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Treatment of Mycotic Aneurysms with Involvement of the Abdominal Aorta: Single-centre Experience in 44 Consecutive Cases

M. Dubois [a], K. Daenens [a], S. Houthoofd [a], W.E. Peetermans [b], I. Fourneau [a,*]

[a] *Department of Vascular Surgery, University Hospitals Leuven, Herestraat 49, B-3000 Leuven, Belgium*
[b] *Department of Internal Medicine, University Hospitals Leuven, Leuven, Belgium*

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Abstract *Objective:* To review our management of mycotic aneurysms involving the abdominal aorta over the past 2 decades to assess the safety and efficacy of *in-situ* and extra-anatomic repair combined with antibiotic treatment.
Materials and methods: From March 1990 to August 2008, 44 patients with a mycotic aneurysm involving the abdominal aorta were treated at our University Hospital. For all patients, we recorded the aetiology, clinical findings and anatomic location of the aneurysm, as well as bacteriology results, surgical and antibiotic therapy and morbidity and mortality.
Results: Twenty-one (47.7%) of the mycotic aneurysms had already ruptured at the time of surgery. Free rupture was present in nine patients (20.5%). Contained rupture was observed in 12 patients (27.3%).

Urgent surgery was performed in 18 cases (40.9%). Revascularisation was achieved by *in-situ* reconstruction in 37 patients (84.1%), while extra-anatomic reconstruction was performed in six patients (13.6%). One patient (2.3%) was treated with a combined *in-situ* and extra-anatomic reconstruction. In one case (2.3%), endovascular aneurysm repair (EVAR) was performed.

In-hospital mortality was 22.7%, 50% in the extra-anatomic reconstruction group and 18.9% in the *in-situ* repair group. One-third (33.3%) of our patients, who presented with a ruptured mycotic aneurysm died in the peri-operative period. This mortality was 13% in the patient-group presenting with an intact aneurysm.

Of the 34 surviving patients, 12 patients (27.3% of surviving patients died after discharge from our hospital. In half of these patients, an acute cardiac event was to blame. Three patients (8%) showed re-infection after *in-situ* reconstruction.

* Corresponding author. Tel.: +32 16 34 68 50; fax: +32 16 34 68 52.
E-mail address: Inge.Fourneau@uzleuven.be (I. Fourneau).

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Conclusion: Management of mycotic aortic aneurysms remains a challenging problem. The results of surgery depend on many factors. In our experience, *in-situ* repair remains a feasible and safe treatment option for patients who are in good general condition at the time of surgery.
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Introduction

Mycotic aneurysms were first described by Sir William Osler in 1851 in a 30-year-old man with four aneurysms of the aortic arch, arising as a complication of endocarditis.[1] Since there is no apparent association with fungal disease, the term mycotic aneurysm has always been a source of discussion among vascular surgeons. However, most authors use the term 'mycotic aneurysm' to describe any aneurysm, secondary to infection, regardless of its pathogenesis.

Infected aortic aneurysms remain quite infrequent. They are reported at around 1% of all aortic aneurysms. They occur all over the aorta, but nearly 50% are seen at the infrarenal aorta. The juxtarenal or pararenal aorta is involved in 25% of the cases.[2]

This article describes our experience with the treatment of 44 patients with a mycotic aneurysm involving the abdominal aorta in order to assess the safety and efficacy of *in-situ* and extra-anatomic repair of mycotic aneurysms in a single-centre.

Materials and methods

From March 1990 to August 2008, 44 patients with a mycotic aneurysm involving the abdominal aorta were treated at our University Hospital. We retrospectively analysed all these patients. The diagnosis of mycotic aortic aneurysm was established, based on the following criteria: (1) symptoms of infection (fever, associated with abdominal or back pain), (2) computed tomography (CT)-scan findings (peri-aortic soft-tissue mass or oedema, rapid aneurysm development and progression on sequential studies, peri-aortic gas or gas within the aneurysm thrombus), (3) intra-operative findings of inflammation and purulence and (4) positive aneurysm wall culture. Other evidence such as positive blood cultures and the presence of recent infection or sepsis was also taken into account. For all patients, we recorded the aetiology, clinical findings and anatomic location of the aneurysm, as well as bacteriology results, surgical and antibiotic therapy and morbidity and mortality. The results are presented below.

Results

During this 18-year period, 38 men and 6 women were treated, with a mean age of 67.3 years (range, 42—84 years).

Etiology

Fourteen patients (31.8%) had a proven history of infectious or septic disease. Six of them (13.6%) had presented with *Salmonella enteritis* weeks to months prior to surgery. Two patients (4.6%) had presented with urosepsis. The other patients presented with septic arthritis of the ankle joint and concomitant pneumonia ($n = 1$), spondylodiscitis on L1—L2 level ($n = 1$), calcaneal osteomyelitis ($n = 1$), cathetersepsis ($n = 1$), sternitis post-cardiac surgery ($n = 1$) or pharyngitis ($n = 1$). In the other patients, no clear history of infectious disease could be retrieved. However, an infectious episode presenting as malaise remains often unrecognised in a retrospective analysis.

In 19 patients (43.2%) there were one or more indications of depressed immunocompetence. Of these patients, 11 (25%) had diabetes mellitus; 11 patients (25%) were on corticosteroids, less than 3 months before surgery; and one patient (2.3%) received chemotherapy for a non-Hodgkin lymphoma.

The cardiovascular risk-factors are summarised in Table 1.

Symptoms and clinical findings

Forty-two patients (95.5%) were symptomatic. These symptoms are summarised in Table 2. Thirty-four patients (77.3%) complained of pain: 19 patients (43.2%) complained of abdominal pain and 21 patients (47.7%) of back pain. Six patients (13.6%) had pain in a hip and/or leg. Fever was present in 20 cases (45.5%). Five patients (11.4%) presented with weight loss and four patients (9.1%) had gastro-intestinal symptoms, such as vomiting or diarrhoea. Fourteen patients (31.8%) felt generally ill, without further specification. Eight patients (18.2%) presented with collapse and hypovolaemic shock, due to rupture. One patient (2.3%) presented with a painful swelling on the base of the right thoracic wall. One patient (2.3%) presented with intermittent fever, chills, weight loss and nightly sweating for several months. Six patients (13.6%) were septic at presentation to our department.

Anatomic location

For this study, only mycotic aneurysms with involvement of the abdominal aorta were included. The infrarenal aorta was affected in 33 cases (75%). The iliac arteries were involved in two cases (4.5%). A juxtarenal mycotic

Table 1 Cardiovascular risk-factors.

Cardiovascular risk-factors	*N*	% of total
Arterial systolic hypertension	20	45.5
Hyperlipidemia	12	27.3
History of CVA/TIA	4	9.1
Diabetes	11	25
Active smokers	18	40.9
Past smokers	7	15.9

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