Eur J Vasc Endovasc Surg (2011) **42**, 54—58

Fenestrated Aortic Endografts for Juxtarenal Aortic Aneurysm: Medium Term Outcomes

A.L. Tambyraja*, **N.G. Fishwick**, **M.J. Bown**, **A. Nasim**, **M.J. McCarthy**, **R.D. Sayers**

Leicester Royal Infirmary, Infirmary Square, Leicester LE1 5WW, United Kingdom

Submitted 2 March 2011; accepted 31 March 2011
Available online 22 April 2011

KEYWORDS
Aortic aneurysm;
EVAR;
Fenestrated

Abstract *Aims:* The utility of fenestrated-endovascular aneurysm repair (FEVAR) remains uncertain. This study examines the medium term outcomes of patients undergoing FEVAR for asymptomatic juxtarenal abdominal aortic aneurysm (AAA).
Methods: Consecutive patients undergoing elective FEVAR for juxtarenal AAA at a single tertiary centre were studied between October 2005 and March 2010. Patients were followed up for at least six-months within a protocol including clinical examination, laboratory studies, CT and duplex imaging, and abdominal radiographs. Outcomes were assessed in terms of survival, target vessel patency and graft related complications.
Results: Twenty-nine patients were analysed on an intention to treat basis. There were 27 men and two women of median (range) age 74 (54—86) years. Mean (SD) aneurysm diameter was 68 (7) mm. Median (range) ASA score was 3 (2—4). No procedures required conversion to an open procedure, but one procedure was abandoned. Seventy-nine visceral vessels were perfused through a fabric fenestration or scallop. All vessels remained patent at completion angiography. No patients died within 30-days of surgery. During follow up there were four (14%) deaths at a median (range) of 17 (8—21) months after aneurysm repair. None of these deaths were aneurysm related. Eighteen (62%) patients suffered one or more graft related complications, of whom 11 (38%) required one or more early or late reintervention.
Conclusions: Fenestrated aortic endografts can be utilized safely in the management of juxtarenal AAA in patients at high-risk for open surgery. However, the rate of graft related complication and reintervention is high at medium term follow up.

* Corresponding author. Tel.: +44 131 242 3622; fax: +44 131 242 3617.
E-mail address: andrew.tambyraja@ed.ac.uk (A.L. Tambyraja).

1078-5884/$36
doi:10.1016/j.ejvs.2011.03.033

Introduction

Endovascular Aneurysm Repair (EVAR) has established itself as an effective treatment in the management of asymptomatic, large, infrarenal abdominal aortic aneurysm (AAA).[1,2] However, more than 50% of patients have aneurysm morphology that is unsuitable for conventional endovascular repair.[3] Of these, a significant proportion will have an inadequate length of normal infrarenal aorta above the aneurysm within which to achieve a proximal seal, and account for up to 15% of AAA.[4] Fenestrated endovascular aneurysm repair (FEVAR) was first described in 1999 as an endoluminal solution for patients with an inadequate infrarenal aortic neck.[5] Fabric fenestrations of the endograft, with or without bridging stents, permit perfusion of visceral branch vessels while achieving a secure proximal seal. Such devices are now commercially available and are challenging the established indications for EVAR.

Although a large number of fenestrated endoprostheses have been implanted into patients, there is a paucity of evidence to support the use of FEVAR. In the absence of randomised controlled trials, small cohort studies underpin the existing evidence base. Existing reports are generally from endovascular enthusiasts reporting favourable short-term outcomes.[6–10] The present series reports the medium term outcomes from a single centre, with the specific aim of highlighting the challenges faced in the implementation of a fenestrated aortic endograft programme.

Patients and Methods

A single-centre, retrospective, observational cohort study was performed at the Leicester Royal Infirmary, UK. This is a high-volume tertiary referral vascular surgical service performing, approximately, 100 conventional EVARs each year. Consecutive patients undergoing attempted repair of an intact juxtarenal or suprarenal AAA with a fenestrated endograft were accumulated over the period October 2005—June 2010 and studied on an intention to treat basis.

Patients were selected for FEVAR on the basis of a juxtarenal AAA of at least 55 mm in diameter, with a proximal neck too short for standard EVAR, but otherwise suitable anatomy for EVAR together with unsuitability for open aneurysm repair. Patients were deemed unsuitable for open surgery on the basis of co-morbidities or previous abdominal surgery with an abdomen too hostile for further laparotomy. Patients were classified using the American Society of Anaesthesiologists (ASA) guidelines.

Preoperative high-resolution computed tomography (CT) scans for all patients, and angiography obtained at the physician's discretion, were used to determine if the aneurysm morphology was suitable for FEVAR. Customised fenestrated devices based on the Cook Zenith system (William A. Cook Australia, Ltd., Brisbane, Australia) were designed on multiplanar reconstructions and centreline of flow calculations derived from CT scans. Diameters and lengths of the aorta and iliac arteries, and visceral vessel morphology were used to measure the relative positions of visceral vessels to match the fenestrations in a similar manner to prior publications.[11] Small (6 × 8 mm), large (>8 mm), or scalloped (located at the uppermost portion of fabric) fenestrations were included as options for the device design. All procedures were performed under general anaesthesia in a conventional operating room with mobile imaging equipment. Completion angiography was used to ensure freedom from endoleak, vessel patency and aneurysm exclusion. The first four cases in the series were undertaken under the mentorship of the multidisciplinary team from the Royal Liverpool Hospital, UK.[6]

Patients were followed up for at least six-months within a protocol which included clinical examination, laboratory studies, CT and duplex imaging, and abdominal radiographs. The current surveillance protocol entails anteroposterior and lateral plain X-rays, duplex ultrasound and CT aortography prior to discharge. Duplex ultrasound and CT scan at 3 months, plain X-rays and duplex ultrasound at 6 months and plain X-rays, duplex ultrasound and CT scan at 12 months and yearly thereafter. Diagnostic angiography was utilized selectively. Outcomes were assessed in terms of survival, target vessel patency, graft related complications and reintervention, in accordance with SVS reporting standards for EVAR.[12] An increase in aneurysm sac size of >5 mm was regarded as a complication.

Results

Patients

Twenty-nine patients were included within an intention to treat protocol. There were 27 men and two women of median (range) age 74 (54—86) years. The mean (SD) aneurysm diameter was 68 (7) mm and the median (range) ASA score was 3 (2—4). Three patients had undergone a failed attempt at open AAA repair at another centre prior to FEVAR. One patient was already established on haemodialysis prior to intervention. Patient comorbidity is shown in Table 1.

Endografts

A three-component system was utilized in all but one of the patients. In the remaining patient, an aorto uni-iliac system and contralateral iliac occluder device were used due to access difficulties. Seventy-nine visceral vessels were intended to be perfused through a fenestration or scallop, including 52 renal arteries, 25 superior mesenteric arteries (SMA) and 2 coeliac arteries. The most common configuration, two fenestrations for the renal arteries and a scallop fenestration for the SMA, was used in 19 patients. Three patients had a single renal fenestration, two required one renal fenestration with two scallops for the remaining renal and SMA, two required a single renal fenestration and a scallop for the other renal and one patient only needed a single scallop for a single renal artery. Two patients needed grafts with four fenestrations to also include the coeliac artery. None of the grafts incorporated an accessory renal artery.

Procedural details

None of the procedures required immediate conversion to an open repair. However, five (18%) patients suffered an intraoperative complication. In one patient with