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Management of Infected Aortobifemoral Bypass Graft with Ureteral Fistula in a Patient with Complex Vascular History: A Case Report

Rakshand Shetty[1]* & Griffin Stinson, BS[2]

[1]*KMC Hospital, MAHE, Manipal, Karnataka, India*
[2]*University of Florida College of Medicine, Gainesville, Florida*

***Corresponding author:** Dr Rakshand Shetty, KMC Hospital, MAHE, Manipal, Karnataka, India. ORCID ID: 0000-0003-2228-2857.

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Abstract

Aortobifemoral bypass (ABF) grafting is an effective procedure for managing severe aortoiliac occlusive disease. Among the multiple potential postoperative complications, some of the most feared and complex in its management are vascular graft infections (VGI). The use of synthetic material for reconstructive vascular surgery was first reported during the early 1950s, and infections of these grafts were associated with high morbidity and potential mortality. More recently, the incidence of VGI varies on the graft location. Extracavitary grafts carry a 1.5% to 2% infection rate, and up to 6% in those implanted in the groin. Similarly, intracavitary grafts carry between a 1% to 5% infection rate [1,4,5]. Though improvements in graft design and surgical technique have reduced VGI frequency and severity, they remain a serious complication. Sequelae of VGI can include fulminant bacteremia and sepsis as well as fistula formation. Here, we focus on the aorta ureteral fistula (AUF) after the open aortobifemoral bypass. AUF is of particular interest to practitioners because of a sometimes-indolent course and delayed diagnosis, leading to catastrophic outcomes [3]. AUF diagnostic difficulty is compounded as conventional radiographic tests are often unsuccessful in identifying the fistulas resulting from graft infections. Clinical findings may therefore best alert physicians to AUFs, like the presence of gross haematuria [2]. Historically, Staphylococcus Aureus was a predominant pathogen in VGI and resulting AUF. However, advances in surgical techniques, changes in patient demographics and hospital flora have led to a diverse range of causal pathogens. Treatment requires collaboration between vascular surgery and infectious disease teams when managing complex VGIs. This case report details a challenging instance of VGI and associated AUF in a patient with a complex medical history.

Keywords: Aortobifemoral Graft, Vascular Surgery, Urinary Stent, Hematuria, Fistula, Revascularisation, Antibiotics Therapy.

Case Presentation

Our patient was a 46-year-old male with a past medical history including type 2 diabetes mellitus, peripheral artery disease, smoking-1 PPD, intravenous drug use, amphetamine use, and previous MRSA bacteraemia. He additionally had a past surgical history of a low anterior resection and end colostomy for rectal cancer and left ureteral stenting for previous ureteral obstruction.

The patient originally underwent open aortobifemoral bypass grafting for severe aortoiliac occlusive disease fifteen months before index admission at an outside hospital. This bypass was complicated by a left common femoral artery pseudoaneurysm with ultimate occlusion. Five days postoperatively, the patient developed left foot gangrene and underwent left fourth and fifth ray Amputation followed by a five-day course of cefepime and vancomycin. Two months later, he required left groin incision exploration, debridement, and ligation of the left limb of the ABF graft. The patient was initially treated with daptomycin and ertapenem, but therapy was later switched to meropenem and linezolid due to methicillin-resistant Staphylococcus aureus

with resistance to daptomycin. Following this, the patient underwent left below-the-knee amputation and subsequent revision to above-the-knee amputation due to infectious concerns. Approximately ten months later, the left groin wound dehisced, and despite antibiotic treatment for culture-positive extended-spectrum beta-lactamase-producing Klebsiella pneumoniae and vancomycin-resistant Enterococcus faecium, the patient continued to experience haematuria and non-healing wounds. He was ultimately transferred to our institution for definitive management of a suspected VGI of his ABF graft, given his worsening clinical status.

Imaging confirmed VGI of the ABF graft with resulting thrombosis. The patients outside hospital course of IV daptomycin was continued given his history of vancomycin-resistant Enterococcus Faecium, though this was later changed to vancomycin given an apparent history of daptomycin-resistant MRSA and somewhat questionable history of Enterococcus culture. Further, his course of ertapenem was changed to meropenem, with concern for pseudomonal coverage as well. Upon surgical exploration for infected ABF graft removal, the patient was found to have communication between the graft and the left ureter. This required intraoperative consultation with urology, with eventual left nephrectomy. The repair ultimately required an aorta to the right superficial femoral artery bypass with femoral vein conduit, profunda femoris reimplantation, and femoral thrombectomy. Due to prolonged aortic cross-clamp time, the patient required additional right lower extremity fasciotomies. Cultures obtained intraoperatively including blood, tissue, and previous ABF grafts showed no growth. However, an intraabdominal culture grew Candida glabrata with pending susceptibilities. Without susceptibilities, the patient was given an empiric course of IV micafungin.

The abdomen was left open with a negative pressure wound closure and the patient returned to the operating room on postoperative day one for re-exploration, washout, and definitive closure of the abdominal incision with groin incisions intentionally left open. Three days later, the patient was noted to have suspected enteric contents leaking from his left groin wound and underwent abdominal exploration, showing no perforations or enterocutaneous fistulae. Again, a negative pressure wound closure device was used to close the abdomen, and he returned to the operating room two days later for definitive closure.

At this point, susceptibility returned for Candida glabrata indicating that it was susceptible to high-dose fluconazole. Thus, IV micafungin was exchanged for PO fluconazole. He underwent revision of his left above-the-knee amputation thirteen days after his index operation for non-healing wounds. Psychiatry followed the patient through his remaining recovery, and he was eventually discharged back to the referring hospital. Upon discharge, his medications included 1g meropenem IV every 8 hours for six weeks, 800mg fluconazole IV or oral for six weeks, and 1g vancomycin IV for six weeks. The patient ultimately did not require suppressive antibiotics.

The patient showed gradual improvement with the revised management approach. He was eventually discharged back to his previous hospital with a detailed plan for continued wound care and extended antibiotic therapy. Although he faced numerous challenges, the multidisciplinary approach proved essential in stabilizing his condition and addressing the complex issues resulting from the infected graft.

Discussion

This case exemplifies the complexity of managing VGIs, especially in a complex medical and surgical history. The patient's severe complications, including persistent infection and multiple amputations, highlight the challenges of diagnosing and treating VGIs. Additionally, the patient's extensive comorbidities, including diabetes and a history of intravenous drug use, significantly impacted wound healing and infection control. Choosing effective antimicrobial therapy is important and empirical therapy should cover Staphylococci and gram-negative enteric flora with good biofilm penetration. The difficulty of treating biofilm infections arises from several factors including poor penetration, low metabolic activity and hence resistance to antibiotic mechanisms, genetic heterogeneity within biofilms facilitating resistance, and quorum sensing mechanisms that mediate responses to altered environmental factors and thereby mediate longevity. The lack of guidelines means that the duration of treatment is uncertain, but it should probably depend on the extent, location, and type of graft. Treatment over 4-6 weeks followed by 6-12 months is effective. However, 2% of patients treated without antibiotics showed good long-term results, showing that surgery can also have a curative role [12].

The risk factors that were frequently associated with the development of an AUF were a history of abdominal or pelvic cancer surgery, vascular abdominal surgery, urinary deviation surgery, ureteral stenting, and radiotherapy. In particular, previous cancer and vascular surgery were frequently independently seen in the studied patients. The oncologic history in the patients with cancer consisted of the following previously treated cancers: cervical, bladder, colorectal, lymphoma, sarcoma, endometrial, prostate, vaginal, and osteosarcoma respectively in the frequency order [9]. The interval between the primary oncologic or vascular treatment and the first symptoms of the fistula was not always reported, but it could be large.

In certain patients with an AUF, surgery for an aneurysm of the abdominal aorta had been performed 20 years previously. In the majority of patients, the first episode of haematuria was directly related to the change or insertion of a ureteral stent. The AUF had an iatrogenic cause in other patients, of which AUFs had occurred after balloon endoureterotomy. The use of rigid ureteral stents during pregnancy was the cause of AUF in a minority of patients, both originating from as early as 1939 [7]. In case the ureter is fixed due to indwelling ureteral stents and/or retroperitoneal fibrosis, it could cause friction due to the pulsatile artery. Fibrosis, ischemia, and/or friction could cause localized necrosis and eventually AUF. In addition, indwelling ureteral stents and endovascular stent grafts are associated with urinary tract infections and graft infections, respectively [8]. In an emergency, without a preoperative diagnosis, most patients undergo a nephroureterectomy; this procedure is fast and effective but may cause problems if the contralateral kidney is poorly functioning. In a few cases, simple ligation of the artery or removal of an earlier graft without further reconstruction has been performed with only mild symptoms of distal ischemia. Late results are unknown because of the short follow-up in published cases;

long-term results would disclose the incidence of recurrent fistula [6]. A recent study reported a 3-year 100% freedom from infection in 11 patients treated with stent grafts. Long-term prophylactic antibiotics were used in 8 of these patients. Relative contraindications pointed out by these authors for graft stenting in selected cases of AUF include enteric communication or pelvic abscess. Long-term patency and infection rates remain an important concern [10]. In the case of proven VGI, the antibiotic schedule depends on the type of graft or prosthesis. In the case of arterial allo/homograft or of the prosthesis, it seems logical to propose prolonged IV antibiotic therapy for 6 weeks as for endocarditis on material, with a relay per os for a minimum of 6 months. Six weeks would be the time necessary for endothelialization of a vascular prosthesis acknowledging that it would be incomplete in most cases. In the case of a venous graft, the duration of antibiotic therapy may be decreased to 3 weeks by using agents with cutaneous diffusion. If the material cannot be replaced, suppressive antibiotic therapy may be proposed with doxycycline, trimethoprim-sulfamethoxazole, or fluoroquinolone depending on the susceptibility profile of the strain and the patient's features. If VGI is suspected, that is in case of bacteremia occurring within the first months following vascular surgery related to another infectious focus than the vascular material, the duration of treatment is not clearly defined but ranges between 2 and 6 weeks [11].

This case underscores the need for a multidisciplinary approach, integrating surgical intervention, advanced imaging, and comprehensive wound and psychosocial care to address the multifactorial nature of VGI-related complications effectively.

Conclusion

The case highlights the complex management of a critically infected ABF graft with multiple complications, including graft infection, ureteral fistula, and bowel adhesions. Clinical awareness and detailed past medical history with imaging were essential for diagnosis, whilst a multi-disciplinary approach including Urology, Vascular Surgery, and Infectious Disease consultation was required to address the patient's extensive surgical management and achieve effective postoperative recovery.

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Informed Consent

Written informed consent was obtained from the patient's legal representatives for publication of this case report.

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None

Conflict of Interest

Authors declare no conflict of interest for this article. The manuscript has been read and approved by all the authors, the requirements for authorship as stated earlier in this document have been met, and each author believes that the manuscript represents honest work.

Data availability

No additional data is available for this case report.

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