Turk Gogus Kalp Dama 2015;23(4):748-752
doi: 10.5606/tgkdc.dergisi.2015.11660

Case Report / Olgu Sunumu

Percutaneous mechanical thrombectomy with retrograde popliteal approach for the treatment of acute femoropopliteal stent occlusion

Akut femoropopliteal stent tıkanıklığı tedavisinde retrograd popliteal yaklaşım ile perkütan mekanik trombektomi

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ABSTRACT

Acute and subacute ischemia of the legs in acute and subacute femoropopliteal stent occlusion are dramatic conditions which endanger the survival of the limbs depending on the severity of the ischemia. A 56-year-old male patient with generalized atherosclerosis, particularly extensive in lower limb arteries, was admitted to our clinic 10 months after endovascular procedure for critical ischemia of the left lower limb. Angiography revealed an occlusion of the superficial femoral artery along its entire length, including previously implanted stents. A decision was made to perform percutaneous mechanical thrombectomy using the Rotarex system with retrograde popliteal approach followed by a stent-in-stent placement procedure. Follow-up angiography and Doppler ultrasound scan at 24 hours after the procedure and at sixth months revealed a patent vessel with satisfactory blood flow. Percutaneous mechanical thrombectomy with retrograde popliteal approach is an invaluable option for the treatment of acute femoropopliteal stent occlusion in high-risk patients, in particular, for surgical treatment.

Keywords: Mechanical thrombectomy; peripheral arterial disease; retrograde popliteal access; stent occlusion.

ÖZ

Akut ve subakut femoropopliteal stent tıkanıklığında akut veya subakut bacak iskemisi, iskeminin derecesine bağlı olarak, ekstremitenin sağkalımını tehlikeye sokan dramatik hastalıklardır. Elli altı yaşında erkek hasta, sol bacağındaki kritik iskemi nedeniyle endovasküler işlemden 10 ay sonra, özellikle alt ekstremite arterlerinde yaygın ateroskleroz ile kliniğimize başvurdu. Anjiyografide daha önce implante edilen stentler ile birlikte, yüzeyel femoral arterde uzunluğu boyunca tıkanıklık tespit edildi. Retrograd popliteal yaklaşımı takiben stent içine stent yerleştirme işlemi ile Rotarex sistemi kullanılarak perkütan mekanik trombektomi yapılma kararı alındı. İşlemden sonra 24. saat ve altıncı ayda yapılan takip anjiyografisi ve Doppler ultrasonda yeterli kan akışı ile damarın açık olduğu saptandı. Akut femoropopliteal stent tıkanıklığının tedavisinde retrograd popliteal yaklaşım ile birlikte perkütan mekanik trombektomi, özellikle cerrahi tedavinin yüksek düzeyde riskli olduğu hastalarda değerli bir seçenektir.

Anahtar sözcükler: Mekanik trombektomi; periferik arter hastalığı; retrograde popliteal girişim; stent tıkanıklığı.

Ischemia of the limbs is characterized by a significant reduction in arterial perfusion which, in addition to the danger of injury to the limbs including amputation, can be a possible life-threatening complications. Prosthetic bypass graft or stent occlusion is a dramatic condition which endangers the survival of the limbs, depending on the severity of the ischemia.[1]

Available online at
www.tgkdc.dergisi.org
doi: 10.5606/tgkdc.dergisi.2015.11660
QR (Quick Response) Code

Received: February 27, 2015 *Accepted:* May 07, 2015

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Ideal management of an occluded stent still remains controversial. In addition, surgical therapy of the underlying cause of thrombosis is associated with significant perioperative morbidity and limited patency.[2] Recent advances in catheter-based interventions have led to the development of a variety of minimally invasive endovascular strategies to remove the thrombus such as catheter-directed thrombolysis (CDT) or percutaneous mechanical thrombectomy procedures. Therapeutic recommendations based on large-scale randomized studies can be followed in the current TransAtlantic Inter Society Consensus (TASC) Working Group Guidelines.[2]

In this study, we aimed to evaluate the efficacy of rotational thrombectomy with retrograde popliteal approach using the Rotarex Mechanical Thrombectomy System in terms of technical success and limb salvage.

CASE REPORT

A 56-year-old man with generalized atherosclerosis, particularly extensive in lower limb arteries, with a long history of chronic peripheral arterial disease was admitted to the Department of Cardiovascular Surgery. The patient had femoropopliteal bypass graft operation three years ago and history of angioplasty with implantation of two vascular stents into the superficial femoral artery after bypass graft occlusion. He was non-compliant to the use of anti-platelet drugs and was re-admitted 10 months after endovascular procedure for critical ischemia of the left lower limb. The patient reported significant shortening of intermittent claudication distance down to 40 m for the past two months, followed by resting pain and necrotic foci on his feet first observed two weeks before his admission. Physical examination upon admission revealed well-palpable pulse in both groins and along the right lower limb and non-palpable pulse in the left popliteal fossa and along the left foot.

Doppler ultrasound of the lower limb arteries revealed normal patency of the common femoral artery and its bifurcation and a short stump of the left superficial femoral artery with stents in the superficial femoral artery occluded along the entire length. Narrow popliteal artery was supplied through collateral circulation. Due to the occluded stent, a decision was made to perform angiographic examination of the lower limb arteries. Angiography showed diffuse atherosclerotic lesions at the distal segment of the abdominal aorta and at the arteries of both iliac axes; however, no significant stenosis was observed in these vessels. The femoral, popliteal, anterior tibial, and interosseous arteries of the right limb were patent. Narrowing of the proximal and middle segments of the common femoral artery of the left limb of about 50% and 30%, respectively, was revealed. Deep femoral artery was also patent. However, superficial femoral artery was occluded along its entire length, including previously implanted stents (Figure 1a). Blood was supplied by collateral circulation down to the popliteal artery and bifurcation. Crural arteries were also patent.

Finally, a decision was made to perform mechanical thrombectomy using the Rotarex system (Straub Medical, Wangs, CH) with retrograde popliteal approach, followed by a stent-in-stent placement procedure.

The popliteal artery was punctured using an 18 gauge needle under ultrasound guidance.

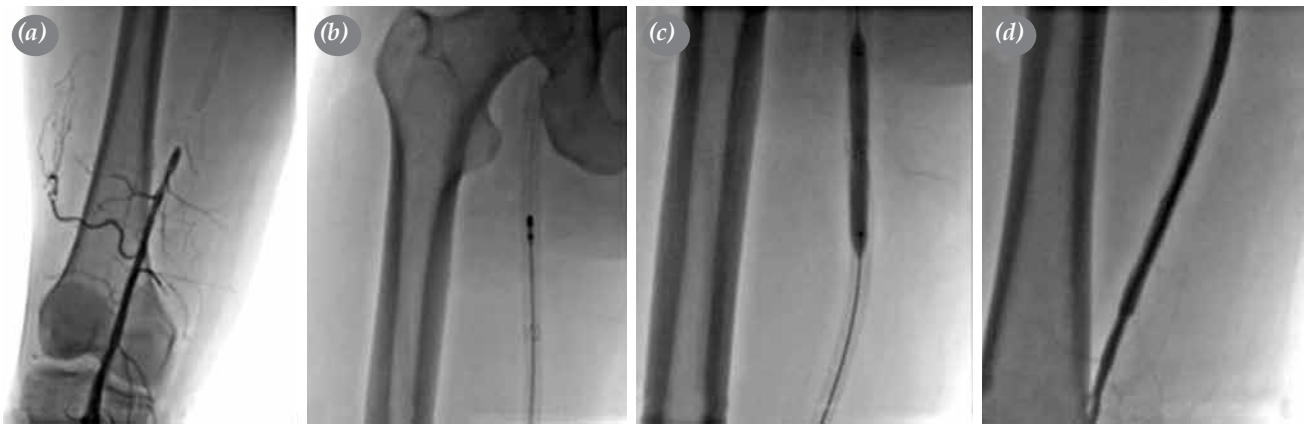

Figure 1. (a) Angiography with retrograde popliteal approach showing total occlusion of the self-expandable Nitinol stent **(b)** Mechanical thrombectomy of the occluded superficial femoral artery stent using the Rotarex S 6F atherectomy catheter **(c)** Balloon angioplasty of the proximal and medial segments of stent using 6x80 mm balloon catheter **(d)** Postoperative angiography showing the full patency of superficial femoral artery stent.

After insertion of a 6F introducer sheath along with diagnostic angiogram, intravenous heparin (100 IU/kg) was administered. A 0.035 Road Runner guide-wire used through the right Judkins guiding catheter (Cook Medical Inc. Bloomington, IN, USA) to cross the occluded stent. The initial passage of the occlusion was carried out and the wire was exchanged for a 0.018-inch or 0.020-inch wire. The Rotarex device was introduced and slowly moved forward with a to-and-fro motion at a speed of about 1 to 2 cm per second, until the distal end of the occlusion was reached. Repeated angiography was performed after the first passage and, if necessary, an additional run was performed, until the occluded segment was recanalized. After recanalization of the superficial femoral artery (SFA) and proximal popliteal artery with balloon angioplasty and mechanical thrombectomy with 6F Rotarex catheter system (Figure 1b, c), a self-expandable Nitinol stent was deployed to cover the needed parts of the lesion. Follow-up angiography revealed full patency of femoral artery and popliteal artery (Figure 1d).

The patient was discharged with dual antiplatelet therapy consisting of aspirin and clopidogrel (75 mg) even after the study. Follow-up angiography and ultrasound scan at 24 hours and six months after the procedure revealed a patent vessel with satisfactory blood flow (Figure 2).

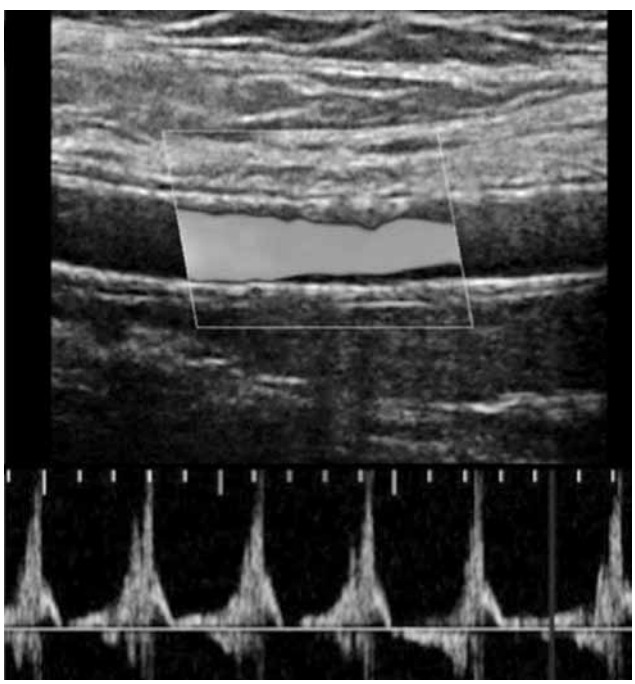

Figure 2. Follow-up ultrasound scan showing triphasic flow in the superficial femoral artery stent.

DISCUSSION

Successful percutaneous mechanical thrombectomy for the treatment of acute limb ischemia can overcome the disadvantages of open surgery and pharmacological lysis. Confirmation of occlusion or stenosis within an artery, in this case within the SFA, is an indication to attempt endovascular treatment. Endovascular treatment methods include angioplasty, implantation of vascular stents, utilization of drug-eluting stents, thrombolytic procedures, as well as atherectomy and thrombectomy. The term "angioplasty" covers a group of endovascular procedures performed under fluoroscopic guidance including balloon angioplasty, cryoplasty, or drug-eluting balloon (DEB) angioplasty.

Symptomatic lower limb atherosclerosis most commonly involves the SFA with complex lesions and occlusions mostly and diffusely involving this thigh vessel. Treatment strategies in the SFA and popliteal artery are potentially compromised by the high calcium content within the plaque and vessel wall, long lesion length, and unique dynamic forces of these arteries. Most of these occlusions are TASC C and a D lesion, in which surgery is still recommended as the preferred treatment modality.[2] However, endovascular treatment of even total occlusions of the entire SFA including the proximal segment of the popliteal artery, is now feasible in more than 90% of cases.[3-5]

In the femoropopliteal region, lesions are often multiple, long, and ulcerated. Accordingly, the long-term patency results of femoropopliteal interventions may be disappointing compared to surgery. However, thanks to the less invasive nature of the procedure and a low complication rate, the endovascular approach

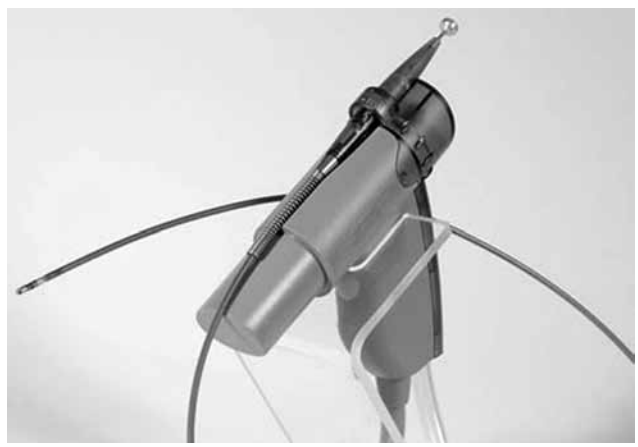

Figure 3. Rotarex 6 Fr rotational thrombectomy catheter used in combination with a 0.018-inch hydrophilic guide-wire (Reprinted with permission by Straub Medical, Wangs, Switzerland).

continues to be considered as a first-line treatment in bypass graft or stent occlusion cases and in patients with severe comorbidities or those who are ineligible for surgery, in particular.[3,4] Prior endovascular treatment rarely precludes surgical therapy. In addition, endovascular treatment is a repeatable procedure and appears to be cost-effective compared to surgery.

Vascular stent implantation is often performed upon failure of angioplasty or in cases of arterial dissection. Mechanical thrombectomy and atherectomy are other effective methods of arterial recanalization which are used in the treatment of acute, subacute or even chronic occlusions or stenosis of peripheral vessels.[3] Efficacy of mechanical thrombectomy with aspiration of released material using the Rotarex catheter is estimated at as much as 97.5% in the literature.[4] It is a rapid and effective method which allows restoration of the vessel patency within 30 minutes. Rotarex percutaneous mechanical thrombectomy (PMT) device has many applications. It is highly effective which allows prompt thrombectomy in the treatment of occluded blood vessels, bypasses, dialysis accesses, stent-grafts, as well as stent restenosis and obstructions. Particularly, in subacute or chronic cases, PMT is preferable technique due to thrombus age. Therefore, we preferred mechanical thrombectomy in our case rather than catheter directed thrombolysis.

Percutaneous treatment of SFA lesions usually requires either the contralateral retrograde or ipsilateral antegrade common femoral artery access. The contralateral approach can be challenging in patients with a narrow aortic bifurcation and even unlikely in patients previously treated for an abdominal aortic aneurysm. Moreover, long introducers and devices are required, and pushability is not ideal. Although the antegrade ipsilateral femoral approach offers better pushability using short instruments, this approach can be challenging to perform in obese patients and cannot be performed in the presence of lesions involving the common femoral artery. In addition, it can be extremely challenging in the presence of lesions located in the proximal SFA. Transaxillary or transradial approaches are also alternatives which require a considerable increase in catheter/wire lengths and they can be useless when the SFA occlusion is either flush or adjacent to a large collateral that prevents the guide-wire from entering the occluded segment.

Although the antegrade and contralateral (crossover) femoral approaches have been well-established, the retrograde transpopliteal access is still evolving as a potentially effective alternative for endovascular treatment of infra-inguinal arterial lesions in patients who are ineligible for antegrade procedures.[5] To date, few series of this alternative access have been published, reporting the failure of antegrade recanalization, inability to re-enter the true lumen distal to the obstruction, common femoral artery occlusion, or SFA occlusion with a small stump, and tandem lesions as the major indications.[5]

Low associated morbidity and mortality as well as high technical success rates of endovascular treatment of SFA disease have made it the preferred first-line revascularization modality in highly symptomatic patients with short lesions (<10 cm). Fortunately, thanks to the advances in endovascular technologies, including new thrombectomy devices, new stent designs, and drug eluting technologies, procedure-related outcomes have been improved and promising results have been attained for the management of more complicated SFA lesions.

Due to their anatomic localization, the SFA and popliteal artery are subject to various forces by the working muscles. These include stretching, bending, twisting, crushing and rotational forces. Therefore, stents implanted into these arteries should be stabilized properly. Stents are made of nitinol, i.e. a nickel and titanium alloy. Nitinol belongs to the group of intelligent materials with shape memory effects and is characterized by high stability and elasticity.[6] Self-expanding nitinol stents may be divided according to their design into open-cell and closed-cell stents. Differences in their designs additionally affect their physical properties such as radial force, elasticity, or stability. Despite all of favorable design characteristics and properties of the stents, post-implantation complications may be seen, including acute stent thrombosis, restenosis or stent fracture.[6] These are serious complications which may lead to restenosis or reocclusion and, in rare cases, formation of pseudoaneurysms. Nitinol stents are significantly less prone to the fractures, which make them useful in such locations as femoral or popliteal artery.[6] In the described case, subacute lower limb ischemia occurred due to an occlusion of a nitinol stent implanted into the SFA. Due to the nature of the changes reported in diagnostic imaging and clinical symptoms of subacute ischemia, the patient was referred for rotational thrombectomy using the Rotarex catheter.

In conclusion, as the frequency of angioplasty and vascular stent implantation procedures has

been recently increased in patients with peripheral arterial disease, the incidence of reported early and late complications such as acute stent thrombosis, restenosis and stent fractures has been increased. Percutaneous mechanical thrombectomy with retrograde popliteal approach is an invaluable and safe option for the treatment of acute femoropopliteal stent occlusion in high-risk patients, in particular, for surgical treatment. A retrograde popliteal approach in the supine position can be considered a safe maneuver for the recanalization of an occluded SFA stent. We suggest that the combination of low-profile introducing sets and ultrasound-guided puncture can limit the popliteal-specific complications.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

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