Novel-Designed Iliac Branch Stent Graft for Internal Iliac Artery Reconstruction during Aneurysm Repair

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Background: Iliac branch stent grafts (IBSGs) have been used for internal iliac artery preservation during aneurysm repair. However, current available branch iliac stent grafts used in Western countries are not suitable for many patients in Asia because of shorter common iliac arteries (CIA). The aim of this study was to evaluate the efficacy of a novel-designed IBSG in preservation of internal iliac artery during endovascular aneurysm repair in Chinese.

Methods: Eleven male patients (range, aged 65−80 years) underwent endovascular repair with 15 IBSGs, including 4 bilateral repairs between January 2011 and December 2012. The median abdominal aortic aneurysm diameter was 50 mm and the common iliac diameter was 38 mm. All patients received computed tomography angiography (CTA) before discharge and every 3 months afterward.

Results: The stent-graft deployment was technically successful in all cases. Seven of the 11 patients had uneventful procedures and the rest 4 complicated with fever, renal insufficiency, and groin hematoma. The median length of hospitalization was 7 days. Perioperative mortality was zero. Follow-up documented that 1 patient died at 14 months after surgery because of an unrelated cause. Two patients were found to have a type I and III endoleak, respectively, then successful treatments with internal iliac artery extension stent grafts were applied at 6 months. The overall primary patency was 86.7%. Follow-up CTA showed aneurysm shrinkage in all patients.

Conclusions: These novel-designed IBSGs are safe and effective in preservation of internal iliac artery. It provides an alternative option for endovascular repair of the iliac aneurysms with short CIA, which is more common in Asian population.

INTRODUCTION

Iliac aneurysm is bulging and weakness in the wall of iliac artery, which accounts for approximately 3% of all kinds of aneurysms and is commonly correlated with abdominal aortic aneurysms (AAAs; 40%).[1,2] A total of 70−90% of the iliac aneurysms occur in common iliac arteries (CIAs), with internal iliac arteries (IIAs) involvement in 10−30% of the cases, which makes endovascular aneurysm repair more complicated.[3] Current open or endovascular treatments of iliac aneurysms often sacrifice IIA, which may result in buttock or thigh claudication, erectile dysfunction, ischemic colitis, gluteal or perineal necrosis, spinal cord injury, and acute limb ischemia.[4−10]

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To address these issues, various technologies of IIA reconstruction in the treatment of iliac aneurysms have been reported.[11,12] The most commonly used method is open surgical repair featured with IIA transposition or bypass based on the hybrid open approach.[12,13] Although it is effective, the open procedure, compared with endovascular reconstruction, is associated with more blood loss, longer operation time, longer hospital stay, higher morbidity, and mortality.

Various endovascular techniques, including external iliac to IIA stent grafts coupled with aorto-monoiliac repairs, ''sandwich'' stent grafts, and iliac branch stent grafts (IBSGs), have been used for the treatment of iliac aneurysm.[14–17] Compared with the other techniques, IBSGs represent a significant improvement in the treatment of iliac aneurysms by allowing preservation of pelvic flow as a totally endovascular technique in a minimally invasive manner, featured with satisfactory patency rates and decrease in mortality or stent graft–related complications.[18–21] However, current available IBSGs are developed based on anatomic structures of Caucasians with 50–60 mm of CIAs; and therefore, may not be effective in patients in the Asia-Pacific region with shorter CIAs (25–30 mm).[22]

In this study, a novel-designed IBSG was used for the treatment of iliac artery aneurysms only or combined with endovascular abdominal aneurysm repair. The safety, effectiveness, and short-term outcomes of the novel-designed IBSG were investigated in Chinese.

METHODS

Patients were identified from a surveillance register. Informed consent was obtained from all participants in this study, which was conducted in compliance with the Declaration of Helsinki and according to the ethics policies of the involved institutions.

Indications and Considerations

The novel-designed IBSG was used following the criteria: (1) the presence of a CIA with diameter more than 24 mm, (2) the presence of a patent CIA lumen > 18 mm at the level of bifurcation, (3) an adequate length of external iliac artery (EIA) for distal landing of more than15 mm, and finally, (4) sufficient length of IIA of more than 10 mm. Regarding the IIA, it has been stated that the IIA must be of ''normal diameter'' or up to 11 mm in diameter.

Exclusion criteria were as follows: (1) Severe IIA atherosclerosis, severe kinking and calcifications of EIA, and wide angle of IIA. (2) Pseudoaneurysms and ruptured iliac aneurysms as well as iliac aneurysms managed with open repair, and (3) Patients with ruptured or infected and inflammatory aneurysms and hypersensitivity to iodinated contrast media were also excluded.

Procedural success was defined as accurate positioning of the endografts that achieved complete exclusion of the aneurysm or a residual diameter stenosis of <30% in the cases with coexistent obstructive lesions. Angiographic patency at follow-up was defined as <50% diameter restenosis. Primary patency was referred as uninterrupted patency of the endograft with no procedures performed on or at the margins of the treated vessel segment. Secondary patency was defined as adequate blood flow restored by repeat interventions for restenosis or reocclusion.

Arterial diameters were measured as the shortest outside transverse diameter of the artery on computed tomography (CT) scans by the same observer. Arterial lengths were measured with centerline of flow from the CT scan. The maximal diameter of preoperative aneurysm was compared with that measured on 1-year follow-up CT and the latest follow-up CT scan. Decrease or increase by 5 mm or more in diameter was considered as significant.

Primary end points were mortality, pelvic ischemia (bowel and spinal cord or nerve ischemia, erectile dysfunction, buttock or thigh claudication, and necrosis), and failure to exclude iliac aneurysm (growth >5 mm in maximum diameter, endoleak or rupture) up to 1 year after repair. Secondary end points were technical success, defined as successful implantation of the IBSG in the target iliac vessels with preservation of antegrade flow to the internal iliac tributaries, iliac patency (iliac branch or CIA patency and EIA patency), and need for reintervention.

Patients' Characteristics

From January 2011 to December 2012, 15 IBSGs were implanted in 11 male patients. Four of them underwent bilateral repair of common iliac artery aneurysms (CIAAs) and required 2 IBSGs for each patient. The median age was 70 years (range, aged 65–80 years). The most relevant comorbidities were smoking (81.8%), hypertension (72.7%), dyslipidemia (54.5%), coronary artery disease (45.5%), diabetes mellitus (36.4%), and chronic obstructive pulmonary disease (27.3%). The median AAA diameter was 50 (43–70) mm, and the common iliac aneurysm diameter was 38 (31–60) mm.