Aortic bypass surgery using synthetic conduits in a child with mycotic aneurysmal disease

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ABSTRACT

A six-year-old child developed multiple aortic aneurysms as a consequence of fungal infection following thoracic aortic surgery for coarctation. Several repairs of both the thoracic and abdominal aorta were carried out using synthetic material combined with long-term postoperative antifungal treatment. We describe the surgical interventions performed and follow-up. The choice of conduit continues to be the main concern; however, when other alternatives are not available, synthetic material combined with indefinite antifungal treatment can produce satisfactory medium-term results.

KEYWORDS

Paediatric – Aorta – Aneurysm – Infection – Surgery

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Paediatric aortic surgery is rare. Barral *et al* report that these cases account for 0.003% of aortic surgery at their centre.¹ They note that most reports of paediatric aortic surgery describe only few cases of mixed populations, with different treatment approaches and insufficient follow-up to provide enough insight into the impact of surgery over time. In a study of patients undergoing surgical treatment of abdominal aortic coarctations over a period of 45 years, Stanley *et al* stated: ‘Individualized treatment changed little over the period of study, remaining dependent on the pattern of anatomic lesions, patient age, and anticipated growth potential.’²

We report a rare case of mycotic aortic aneurysms in a young child, and describe the challenges and difficulties experienced during management.

Case history

A six-year-old developed an infected thoracic pseudoaneurysm following aortic coarctation surgery (Fig 1). The lesion embolised to the aortic bifurcation and the right superficial femoral artery. The thoracic pseudoaneurysm was managed by resection and synthetic patch repair. *Aspergillus* infection was diagnosed by tissue culture. Control of infection was achieved using the antifungal drugs liposomal amphotericin B and voriconazole for six weeks. The patient subsequently developed mycotic aortoiliac aneurysms (Fig 2). Following a further period of antifungal treatment, these were resected. The superficial femoral veins were considered too small to be used for deep venous

reconstruction and biological grafts were not available. Reconstruction was achieved using a synthetic (6mm polyethylene terephthalate), bifurcated, silver coated graft (Fig 3).

At eight months, the aorto bi-iliac graft thrombosed and bilateral femoral thrombectomies were performed. A simultaneous bypass of the lower limb occlusion was performed using autologous vein. Imaging revealed that the arterial supply to both lower limbs had remained patent (Fig 4). However, by this time, the thoracic aortic repair was associated with significant inflammation (Fig 5). Resection of the diseased thoracic aortic segment was undertaken using a synthetic graft (20mm polyethylene terephthalate) impregnated with voriconazole as insufficient biological material was available to replace the diseased intrathoracic segment.

Oral antifungal treatment continues indefinitely. Follow-up review at 48 months revealed patent revascularisation, no recurrence of the aneurysms and no recrudescence of sepsis or elevation in inflammatory markers.

Discussion

Aortic aneurysmal disease in paediatric patients may be related to a variety of diseases such as connective tissue disorders, autoimmune diseases, Kawasaki disease, tuberculous sclerosis, valvular disease or umbilical artery catheterisation, trauma, coarctation of the aorta and infection.⁵ Aneurysms are at risk of embolism and thrombosis, and are typically treated immediately.⁴ This is in contrast to

other aortic diseases, where correction should be deferred until the patient is older.^{1,4} In the reported case, all operations were performed to prevent rupture or further dissemination of the infection.

The choice of bypass conduit is controversial. It is preferable to use autologous grafts.⁴ On the other hand, the use of prosthetic conduits has been reported with satisfactory results.^{1,4,5} Barral *et al* suggest that the greatest potential problem lies in the size discrepancy between

Figure 5 Coronal imaging demonstrating thoracic inflammatory mass

aorta and graft.¹ They therefore recommend deferring surgery until the patient is older to mitigate this discrepancy. Robicsek *et al* have reported elongation of synthetic graft material with progression of body morphology.⁵

The surgical management of mycotic aneurysms should include: i) preoperative control of infection; ii) aneurysm resection and debridement of infected tissues as well as arterial reconstruction through uninfected tissue planes with selected use of interposition grafting through the bed of the resected aneurysm; iii) soft tissue coverage; and iv) the use of autologous tissue for reconstruction whenever possible.⁶ The use of allograft in infected fields has been reported⁷ but the lack of readily available cryopreserved grafts of the appropriate diameter and length limits its application.⁶ Meyers *et al* used a decellularised and antigen reduced allograft in an attempt to reduce the lifetime risk of graft infection and to maintain the potential for ingrowth by native tissues.⁵ Further experience will be necessary to determine whether this graft type facilitates this.

Late results of the few reported paediatric aortic reconstruction cases are satisfactory and encouraging.^{1,2} Paran *et al* reported a successful aortic replacement by a tube graft in a child who remained asymptomatic with normal distal blood flow on magnetic resonance angiography and with normal growth.⁸

Conclusions

Repair of mycotic aneurysms in this patient population is feasible. However, the choice of conduit is the primary concern. Autologous vein grafts are the preferred option. Prosthetic grafts may be used when a biological alternative is not available and in this case has been shown to be associated with satisfactory medium-term results when combined with indefinite antifungal treatment.

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