Eur J Vasc Endovasc Surg **33**, 302–305 (2007)
doi:10.1016/j.ejvs.2006.09.021, available online at http://www.sciencedirect.com on ScienceDirect

SHORT REPORT

Successful Endovascular Treatment of Infrarenal Aortic Rupture after Chemotherapy of a Mesenchymal Periaortic Tumor

R.I. Rückert,[1*] M. Pirlich,[2] P. Rogalla,[3] M. Ismail[4] and J.M. Müller[4]

[1]*Department of Surgery, Franziskus-Krankenhaus Berlin, Berlin, Germany, Departments of* [2]*Internal Medicine,* [3]*Radiology, and* [4]*General, Visceral, Thoracic and Vascular Surgery, Charité — Universitätmedizin Berlin, Campus Mitte, Berlin, Germany*

Purpose. *To report the first successful endovascular repair of a non-aneurysmal aortic rupture due to periaortic tumour regression.*
Case Report. *A 58-year-old man developed spontaneous infrarenal aortic rupture following chemotherapy which led to regression of a periaortic mesothelioma that had been diagnosed during explorative laparotomy 11 months earlier. Stent-graft placement was performed with intentional conversion of a bifurcated (Zenith, COOK) into an aorto-uni-iliac system. No complications were encountered during a 40 months follow-up.*
Conclusion. *Endovascular repair should be considered as a treatment option in non-aneurysmal aortic rupture.*

Keywords: Infrarenal aortic rupture; Peritoneal mesothelioma; Therapeutic management; Endovascular stent-graft repair.

Introduction

Atraumatic, noninfectious rupture of a nonaneurysmal infrarenal aorta is exceptionally rare. Seventeen cases have been reported of spontaneous rupture of a nonaneurysmal infrarenal aorta believed attributable to penetrating aortic ulcers.[1] To our knowledge, aortic rupture due to regression of a periaortic tumour has not yet been described. Aortic rupture requires immediate surgery. Stent-graft repair has recently become an alternative treatment to open surgery for aortic aneurysm rupture.[2,3] The present case report demonstrates successful endovascular treatment of infrarenal aortic rupture after chemotherapy of a mesenchymal periaortic tumour.

Case Report

A 58-year-old man had been readmitted to the department of internal medicine to receive further chemotherapy treatment for a peritoneal mesothelioma. This tumour had been diagnosed during explorative laparotomy 11 months earlier (Fig. 1). Following the fourth cycle of a second chemotherapy series, the patient developed severe leukopenia, temperatures of up to 40 °C, and flank pain due to staphylococcus sepsis which required treatment in the intensive care unit. A CT exam was performed to search for a focus of infection and led to the detection of spontaneous infrarenal aortic rupture (Fig. 2A) most probably due to regression of the periaortic tumour. Neither at the initial explorative laparotomy nor during the follow-up was there any evidence of infrarenal aortic enlargement or aneurysm formation. The patient's blood pressure was low but stable. Under emergency conditions EVAR was undertaken immediately.

The only available stent-graft system (Zenith, TFB-3-24, COOK® Europe, Bjaerskov, Denmark) was larger than ideally required. As a result, intraoperative occlusion of the left iliac artery occurred, thus converting

The authors have no commercial, proprietary, or financial interest in any products or companies described in this article.
*Corresponding author. R.I. Rückert, MD, Department of Surgery, Franziskus-Krankenhaus, Budapester Str. 15-19, D-10787 Berlin, Germany.
E-mail address: rir-chirurgie@franziskus-berlin.de

1078–5884/000302 + 04 $32.00/0

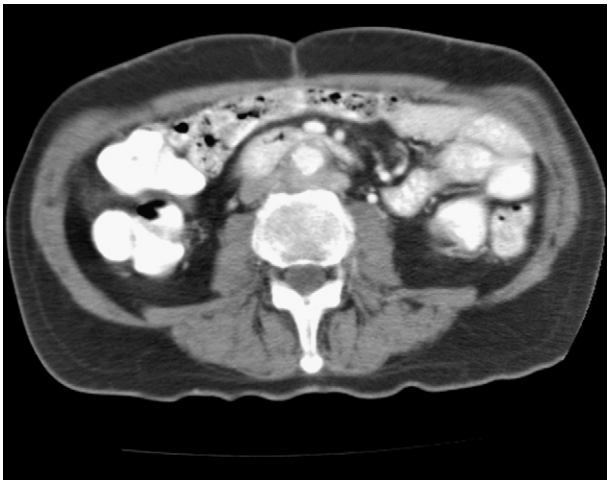

Fig. 1. Axial computed tomography (CT) three months before aortic rupture demonstrating laterodorsal periaortic tumor manifestation of mesothelioma.

the originally bifurcated stent-graft system functionally into an aorto-monoiliac system (Fig. 2C,D). Hence separate occlusion of the left iliac artery was not necessary. To revascularize the left lower extremity, a silver-impregnated cross-femoral bypass graft was chosen prophylactically to protect against graft infection. Another consequence of strongly oversizing the stent-graft was that the aortic diameter increased up to the stent-graft diameter at follow-up (Fig. 2B,C).

On the first postoperative day, CT-guided biopsy of the periaortic fluid collection was performed, revealing hematoma but no abscess formation. Postoperatively, there was an immediate drop in body temperature to normal values. Severe neutropenia and sepsis were successfully treated using G-CSF (Filgastim) and antibiotics (initially Piperacillin-tazobactam and then Cefazolin/Vancomycin according to antibiotic sensitivities). Because the margin of retroperitoneal hematoma showed contrast enhancement on CT

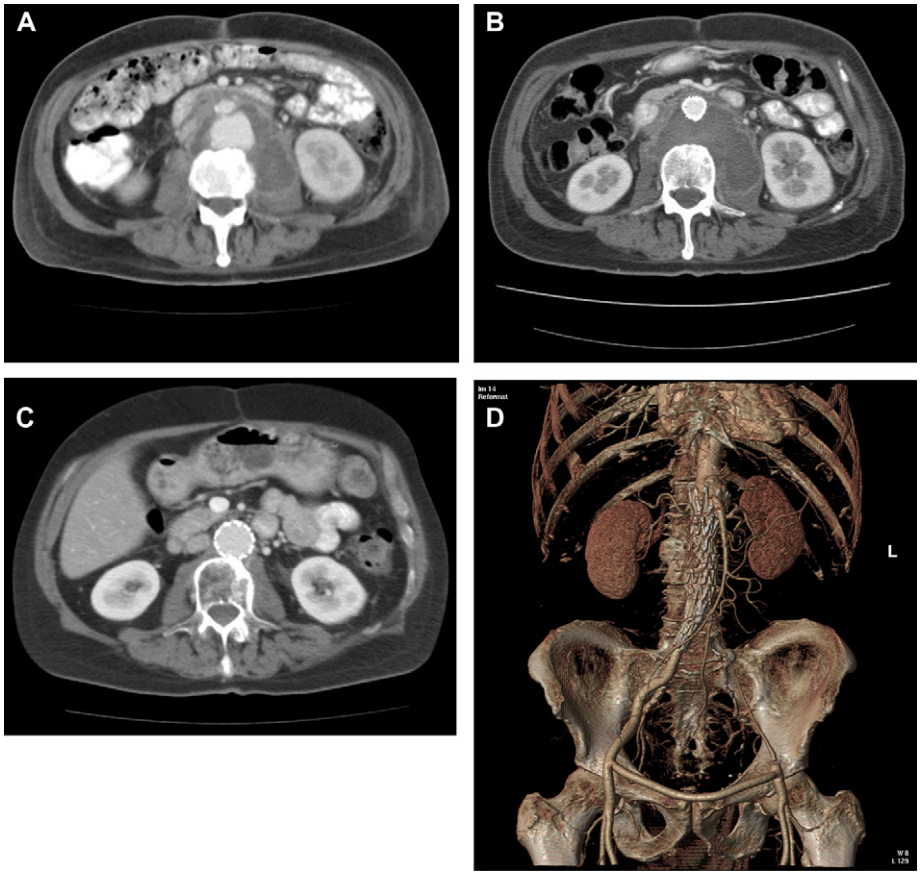

Fig. 2. CT scans after aortic rupture and during follow-up after stent-graft repair using a bifurcated system (Zenith, TFB-3-24, COOK® Europe, Bjaerskov, Denmark). (A) Axial CT demonstrating infrarenal aortic rupture cranial to the aortic bifurcation. (B) Axial view one week after EVAR. (C) Axial view 19 months postoperatively. The aortic diameter has gradually increased up to the real diameter (24 mm) of the more than usually oversized graft. (D) Three-dimensional CT reconstruction showing the functionally aorto-monoiliac stent-graft without pathological findings and the patent cross-femoral graft 25 months after EVAR.

Table 1. Stent-graft repair of penetrating ulcer of the infrarenal abdominal aorta

Author/Year	Number	Rupture	Stent-graft system	Follow-up (months)
Eggebrecht[4]/2001	1	–	Talent® (Medtronic)	6
Tsuji[5]/2003	4	2	Gianturco Z-Stent (COOK) + Dacron graft (UBE woven graft, Ube Inc.)	32/7/11/4
Vasquez[6]/2003	1	1	Talent® (Medtronic)	6
Batt[1]/2003	3	–	Talent® (Medtronic, bifurcated) + Hemobahn® (Gore)	41
			Zenith® (COOK, bifurcated)	26
			Zenith® (COOK, aortomonoiliac)	12

on the 7th postoperative day CT-guided biopsy was repeated, now demonstrating coagulase-negative staphylocci. Long-term antibiotic therapy with Ciprofloxacin was initiated. The patient made an uneventful recovery and was discharged on the 15th postoperative day. At present, 51 months after diagnosis of retroperitoneal mesothelioma, there is no suspicion of residual or recurrent disease. The stent-graft has dilated the infrarenal aorta up to its nominal diameter of 24 mm and the cross-femoral bypass graft is patent (Fig. 2D). Follow-up is being continued every six months.

Discussion

Although the most frequent cause of aortic rupture is aneurysm there are other potential causes such as trauma or plaque rupture. Non-traumatic, non-infectious rupture of the non-aneurysmal infrarenal aorta is rare and most frequently caused by penetrating atherosclerotic ulcer.[1] Nine cases could be identified in the literature in which EVAR had been performed to treat infrarenal penetrating aortic ulcer (Table 1).

Infrarenal aortic rupture due to tumour erosion is extremely rare. For primary aortic tumours, rupture has been described only in a single case of leiomyosarcoma of the thoracic aorta.[7] Spontaneous rupture of the non-aneurysmal infrarenal aorta has been reported with tumour infiltration in neurofibromatosis.[8] All reported cases of primary malignant lymphoma invading the infrarenal aorta were associated with symptomatic or ruptured aortic aneurysms. EVAR was successfully performed in one such case.[9] Rupture of the infrarenal aorta due to either erosion of the aortic wall or periaortic tumor regression after successful chemotherapy has not been reported to date. The development of an aortic pseudoaneurysm after chemotherapy of a germ cell tumour was described.[10] Therefore, the present case is most probably the first report of successful EVAR for spontaneous aortic rupture after chemotherapy of a periaortic peritoneal mesothelioma. Furthermore, the present case is the fourth report to date of EVAR to treat non-aneurysmal infrarenal aortic rupture. All three cases reported earlier were caused by penetrating ulcer (Table 1).

On the other hand, aortic rupture due to focal aortic infection can not be ruled out completely because CT-guided biopsy on the 7th postoperative day revealed infected periaortic haematoma. However, the same investigation on the first postoperative day did not prove infection. Thus, the periaortic haematoma might also have become infected during leukopenia postoperatively.

In the case reported here two treatment options were available. We felt that open surgery had some major drawbacks due to the need for re-laparotomy, the poor general condition of the patient and the potential for infection of the operation field. Minimally invasive EVAR was deemed to offer advantages with respect to all potential disadvantages of conventional aortic repair. EVAR seems to be safer than conventional grafting in a potentially infected operating field.[11,12] Because of severe leukopenia, a minimally invasive procedure was strongly recommended. Hinchliffe *et al.* reported the successful use of EVAR to treat a ruptured pseudoaneurysm of the infrarenal aorta secondary to pancreatitis.[13] However, in case of infection EVAR may only represent an interim measure prior to conventional repair because of persistent infection and potential progressive aortic necrosis.

In conclusion, after 40 months, in the case presented EVAR has proven to be a successful treatment of non-traumatic rupture of the non-aneurysmal infrarenal aorta. However, long-term follow-up, particularly concerning tumour staging, is required. EVAR should become an established treatment option of aortic rupture.

References

1 Batt M, Haudebourg P, Planchard PF, Ferrari E, Hassen-Khodja R, Bouillanne PJ. Penetrating atherosclerotic ulcers of the infrarenal aorta: life-threatening lesions. *Eur J Vasc Endovasc Surg* 2005;**29**:35–42.

2 Hinchliffe RJ, Braithwaite BD, Hopkinson BR. The endovascular management of ruptured abdominal aortic aneurysms. *Eur J Vasc Endovasc Surg* 2003;**25**:191–201.
3 Scharrer-Pamler R, Kotsis T, Kapfer X, Görich J, Sunder-Plassmann. Endovascular stent-graft repair of ruptured aortic aneurysms. *J Endovasc Ther* 2003;**10**:447–452.
4 Eggebrecht H, Baumgart D, Herold U, Jakob H, Erbel R. Multiple penetrating atherosclerotic ulcers of the abdominal aorta: treatment by endovascular stent graft placement. *Heart* 2001;**85**:526.
5 Tsuji Y, Tanaka Y, Kitagawa A, Hino Y, Taniguchi T, Sugimoto K *et al*. Endovascular stent-graft repair for penetrating atherosclerotic ulcer in the infrarenal abdominal aorta. *J Vasc Surg* 2003;**38**:383–388.
6 Vasquez J, Poultsides GA, Lorenzo AC, Foster JE, Drezner AD, Gallagher J. Endovascular stent-graft placement for nonaneurysmal infrarenal aortic rupture: A case report and review of the literature. *J Vasc Surg* 2003;**38**:836–839.
7 Steinberg JB, Johnson ER, Benda JA, Lanza LA. Primary leiomyosarcoma of the thoracic aorta presenting as a contained rupture. *Ann Thorac Surg* 1993;**56**:1387–1389.
8 Hines GL, Lefkowitz L, Mohtashemi M. Infrarenal aortic rupture secondary to neurofibromatosis. *Ann Vasc Surg* 2002;**16**:784–786.
9 Williamson AE, Annunziata G, Cone LA, Smith J. Endovascular repair of a ruptured abdominal aortic and iliac aneurysm with an acute iliocaval fistula secondary to lymphoma. *Ann Vasc Surg* 2002;**16**:145–149.
10 Jerius JT, Elmajian DA, Rimmer DM, Spires KS. Floppy aortic graft reconstruction for germ cell tumor invasion of the infrarenal aorta. *J Vasc Surg* 2003;**37**:889–891.
11 Koeppel TA, Gahlen J, Diehl S, Prosst RL, Düber C. Mycotic aneurysm of the abdominal aorta with retroperitoneal abscess: Successful endovascular repair. *J Vasc Surg* 2004;**40**:164–166.
12 Jones KG, Bell RE, Sabharvl T, Aukett M, Reidy JF, Taylor PR. Treatment of mycotic aortic aneurysms with endoluminal grafts. *Eur J Vasc Endovasc Surg* 2005;**29**:139–144.
13 Hinchliffe RJ, Yung M, Hopkinson BR. Endovascular exclusion of a ruptured pseudoaneurysm of the infrarenal abdominal aorta secondary to pancreatitis. *J Endovasc Ther* 2002;**9**: 590–592.

Accepted 17 September 2006
Available online 9 November 2006