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Successful Exclusion of a Large Femoropopliteal Aneurysm with a Covered Nitinol Stent

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Abstract

A 70-year-old woman presented with a large femoropopliteal aneurysm. A covered nitinol stent was implanted successfully and complete exclusion of the aneurysm was achieved. At follow-up 5 months later the stent was still patent and the patient was free of symptoms. However, moderate stenosis was seen at the proximal end of the stent.

Key words: Aneurysm, popliteal—Stents and prostheses

Recently, a polyester-covered nitinol stent, the Cragg Endopro System 1 (MinTec, Minimal Invasive Technologies SARL, La Ciotat, France) has been used to prevent restenoses of the iliac and femoral arteries after angioplasty or to treat complications [1–3]. There are also a few reports about the treatment of iliac or femoral artery aneurysms with this stent [1, 2, 4]. The value of the Cragg Endopro System 1 for the treatment of aneurysms in distal vessels is not well defined [5]. We report the successful implantation of this device in the distal femoral and popliteal artery for exclusion of a large aneurysm and the mid-term follow-up results.

Case Report

A 70-year-old woman was admitted to the department of surgery because of claudication of both lower extremities, which was classified as stage IIb according to Fontaine's criteria. Intraarterial digital subtraction angiography (DSA) performed by retrograde puncture of the right femoral artery revealed, at the left distal superficial femoral artery, a large aneurysm with a diameter of 5 cm × 2 cm (Fig. 1A) extending into the popliteal artery. On the right side, segments 1 and 2 of the popliteal artery were occluded due to thrombosis of another aneurysm, which was confirmed by sonography. In both legs patent tibial arteries provided good runoff. The ankle-brachial index was 0.52 on the right side and 0.83 on the left.

On the right side, surgical vein bypass grafting was performed to treat the occlusion of the popliteal artery. Stenting of the left popliteal artery was considered adequate. Via an antegrade femoral approach on the left side, the 9 Fr Cragg introducer sheath was inserted over a 0.035-inch guidewire. A 10-cm stent with a diameter of 6 mm was chosen and was placed in the P1 segment (from the opening in the adductor magnus to the branches of the superior genicular arteries) of the popliteal artery under fluoroscopic guidance. Irrigation of the system with cool saline was not administered. Then dilatation of the stent was performed with a 6-mm Olbert balloon (Meadox, Surgimed AIS, Stenlose, Denmark). Angiography immediately after stent placement showed diffuse contrast extravasation through the woven fabric into the aneurysm, though the stent was completely opened (Fig. 1B). However, angiography 15 min after stent implantation showed complete exclusion of the aneurysm and a patent distal femoral and popliteal artery. The patient was anticoagulated by 5000 IU heparin intraarterially during the procedure and by 1000 IU heparin intravenously per hour for the next 2 days (prothrombin time 1.5–2 times normal). For long-term anticoagulation, Phenproucoumon was prescribed and was maintained throughout the follow-up period. There were no complications. Intravenous DSA performed 4 days later revealed exclusion of the aneurysm by the Cragg Endopro Stent (Fig. 1C).

At follow-up 5 months later, intravenous DSA showed no evidence of recurrent aneurysm and the stent was patent. However, moderate stenosis (about 30%) was seen at the proximal end of the stent, caused by intimal hyperplasia (Fig. 1D). The ankle-brachial index was 0.91. The patient was free of symptoms and did not develop pain or fever throughout the follow-up period.

Discussion

Percutaneously implanted metal mesh endoprostheses are widely used in the treatment of obstructive arterial disease [6–12]. There are a few reports about the treatment of aneurysms using non-covered stents [8, 13]. However, these devices are grossly ineffective for the treatment of arterial aneurysms. Thus, covered stents have been developed to address this problem [14]. The

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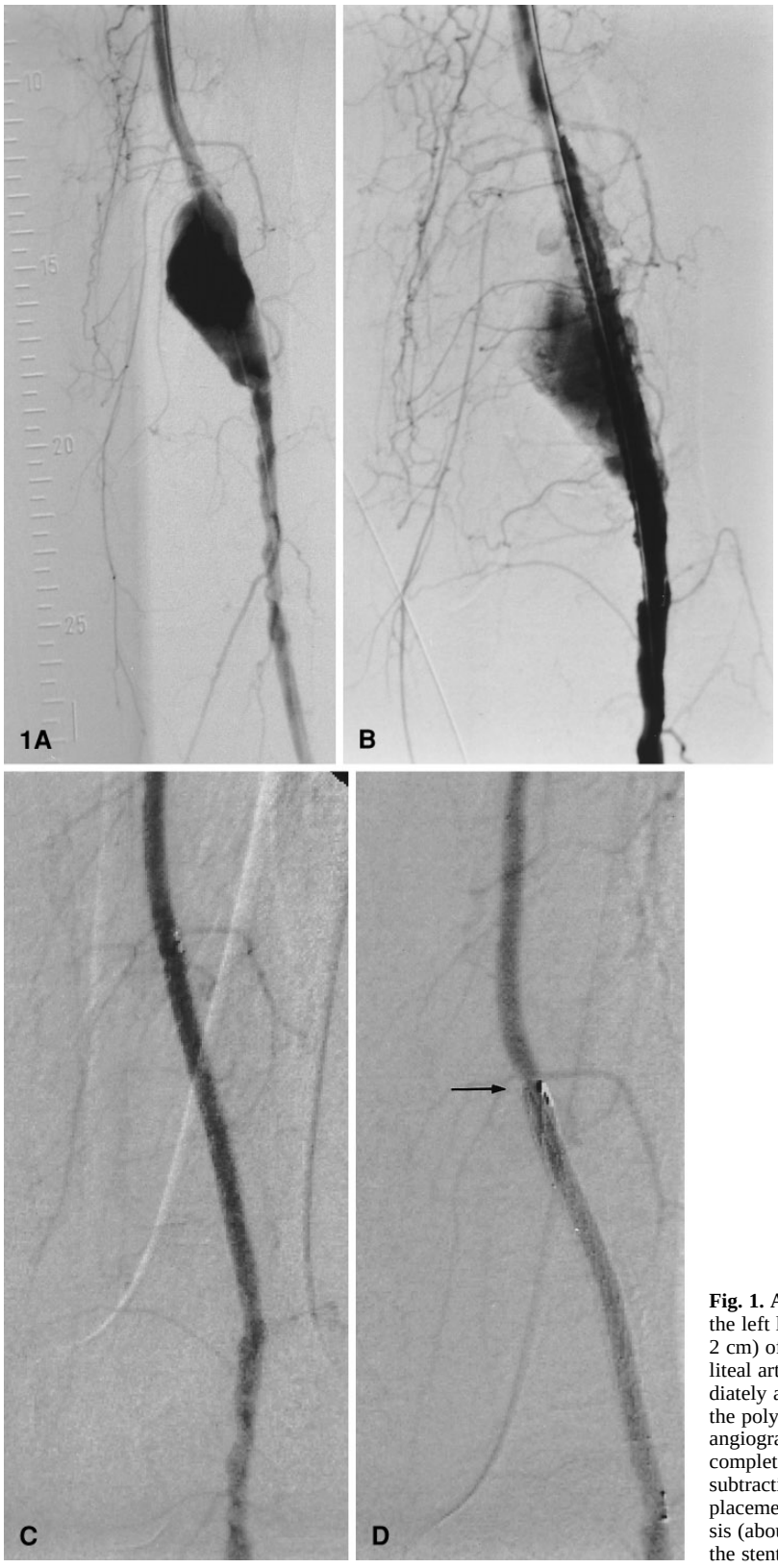

Fig. 1. A Intraarterial digital subtraction angiography of the left lower extremity depicts a large aneurysm (5 cm × 2 cm) of the distal femoral artery extending into the popliteal artery. **B** Intraarterial angiography performed immediately after stent placement shows extravasation through the polyester membrane. **C** Intravenous digital subtraction angiography performed 4 days after stent placement shows complete exclusion of the aneurysm. **D** Intravenous digital subtraction angiography performed 5 months after stent placement shows a patent stent. However, moderate stenosis (about 30% diameter reduction at the proximal end of the stent) developed (arrow).

Cragg Endopro System 1 is a flexible, self-expanding nitinol stent covered by an ultrathin woven polyester fabric (approximate price $US1200–2000). Recently, Henry et al. [1, 2] reported the application of this covered stent for the treatment of complications after angioplasty, including dissection, ulcerated lesions, or residual or restenoses. Three aneurysms of the femoral artery were included in this study. Two patients were treated successfully, although there was one case of a large tortuous femoral aneurysm with a persistent small arterial leak in the aneurysm sac. Vorwerk et al. [4] reported the occlusion of the neck of an iliac aneurysm with the Cragg Endopro System 1. In their preliminary results, Rousseau et al. [5] first reported the successful implantation of this device in three popliteal arteries for treatment of an aneurysm. However, they observed stent obstruction in one case 15 days after implantation.

The present case reports the successful implantation of this device in the distal femoral and popliteal artery. The aneurysm was completely excluded with the stent with no complications. Diffuse contrast extravasation through the woven fabric into the aneurysm was observed within the first 15 min; however, this is a well known phenomenon in Dacron prostheses (Fig. 1B).

Though the polyester was coated with low-molecular-weight heparin to prevent proliferation of smooth muscle cells, intimal hyperplasia developed at the proximal end of the stent 5 months after the procedure (Fig. 1D). Similar findings have been reported in polytetrafluoroethylene(PTFE)-coated stents and even in stents that release heparin [15]. However, development of intimal hyperplasia at the ends of surgically implanted prosthetic grafts is well known, and the pathogenesis and therapy are still a matter of debate [16]. This study indicates that follow-up of patients after treatment of aneurysms with this covered stent is mandatory to recognize intimal hyperplasia early enough to perform dilatation of stenoses.

Another problem is the size of the system, which does not allow placement of the stent using crossover techniques. However, introducer systems with a diameter of 8 Fr are now available. Furthermore, implantation in vessels subject to mechanical stress, such as the popliteal segments 2 (from the branches of the superior genicular arteries to the branches of the inferior genicular arteries) and 3 (from the branches of the inferior genicular arteries to the arcus tendineus m. solei), is not recommended because disintegration of stent filaments could occur (G. Küffer, personal communication).

This case demonstrates that the implantation of the Cragg Endopro System 1 to treat aneurysms of the distal femoral artery and popliteal segment 1 can be performed safely under local anesthesia by puncture of the femoral artery. However, development of intimal hyperplasia could be a potential problem. Prospective studies with a large series of patients are necessary to establish the long-term efficacy of this method.

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