

## Multiple Infected Aortic Aneurysms Repaired by Staged in situ Graft Replacement

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**The development of multiple infected aortic aneurysms is extremely rare, and treatment remains challenging. We report here a 72-year-old man with multiple infected aortic aneurysms in whom a staged in situ graft replacement for the aortic arch and pararenal abdominal aorta was successfully performed. A rifampicin-bonded graft seemed to be effective in preventing postoperative infection. Perioperative control of infection played a key role in the patient's surviving this critical condition. (Ann Thorac Cardiovasc Surg 2010; 16: 60–62)**

**Key words:** infected aortic aneurysm, in situ graft replacement, staged operation, rifampicin-bonded graft

### Case Report

An infected aortic aneurysm is infrequent, but it is fatal without surgery because of its high incidence of rupture. In particular, the development of multiple aneurysms is extremely rare, and a standard treatment strategy has not been established.<sup>1–5)</sup> We report here a case of multiple infected aortic aneurysms successfully treated by staged in situ graft replacement.

A 72-year-old man with primary biliary cirrhosis was referred to our hospital for low back pain and a high fever that had persisted for 2 weeks. The patient was hemodynamically stable, but his white blood cell count was elevated to  $15.9 \times 10^3/\text{ml}$ , and C-reactive protein concentration was 9.4 mg/dl. Since an infectious disease was strongly suspected, antibiotic therapy was immediately started. Computed tomographic (CT) scan showed an

irregular and hazy aortic wall with periaortic soft tissue mass in the distal aortic arch and pararenal abdominal aorta, suggesting infection (Fig. 1A). After admission, the patient's back pain was aggravated in spite of medical therapy. Subsequent CT scan showed that the two saccular aneurysms had visibly grown; their diameters were 50 mm in the distal aortic arch and 30 mm in the abdominal aorta (Figs. 1B and 1C). Although no specific organisms were detected in the patient's blood culture, he was diagnosed as having multiple infected aneurysms from CT scan, presenting with eccentric and penetrated aneurysms. Fortunately the patient showed good response to the administration of vancomycin and ciprofloxacin. After 7 weeks of antibiotic treatment, the patient was afebrile with a normalized white blood cell count and decreased C-reactive protein concentration of 1.4 mg/dl. Thus we planned surgical intervention for these aneurysms.

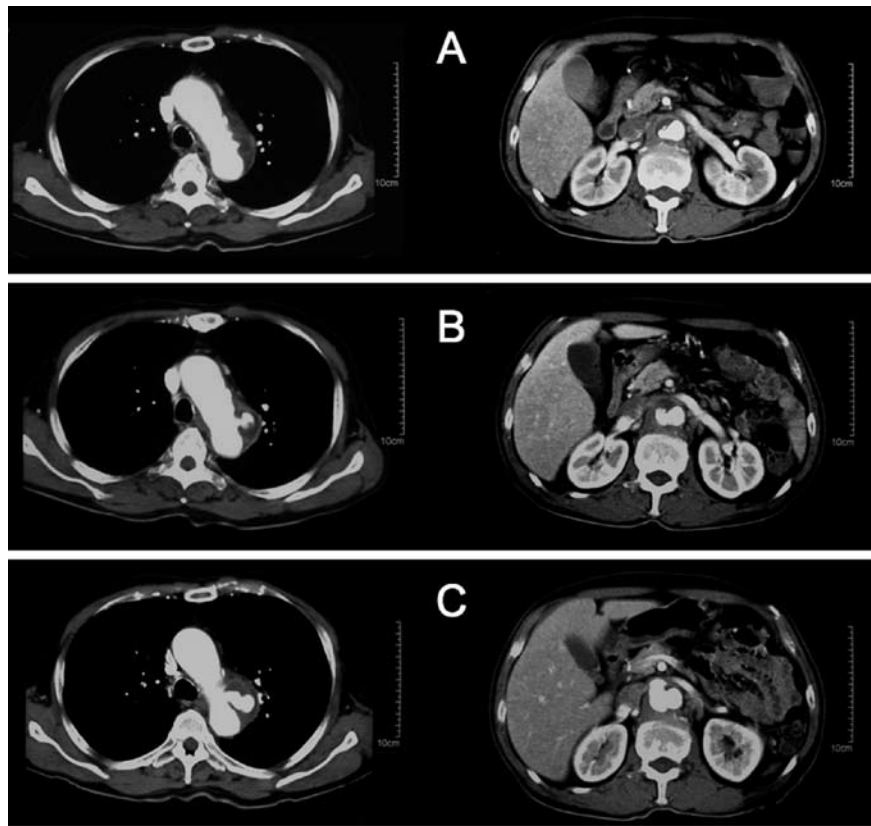
At surgery, reconstruction of the cervical arteries and visceral arteries was inevitable because of the location of the aneurysms. A one-stage operation seemed too invasive and was therefore abandoned. For the first operation, the patient was operated on through an L-incision approach (hemi-clamshell incision)<sup>6)</sup> to facilitate better exposure of the distal aortic arch. A cardiopulmonary bypass and selective cerebral perfusion through bilateral axillary artery perfusion were established.<sup>7)</sup> A defect of the aortic wall detected in the lesser curvature of the aortic arch

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**Fig. 1.** CT scans showing progression of multiple infected aortic aneurysms.

- A:** Initial CT scan taken on the third day of admission. A hazy aortic wall and periaortic soft tissue mass were seen in both the distal aortic arch and the pararenal abdominal aorta.
- B:** Ninth day of admission. Saccular aneurysms had visibly grown.
- C:** After 7 weeks of antibiotic treatment. Eccentric and penetrated aneurysms were present.

confirmed the diagnosis of a contained rupture of an infected aneurysm. The aneurysm was filled with thrombus but not pus. Surgical debridement of the aneurysm wall was performed, and then a total arch replacement with a branched 26 mm Dacron graft (Hemashield Platinum, Boston Scientific, Wayne, NJ) was conducted. The graft was soaked in rifampicin solution before its implantation.

After 4 weeks of antibiotic therapy, the second operation was performed. The patient was operated on through a left thoraco-retroperitoneal exposure. Cerebrospinal drainage and epidural cooling were employed to decrease the risk of spinal ischemia. An aneurysm was located in the pararenal aorta, involving the right renal artery. A defect was found in the abdominal aortic wall just below the orifice of the right renal artery. Purulent fluid was not seen in the pseudoaneurysmal cavity. An en bloc resection of the aneurysm and the adjacent aorta could be successfully performed. A rifampicin-bonded graft was again used to replace the abdominal aorta, and bilateral

renal arteries were reimplemented to this graft.

Müller and colleagues previously indicated that aneurysms with sterile cultures are considered “infected” if (1) they intraoperatively displayed the typical aspect of an eccentric and perforated or penetrated aneurysm, (2) if the patient had signs of infection, and (3) if the patient had been treated with antibiotics before surgery.<sup>8)</sup> Although no bacteria were identified within either gram-stain or bacterial culture of the aneurysmal wall and contents, both aneurysms were considered “infected” because the case met this diagnostic criteria. A pathohistological examination showing an infiltration of inflammatory cells in the media of the aortic wall was also compatible with an infective process. The postoperative course was uneventful, and inflammatory findings were normalized with the use of antibiotics over 10 days after surgery. Postoperative CT scan showed no signs of graft infection or recurrence of the aneurysm. The patient remains well after a follow-up of 7 months.

## Comment

The development of multiple infected aortic aneurysms is extremely rare. Oderich and colleagues<sup>1)</sup> reported that just 2 of 43 surgically treated infected aortic aneurysms were of the multiple type, accounting for only 0.03% of all aortic aneurysms. Only a few cases of multiple infected aortic aneurysms have been reported in the literature.<sup>2-5)</sup>

Recent studies have shown that early surgical intervention and prolonged antibiotic therapy provide a good outcome in managing infected aortic aneurysms.<sup>1)</sup> The mortality rate is lower if the diagnosis is made before rupture and if a resolution of active infection is established before surgery. Although we could determine no specific pathogen, a good response obtained by antibiotic therapy and the aneurysmal diameters that were not so large led to a successful outcome.

The multiplicity of aneurysms causes some concerns. Multiple aneurysms can be operated on simultaneously through the same approach if they are located close to one another, but a one-stage operation through different approaches may be too invasive to perform if they are too far apart, especially when both cervical and visceral arteries are involved. We planned a staged operation in this particular case, though a one-stage operation should be considered if the infection is uncontrollable despite maximal medical therapy. Determinating the timing of the second operation is another difficult issue. Leaving infected tissue behind may increase the risk of postoperative infection. Thus the second operation should be performed as soon as the patient recovers from the first one.

Complete resection of the infected tissue is the golden standard to prevent postoperative graft infection. However, if the infected aneurysms are located at the aortic arch or the visceral aortic segments, as in the present case, a complete resection of infected tissue is not technically practical. Therefore the staged in situ graft replacement was performed using rifampicin-bonded grafts. A rifampicin-bonded graft is reported to have considerable antistaphylococcal activity for 7 days and can easily be prepared.<sup>1,9)</sup> Although some studies have reported the effectiveness of the placement of pedicled vascular tissue such as omentum to control infection,<sup>1,2)</sup> we did not use this technique because later pararenal abdominal aortic replacement was necessary, and possible adhesion caused by using

omentum may cause trouble for a second operation. The optimal duration of antibiotic therapy is not well established, and recommendations range from several weeks to even lifelong treatment.<sup>1)</sup> Fortunately no recurrent infection has been encountered in the present case; however, careful follow-up is mandatory.

In conclusion, we present a case of a successful staged in situ graft replacement in a patient with multiple infected aortic aneurysms. Perioperative control of infection played a key role in surviving this critical condition.

## References

- Oderich GS, Panneton JM, Bower TC, Cherry KJ Jr, Rowland CM, et al. Infected aortic aneurysms: aggressive presentation, complicated early outcome, but durable results. *J Vasc Surg* 2001; **34**: 900–8.
- Kuki S, Taniguchi K, Miyagawa S, Takano H. Multiple mycotic arch-thoraco-abdominal aortic aneurysms: a successful case of in situ graft replacement. *Eur J Cardiothorac Surg* 2000; **17**: 184–6.
- de Salazar AO, Izaguirre JL, Zubero Z. Surgical treatment of multiple mycotic aneurysms: in the ascending aorta, aortic arch, and descending aorta. *Tex Heart Inst J* 2003; **30**: 225–8.
- Coutu M, Blair JF. Multiple mycotic aortic aneurysms due to *Streptococcus pneumoniae*. *Ann Vasc Surg* 2003; **17**: 554–7.
- Ting AC, Cheng SW, Ho P, Poon JT. Endovascular repair for multiple *Salmonella* mycotic aneurysms of the thoracic aorta presenting with Cardiovascular syndrome. *Eur J Cardiothorac Surg* 2004; **26**: 221–4.
- Tominaga R, Kurisu K, Ochiai Y, Nakashima A, Masuda M, et al. Total aortic arch replacement through the L-incision approach. *Ann Thorac Surg* 2003; **75**: 121–5.
- Kurisu K, Ochiai Y, Hisahara M, Tanaka K, Onzuka T, et al. Bilateral axillary arterial perfusion in surgery on thoracic aorta. *Asian Cardiovasc Thorac Ann* 2006; **14**: 145–9.
- Müller BT, Wegener OR, Grabitz K, Pillny M, Thomas L, et al. Mycotic aneurysms of the thoracic and abdominal aorta and iliac arteries: experience with anatomic and extra-anatomic repair in 33 cases. *J Vasc Surg* 2001; **33**: 106–13.
- Bandyk DF, Novotney ML, Johnson BL, Back MR, Roth SR. Use of rifampin-soaked gelatin-sealed polyester grafts for in situ treatment of primary aortic and vascular prosthetic infections. *J Surg Res* 2001; **95**: 44–9.