Hypogastric Chimney Patency in Aortic Monoiliacal Endograft Thrombosis: A Life Saved by Collateral Pelvic Circulation

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Abstract

Keywords

- EVAR
- chimney technique
- hypogastric artery
- endograft thrombosis
- endovascular procedure
- limb ischemia
- endograft occlusion

Background To report a case of a high-risk patient treated with hypogastric chimney and aortic endograft for a native infrarenal aorta aneurysmal degeneration, 20 years after an aortobifemoral bypass procedure for severe iliac occlusive disease.

Methods A two-stage procedure was planned. The first stage was right internal iliac artery (IIA) embolization and simple angioplasty of left IIA. The second stage consisted of aortouniliac endograft with femoral crossover and left IIA chimney.

Results Femoral crossover complicated with early thrombosis, but a decision on conservative medical treatment with anticoagulation was made based on no rest pain or severe claudication. After 3 months the patient presented with moderate claudication alone. Scheduled computed tomography scan showed femoral crossover graft and aortic endograft thrombosis with left IIA patency. The axillofemoral bypass was scheduled a week later, and the patient discharged home.

Conclusion Preservation of pelvic circulation is mandatory to avoid life-threatening complications. The chimney technique demonstrates good patency and should be considered in the endovascular approach armamentarium for hypogastric artery revascularization.

Endovascular aortic repair (EVAR) has evolved in past years and is the first choice of therapy for the treatment of abdominal aortic aneurysms in many centers. This treatment offers a less invasive therapy for high-risk patients and less aggressive solutions for some complications of patients formerly treated with the open technique of the aortic sector. However, aortoiliac aneurysm presentations cannot always be treated by standard EVAR. Some reports¹ have demonstrated the utility of “off the shelf” techniques for the treatment of this kind of disease. Moreover, physician-modified endografts² are applied in some other centers with good outcomes. The preservation of pelvic circulation needs to be taken into account in standard EVAR, and it is even more important if one hypogastric needs to be oc-

cluded, and inferior mesenteric artery (IMA) shows no patency. Internal iliac artery (IIA) patency minimizes the risk of bowel ischemia, gluteal claudication, and even paraplegia.^{3,4}

We describe a patient treated several years before for bilateral occlusive iliac disease with an aortobifemoral bypass graft who developed aneurysmal degeneration of his native aorta.

Case Report

A 79-year-old male obese patient, with coronary artery disease, oxygen therapy at home for chronic obstructive pulmonary disease and a 20-year aortobifemoral bypass for

Fig. 1 (A) Diagnostic CT scan. (B) Stage 1: shows big left hypogastric artery in selective angiography. (C) Selective right internal and common iliac artery embolization (white arrow each). (D) Big star point native aneurysmal aorta, small star points graft at proximal anastomosis, and white arrow point at occluded right hypogastric in final angiography. CT, computed tomography.

severe iliac occlusive disease presented with an infrarenal aneurysmal degeneration of his native aorta of 55 mm. Both common iliac arteries (CIA) and IIA were severely calcified but patent. External iliac arteries were occluded. Left IIA appeared to be less diseased. A two-stage treatment was planned. The first stage consisted of coil embolization of right CIA and IIA and simple balloon angioplasty of the left IIA and CIA (→Fig. 1). The second stage was done 2 weeks later with an Endurant 36 mm (Medtronic, Santa Rosa, CA) endograft monoiliacal configuration (oversizing 25%) with femoral crossover bypass and a long chimney to the left IIA. The hypogastric chimney was performed with a Viabahn (W. L. Gore & Associates, Inc., Flagstaff, AZ) 8 × 15 mm plus a proximal Omnilink (Abbott Vascular, Santa Clara, CA) 9 × 39 balloon expandable stent (→Fig. 2). Monoiliacal configuration was decided as the distance from the lowest renal artery to aortic graft anastomosis was exactly 49 mm, in the case of using a bifurcated endograft, we could have expected many problems in the contralateral limb opening and/or capture. Final angiography showed patency of the endograft and the left IIA chimney without endoleaks. After 2 days the patient revealed left limb pain, and diagnosis of thrombosis of the left portion of the femoral crossover graft was confirmed with Doppler ultrasonography. The patient did not refer rest pain or severe claudication. After 5 days of observation and with anticoagulation he referred limb pain improvement and was discharged home. Computed tomography (CT) scan at 1 month showed patency of the endograft, the chimney and the right anastomosis of the femoral graft. A small type Ia endoleak was encountered and attributed to the chimney gutter and anticoagulation. The patient stopped anticoagulation treatment after 1 month

Fig. 2 (A) Stage 2: Kissing balloon technique at proximal endograft and stent. (B) Final angiography showing left hypogastric artery patency and no endoleaks. The big white arrow shows distal part of guidewire inside HA, small white arrow displays distal part of the introducer sheath for the chimney. HA, hypogastric artery.

Fig. 3 Control CT scan at 1 month (A) posterior view and (B) anterior view. (C) Small type IIA endoleak (gutter)—on anticoagulation. (D) CT scan at 3 months with endograft thrombosis. CT, computed tomography.

and controlled CT scan was scheduled for 6 months. At month 3, the patient presented to the emergency department with short claudication and urgent CT scan (→ **Fig. 3**) demonstrated aortic endograft, and femoral graft occlusion/thrombosis and a patent left IIA chimney. No symptoms of pelvic ischemia, buttock claudication, ischemic colitis, paraparesis or critical limb ischemia were found on physical examination. The patient was scheduled for axillofemoral bypass with previous femoral crossover graft repair. He was discharged home 4 days after the procedure. Control CT scan 1 year after initial procedure reveals graft and chimney patency with aneurysmal sac regression of 5 mm (→ **Fig. 4**). The patient remains asymptomatic.

Discussion

The collateral network of the pelvic circulation relies on the patency of the SMA by the arc of Riou, the IMA, and the two IIAs. Spinal cord receives an important perfusion network formed by the middle sacral and lumbar arteries. Previous reports describing major acute pelvic ischemia show a rate ranging from 0 to 18%. Jean-Baptiste et al⁵ found a complication rate of 2.8% on 75 procedures of intentional occlusion of the IIA, concluding that a pelvic

Fig. 4 CT scan at 1-year follow-up with axillofemoral and hypogastric chimney patency. CT, computed tomography.

ischemia scenario may be severe and lead to a fatality in these EVAR patients. Occlusion of both IIAs has been described in other reports. Mehta et al⁶ reported the absence of colon ischemia in a 20 patient series of bilateral hypogastric occlusion after EVAR or open repair. Conversely, lots of articles describe on the effort to maintain the bed supply of the hypogastric arteries. Noel-Lamy et al² reported on 15 patients with iliac branch devices extended to the superior gluteal artery for IIA aneurysm, clearly an effort to go beyond the instruction of use of the device, making it feasible and safe. Lepidi et al¹ described on 18 patients a successful treatment with parallel endografts for maintenance of one IIA perfusion. Our case was based using this concept. Furthermore, the evolution in complex endovascular aortic procedures highlights the importance of preserving the collateral bed, as a recent article by Eagleton et al⁷ suggests. Current literature reports on even trying advanced endovascular techniques to keep IIA perfusion patent. Patients with previous open aortic procedures are technically demanding. Adding these patients, severe comorbidities make them a high-risk group. Feasibility of complex and complementary endovascular techniques have been demonstrated in patients with proximal anastomotic aneurysms/pseudoaneurysms,⁸ being maneuverability a strong technical limitation. Reports on endograft occlusion/thrombosis are scarce,⁹ but represent a life-threatening scenario with very high morbidity and mortality rate. Treatment usually needs to be urgent, and can be done by endovascular means using fibrinolytic agents, as reported by Alder et al.¹⁰ Open surgical technique still remains a good option, using the extra-anatomical approach in high-risk patients or endograft partial/total explantation and in-situ reconstruction if possible. In our case, the left femoral crossover anastomosis revealed early failure/thrombosis. The rationale of no treatment was based on the extensive collateral network between left hypogastric and left deep femoral with mild limb ischemia symptoms that improved after anticoagulation alone. This was probably the key point in later crossover bypass and endograft failure; however, we demonstrate and highlight the utility of the hypogastric chimney endograft, as this patient never had any urgent or life-threatening condition.

Conclusion

Pelvic circulation preservation is mandatory when EVAR is planned. Aortic endograft thrombosis is a life-threatening condition, and the support of an important collateral bed circulation is of extreme importance to avoid the severe complications such as bowel ischemia or paraplegia.

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