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Stent fracture as a complication of superficial femoral artery stenting – a case report

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Abstract

Introduction: Peripheral artery disease (PAD) is an atherosclerotic vascular disease that results in obstruction of blood flow in the arteries other than those in the coronary circulation. PAD is often located in lower extremities, with patients presenting symptoms of intermittent claudication or critical lower limb ischemia. Angioplasty and stent implantation are often used in the treatment of PAD. Although these methods are considered as a low invasive and low risk, some factors may limit stent patency in the future. The fracture of the implanted stent may be one of these.

Case report: A 68 old man, long-term smoker, with a history of chronic limb ischemia and many vascular surgeries because of PAD was admitted to the hospital with symptoms of the acute limb ischemia. Angiography showed a fracture of the stent implanted during the earlier hospitalization, with a fragment displacement to the left external iliac artery. The patient was successfully treated with catheter-directed thrombolysis.

Discussion: Stent fracture is usually asymptomatic, however, it may cause complications, such as restenosis, pseudoaneurysm, perforation of the vessel, and in-stent embolism. The cumulative incidence of the femoropopliteal stent fracture varies from 2 to 65% in several studies. Incidence increases with stent length and is significantly lower in the second generation of nitinol stents, that was designed to have enhanced flexibility and durability.

Introduction:

Peripheral artery disease (PAD) is an atherosclerotic vascular disease that results in obstruction of blood flow in the arteries other than those in the coronary circulation [1]. According to recent studies, it affects more than 200 million adults worldwide [2]. PAD is often

located in lower extremities, with patients presenting symptoms of intermittent claudication or critical lower limb ischemia [3].

Endovascular treatment (EVT) or surgical reconstruction is used to treat lifestyle-limiting claudication that doesn't respond adequately to medical therapy, including exercise training [4]. EVT of the arteries in the femoropopliteal area is an established treatment modality and a treatment of choice for the TASC A lesions. For the TASC B EVT is a preferred therapy and for type C, it can be considered as a treatment option. For the TASC D lesions, the treatment of choice is surgery [5]. The BASIL (Bypass Surgery versus Angioplasty in Severe Ischaemia of the Leg) trial found that for patients with severe limb ischemia, due to infra-inguinal disease, suitable for surgery and angioplasty, a bypass-surgery-first and a balloon-angioplasty-first strategy are associated with broadly similar outcomes in terms of amputation-free survival. Moreover, in the short-term, surgery appeared to be more expensive than angioplasty [6]. A randomized trial, held by *Schillinger et al.*, showed that for the superficial femoral artery (SFA) primary implantation of a self-expanding nitinol stent was superior to balloon angioplasty with optional secondary stenting [7].

The SFA is a long, muscular artery, placed between the hip and a knee, which results in unique challenges for endovascular stenting. The SFA is exposed to flexion, extension, torsion, longitudinal and lateral compression and even extrinsic muscular compression [8]. These mechanical factors cause the risk of the fracture of the implanted stent, which has been recognized as one of the adverse effects of the SFA EVT [9]. The cumulative incidence of the femoropopliteal segment stent fractures varies from 2 to 65% in several studies [10]

Case Report:

We report a case of a 68 old man, long-term smoker, with a history of chronic limb ischemia and coronary artery disease, many vascular surgeries because of PAD, and a CABG. In 2010 patient underwent angioplasty of a superficial femoral artery (SFA) in both legs and thromboendarterectomy of the right common femoral artery (CFA). After the procedure, the patient's condition improved, and he was discharged home. In 2016 his condition declined, and he underwent endarterectomy of the common, superficial and deep femoral artery. A day after, the patient needed reoperation, because ofn acute limb ischemia (ALI). Reintervention consisted of a revision of CFA, and a thrombectomy of SFA, using a Fogarty catheter. His state didn't improve, and a day after distal femoropopliteal (fem-pop) bypass, using an artificial graft was done (Figure 1). A day after the patient underwent fem-pop bypass thrombectomy and angioplasty of tibial arteries. His state finally improved, but after a month, he suffered from a graft infection. Infected graft had to be removed, and the patient underwent SFA stenting (Figure 2), and tibial arteries angioplasty. The nitinol stent deployed in the SFA was 7 mm. in diameter and 20 mm. long. The patient was discharged home in a good state. After a year, he was admitted to the hospital because of the ALI. Angiography showed a stent fracture (Figure 3), with a fragment displacement to the left external iliac artery (Figure 4). The patient was successfully treated with a catheter-directed thrombolysis.

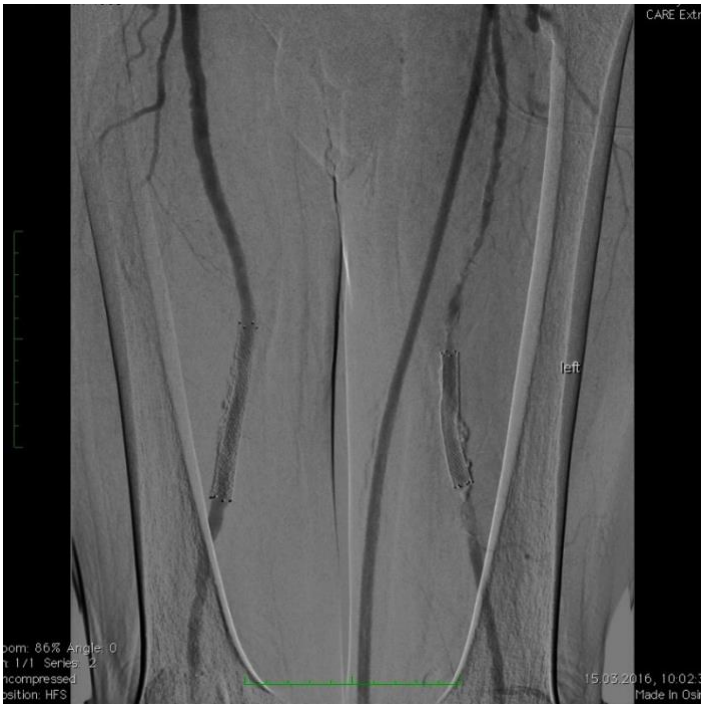

Figure 1. Angiography of the femoral arteries.
Visible patent distal femoropopliteal by-pass.

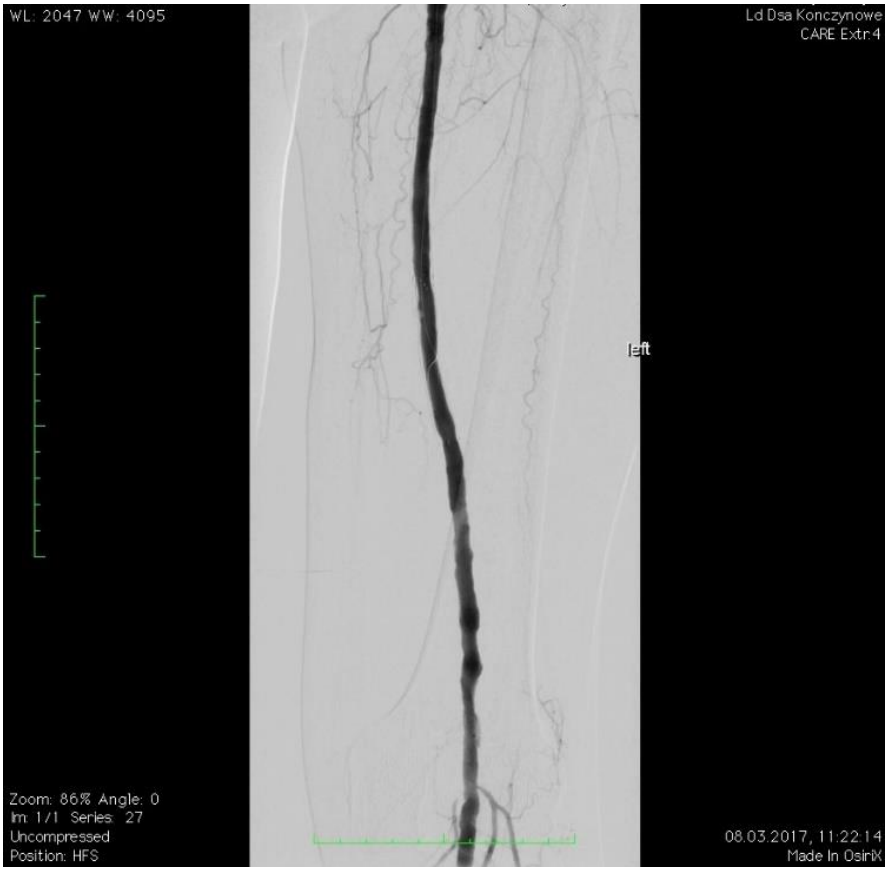

Figure 2. Angiography of the femoral arteries.
Visible patent SFA, with an implanted stent.

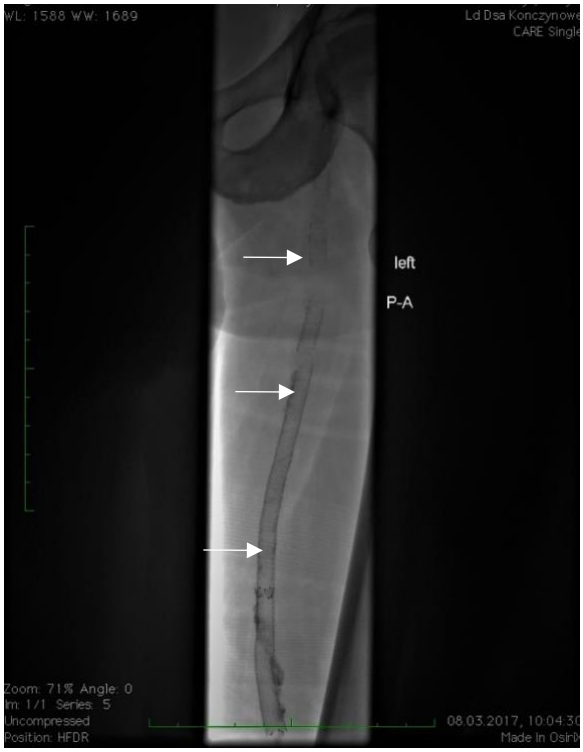

Figure 3. Angiography of the femoral arteries.
Visible fracture of the stent implanted in the SFA.

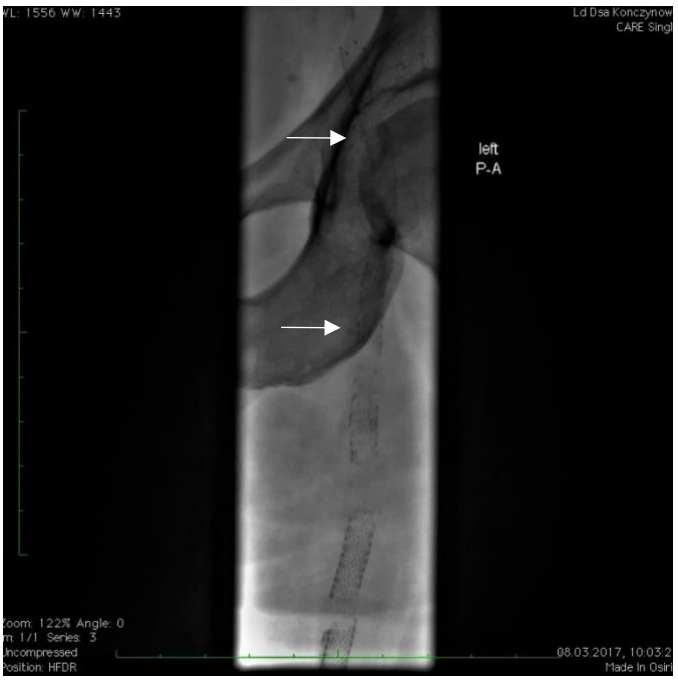

Figure 4. Angiography of the iliofemoral area. Visible fragments of the fractured stent displaced to the external iliac artery.

Discussion:

Stent fracture is usually asymptomatic [11], however, it may cause complications, such as restenosis, pseudoaneurysm, perforation of the vessel, and in-stent embolism [9]. Stent fractures may be classified into five types: Type I – involves only a single strut; Type II – multiple struts, that can occur at different sites; Type III – multiple strut fractures resulting in a complete transverse fracture, without displacement; Type IV – complete, transverse linear fracture with stent displacement; Type V – spiral fracture [11]. According to this classification, stent fracture that occurred in the presented case may be classified into Type IV.

The factors influencing SFA stent fractures are still not well understood, however, studies report that stent fracture incidence increases with stent length, and is significantly lower in segments shorter than 8 cm. [9,12]. Moreover, *Iida et al.* showed in a retrospective study,

that although exercising has been proven to reduce atherosclerotic risk factors and help maintain long-term patency after PTA, it may be associated with higher risk of stent fracture in SFA [12]. Stent fractures appeared to worsen the patency in the first 2 years after implantation, but not beyond 2 years [13].

Though SFA stenting became in the last years widely accepted and common procedure, it is still associated with a quite high rate of reconstruction failures, with many patients requiring intervention in a two years period [14]. Recently, producers introduced the second generation of Nitinol stents, that was designed to have enhanced flexibility, particularly in the axial direction due to a reduction of cell interconnections and a more spiral orientation of the interconnections [15]. Many clinical trials have claimed improved durability and patency of endovascular femoro-popliteal stent-based repairs with patency rates between 43% and 90% at 12 months [16]. Also, some studies investigating the efficacy of SFA stenting using second generation stents (SUPERA, Tigris), or self-expanding stent-grafts (Viabahn), showed a significantly lower incidence of stent fractures [17,18,19], or no cases of stent fractures at all [20,21,22]

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