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Preliminary results of Zenith Fenestrated abdominal aortic aneurysm endovascular grafts

Timothy H. Liao, M.D., Jennifer J. Watson, M.D., M. Ashraf Mansour, M.D.*, Robert F. Cuff, M.D., Shonda L. Banegas, D.O., Christopher M. Chambers, M.D., Ph.D., Jason D. Slaikeu, M.D., Peter Y. Wong, M.D.

Department of Surgery, Spectrum Health Medical Group, Grand Rapids Medical Education Partners, Michigan State University College of Human Medicine, Grand Rapids, MI, USA

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Abstract

BACKGROUND: Patients with juxtarenal aortic aneurysms who are unfit for open repair may be considered for fenestrated endovascular repair (fenEVAR). We report our initial experience with fenEVAR.

METHODS: We reviewed the data on all our patients receiving fenEVAR for juxtarenal aortic aneurysms.

RESULTS: Eight patients, average age 75 years, underwent fenEVAR. Endografts were designed from details obtained from preoperative computed tomography angiography. There were 6 grafts with superior mesenteric scallops and bilateral renal fenestrations, 1 with bilateral renal scallops, and 1 with a single renal fenestration. All patients survived 30 days. There was no renal failure requiring dialysis. At 10 weeks, 1 patient died from acute intestinal ischemia and multisystem organ failure, and another died from respiratory failure.

CONCLUSIONS: It is feasible to offer fenEVAR to patients who are poor candidates for open repair. However, these procedures are technically challenging. Early outcomes are less favorable than other aortic endovascular procedures.

In the last decade in the United States, there has been a paradigm shift in the management of abdominal aortic aneurysms (AAAs), from open repair to endovascular repair (EVAR). In fact, recent hospital discharge data indicate that nearly 80% of patients have EVAR to treat AAAs. Open AAA repair is still performed because of the patient's or the surgeon's preference, or if the AAA is anatomically not suitable for EVAR. Juxtarenal aortic aneurysms (JAAs) are classified as aneurysms that are close to the origin of the renal arteries but do not involve them. JAAs account for 15% of all aortic aneurysms, and the traditional open AAA repair usually involves suprarenal clamping with its attendant complications. In patients with JAAs who are physiologically unfit for open repair, EVAR is possible with a customized endovascular graft. Most of the commercially available aortic stent grafts are not designed to treat JAAs with a short neck (proximal seal zone <15 mm). There have been several reports describing modifications to the commercially available stent grafts to accommodate JAAs.[1,2] In mid-2012, the Food and Drug Administration (FDA) approved a customized fenestrated

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* Corresponding author. Tel.: +1-616-267-8700; fax: +1-616-267-8247.

E-mail address: Ashraf.mansour@spectrumhealth.org

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aortic graft for commercial use. We began implanting fenestrated endovascular grafts (fenEVAR) for JAAs at our institution in August 2012.

The purpose of this study is to analyze the clinical outcomes of our initial experience using fenestrated aortic grafts.

Patients and Methods

Patient selection

After the Institutional Review Board approval, the inpatient and outpatient records of all patients undergoing fenEVAR for JAAs between August 2012 and May 2013 were reviewed retrospectively. Prehospital clinical data, intraoperative findings, as well as all imaging studies were obtained.

Preoperative evaluation

All consecutive patients selected to undergo fenEVAR underwent preoperative computed tomography angiography (CTA) of the abdomen and pelvis. Images were obtained using a 64-slice multidirectional computed tomography scanner and 80- to 120-mL intravenous contrast. Three-dimensional images were reconstructed using iNtuition software (TeraRecon, Foster City, CA). Visceral artery morphology and positions were used to configure custom-made fenestrated endografts. The device used was the Zenith Fenestrated AAA Endovascular Graft (Cook Medical, Bloomington, IN).

Operative technique

The procedure was performed in a hybrid operating room with routine intraoperative monitoring under general anesthesia. Anticoagulation (Heparin 80 to 100 U/kg) was administered after femoral or iliac exposure. Angiography was performed to identify the location of the superior mesenteric and renal arteries. The endograft was delivered via the femoral artery or an iliac conduit if the external iliac artery was too small. After proper alignment of the renal fenestrations, the proximal main body segment was deployed. The renal arteries were accessed from within the proximal main body and stented with iCast balloon-expandable covered stents (Atrium, Hudson, NH). The aortic portions of the renal stents were flared with a 10-mm balloon to ensure adequate seal and to prevent migration. The distal bifurcated main body segment and iliac limb extensions were then deployed in a similar fashion to traditional Zenith AAA endografts. Completion angiography was performed to evaluate adequate repair and to rule out type I and type III endoleak.

Postoperative follow-up

Postoperatively, patients were monitored in the surgical intensive care unit (ICU) and renal functions were monitored on the first postoperative day. CTA of the abdomen was performed on all patients within the first 30 days postoperatively. Clinical follow-up evaluation was performed in the outpatient setting.

Results

Demographics

Eight patients (4 men and 4 women) underwent fenEVAR during the study period. The average age was 75 (range, 64 to 85) years. The demographics, major risk factors, device configuration, and procedural data are outlined in Table 1. Prohibitive comorbidities to open repair included oxygen-dependent chronic obstructive pulmonary disease (COPD; 5 patients) and severe coronary artery disease (3 patients). Three patients had abnormal glomerular

Table 1 Demographics, device configuration, and procedural data

Sex	Age (y)	Comorbidity	AAA diameter (cm)	Infrarenal neck length (cm)	ASA	Configuration				Contrast (mL)	Fluoroscopy time (min)	LOS (d)
						SMA	LRA	RRA	Diameter (mm)			
Female	69	COPD	6.3	.8	IV	S	F	F	28	67	52	2
Female	80	COPD	5.5	.9	III	S	F	F	28	103	68	9
Female	77	CAD	5.6	.4	III	S	S	F	26	89	85	1
Male	64	COPD	6.2	1.2*	IV	S	F	F	28	105	32	1
Male	80	COPD	5.5	.4	IV	–	S	S	30	122	81	2
Male	85	CAD	5.5	.4	IV	S	F	F	36	109	63	8
Female	72	COPD	5.2†	.4	III	–	F	–	24	42	17	1
Male	80	CAD	6.3	.4	III	S	F	F	28	83	41	1

AAA = abdominal aortic aneurysm; ASA = American Society of Anesthesia; CAD = coronary artery disease; COPD = chronic obstructive pulmonary disease; F = fenestration; LOS = length of stay; LRA = left renal artery; RRA = right renal artery; S = scallop; SMA = superior mesenteric artery.

*This patient had a 1.2-cm infrarenal neck that was funnel shaped.

†This patient had a rapidly enlarging aneurysm.