Mycotic pseudoaneurysm of the ascending aorta caused by Escherichia coli

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Abstract

An 81-year old woman with high fever and a history of hospital admission because of pyelonephritis 3 months previously was transferred to our hospital. Contrast-enhanced computed tomography revealed a mycotic pseudoaneurysm in the ascending aorta and a massive pericardial effusion. We resected the ascending aorta and the proximal part of the brachiocephalic artery and performed in situ revascularization with a prosthetic vascular graft. Bacterial examination proved that the causative micro-organism was Escherichia coli. The prosthetic graft was wrapped with a pedicled omentum following completion of the aortic reconstruction. Her postoperative course was uneventful. She was discharged from the hospital 1 month postoperatively.

Keywords: Aneurysm (aorta/aortic) • Infection • Pericardium • Prosthesis

INTRODUCTION

Mycotic aortic aneurysm is a life-threatening condition because of its rapid expansion and tendency to rupture. Here, we report an extremely rare case of ascending aortic mycotic pseudoaneurysm caused by Escherichia coli. In situ revascularization by a prosthetic vascular graft wrapped with a pedicled omentum followed by proper antibiotics led to a good result.

CASE REPORT

An 81-year old woman suffering from high fever was referred to our hospital because of pericardial effusion. She had been treated for diabetes with insulin and had a history of hospital admission because of pyelonephritis 3 months previously. Massive pericardial effusion was incidentally detected on plain abdominal radiograph performed at the previous hospital.

Contrast-enhanced computed tomography revealed a mycotic pseudoaneurysm in the ascending aorta and a massive pericardial effusion. We resected the ascending aorta and the proximal part of the brachiocephalic artery and performed in situ revascularization with a prosthetic vascular graft (Hemashield Platinum Woven Single-Branch Graft; MAQUET Cardiovascular LLC, Barbour Pond Drive Wayne, NJ). She was successfully weaned from the extracorporeal circulation after cardiopulmonary bypass. Her cardiac rhythm returned to a sinus rhythm.

Extracorporeal circulation was established by withdrawing the blood from the right atrium and returning it to the right axillary artery and right common femoral artery. While dissecting the adhesion around the ascending aorta, a small amount of pus flowed out of the tissue. The affected ascending aorta and proximal part of the brachiocephalic artery were resected completely under deep hypothermic (rectal temperature of 22°C) circulatory arrest. In situ reconstruction of the aorta was performed with a prosthetic vascular graft (Hemashield Platinum Woven Single-Branch Graft; MAQUET Cardiovascular LLC, Barbour Pond Drive Wayne, NJ). She was successfully weaned from the extracorporeal circulation with minimal catecholamine administration. We then performed a laparotomy and harvested the greater omentum which was fixed around the graft.

Neutrophilic infiltration and purulent inflammation throughout the aortic wall were identified in the aneurysmal wall tissue by pathological examination (Fig. 2a and b).

We administered 0.5 g of meropenem three times a day empirically for the first 5 postoperative days. Afterward, E. coli was isolated from the pericardial effusion and aneurysmal wall tissue. According to susceptibility information, we altered the
The intravenous administration of antibiotics was ceased followed by oral administration of 100 mg of cefcapene three times a day. Upon discharge without complications from the hospital 1 month postoperatively, C-reactive protein further decreased to 0.1 mg/dl. Oral cefcapene administration was continued up to 3 months. Ten months postoperatively, she shows no symptoms or signs of recurrence of infection.

**DISCUSSION**

Mycotic aortic aneurysm tends to rapid expansion and rupture. In addition to this life-threatening situation, particularly in this case, haemodynamic instability due to pericardial effusion demanded an emergency operation. The patient had not undergone any cardiac operations previously. Thus, we diagnosed the aneurysm not as a secondary condition to pericarditis but a primary condition of her illness.

Mycotic aortic aneurysm of the ascending aorta without previous cardiac surgery is very rare [1]. Macedo et al. [2] reported that the incidence of mycotic aneurysm in the ascending aorta was 2 of 39 (2.6%) cases of mycotic aneurysms in a review of their >25-year experience. Only one case in the literature was caused by *E. coli*. However, the relationship between the bacteria and the site of infection was not presented. Chen et al. [3] reported 17 cases of mycotic aneurysm among 734 patients with aneurysms of any cause in the same period. They presented only one mycotic aneurysm caused by staphylococcus in the ascending aorta. Thus, our case is very rare based on this literature.

Graft selection and the route of the reconstructions are important concerns. Homograft prevents postoperative graft infection more than prosthetic graft does. In our country, however, homograft is not always available. Thus, we usually use only artificial prosthesis, particularly in such an emergency condition. In the ascending aorta, extra-anatomical reconstruction is impossible. Lopes et al. [4] expressed that after the resection of mycotic aneurysms, in situ prosthetic graft reconstruction was the preferred method of revascularization. We agree with this opinion. However, there are some requisites to prevent recurrent infection. We believe that one is wrapping the prosthetic vascular graft with a pedicled omentum as Kuniyoshi et al. described [5]. They reported that all five patients whose grafts had been wrapped with a pedicled omentum had survived, whereas three of four patients without an omentum died in the early postoperative period. The other requisite is an appropriate use of antibiotics. In the treatment of endocarditis, we usually administer the postoperative antibiotics intravenously until plasma C-reactive protein reaches negative followed by 3 months oral administration. In this case, we applied an antibiotic regime that we usually use in endocarditis. It goes without saying that complete resection of the infected tissue prior to reconstruction of the aorta is essential.

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**Conflict of interest:** none declared.
REFERENCES


eComment. Antimicrobial vascular grafts in cardiac surgery

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We read with great interest the manuscript by Yano et al regarding the successful surgical management of an 81-year-old female patient with a septic aortic pseudoaneurysm secondary to Escherichia coli, which presented as cardiac tamponade [1]. In our opinion, a few remarks with respect to the surgical strategy and types of vascular graft ought to be addressed. The term “mycotic aneurysm” was first used in 1885 by Sir William Osler because of the beaded and multilobulated appearance of the aneurysm formation occurring in malignant endocarditis [2]. However, the use of septic aortic pseudoaneurysm (SAP) in this case report is more accurate. Septic aortic pseudoaneurysm is used to describe aortic pseudoaneurysm caused by bacterial invasion of the vessel wall, with or without bacteremia. SAP is a potentially life-threatening aortic lesion. It is uncommon, but not rare, and an increasing incidence has been reported in recent years [3]. Treatment is usually bimodal with intensive antibiotic therapy as well as surgical repair; furthermore, surgical treatment of SAP remains challenging. A literature review of surgical treatment of SAP in the abdominal or thoracic portion of the aorta can be confusing [2]. Whether a patient should undergo extra-anatomic bypass grafting or in situ reconstruction with prosthetic graft or omental wrapping is not well-established and remains a matter of ongoing debate. However, the most performed strategy in this setting is the in situ reconstruction with prosthetic graft. It consists of an aggressive and extensive debridement of infected tissue (aortic wall and surrounding tissue) and irrigation of the operative field with antibiotic solution. Septic aortic aneurysm is then reconstructed with an in situ graft and the prosthetic graft is protected with a great omentum pedicle.

An extra-anatomic reconstruction is technically challenging but is not impossible, as stated by the authors. A review by Oz et al. [3] showed that the aforementioned technique applied in 24 patients with thoracic SAP is feasible; however it is more challenging because it requires multiple operations. Luo et al. [5] described a different technique to repair small SAP located on the distal aortic arch. Under cardiopulmonary bypass with deep hypothermia and circulatory arrest, they excise the SAP and repair the defect with patch aortoplasty. In the setting of small SAP, patch aortoplasty can be an alternative method; this was the case in the patient presented by Yano et al. [1]. Antibiotic-bonded grafts (e.g., rifampicin-bonded Dacron grafts) and silver-coated Dacron grafts are increasingly being used in vascular surgery to prevent graft infection or to treat abdominal aortic infection with encouraging outcomes [4–5]. The availability of the silver-coated Dacron grafts in different types and sizes, its ease of use and its durability remain important advantages. To the best of our knowledge, these grafts have never been used to replace the thoracic aorta. We think that antimicrobial grafts can represent an alternative to aortic allografts and to standard Dacron grafts with omental wrapping and should be considered in the armamentarium of every cardiac surgeon.

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References


eComment. Mycotic aortic aneurysms: a real challenge for the cardiac surgeon

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We read with great interest the manuscript by Yano et al. regarding the surgical treatment of a mycotic aneurysm of ascending aorta [1]. We agree with the authors that the surgical repair of mycotic aortic aneurysms (extensive debridement of infected tissues, irrigation of the operative field with saline solution or antimicrobial fluid and in situ reconstruction of the aorta) combined with wrapping of the prosthetic graft with pedicled omentum and administration of long-term antibiotics for prevention of the recurrence of infection is an acceptable mode of treatment [1].

Rifampicin-bonded prosthetic grafts can offer very good mid-term results. Uchida et al., in their retrospective study of 23 patients with mycotic aneurysms (6 in thoracic aorta, 8 in thoracoabdominal aorta and 9 in abdominal aorta), who treated with in situ replacement of aorta with these grafts (plus omental pedicle grafts) found out that the overall survival at 5 years and freedom from aortic events was 95% and 86%, respectively. One patient died in the hospital due to recurrence of infection and another one required reoperation in another site of the aorta [2].

In addition, cryopreserved arterial homografts can be considered the treatment of choice and is our preferred option. Vogt et al., in their retrospective study of 19 patients with mycotic aneurysms (9/19) or infected grafts (10/19), in the thoracic (7/19) or abdominal aorta (12/19), apart from 16.2% mortality (1 early and 2 late deaths) didn’t report on any recurrence of infection, homograft problems or anastomotic aneurysms in a mean follow-up period of 18.6 ± 13 months [3].

Silver-coated Dacron grafts compared to cryopreserved arterial homografts are reportable safe and present no significant difference in the treatment of infected abdominal aorta (in early mortality and mid-term survival) [4]. During the last years there is an increased use of thoracic endovascular stents and this modality of treatment has to be considered in the management of the complex cases, but with a higher incidence of recurrent infection. Patel et al., in their retrospective study of 20 patients with endovascular stenting of infected aortic pathological cases including 4 with infected grafts (10 aortobronchial fistulae, 2 aorto-oesophageal fistulae, 1 aortocutaneous fistula and 7 mycotic aneurysms) had an in-hospital mortality of 15%. Arch repair was needed in 8 patients, total descending, in 6 patients. Three patients underwent hybrid thoracic endovascular repair or debranching procedures. Mean Kaplan-Meier survival was 39.0 months. Late mortality was seen in 13 patients (history of immunosuppression and concurrent malignancy in 4 and 5 patients respectively) with 3 related to recurrent infection of thoracic aorta [tendency for recurrence when endovascular stent was performed in an infected graft (p = 0.08)]. At last imaging follow-up, 14 patients had a healed aorta [5].

In conclusion, conventional surgical treatment (with cryopreserved homografts or mycotic resistant prosthetic grafts or omental wrapping) is still the treatment of choice. However, knowing and understanding its limitations, the consideration of endovascular treatment in challenging, high-risk patients may offer acceptable results.

Conflict of interest: none declared

References