

Use of hybrid techniques for the treatment of Leriche syndrome with repeated occlusions of the infrarenal aorta, after failed endovascular and open repairs

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Abstract:

Leriche syndrome, known as aortoiliac occlusive disease, is a rare pathological entity that manifests with a triad of symptoms: claudication of both legs, reduction of peripheral pulses of both legs and erectile dysfunction. We present a case of a 55-year-old female patient with acute aortoiliac occlusion and complex surgical history, including both endovascular and open techniques. After initial diagnosis and extensive consideration of the complexity of the surgical history, the therapeutic choices who were left were the following: completely endovascular approach, open repair and finally a hybrid approach. The hybrid approach was elected and a hybrid aorto-iliac reconstruction, with redo-exposure of the right femoral artery, over the wire embolectomy of the right axis and of the proximal anastomosis and implantation of a covered 16x38mm stent at the proximal anastomosis as well as new crossover bypass was performed. Due to embolization of the right renal artery, caused by the deployment of the covered stent, deployment of another 4mm grafted stent in the right renal artery was necessary. The 8-month follow-up revealed primary patency of the whole reconstruction. Patient was free of symptoms and both limbs were salvaged.

In conclusion despite the complexity and severity of the case, a hybrid combination of both open and endovascular techniques managed to completely restore the perfusion of both legs and pelvis.

Keywords: Leriche Syndrome, Hybrid, Acute aortoiliac occlusion, Limb salvage

INTRODUCTION

Leriche syndrome represents a progressive aortoiliac disease which may lead to the thrombotic occlusion of the infrarenal aorta.¹

Clinically it manifests as a triad of symptoms, which includes erectile dysfunction for male patients, claudication and reduction or absence of femoral pulses.^{1,2} Although an exact prevalence and incidence can not be found, it is stated that the rates are getting higher with the ever ageing population.² Usually it affects heavy smoker males in their sixties although female patients have also been reported.³ The main therapeutic solution is an open repair, including aortobifemoral or axillobifemoral bypass. Perioperative mortality and morbidity rates are 5% and 18% respectively and secondary patency at 10years mark reaches 92%.^{3,4} With the progress of the endovascular techniques in the latest years more and more vascular surgeons tend to choose an endovascular approach in

order to deal with Leriche Syndrome. There are studies that documented technical success rate between 96 and 98%, primary patency rates between 85 and 91% at >3years mark and secondary patency rates between 95 and 100% respectively.^{5,6}

CASE

A 55-year-old female with a quite complex vascular surgical history presented to our emergency department with symptoms of acute bilateral leg ischemia, including resting pain affecting both legs as well as sensory and motor deficit. Considering the patient's atherosclerotic risk factors, she had positive history of smoking, hypertension, hyperlipidemia as well as positive family history for cardiovascular disease. Peripheral arterial disease (PAD) was also known to be present on the patient, as she had previously described claudication at stage III according to Rutherford's classification. Clinical examination revealed absence of both femoral pulses, a necrotic lesion at her left toe, a postoperative infected wound at her left groin and ankle systolic pressure of 20mmHg with an Ankle-Branchial Index (ABI) of 0,15. This combination of clinical signs and the patient's history of PAD were suggesting acute on chronic ischemia of both limbs, likely due to occlusion of the aortic bifurcation. Through careful examination of her surgical history we extracted the following informations. Firstly, she was treated in another hospital in 2018 with a kissing stenting angioplasty in order to deal with an acute thrombotic occlusion of both common iliac arteries. The colleagues there decided to use self-expanding stents. A week later both stents

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were occluded and she received a re-stenting angioplasty of both iliac arteries with bilateral stent extension, leading to coverage of the left internal iliac artery. After an unknown period of time, she suffered another acute thrombotic occlusion of the aortoiliac bifurcation. This time an open repair with an aortobifemoral bypass was elected. In October of 2022 the aortobifemoral bypass was occluded. This occlusion was treated with thromboembolectomy of the right bypass axis and a crossover bypass from the right femoral artery to the left, due to a failed thromboembolectomy of the left axis. A day later the whole reconstruction was once more compromised and another thromboembolectomy was performed. An endarterectomy with bovine patch for the right femoral bifurcation was also performed. Due to a suspicion of a stenosis at the proximal anastomosis as the main reason for all those occlusions a stent was implanted right below the renal arteries. Then 2 months later and with progressively worsening of her symptoms, she was presented to our medical care. Computed tomography angiography revealed the magnitude of the reduced, almost absent, limb and pelvis perfusion and the complexity of the case (figure 1). An extensive screening control revealed neither thrombophilia nor any other blood disorder, which could explain the repeated occlusions. Other thromboembolic sources, such as aortic aneurysm, plaque rupture, cardiac arrhythmias, malignancies, blood clots in left heart ventricle, etc. were also ruled out by external medical specialists. Conservative therapy with Heparin and Prostaglandins managed to stabilize the situation and secure valuable time in order to review the therapeutic options and elect an approach. Of the 3 therapeutic options: open repair with a redo-aortobifemoral or a new axillobifemoral bypass, a completely endovascular attempt and a hybrid approach from the right groin, the later was elected. Firstly, a redo-exposure of the right femoral artery was performed and then over the wire embolectomy of the right axis and of the proximal anastomosis followed. Then and due to residual stenosis followed the implantation of a covered 16x38mm stent at the proximal anastomosis. Due to embolisation of the right renal artery, caused by the deployment of the covered stent, deployment of another 4mm grafted stent in the right renal artery was also performed. After the conclusion of the endovascular part a final angiography was performed that revealed the patency of bypass and both stents, as well as the unobstructed perfusion of both kidneys. Subsequently, due to the suboptimal intramuscular course of the old crossover bypass, which included kinking and compression points, there was a high risk of re-occlusion and failure of the entire vascular reconstruction. Therefore, a new crossover bypass was necessary. Due to the inadequate vessel wall of the right femoral artery after all these operations, a short interposition bypass from the right common femoral artery to the right profunda and superficial femoral artery was also necessary. For the crossover bypass and due to the infected wound at the left groin, and therefore an increased risk for graft infection, an 8mm Rifambicin soaked Dacron graft was used. Postoperative, femoral and popliteal pulses were palpable for both legs and ABI reached 0.8. After 12 postoperative days the patient was discharged



Figure 1: 3D reconstruction of preoperative computed tomography angiography, that shows total occlusion of aortoiliac Bifurcation.

with Clopidogrel due to stent implantation and Phenprocoumon due to the extensive thrombotic history as anticoagu-



Figure 2: 3D reconstruction of postoperative computed tomography angiography, that shows primary patency of the hybrid vascular reconstruction and complete perfusion of pelvis, kidneys and both legs.

lation. At 8 month follow-up we were happy to see that our patient was free of symptoms, both limbs were salvaged and both groin-wounds were healed. The postoperative computed tomography angiography at 8 month mark revealed the complete patency of the whole vascular reconstruction, including both stents, the right axis of the old aortobifemoral bypass and the new short interposition and crossover bypass. (figure 2). Consent for publication was given by the patient.

DISCUSSION

Leriche syndrome, or aortoiliac occlusive disease is a rare form of peripheral artery disease.² With the imminent danger of major amputation, the necessity of surgery or intervention is quite evident.⁷ Traditionally the first operative option is an aortobifemoral bypass in anatomical position.^{8,9} With the evolution of endovascular surgery in later years, some studies^{5,10} suggest a complete endovascular approach as a safe alternative to the traditional open repair, with good early and mid-term results. In our case the history of consecutive thrombotic occlusions in combination with the young age of the patient made the completely endovascular approach unappealing. Also, the previously implanted stent at the proximal anastomosis of the aortobifemoral bypass, right below

the renal arteries made the open repair with laparotomy and a redo-aortobifemoral bypass quite risky. Therefore, the hybrid approach was elected. During the intervention and by the deployment of a covered stent the adverse event of the thromboembolic occlusion of the right renal artery occurred. That was a calculated and realistic risk in order to secure the proximal patency of the whole vascular reconstruction. The risk of a potential embolization of the superior mesenteric artery was also evident, which did not occur. By securing the adequate blood-perfusion of both kidneys, by stent implantation in the right renal artery, as well as the perfusion of intestines, the endovascular part of this hybrid approach was concluded and the open-repair part followed, with the implantation of a short interposition bypass and of a Rifampicin soaked crossover bypass. Although an adept surgical technique and the election of the right procedural approach are responsible for the primary patency of the revascularization, the longevity of the reconstruction depends on the right and adequate anticoagulation, which highlights the importance of right postoperative medication. This issue was evident in our case involving a young female patient who underwent numerous interventions and surgeries, all of which ended in failure. The reasons for these repeated occlusions are multifactorial and can only be speculated upon. With hypercoagulopathy and other thrombotic sources ruled out, one potential reason could be the underestimation of atherosclerotic disease both proximally and distally to the aortic bifurcation, leading to suboptimal treatment with kissing stenting. Another possible cause could be inadequate surgical technique. Given that a stent was placed at the proximal anastomosis of the initial aortobifemoral bypass, it is plausible that this anastomosis was sutured too low from the renal arteries, leaving a segment of the infrarenal aorta susceptible to thrombosis due to hemodynamic changes. Myointimal hyperplasia could also impact the longevity of these vascular reconstructions and play a significant role in the repeated occlusions. Finally, the patient's noncompliance with her anticoagulation medication should not be ruled out as a contributing factor. So a combination of technical mistakes, underestimation of the disease and patient's incomppliance should be attributed to the repeated failures and patient's ordeal. For patients with a series of consecutive thrombotic occlusions, without diagnosed blood disorder or thrombophilia, the anticoagulation with Vitamin-K antagonists is suggested.^{11,12} In conclusion hybrid techniques as the one mentioned above offer a great variety of solutions for the more complex vascular cases and should be part of the repertoire of the modern vascular surgeon. Although both completely endovascular reconstruction and aortobifemoral bypass are proven through studies¹³ to be feasible for the treatment of Leriche syndrome, there are no studies that support the usage of hybrid techniques. After the successful treatment of this complex case we suggest and encourage the usage and documentation of such techniques in order to study the long-term postoperative results and validate their place in the treatment algorithm of AOD.

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