dystalnej zatorowości. Wszczepienie stentgraftu wydaje się pewną metodą zapobiegającą zatorowości z owrzodzenia aorty.


Sława kluczowe: ostre niedokrwienie kończyn dolnych, tętniak aorty brzusznej, penetrujące owrzodzenie aorty, tromboliza dotętnicza

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