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REVIEW

Endovascular Aneurysm Repair with Preservation of the Internal Iliac Artery Using the Iliac Branch Graft Device

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Abstract *Objectives:* Aortoiliac aneurysms comprise up to 43% of the specialist endovascular caseload. In such cases endovascular aneurysm repair (EVAR) requires distal extension of the aortoiliac endograft beyond the ostium of the internal iliac artery (IIA) and into the external iliac artery, conventionally necessitating the embolisation of one or both IIA. This has been associated with a wide range of complications, and the use of an Iliac Branch-graft Device (IBD) offers an appealing endovascular solution.
Design: Medline, trial registries, conference proceedings and article reference lists were searched to identify case series reporting IBD use. Data were extracted for review.
Results: Nine series have reported the use of IBD in a total of 196 patients. Technical success was 85–100%. Median operating times were 101–290 min and median contrast dose was 58–208 g, with no aneurysm-related mortality. Claudication developed in 12/24 patients after IBD occlusion. One type I endoleak and two type III endoleaks occurred and were managed endovascularly. Re-occlusion occurred in 24/196 patients.
Conclusion: IBD was performed with high technical success rates and encouraging mid-term patency. Formalised risk stratification and morphological data are required to identify the group of patients who will benefit most. Cost-effectiveness appraisals are needed for this technique.

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Introduction

The evolution of endovascular techniques has increased the proportion of patients with abdominal aortic aneurysm (AAA) suitable for treatment by endovascular aneurysm repair (EVAR) in addition to open repair. However, the proximal or distal extension of aneurysmal disease to visceral or iliac branches of the aorta increases the complexity of EVAR and its consequent morbidity and mortality.[1]

Although isolated iliac aneurysms are rare,[2] aortoiliac aneurysms comprise a significant proportion of the specialist vascular caseload. Unilateral common iliac artery (CIA) aneurysms are present in 43%, and bilateral CIA aneurysms in 11% of patients with intact AAA;[3] In such cases EVAR requires distal extension of the aortoiliac endograft beyond the ostium of the internal iliac artery (IIA) and into the external iliac artery (EIA), conventionally necessitating the embolisation of one or both internal iliac arteries (IIA). Sacrifice of the IIA in this manner has been associated with a wide range of complications. These predominantly comprise buttock claudication[4,5] and erectile dysfunction[6] but may even include bowel or spinal ischaemia,[7] sloughing of the scrotal skin[8] or ischaemic injury to the lumbosacral plexus.[9]

Sequelae of Sacrificing the Internal Iliac Artery: Supply and Demand

The severity of symptoms following the sacrifice of one or both IIA is affected by the demand of end organs in the vascular territory of the IIA, as well as their collateral supply. Younger, more active patients have a greater demand for blood supply and a significantly higher risk of buttock claudication after IIA occlusion, and those with poor supply due to reduced cardiac output are also at high risk.[10] Collateral blood supply is derived from the contralateral IIA and bilaterally from profunda femoris and external iliac branches.[11] Although it is logical to presume that bilateral IIA occlusion would be associated with a greater risk of complications due to pelvic ischaemia, the published evidence suggests that there is no increase in risk compared to unilateral IIA occlusion.[12] A systematic literature review identified the development of buttock claudication in 31% of patients who underwent unilateral IIA embolisation prior to EVAR and in 35% of patients with bilateral IIA embolisation prior to EVAR.[12] New onset erectile dysfunction was reported in 17% of patients undergoing unilateral IIA embolisation prior to EVAR and in 24% of patients undergoing bilateral IIA embolisation prior to EVAR.[12] Publication bias is likely to exert a significant effect and such findings must be interpreted with caution. Furthermore, the rate of major complications occurring as a result of bilateral IIA occlusion is probably under-reported. However, there is no evidence for benefit from the sequential rather than simultaneous sacrifice of bilateral IIA.[13] Interruption of the IIA as proximally as possible reduces ischaemic complications and it is likely that this is due to greater preservation of collateral blood supply.[4,13] However, the importance of significant publication bias in the reporting of pelvic complications following IIA occlusion must be emphasised.

Alternatives to IIA Sacrifice

The group of patients at greatest risk from sacrifice of the IIA remains largely unidentified. Although complications from bilateral IIA sacrifice are relatively innocuous in some series,[4] persistent and debilitating buttock claudication is seen in other series after unilateral IIA occlusion.[12] There are many confounding factors in the literature to explain such heterogeneity, including differences in the prevalence of diabetes, variations in population age, the length of follow-up and the small sample size of existing studies. Nevertheless, some (as yet undefined) groups of patients at high risk of developing complications might benefit from preservation of IIA flow. Techniques described for preservation of the IIA include relocation of the IIA origin,[14] IIA bypass,[15] bell-bottom grafts,[16] and external-to-internal iliac stent-grafts with femoro-femoral cross-over.[17–19] In comparison to these more invasive techniques, the use of Internal Iliac Branch-Graft Devices (IBDs) offers an appealing endovascular solution.

Iliac Branch Devices

IBDs extend from a conventional EVAR stent-graft in to the EIA whilst preserving flow in to the ipsilateral IIA using a side branch. The IIA is cannulated from the contralateral femoral artery using a pre-loaded wire from the side branch (Fig. 1).

Two systems have been reported in current use: the Zenith Bifurcated Iliac Side (ZBIS) device (Cook Inc., Bloomington, IN, USA) (Fig. 2) and the Helical Branch Endograft (HBE) device described by Greenberg et al[20] (Fig. 3) available for commercial use (Cook Inc., Bloomington, IN).

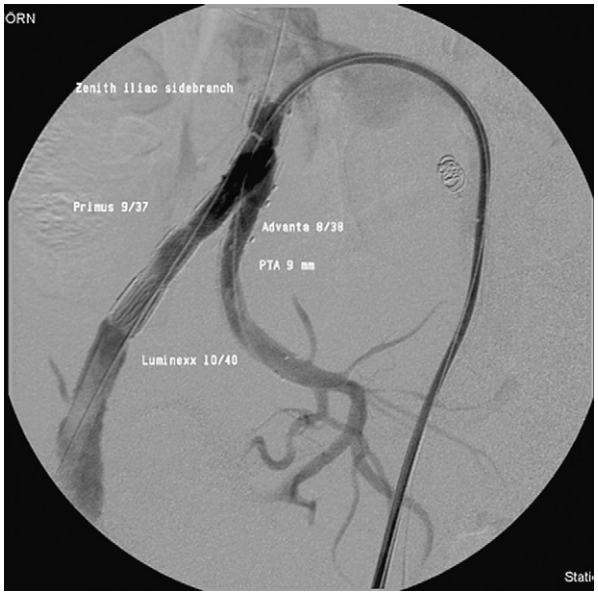

Figure 1 Angiogram to illustrate cannulation of right IIA from the left femoral artery, using a pre-loaded wire from the IIA side branch of the Zenith Bifurcated Iliac Side (ZBIS) device (Cook Inc., Bloomington, IN).