Peripheral Interventions

Endoluminal Exclusion of an Iliac Artery Aneurysm by WALLSTENT® Endoprosthesis and PTFE Vascular Graft

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Aneurysms isolated in the iliac artery and measuring more than 3 cm in diameter are associated with an increased rate of rupture and a high mortality rate. The current therapy recommended for such aneurysms is surgical exclusion. Percutaneous exclusion of isolated iliac aneurysms with covered or uncovered stents, however, reduces the morbidity and mortality rates associated with surgery by obviating the need for general anesthesia, avoiding significant blood loss, and reducing in-hospital recuperation time.

We report the case of a patient who had an isolated atherosclerotic iliac artery aneurysm that was successfully excluded percutaneously by use of an endovascular prosthesis (WALLSTENT® Endoprosthesis) made by Schneider (USA), Inc; Minneapolis, Minn, in conjunction with the Thin-Walled GORE-TEX® (polytetrafluoroethylene) Vascular Graft (W.L. Gore & Associates, Inc.; Flagstaff, Ariz). Although various stent devices have been used recently in conjunction with a polytetrafluoroethylene graft to exclude peripheral arterial aneurysms, the self-expandable WALLSTENT has not been used with polytetrafluoroethylene in this fashion and for this purpose until recently. We present herein the technical aspects of endoluminal exclusion of the isolated iliac artery aneurysm with this composite stent–graft. ***(Tex Heart Inst J 1997;24:11-4)***

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During the past 5 years, intravascular stents have gradually gained acceptance for treatment of patients with occlusive disease in selected arterial systems. However, the current commercially available clinical stents are extremely porous and are unsuitable for treating lesions that require a watertight seal, such as arterial aneurysms, pseudoaneurysms, and arteriovenous fistulas. To overcome this problem, various prosthetic graft materials have been used in conjunction with stents to blend the efficient "anchoring" qualities of stents with the flexible, hemostatic sealing properties of vascular grafts. More than 2 dozen types of such endoluminal grafts have been designed[1] and used in aneurysms of the aorta,[2,3] and in aneurysms of the iliac,[4] subclavian,[5] femoral, and popliteal arteries.[1] However, experience with endoluminal exclusion of iliac artery aneurysms using stent–grafts is limited. Moreover, the endoluminal grafts used in all the reported cases have been either PALMAZ™ Balloon-Expandable stents (Johnson & Johnson's Cordis Corp. affiliate; Miami Lakes, Fla) or Z stents covered with polytetrafluoroethylene (PTFE) or polyester vascular grafts. We describe the successful endoluminal exclusion of an isolated iliac artery aneurysm with use of an endovascular prosthesis (WALLSTENT® Endoprosthesis) made by Schneider (USA), Inc; Minneapolis, Minn, in combination with the Thin-Walled GORE-TEX® (PTFE) Vascular Graft (W.L. Gore & Associates, Inc.; Flagstaff, Ariz).

Case Report

A 69-year-old man was admitted to our institution with intermittent claudication in his left leg and angiographic evidence of severe stenosis of the left common iliac artery. Three months before admission, the patient had undergone angioplasty of the right common iliac artery with placement of a PALMAZ™ Balloon-Expandable stent. His medical history also included arterial hypertension,

hyperlipidemia, coronary artery disease, chronic renal failure, and 40 years of smoking. On physical examination, bilateral carotid bruits were detected. Arterial pulses in the right lower extremity were minimally diminished, and the left lower extremity pulses were barely palpable. The serum creatinine was 2.3 mg/dL. The ankle–arm index revealed a marked decrease in the arterial flow in the left leg.

Device Design and Placement

After giving his informed consent for the procedure, the patient was taken to the endovascular suite for transfemoral stent–PTFE vascular graft repair of the iliac artery aneurysm. A subcutaneous injection of lidocaine was used for local anesthesia of the left groin. A 45-cm, 11-F sheath was introduced retrogradely into the left femoral artery and advanced over a 0.035" guidewire across the iliac artery to the abdominal aorta. Heparin (15,000 U) was administered intravenously.

Left iliac angiography revealed an 80% stenosis of the left common iliac artery, as well as a large aneurysm (3 × 4 cm) distal to the stenosis, ending about 0.5 cm proximal to the origin of the left internal iliac artery. Diffuse disease was seen in a long segment of the external iliac artery; the disease-free segment was 9 mm in diameter (Fig. 1).

The stent–graft was prepared at the time of the procedure with commercially available products for intravascular use, including a 4-mm Thin-Walled GORE-TEX® (PTFE) Vascular Graft and a 10- × 94-mm Schneider WALLSTENT® Endoprosthesis (Fig. 2). The PTFE graft was cut to the desired length of 5 cm and predilated with a 10- × 40-mm peripheral angioplasty balloon to the diameter of the unconstricted stent. The selected stent was then partially exposed on a UNISTEP™ delivery system (Schneider), and the predilated PTFE graft was sutured at the proximal and distal ends of the WALLSTENT prosthesis using 6-0 Prolene™ sutures (Ethicon, Inc.; Somerville, NJ). The stent–graft was introduced and constrained in an 11-F PEEL-AWAY® sheath (Cook Inc.; Bloomington, Ind), which was then placed into an 11-F femoral sheath. The stent–graft was advanced to the desired location over a 0.035" guidewire, and the PEEL-AWAY sheath was removed. Under fluoroscopic guidance, the femoral sheath was partially withdrawn to expose the stent–graft. After final adjustment of the device's position, the sheath was removed and the stent assumed a self-expanded dimension. The stent adhered to the iliac artery wall and excluded the aneurysmal segment. The device was then dilated with a 10- × 40-mm peripheral angioplasty balloon for nominal apposition of the device to the arterial wall. Exclusion of the aneurysm and normal flow to the left internal iliac and femoral arteries were documented on postdilatation angiography (Fig. 3).

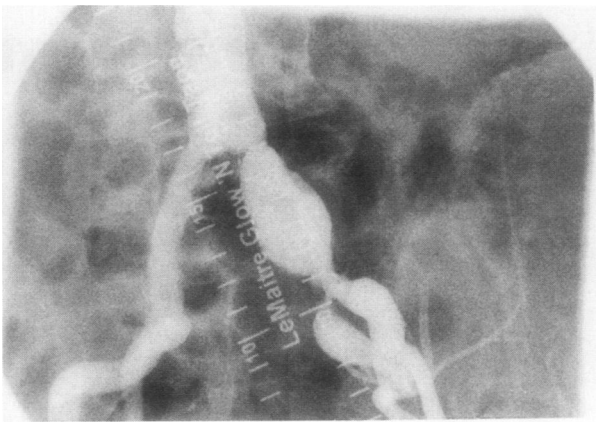

Fig. 1 *Atherosclerotic isolated iliac aneurysm as seen on angiography.*

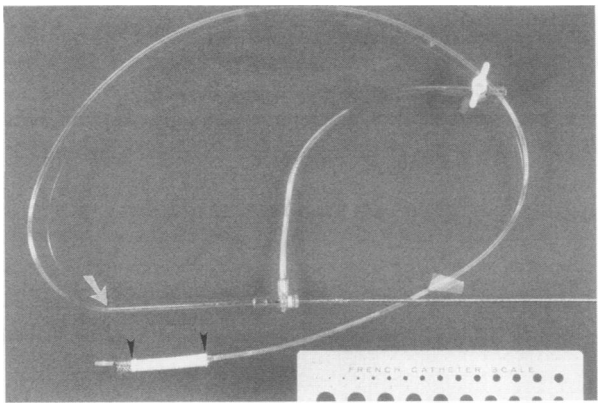

Fig. 2 *Stent–graft prior to placement.*

A color duplex scan performed 2 months after the procedure showed thrombosis of the aneurysmal lumen outside the graft; arterial flow within the graft was normal. Ankle–arm indices at the 2-month follow-up were also compatible with normal flow to the left lower extremity.

Discussion

Isolated iliac artery aneurysms are relatively rare; a large autopsy series[6,7] has estimated a prevalence of 0.008% to 0.03%. Although conditions such as pregnancy, infection, postoperative injury, dissection, trauma, Marfan syndrome, and other collagen diseases have been associated with iliac artery aneurysms, the most common cause by far is atherosclerosis.[4] The signs and symptoms of an iliac artery aneurysm are usually caused by the compressive effects on, or erosion into, adjacent organs.[8] Symptoms typically arise from gastrointestinal, genitourinary, neurologic, and venous structures.

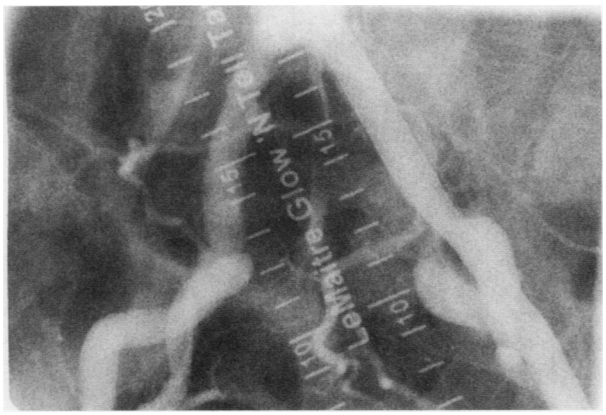

Fig. 3 *Exclusion of isolated iliac artery aneurysm after stent–graft implantation.*

Despite the clinical manifestations, justification for treatment of this condition rests on the natural history of the isolated iliac artery aneurysm. This history is one of progressive expansion, which eventually leads to rupture.[8,9] The rate of rupture, which increases with aneurysmal size, has been estimated to be 31% by Richardson and Greenfield,[8] whereas others estimate the rate to be from 14% to 70%.[10,11] Richardson[8] reported a mean diameter of 5.6 cm in the iliac artery aneurysms that ruptured; the smallest was 3 cm.[7] The mean transverse diameter of the aneurysm in our patient was 3.4 cm.

Despite a high overall perioperative mortality rate (33% to 50% in emergent operations; 7% to 11% in elective procedures[8]), the natural history of iliac artery aneurysms larger than 3 cm in diameter indicates that the appropriate approach is surgical repair, which is currently the recommended therapy.[8,10] Compared with the conventional surgical approach, percutaneous exclusion of iliac artery aneurysms offers the advantage of immediate isolation of the aneurysm from the circulation without general anesthesia, thus reducing the likelihood of clinically significant blood loss, as well as decreasing postoperative recovery time. These advantages are particularly important in patients who are at high risk for surgery because of concomitant illnesses.

A variety of percutaneous approaches have been used to repair or exclude iliac artery aneurysms. Using noncovered self- or balloon-expandable stents, Vorwerk and coworkers[12] and Blais and Bonneau[13] have theorized that apposition of the stenotic hyperplastic intima against the separated layers of the vessel wall can lead to thrombosis and exclusion of the aneurysm. Stenting of the neck of the aneurysm followed by coil embolization through the stent struts is another approach, used by O'Brien and Rankin.[14] Yet another method is extra-anatomic surgical bypass followed by transcatheter coil embolization of the aneurysm.[15]

Percutaneous placement of stent–grafts combines the efficient anchoring qualities of stents with the flexible, hemostatic sealing properties of vascular grafts. Currently, more than 2 dozen types of these endoluminal grafts have been designed and are being used in the aorta and other selected arterial systems.[1]

Experience to date with percutaneous endoluminal grafting of isolated iliac aneurysms is limited to occasional case reports or limited case series. In the largest series reported (n=9), Razavi and others[1,4] described the successful exclusion of iliac artery aneurysms with self-expanding Z stents covered with PTFE or woven polyester grafts. The procedure was successful in all 9 patients and resulted in no thromboembolic events, infection, or death. Short-term follow-up results (median, 8.5 months) were also reported to be favorable.

The WALLSTENT is available in larger diameters and longer lengths than conventional stents and uses smaller arterial sheaths than the ones required for other conventional endoluminal grafting techniques. Thus, the WALLSTENT is effective in treating aneurysms of a variety of sizes and lengths, particularly longer aneurysms in which conventional stents may be unsuitable. The use of the stent–graft technique for exclusion of aneurysms in various peripheral arterial locations is described elsewhere.[16]

The main symptom in our patient, intermittent claudication, was related primarily to a concomitant obstructive atherosclerotic lesion, which is often seen in patients with the most common form of iliac artery aneurysms. Stent grafting is an appropriate and effective alternative in this situation, because the presence of the concomitant lesions increases the risk of surgical treatment of the aneurysm.

The short-term results after use of a stent–graft in our patient have been very favorable. It is not yet known whether these devices will completely eliminate the long-term risk of rupture. As is the case with other percutaneous approaches, compressive symptoms might not be relieved by stent–grafts. Furthermore, if the aneurysm involves or closely approximates the internal iliac artery, there is potential for retrograde flow into the aneurysm via collateral circulation.

In our initial experience, endoluminal grafting of an iliac artery aneurysm using the WALLSTENT–PTFE vascular graft appears to be a safe and effective alternative to surgery.

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