Case Report

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A Septic Foot Leading to a Mycotic Iliac Aneurysm

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Abstract

A mycotic aneurysm is an infected, focal dilatation of the arterial system that commonly develops in the setting of bacteraemia or septic embolization. Microbial inoculation of diseased arterial endothelium is the most common mechanism. There is limited evidence guiding the management of mycotic aneurysms which is often complex and requires individualisation. In this report, we describe the case of a 68-year-old male presenting with septic arthritis of his left first metatarsophalangeal joint. The patient had ongoing fevers despite debridement and appropriate antibiotic therapy. Further investigation demonstrated a 5.6cm left common iliac artery aneurysm with focal uptake on white cell scan. The patient subsequently developed back pain and an interval scan demonstrated widening of the aneurysm up to 6.7cm. The patient was taken to theatre for emergency excision and successful repair with a bifurcated Dacron graft despite a presumably infected surgical field. The patient had an uneventful recovery and was discharge on life-long antibiotics. This unconventional surgical management highlights the ambiguities surrounding mycotic aneurysm repair and the need for further research to determine a method of best practice. .

Keywords: Mycotic aneurysm; Septic foot; Vascular conundrums

Abbreviations: MSSA: Methicillin Sensitive Staphylococcus Aureus; HB: Haemoglobin; WCC: White Cell Count; CRP: C-Reactive Protein; CIA: Common Iliac Artery; CTA: Computerised Tomography Angiography; PCR: Polymerase Chain Reaction; ESVS: European Society for Vascular Surgery

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Introduction

A mycotic aneurysm is an infected abnormal focal arterial dilatation that usually develops in the setting of bacteraemia or septic embolisation following microbial inoculation of the diseased arterial endothelium [1]. Mycotic aneurysms of the aorto-iliac system are rare pathologies associated with life-threatening consequences. The aims of mycotic aneurysm management are elimination of the infection and institution of arterial flow [2]. Typically, simultaneous resuscitation and workup are undertaken with initiation of empirical antibiotic treatment, septic screening and source control by excising the mycotic components in their entirety. Surgical approaches can vary pending on severity of infection, anatomic location of the aneurysm and the surgical equipment and expertise available at the time of the operation. The procedure typically involves complete resection of the infected tissues, anastomoses to viable healthy tissues and potential use of an omental flap which is rich is vascular supply, has an extensive lymphatic network and is capable of occupying the dead space once the infection is cleared [3]. Arterial reconstruction can be performed with in situ or extra-anatomical bypass grafts [4-6]. Graft options include use of untreated or antibiotic-soaked Dacron graft, PTFE, cryopreserved aortic allografts and bovine pericardial roll [2]. The use of antibiotic-treated grafts is associated with a much lower incidence of morbidity, mortality and recurrent infection rates [7]. Autologous vein grafts harvested from the femoral or long saphenous veins are also suitable options for extra-anatomical bypass or in situ reconstruction as they are functional and durable over time [2].

Case Report

A 68-year-old man was admitted with septic arthritis of his left metatarsophalangeal joint, for which he underwent a washout and debridement by the orthopaedic team. His past medical history featured ischaemic heart disease, hypertension, hypercholesterolaemia, schizophrenia and previous smoking. Intraoperative specimens grew MSSA and he was commenced on intravenous flucloxacillin. Postoperatively, he had intermittent fevers and developed back pain one week down the track. Initial investigations revealed a mild anaemia (Hb 88g/L) with elevated

inflammatory markers (WCC 12.3/nL, neutrophil count 10.2/nL and CRP 77 mg/L). His blood cultures were negative and a transthoracic echocardiogram demonstrated no evidence of infective endocarditis.

A CT-angiogram of the patient's thoracic and lumbar spine was performed at that stage to look for an epidural abscess. The scan revealed a 5.6cm left common iliac artery (CIA) aneurysm and the vascular surgical team was contacted.

A large, non-tender, pulsatile and expansile abdominal mass was confirmed on examination.

A labelled white cell scan showed focal uptake in the abdominal aortic aneurysmal wall suspicious for mycotic aneurysm. Given that the patient was stable and his pain had resolved, he was scheduled to have an open repair of his aneurysm within the week. However, he developed new flank and back discomfort 4 days after the labelled white cell scan. A CT-angiogram then showed that the aneurysm had increased in size from 5.6cm to 6.7cm with measurements performed perpendicular to the longitudinal aortic axis (**Figure 1**).

The patient was taken emergently to theatre for excision and repair of the presumed mycotic left common iliac aneurysm. A transperitoneal approach was selected via a midline laparotomy. Supracoeliac aortic exposure was obtained for safety but clamping at that level was not required. The supracoeliac approach was chosen as the degree of contamination of the infrarenal segments was unknown. Proximal control was at the infrarenal aorta and distal control was established by clamping both internal and external iliac arteries. A small focus of shallow ulceration was found on the duodenum and this did not require repair after consultation with the general surgical team. It was noted that the aneurysmal components involved the distal aorta, most of the left common iliac artery and the proximal half of the right common iliac artery.

All of the mycotic components were excised. An intraoperative decision was made to perform an in-situ reconstruction with a 16 x 8mm x 8mm bifurcated Dacron graft. Ideally, we would have used a bifurcated Dacron treated graft (eg; soaked in silver, triclosan or rifampicin) but due to urgency of the case and equipment availability the risks and benefits were weighed and decision was made to perform the arterial reconstruction with an untreated graft.

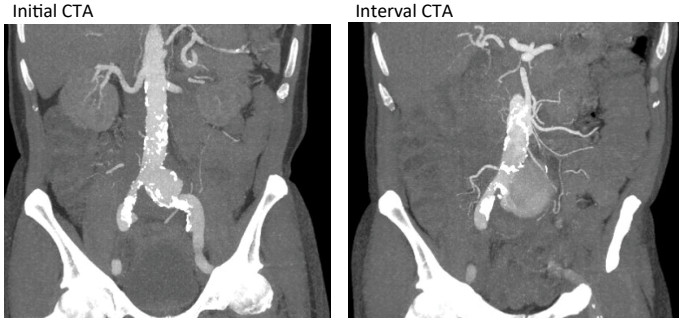

Figure 1 Coronal views of CTA of abdomen and pelvis demonstrating progressive increase in size and thinning of saccular wall of left CIA aneurysm.

Following the procedure, the patient made an uneventful recovery and was discharged home with lifelong oral antibiotics. Histopathology for the resected aorta revealed aortitis, without growth on culture and polymerase chain reaction (PCR) testing.

Discussion

Microbial inoculation of diseased arterial endothelium results in rapid degradation of the intima and media to form an aneurysm [1]. Existing intimal injury, atherosclerotic plaque or pre-existing aneurysm predispose arteries to mycotic aneurysms [8]. Common mechanisms of microbial inoculation include direct bacterial inoculation into the arterial wall through intravenous drug use, iatrogenic causes, trauma, and other bacteraemia [8]. The most likely mechanism for the mycotic aneurysm in the case of our patient is bacterial seeding through bacteraemia of the left common-iliac which may have contained pre-existing intimal injury or atherosclerotic disease.

Our case did not yield any organism on culture or PCR testing of the mycotic components of the excised aneurysm. However, blood cultures are positive in only 50-88% of cases, with organisms isolated from aneurysmal tissue 76% of the time [8-11]. The most common organism is *Staphylococcus* species with Staphylococcus. Aureus reported in 28-71% of cases [8,9]. *Salmonella* is reported in 15-24% of cases and commonly isolated in infected aneurysms due to bacteraemic seeding of atherosclerotic plaque. Fungal arterial infections may occur in rare circumstances in patients with immune suppression, diabetes mellitus or following treatment of disseminated fungal disease with common pathogens including *Candida*, *Cryptococcus, Aspergillus, Pseudallescheria boydi* and *Scedosporium* [12-15].

There are no firm recommendations in regards to management of mycotic aneurysms due to the rarity of the disease and associated lack of strong evidence. The European Society for Vascular Surgery have brief management guidelines for abdominal aorto-iliac artery aneurysms [16]. Current strategies are based on clinical experience and case series. Typically, simultaneous resuscitation and work up is required. This involves performing a septic screen to determine the source of infection, resuscitation with oxygen and intravenous fluids, monitoring of urine output and commencement of empirical antibiotics [6,10]. There is no consensus regarding specific duration of antibiotics, case specific guidance is based on the immune competence of the patient, source of infection, target organism, type and technique of graft reconstruction and clinical and biochemical response to treatment. Patients with reconstructed prosthetic graft material in-situ during active infection are recommended to intravenous antibiotics post-operatively to avoid failure and infection of the graft [8,11]. ESVS guidelines suggested 6-12 months or life-long duration of post-operative antibiotic treatment [16].

Mycotic aneurysm repair is recommended irrespective of the size of the aneurysm [16]. Surgical management of mycotic aneurysms follows the same general principles of a vascular graft infection where the goal is to remove all infected and necrotic tissue and treat any ensuing ischaemia [17]. The clinical decision to pursue vascular reconstruction depends on the patient's vascular status, the anatomical site to assess the risk of ischaemia distal to the

site of aneurysm excision and availability of autologous graft [17]. Endovascular reconstruction remains an option but involved implanting foreign material in an infected field. A Swedish study by Sorelius et al. of 132 patients with mycotic aortic aneurysm over a 10-year period showed that endovascular repair had a higher 3-month survival rate (96% *vs.* 74%) but no significant difference in survival at the 1-year (84% *vs.* 73% and 5-year mark (58% *vs.* 60%) [18]. Additionally, infection-related complications (24% *vs.* 18%) and reoperation rates (24 *vs.* 21%) were similar in the open-repair and endovascular groups [18].

Mortality of mycotic aorto-iliac aneurysms is significantly lower with combined surgical and medical therapy at 38% compared to medical therapy alone (96%) [19]. Following debridement, extra-anatomical reconstruction is usually preferred. Re-operation rates are 25% with placement of a prosthetic graft material into the infected retroperitoneum [20]. Thus, autogenous vein is usually preferred as there is lower risk of infection but greater potential of graft thrombosis.

The predominant learning point of this case are the unique patient, medical, surgical and pathophysiological challenges associated with the treatment of mycotic aneurysms. Although our case utilised an unorthodox approach by using a prosthetic graft in a potentially infected field for in-situ open vascular reconstruction following excision of the patient's mycotic aneurysm, the patient had a good recovery and favourable outcome following the procedure. This demonstrates that current medical and surgical management of mycotic aneurysms is very complex and should be individualised. There are multiple approaches possible but further research into management and outcomes of patients with mycotic aneurysms is required to develop a method of best practice.

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