Endovascular Repair of Inflammatory Abdominal Aneurysm: A Retrospective Analysis of CT Follow-up

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Retrospective radiologic and clinical midterm follow-up is reported for 10 patients with inflammatory abdominal aortic aneurysm (IAAA) after endovascular aortic aneurysm repair (EVAR). At a mean follow-up of 33 months, regression of the thickness of the perianeurysmal fibrosis (PAF) and decrease of aneurysmal sac diameter was observed in nine patients. Four EVAR-associated complications were observed: periinterventional dissection of femoral artery ($n = 1$), blue toe syndrome ($n = 1$), and stent-graft disconnection ($n = 2$). EVAR is the less invasive method of aneurysm exclusion in patients with IAAA with a comparable evolution of the PAF as reported after open repair.

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Abbreviations: AAA = abdominal aortic aneurysms, EVAR = endovascular aortic aneurysm repair, IAAA = inflammatory abdominal aortic aneurysm, PAF = peri-aneurysmal fibrosis

ABOUT 4.5% of all abdominal aortic aneurysms (AAA) are called inflammatory because of clinical and radiologic signs (1). Raised erythrocyte sedimentation rate, weight loss, aneurysmal wall thickening, and perianeurysmal fibrosis (PAF) are significantly more frequent encountered in inflammatory AAA (IAAA) compared with atherosclerotic AAAs (1). Although the late outcome of atherosclerotic AAAs and IAAAs are similar, the perioperative morbidity of the latter is slightly higher because of the PAF (2). In recent years, the less invasive, endovascular aneurysm repair (EVAR) has been described also as an alternative to open aortic surgery for IAAAs (3). The clinical series reported on EVAR of IAAAs include up to 14 patients, and so far, the results are divergent. In particular, issues such as the clinical evolution of the inflammation, the additional need of anti-inflammatory drugs or the radiological changes of the PAF remain controversial (4–6). In two cases, even induction of an aortitis with significant ureteral obstruction after EVAR of a non-inflammatory AAA has been reported (7,8).

This retrospective study reports midterm follow-up after EVAR of IAAAs focusing on the evolution of inflammatory changes seen at contrast enhanced CT.

Table 1
Evolution of Perianeurysmal Fibrosis

Months after EVAR	Mean (mm)	Median (mm)	Min/Max (mm)
0	12.65	12.5	6/20
1	12.33	13	10/14
6	9.8	9	4/17.7
12	8.68	7.5	4/18.4
24	4.3	4	0/7
36	5.3	3	0/12.8
48	5.6	5.6	0/11.2

Table 2
Thickness of Fibrosis for Different Quadrants

Quadrant	Mean ± SD (mm)	Maximum	Minimum	*P*-Value Compared with Posterior
Anterior	6.3 ± 4.2	17	0	<.05
Left	6.7 ± 4.0	17	0	<.05
Posterior	0.9 ± 2.6	14	0	
Right	4.4 ± 3.3	13	0	<.05

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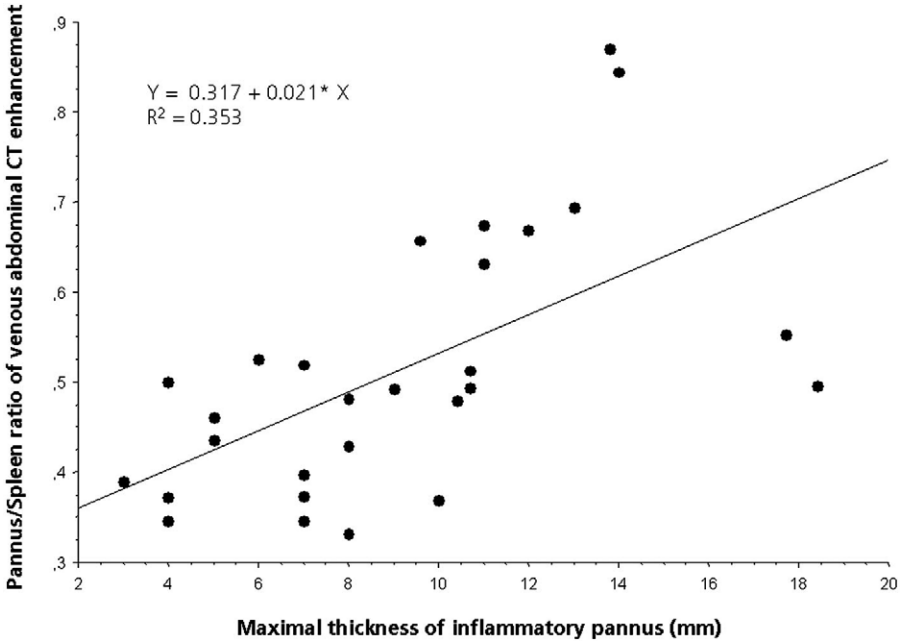

Figure 1. Relationship between maximal wall thickness and ratio of Hounsfield units of the venous enhancement of the pannus and the spleen.

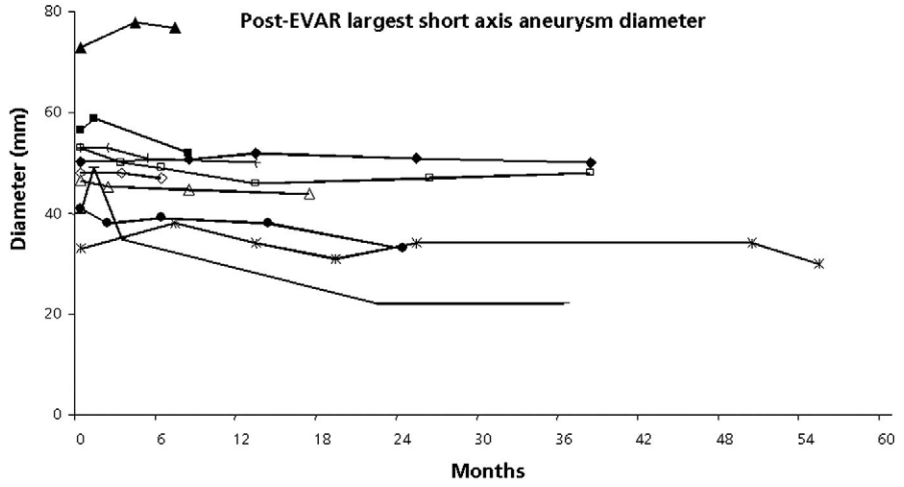

Figure 2. Evolution of post-EVAR largest short axis aneurysm diameter.

METHODS

Patient Group

An institutional prospective data base of 332 patients with AAAs treated by EVAR between June 1997 and December 2002 was reviewed for cases of IAAAs. Overall 10 patients (eight men, two women; mean age, 64 years; range, 57–80 years) with IAAAs, who underwent EVAR, were identified. Mean maximal aneurysm diameter was 50 mm, ranging from 40 to 73 mm. Three different types of bifurcated endovascular grafts were used: Vanguard (Boston Scientific, Natick, MA; $n = 2$), Excluder (W.L. Gore, Flagstaff, AZ; $n = 6$), and Zenith (Cook Endovascular, Bloomington, IN; $n = 2$). None of the patients had prior open surgical attempt at aneurysm exclusion.

The standard institutional surveillance protocol after EVAR included serial computed tomography (CT) as well as clinical examination after 1, 6, and 12 months and thereafter annually. All patients had the same follow-up scheme.

Because of one upgrade of the CT scanner during the study period, CT imaging was not uniform. Until the installation of a multi-slice CT unit, scanning was performed on a Single Slice Spiral-CT (Somatom Plus 4, Siemens, Erlangen, Germany). Since April 2000, CT imaging was done on a 4-channel Multi-Detector Row CT (Volume Zoom; Siemens, Erlangen, Germany).

The medical hospital records and the records of the involved general practitioners were reviewed for erythrocyte sedimentation rate, white blood cell count, C-reactive protein, and creatinine level as well as for the treatment by steroidal and non-steroidal anti-inflammatory drugs, and the presence of ongoing abdominal or back pain after EVAR.

Preinterventional CT scans were reviewed to assess size, location and configuration of the IAAA, follow-up CT scans to assess graft-related complications like endoleaks, limb occlusion, graft kinking, and graft migration. On the preinterventional and follow-up CT scans, the thickness of PAF and the aneurysmal diameter were measured with a method reported by Iino et al (9), additionally the largest long axis diameter of the aneurysm as well as the maximal thickness of the fibrosis were measured. Because of the venous enhancement properties of the PAF reported by Iino et al (9) the enhancement of the PAF and of the splenic parenchyma were measured in the venous CT phase. A pannus/spleen enhancement coefficient was formed to minimize the bias caused by changes of the venous enhancement of abdominal structures, which will result even in a standardized CT protocol with bolus triggering and the same amount and injection rate of the contrast agent. Attention was paid to renal atrophy, hydronephrosis and ureteric obstruction.

Approval by our institution's ethical committee was not required for this retrospective study.

Statistical Analysis

Statistical analyses were made with Stat View 5.0.1 (linear regression) and SPSS 11.5 (Wilcoxon signed rank test). A P value of less than .05 was considered to be statistically significant.