Endovascular treatment of iliac limb occlusion of a bifurcated abdominal aortic stent graft – rotational and aspiration thrombectomy followed by primary angioplasty and stenting

Abstract

Iliac limb occlusion of bifurcated aortic stent graft appears as complication of endovascular repair of abdominal aortic aneurysm, and several therapeutic approaches have been used to treat this problem in cases of lower limb ischemia. We describe two cases in which a totally endovascular approach was used to treat limb occlusion by means of rotational and aspiration thrombectomy, followed by stenting. In both cases there were no postoperative complications.

Keywords: graft occlusion, vascular; thrombectomy; aneurysm.

Resumo

A oclusão de ramo ilíaco de endoprótese bifurcada de aorta surge como complicação decorrente da correção endovascular do aneurisma de aorta abdominal e várias abordagens terapêuticas têm sido empregadas para o tratamento dessa complicação em casos de isquemia de membro inferior. Apresentamos dois casos de tratamento totalmente percutâneo da oclusão de ramo ilíaco de endoprótese de aorta abdominal com dispositivo de trombectomia rotativa e aspirativa seguida de angioplastia com stent primário, sem complicações operatórias.

Palavras-chave: oclusão de enxerto vascular; trombectomia; aneurisma.

Introduction

Endovascular repair of abdominal aortic aneurysm (EVAR) was developed as a less invasive treatment and with the aim of reducing surgery-related morbidity and mortality in patients with aortic aneurysms. It has been shown to significantly reduce operative mortality rates, volume of blood transfusion and surgery duration, and hospitalization in intensive care unit. However, EVAR requires a greater number of secondary interventions to maintain aneurysm exclusion and/or to treat complications1-6.

Secondary interventions are defined by the Society for Vascular Surgery (SVS) and by the American Association for Vascular Surgery (AAVS) as any surgical or endovascular procedure performed after the initial endovascular repair2.

The Eurostar® registry classifies secondary interventions according to their magnitude: 1) need for laparotomy; 2) extra-anatomic procedures; 3) open or percutaneous transfemoral interventions; all these criteria are aimed at standardization, for better acknowledgement and handling of EVAR complications.

Currently, the rates of secondary intervention after EVAR are directly related to professional experience,
morphological selection of cases, arterial remodeling, material used, patient follow-up, and diagnosis of complications (leaks, endotension, migration/disconnection, occlusions, and ruptures).

Iliac limb occlusion may occur with all models of bifurcated aortic stent grafts and affects less than 10% of patients submitted to EVAR9,10. It appears earlier than possible leaks (3.5 months versus 14.3 months) and, in most cases, requires intervention due to ischemia of the affected limb11. The small number of cases, the absence of studies reporting long-term results and the arsenal of therapies available for the treatment of iliac limb occlusion, with different risks and results (thrombolysis, surgical thrombectomy, angioplasty, and extra-anatomic procedures, among others), make it difficult to define the gold standard therapeutic approach. Initially, extra-anatomic bypasses were defined as the treatment of choice, but currently there is a worldwide tendency toward a totally percutaneous approach to this complication, which has shown initial satisfactory results12-15.

We describe two cases in which a totally endovascular approach was used to treat limb occlusion by means of rotational and aspiration thrombectomy, followed by stenting.

Description of cases

Case I

Male patient, 69 years old, having, as comorbidities, hypertension, diabetes mellitus, and coronary artery disease, underwent EVAR for symptomatic bisaccular infrarenal aneurysm with Talent® 26×16×105 bifurcated aortic stent graft (Medtronic Inc./USA) implantation, with bilateral distal fixation in the common iliac artery. The patient developed an uneventful postoperative and was discharged after 3 days of hospitalization, asymptomatic, and with ankle-brachial index (ABI) 1.0 in both lower limbs.

After 30 days, the patient had sudden pain in the right lower limb, which progressed to disabling claudication (Rutherford I-3). Physical examination showed no palpable pulses in that limb, ABI 0.6 and echo color Doppler with monophasic flow from common femoral artery to distal arteries. An angiography was performed and confirmed occlusion of the stent-free right iliac segment of the stent graft, with normal flow reestablished at the iliac bifurcation level. Compression of the right segment by the patent left branch was evidenced, as well as no disconnections, and the maintenance of aneurysm exclusion (Figures 1A and 1B).

Then, under local anesthesia and sedation, bilateral percutaneous femoral access was performed, with the insertion of a 7F sheath into the right and a 6F sheath into the left, passing through the lesion with hydrophilic guidewire 0.035×260.000 mounted on a 4F hydrophilic microcatheter, followed by aortography. Rotational and aspiration thrombectomy was also performed, using Rotarex® 6F device (Straubmedical Inc./CHE), followed by angioplasty with 12 mm diameter self-expandable stent and post-dilatation with 10mm diameter to the right and 8 mm to the left balloon catheter (kissing balloon), so as to avoid contralateral compression. Control aortography showed complete recanalization and no signs of elastic recoil and/or distal embolization (Figure 2).

The patient developed an uneventful postoperative and was discharged after 3 days of hospitalization, asymptomatic, with all palpable pulses, and bilateral ABI 1.0. When we finished this article, he was at the 9th month of ambulatorial follow-up after the secondary intervention. The patient was asymptomatic, with all palpable pulses, and bilateral ABI 1.0.

Control angiographies performed on the first, third and sixth postoperative months showed no sign of restenosis (Figure 3).

Case II

Male patient, 74 years old, having, as comorbidities, hypertension, diabetes mellitus, chronic obstructive pulmonary disease and coronary artery disease, underwent EVAR for infrarenal fusiform aneurysm (largest diameter: 6.7 cm) with Talent® 28×16×105 bifurcated aortic stent graft (Medtronic Inc./USA) implantation, with bilateral distal fixation in the common iliac artery. The patient developed an uneventful postoperative and was discharged after 3 days of hospitalization, asymptomatic, with bilateral ABI 1.0.

The patient remained asymptomatic, showing no particularities on physical examination. Angiographies performed on the first, third and sixth postoperative months showed aneurysm exclusion and no signs of leak, disconnection or compression (Figure 4).

On the ninth postoperative month the patient had sudden pain in the right lower limb, which progressed to disabling claudication (Rutherford I-3). Physical examination showed no palpable pulses in that limb, ABI 0.68 and echo color Doppler with monophasic flow from common femoral artery to distal arteries. Then, an angiography was performed, which identified right iliac
Figure 1. a) Postoperative angiography showing occlusion of the right iliac segment; b) Identified compression, in sagittal section, of the stent-free iliac segment.

Figure 2. Perioperative control aortography showing complete recanalization of the occlusion.

Figure 3. Control angiography showing patency of the right iliac segment after stenting.
occlusion of the stent graft, with normal flow reestablished at the iliac bifurcation level. A change of angulation between the iliac segment of the stent graft and normal flow at the external iliac artery were observed, as well as absence of migrations, disconnections or leaks (Figure 5).

Then, under local anesthesia and sedation, left percutaneous brachial access was performed, with the insertion of a long 7F sheath, passing through the lesion with hydrophilic guidewire 0.035×260.000 mounted on a 4F hydrophilic microcatheter, followed by aortography, showing occlusion. Rotational and aspiration thrombectomy was also performed, using Rotarex 6F® device (Straubmedical Inc./CHE), followed by angioplasty with 12 mm diameter self-expandable stent, covering the entire occluded segment of the stent graft up to the right external iliac artery, and post-dilatation with 10 mm diameter balloon catheter. Control angiography showed complete recanalization of the lesion and no signs of elastic recoil and/or distal embolization (Figure 6).

The patient developed an uneventful postoperative and was discharged after 3 days of hospitalization, asymptomatic, with all palpable pulses, and bilateral ABI 1.0.

When we finished this article, the patient was at the 14th month of ambulatorial follow-up after the secondary intervention. He was asymptomatic, with all palpable pulses, and bilateral ABI 1.0. Control angiographies performed on the first, third and sixth postoperative months showed no sign of restenosis (Figure 7).
Discussion

Iliac limb occlusion of aortic stent graft is defined as a complication after EVAR. Factors related to the etiology of this complication include: areas of stenosis/tortuosity in native artery or inside stent graft, unsatisfactory distal channel, model of stent used (high risk in first-generation and without support stents), irregular overlap of stent graft modules, extension of stent graft up to the external iliac artery, reduced diameter of iliac arteries, external compression, and arterial remodeling\(^{16-20}\). Another important factor is the low flexibility of some models of stent grafts, fact which is also related to the presented cases.

Case I, in which was performed treatment for saccular infrarenal aneurysm and the patient developed thrombosis of iliac artery one month later, we identified compression of the stent-free iliac segment of the stent graft (feature already modified by Medtronic Inc./USA on the new Endurant\(^{\circ}\) stent) by the contralateral patent iliac branch juxtaposed to the aortic bifurcation (24mm diameter).

Case II, in which was performed endovascular treatment for infrarenal aneurysm of 6.7cm diameter and the patient developed iliac thrombosis nine months later, we identified a significant increased angulation between the distal fixation iliac segment of the stent graft and the right common iliac artery, fact which was not present in the initial treatment.

We believe in arterial remodeling, as it showed no disconnection or migration of any stent graft segments, iliac artery diameter greater than 10mm, and no previous significant angulation.

In both cases, preoperative angiography identified the anatomical cause of thrombosis, and the use of intravascular ultrasound (IVUS) was not necessary. Treatments described in the medical literature for this complication include: Fogarty catheter thrombectomy, Fogarty catheter thrombectomy through a 16F sheath, followed by angioplasty with primary stenting, thrombolysis with or without stenting, thrombectomy with Angiojet\(^{\text{R}}\) rheolytic system (Possis Medical Inc./USA), followed by stenting, associated or not with thrombolysis, angioplasty with primary stenting, and anatomic and extra-anatomic open surgical procedures (femoro-femoral, axillary-femoral and aorto-femoral bypasses)\(^{21,22}\).

Note that:

- Thrombolysis is not without risk, and severe hemorrhagic complications are described in various types of treatment\(^{24}\);
- Direct angioplasty without previous thrombectomy or thrombolysis may lead to embolization of thrombotic material as well as to early restenosis; and
- Extra-anatomic procedures have higher morbidity rates and reduced long-term patency\(^{25,26}\).

We opted, in both cases, for a totally percutaneous initial approach on treatment of iliac occlusion of the stent graft. In case I, the patient was morbidly obese, having high risk of infection in case of extra-anatomic bypasses with use of prostheses in the inguinal region, and, in case II, we had technical difficulties at femoral surgical access due to the presence of keloid in the right inguinal region (the patient had been submitted to inguinal linfadenectomy for cutaneous tumor), with previous surgical access to the right femoral artery. After identifying the anatomical cause of occlusion, we performed percutaneous access with low-profile sheaths, followed by rotational and aspiration thrombectomy – aspiration that we believe can minimize the risk of distal embolization – and angioplasty with primary stenting in the entire extension of the iliac segment of the stent graft.

We use Rotarex\(^{\circ}\) device (Straubmedical Inc./CHE), recommended for acute or subacute thrombotic material removal in native artery or within prostheses and whose size varies according to the size of the vessel or the prosthesis to be treated. This device works with a system of rotational thrombectomy (40.000 to 60.000 revolutions per minute) associated to continuous aspiration, promoting detachment, aspiration and fragmentation of thrombotic waste, and its transportation to a reservoir. The thrombectomy catheter is always manipulated over the guidewire after the passing of occlusion. This procedure’s main contraindications include: calcified plaques, subintimal guidewire positioning, guidewire inability to pass occlusion, and continuous vasospasm.

The fact that, in both cases, we performed thrombectomy only inside the stent graft, which is consisted of an exoskeleton, allowed us a more secure application of this endovascular technique. However, we warn that the use of Rotarex\(^{\circ}\) device presents a risk of arterial rupture, especially in calcified and reduced-caliber vessels.

Procedures were performed under local anesthesia and sedation, with no need for thrombolysis or surgical access. Extra-anatomic surgical procedures, in our judgment, should be reserved for cases of percutaneous treatment failure.
Percutaneous endovascular treatment with rotational and aspiration thrombectomy, followed by angioplasty with primary stenting of iliac limb occlusion of a bifurcated abdominal aortic stent graft, presents itself as a viable technique, showing good initial results and low operative complication and mortality rates. However, we need further studies, with larger numbers of cases and longer-term follow-ups before this technique can be recommended for all cases that are experiencing this type of complication.

References


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