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Case Report
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Successful Treatment of Bilateral Chronic Ischemia due to Limb Occlusion after Endovascular Aortic Aneurysm Repair

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Abstract

Purpose: Bilateral limb occlusion after Endovascular Aortic Aneurysm Repair (EVAR) is relatively uncommon. The present report illustrates a successful treatment of bilateral ischemia resulted by chronic limb occlusion after EVAR with Rotarex mechanical thrombectomy devices.

Case Report: A 67-year-old male complicated with diabetic, hypertension, Coronary Heart Disease (CHD), and renal insufficiency disease had undergone EVAR for abdominal aortic aneurysm 10 years ago. At 4 years after the first surgery, the patient experienced pain and fatigue in both lower limbs without further examination for false consideration as a manifestation of CHD. In the last 6 months, the patient's symptoms have worsened, and Computed Tomography Angiography (CTA) confirmed the diagnosis of bilateral limb occlusion. A mechanical thrombectomy for in-stent restenosis with Rotarex was performed in bilateral iliac limb combined with a bare-metal stent deployment. The patient was followed up for 1 year without any lower ischemic symptoms, and the CTA showed bilateral iliac limb was patent.

Conclusion: Rotarex mechanical thrombectomy could be an effective treatment of lower extremity ischemia due to bilateral limb occlusion after EVAR.

Introduction

Abdominal Aortic Aneurysm (AAA) is an abnormal focal dilation of the abdominal aorta and the diameter increases by more than 20%. Ruptured abdominal aortic aneurysm can lead to death in 65% of patients. The current main treatment methods are mainly divided into Open Repair (OR) and Endovascular Aortic Aneurysm Repair (EVAR). It was previously found that EVAR is regarded as a lower operative mortality rate compared with OR [1-3]. However, EVAR is not absolutely safe, some complications such as endoleak, heterotopic stent graft, torsion, pelvic ischemia, graft occlusion, infection might occur after EVAR. The previous works have shown that the larger the diameter of the abdominal active aneurysm before surgery, the higher the incidence of complications. The complication incidence of patients received EVAR treatment reaches 16% to 30%, and more than 19% of these patients require secondary intervention [4-7]. Ischemic complication due to limb occlusions, embolism, surgical access such as common femoral artery thromboses, hypogastric artery embolization accounts for 9%. However, the ischemia caused by limb occlusion was mostly occurred in unilateral, and bilateral limb graft occlusion was rare among patients after EVAR [8]. Thrombolytic or thrombus-removal treatment and new iliac branch stents can be used for closed graft placement. Currently, modern vascular thrombus resection devices by means of different thrombus crushing and transportation methods can be used for treating arterial occlusion or in-stent occlusion [9,10]. Today, despite the well-accepted effect of Rotarex device in the lower extremity arteries for the recanalization of acute artery occlusion, the system has been applied to the treatment of other blood vessels as reported in different cases [11-13].

The authors report a case of percutaneous mechanical thrombectomy with Rotarex for treatment of bilateral limb occlusion after endovascular aortic aneurysm repair.

Case Presentation

The patient was a 68-year-old male complicated with diabetic, hypertension, renal insufficiency, and a long history of myocardial infarction disease was admitted to the hospital due to critical ischemia of lower limbs. And he also had been underwent coronary artery bypass, valve repair 10 years ago. He received EVAR for Abdominal aortic aneurysm, with the inferior mesenteric artery

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and the left internal iliac artery was covered, and the right internal iliac artery was reconstructed with sandwich technology. He reported numbness and pain in both lower limbs for the past six years followed by chills on the left feet before admission. Along with the condition, symptoms gradually worsened and the distance of intermittent claudication was significant shortening half a year ago.

Color Doppler ultrasound of lower extremities confirmed the occlusion of both iliac artery and left anterior tibial artery. Given that the perioperative complication rate of surgical bypasses still relatively high compared with endovascular therapy, especially this kind of old people with multiple complications. The authors preferred endovascular treatment as first choice. Timely management of this complication is especially important so as to decrease the likelihood of distal limb ischemia and to improve patient outcomes.

Endovascular surgery was performed under local anesthesia; vascular access was achieved from the left femoral artery. A 5F introducer was inserted. Subsequently, occluded section of the left iliac artery was forced through using a 0.035' hydrophilic guidewire and 0.018' Treasure wire. The hydrophilic stiff guidewire was advanced into the aortic arch. Digital subtraction angiographic acquisitions of the aorta with iodine contrast agent confirmed postoperative changes of abdominal aorta and both iliac arteries, the occlusion segment of left limb was from the origin of the external iliac artery to the proximal segments of the common femoral artery, and the occlusion in right side limited in the limb of iliac artery. All the blood flow of both lower limbs comes from the right internal iliac artery reconstructed with parallel stent technique. No significant stenosis was observed in other vessels below the groin. The 5F introducer was changed to an 8F introducer, and the following procedures were carried out:

1. Balloon angioplasty (PTA) of the all of left iliac limb using 6 mm × 200 mm balloon catheters.

2. Mechanical thrombectomy of the occluded left iliac limb using a Rotarex atherectomy catheter 2 times.

3. Balloon angioplasty (PTA) of the left iliac limb and external iliac artery using 8 mm × 80 mm and 10 mm × 60 mm balloon catheters until the level of the femoral head.

4. Intraoperative angiography was performed and confirmed residual stenosis in the left external iliac artery.

5. Use the same method to treat the right iliac limb with Roterex and Balloon.

6. Angiography was confirmed there are external iliac and internal iliac stents sandwiched in the right iliac branch. The internal iliac stent squeezes the external iliac stent.

7. Deployment of an 8 mm × 120 mm Self-expanding stent in the right iliac artery after measurement.

8. An additional 8 mm × 120 mm self-expanding stent was inserted at the left external iliac artery.

Postoperative angiography revealed full patency of both iliac arteries. Patient reported resolution of rest pain on the first day after the procedure (Figures 1-3).

Discussion

Nowadays, more and more Peripheral Arterial Disease (PAD) patients were diagnosed, the vascular formation and vascular stent

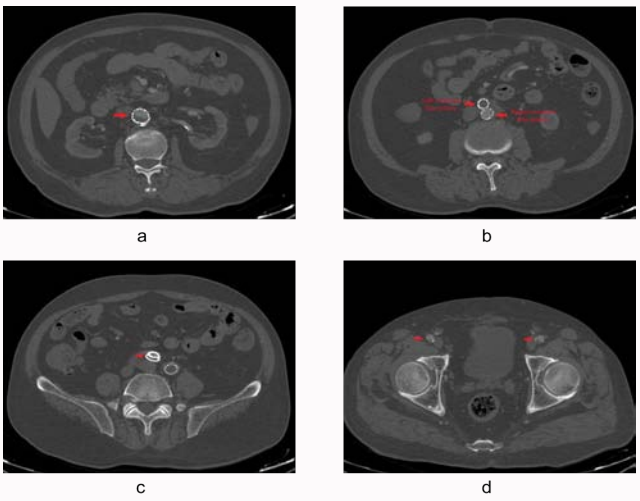

Figure 1:
a. Mural thrombus in the abdominal stent-graft.
b. Bilateral limbs of the abdominal stent-graft.
c. The compression of the external iliac artery following sandwich technology at CT image.
d. Vessels of the distal outflow tract.

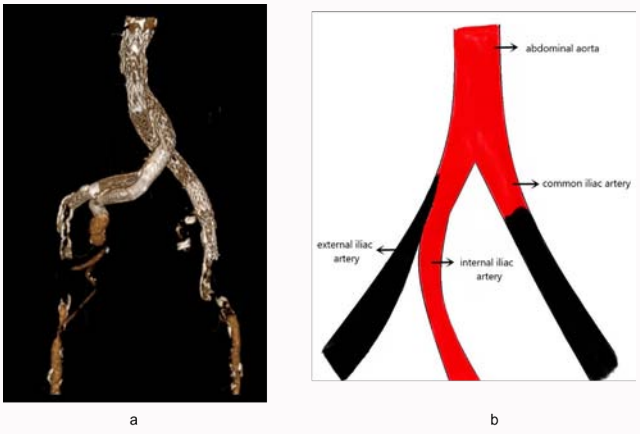

Figure 2:
a. Occlusion of bilateral iliac artery bypass at CT reconstruction.
b. Schematic diagram.

implantation in patients with peripheral artery disease was increasing, thereby increasing the incidence of initial and late complications such as acute stent thrombosis, restenosis, and stent fractures, etc. In-Stent Restenosis (ISR) angiography is defined as 50% stenosis at or adjacent to the previous stent area. Acute period (within 24 h), the subacute stage (24 h to 30 days), the late stage (30 days to 1 year) and the very late stage (>1 year) are defined according to the time after placing the stent [14].

In this case, symptoms began to appear four years after the EVAR. And six months ago, the condition worsened and intermittent lameness occurred, indicating that the patient was at a very late stage and has a long history. The preoperative examination showed a postoperative change of EVAR, accompanied by the occlusion of both iliac arteries.

According to statistics, there are about 20% to 30% AAA patients with iliac artery aneurysm (CIAA) [15]. Longer anchoring areas are required at the far end when implanting mulch stents, which often covering the internal iliac artery. However, covering the internal iliac

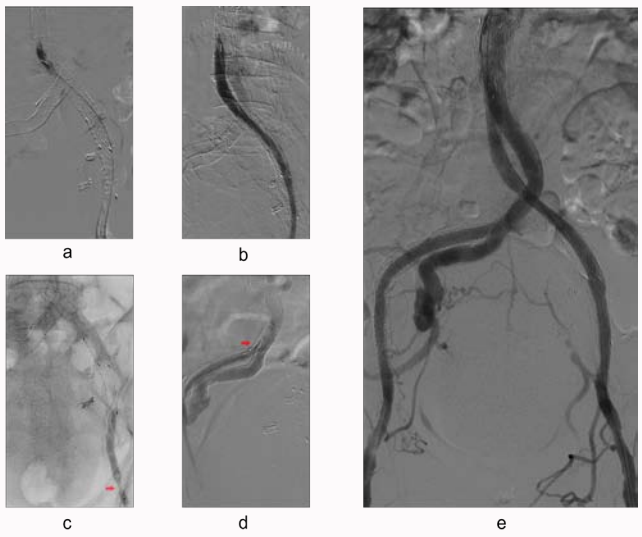

Figure 3:
a. Occlusion of the left iliac artery before using the Rotarex mechanical thrombectomy system.
b. Restoration of the left iliac artery patency after using the Rotarex mechanical thrombectomy system.
c. Angioplasty-balloon dilation on left iliac artery.
d. The compression of the external iliac artery following sandwich technology inDSA image.
e. Postoperative angiography.

artery may bring a series of complications, such as limping of the hip muscles, sexual dysfunction, intestinal ischemia, spinal ischemia, etc. It can be seen that it is important to retain at least one side of internal iliac artery during EVAR. At present, the artery reconstruction technology mainly includes horn mouth technology, artery branch stent technology, and sandwich technology and so on.

In this patient, the left internal iliac artery is embolized with a spring ring, which is then directly covered with a mulch stent. Sandwich technology is used when dealing with the right side. At the same time, the external iliac artery is rebuilt while the internal iliac artery is preserved. Four years after surgery, the patient developed symptoms of ischemia in the lower limbs and examination prompted: Arterial occlusion. In most postoperative cases of EVAR, one side of the occlusion is common, while the bilateral limb occlusion is rare. There are many reasons for arterial closure: twisting into angles, severe calcification, poor neck conditions, and narrow blood vessels flowing out of the channel. The use of "sandwich technology" can also increase the risk of complications. In one study, 8 patients underwent EVAR and sandwich reconstruction techniques. Some postoperative complications were found, including 1 internal iliac and 1 external iliac stent-graft occlusion, 1 gutter endoleak and 2 type II endoleaks [16]. In this case, the closure of the right artery was considered caused by "sandwich technology". We can see that there is a significant compression of the external iliac stent on the internal iliac stent. However, there were no obvious risk factors in the left branch. There is no serious distortion of the left aorta, which is angled 145 degrees. The common iliac artery is 1.47 cm in diameter; the external iliac artery is 8.37 mm in diameter. The blood vessels are flowing out of the channel well, and there is no significant calcification. Therefore, the cause of left branch lesions is open to question. But we need to take into account the age of 68, 20 years of previous history of hypertension, 10 years of coronary heart disease, and 3 years of diabetes, 1 year of renal dysfunction. Because of the high number of underlying diseases, the patient's underlying vascular condition may be worse than that of normal people. Even if there are no obvious risk factors at the anatomical level, if the duration was longer enough, it can lead to occlusion of the vascular with stent. When the balloon dilated the external iliac artery after mechanical thrombectomy, the balloon was found to be indentation. Therefore, besides thrombosis, there is also intimal hyperplasia as the cause of occlusion. This is the result of a long period of time.

Currently, ISR treatments include conventional Plain Old Balloon Angioplasty (POBA), cutting balloon angioplasty, refrigeration angioplasty, repeatedly placement of Drug-Eluting Stent (DES) or drug coated balloon into stent and a cytoreduction (percutaneous mechanical debulking/laser ablation) [14]. Although a large amount of published data describes the various treatment modalities for ISR, most studies compare one or at most two established modalities to the "new kid on the block." As a result, figuring out which treatment option is the gold standard is quite challenging.

With the development of debulking technology, such as physically removing neointima or atherosclerotic plaque through rotating/orientation atherosclerotic resection and excimer laser, a novel ISR treatment approach is available now, which includes the removal of excess stenosis tissue through reduced pressure device and the subsequent low-pressure balloon dilatation.

PMT is mainly used for removing thrombus through mechanical suction, including two types in China: Rotarex and Angiojet. Angiojet and Rotarex are different in the working principle. By means of AngioJet, thrombus is crushed and sucked out with high-speed injection water (at a speed of 350~450 km/h) while adding urokinase and other thrombolytic agents into the injected water, which is a thrombolysis + thrombus suction process not involving mechanically cutting. Therefore, with small damage to the blood vessel, it is also more suitable for fresh thrombus, especially suitable for patients with high thrombosis load under the strong suction of 5.8 k [17]. However, the presence of thrombolytic agents will increase the risks of hemorrhage and myoglobinuria. However, through Rotarex method, a high-speed rotor of 40,000 r/min to 80000 r/min crushes and absorbs the thrombus, which has effects on acute and chronic thrombosis. At the same time, it can remove the proliferated inner membrane and has broader application [18]. In the above case, the patient has suffered pains and numbness in both lower extremities for 6 years, which are late-stage lesions. In view of this, we decided to adopt Rotarex for mechanical removal, conduct balloon dilatation and stent placement.

Conclusion

In summary, after applying Rotarex device for the treatment of EVAR postoperative iliac branch occlusive lesion, the initial results show that Rotarex device is safe and effective with small trauma. It can quickly remove chronic thrombosis and hyperplastic intima; shorten surgery and length of stay. Its application with traditional balloon dilation and stent-assisted angioplasty will achieve significant treatment efficacy.

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