A rare case of *Clostridium septicum* aortitis with colon adenocarcinoma

Niti Shahi, MD, Mariano Arosemena, MD, Jeontaik Kwon, MD, Paul DiMuzio, MD, Babak Abai, MD, *and* Dawn M. Salvatore, MD, *Philadelphia, Pa*

ABSTRACT

Clostridium septicum aortitis is a rare, highly morbid condition typically accompanied by malignant disease, such as hematologic cancer or colon adenocarcinoma. Presenting symptoms commonly described include acute onset of abdominal pain, nausea, and fevers. Prompt diagnosis of infectious aortitis is critical to prevent deadly complications, such as sepsis and vascular catastrophe. The described management largely involves surgical resection of the infected aorta, débridement, and arterial revascularization through extra-anatomic bypass or aortic graft placement. (J Vasc Surg Cases and Innovative Techniques 2018;4:87-90.)

We present the first reported case of *Clostridium septicum* aortitis with associated colon adenocarcinoma successfully treated with excision and aortoiliac reconstruction using an arterial homograft in addition to a literature review. The patient's consent was obtained for publication.

CASE REPORT

A 66-year-old man without prior medical care presented with a 3-day history of sharp right lower quadrant abdominal pain, fevers, chills, and bloody bowel movements. He had originally presented to an outside hospital, where computed tomography (CT) of the abdomen and pelvis showed marked thickening of the cecum and ascending colon wall and gas in the walls of the infrarenal abdominal aorta and inferior mesenteric artery.

On examination, the patient was nontoxic and hemodynamically stable with a temperature of 102.3°F; the abdomen was distended and tender in the right lower quadrant without peritoneal signs and no pulsatile mass, and femoral and pedal pulses were 2+ bilaterally. Laboratory studies were notable for leukocytosis to 19.5 cells per microliter of blood. Preliminary blood cultures were positive for gram-positive rods, and he was started on intravenous cefepime, vancomycin, and metronidazole (Flagyl). Additional workup included esophagogastroduodenoscopy (given gastrointestinal bleed), the findings of which were normal (specifically no aortoenteric fistula), and colonoscopy demonstrated cecal and rectal masses.

CT angiography of the abdomen and pelvis, performed for surgical planning, demonstrated circumferential wall thickening and air within the wall of the infrarenal aorta and a fluid collection from the aortic bifurcation to the common iliac arteries, concerning for infected infrarenal aorta (Fig 1). The patient underwent urgent transabdominal removal of the infected aortobi-iliac segment and in-line reconstruction with an aortobi-iliac homograft and left renal artery reimplantation into the homograft (Fig 2). Given the urgency of the procedure and availability of homograft at our institution, homograft was selected as the conduit of choice over alternatives such as a neoaortoiliac system (NAIS) procedure. The left renal artery required reimplantation because of proximal inflammation extending to the orifice of this vessel, with a total renal ischemic time of 70 minutes and reimplantation time of 15 minutes. Concurrently, open right hemicolectomy was performed with the bowel left discontinuous because of the patient's septic state, lack of bowel preparation, and presence of cecal and rectal masses. The retroperitoneum was approximated over the graft using 2-0 Vicryl in a standard running fashion, and the abdominal wall was left open with an ABThera wound vacuum (Acelity, San Antonio, Tex). As planned, 2 days later, the patient underwent end-ileostomy creation and abdominal wall closure. Intraoperative aortic cultures grew *C. septicum*, and antibiotics were narrowed to ampicillin-sulbactam (Unasyn). The rectal mass was to be addressed at a later time.

His postoperative course was marked by acute renal failure; serum creatinine concentration peaked at 6.2 mg/dL with glomerular filtration rate of 9.0 mL/min/1.73 m^2 on postoperative day 6, without need for hemodialysis. At 1 week postoperatively, serum creatinine concentration was 2.2 mg/dL; it was nearly normalized to 1.5 mg/dL with a glomerular filtration rate of

From the Division of Vascular and Endovascular Surgery, Department of Surgery, Thomas Jefferson University.

Author conflict of interest: none.

Presented at the Forty-fourth Annual Symposium of the Society for Clinical Vascular Surgery, Las Vegas, Nev, March 12-16, 2016; and the Delaware Valley Vascular Society Fall Dinner Meeting, Atlantic City, NJ, October 16, 2015.

Correspondence: Dawn M. Salvatore, MD, Division of Vascular and Endovascular Surgery, Department of Surgery, Thomas Jefferson University, 111 S 11th St, Gibbon Bldg, Ste 6210, Philadelphia, PA 19107 (e-mail: dawn.salvatore@jefferson.edu).

The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2468-4287

https://doi.org/10.1016/j.jvscit.2017.12.002

Fig 1. Preoperative computed tomography (CT) scan of *Clostridium septicum* aortitis showing free air in inferior mesenteric artery on coronal section.

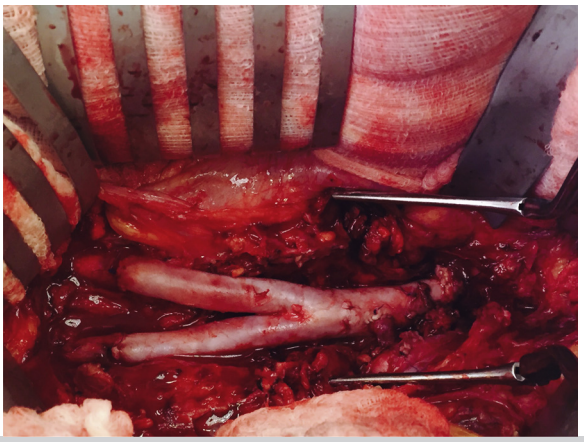

Fig 2. In situ aortobi-iliac homograft after débridement and excision of infected aorta.

47.0 mL/min/1.73 m^2 by discharge. Postoperatively, he remained afebrile, and the white blood cell count normalized. He was released on postoperative day 28 to a rehabilitation facility in stable condition with no systemic symptoms and planned 6-week course of Unasyn from time of resection of the infectious nidus.

DISCUSSION

A PubMed search using the key words "aortitis," "mycotic," "aneurysm," "clostridium," "colon," and "aorta" was conducted in September 2015 to find a composite of cases for our analysis. The search yielded 55 studies published between 1976 and 2015 that were narrowed by the following exclusion criteria: absence of both aortitis and colon adenocarcinoma, aortitis due to organisms other than *C. septicum*, patient outcomes not addressed, presenting with aortic rupture, and paper not available in English.[1-19]

C. septicum aortitis has a poor prognosis with a 50% to 100% mortality rate.[3,20] Early surgical intervention for patients with *C. septicum* aortitis is necessary to prevent progression to sepsis. The hypothesized relationship between colon cancer and *C. septicum* aortitis stems from the anaerobic environment fostered by the tumor cells optimal for *C. septicum* spores, which can hematogenously spread from the tumor site to the aorta.[11] All deaths in our review occurred in patients treated medically. For patients treated with antibiotics alone, high surgical risk due to advanced age, acute clinical decline, comorbidities, and preference of the patient contributed to the decision to forgo surgery.

The options for surgical management of *C. septicum* aortitis include axillobifemoral bypass (with excision of the aorta), excision of the infected aorta and insertion of an aortic graft, and NAIS procedure. In most cases, nonsurgical treatment resulted in high morbidity that outweighed the risks of surgery.[19] A combination of early surgical intervention and long-term antibiotics has proved to be more effective than medical therapy alone.[19] The average length of parenteral antibiotic treatment was 6 to 8 weeks postoperatively, and only 5 of 22 (22.7%) patients were treated with lifelong antibiotics. Because of the higher rates of homograft resistance to bacteria compared with other conduits, our patient was prescribed a 6-week regimen of antibiotics instead of lifelong antibiotic suppression.[21] Our plan for follow-up after completion of the course of antibiotics included close clinical follow-up and postoperative CT angiography at 6 months.

In a series by Lau et al,[22] following 6 weeks of intravenous antibiotics after open repair of mycotic aortic aneurysms, lifelong suppression with narrow-spectrum oral antibiotics (typically trimethoprim-sulfamethoxazole, cephalexin, doxycycline, or metronidazole) was prescribed. With the combined presence of colon cancer, the addition of anaerobe coverage is recommended. The duration of antibiotic use for *C. septicum* aortitis may depend on persistence of the patient's infectious symptoms, intraoperative findings and surgical cultures, mode of antibiotic administration, and specific antibiotic regimens.

In our case review, in those treated surgically for aortitis, 31.8% (7/22) received axillobifemoral bypass, and 31.8% (7/22) received an aortic graft. For critically ill patients, an axillobifemoral bypass can serve as a bridge until the patient is medically stabilized. In comparison to surgical excision of the infected aorta and aortic graft reconstruction, axillobifemoral bypass requires a shorter operative time, and it has less hemorrhage and shorter

aortic cross-clamp time with the excision of the infected aorta.[23] Although axillobifemoral bypasses confer certain advantages over in situ aortic graft placement, stump rupture and graft occlusion are the major postoperative complications.

Unlike synthetic grafts, homografts appear to be more mechanically stable and more resistant to infections because of their immunologically inert property with cryopreservation.[23,24] Given the lower rate of postoperative infections, cryopreserved homografts have become more commonly used in the treatment of aortic graft infections, aortoenteric fistulas, and mycotic aneurysms.[23] In an operative field with an existing infection, homografts are probably preferred to synthetic grafts. However, the major impediments to the widespread use of homografts are availability and high cost. Because of the relatively short history of homograft use in treatment of mycotic aneurysms, there are limited data on the long-term outcomes and complications of these grafts.

In centers with limited access to homografts, antibiotic-soaked prosthetic grafts are an alternative option for aortic repair, specifically rifampicin-soaked Dacron grafts. Both in situ repair options, homografts and antibiotic-soaked grafts, avoid the risk of stump blowout feared in extra-anatomic bypasses. Although Dacron antibiotic-soaked grafts are less expensive than homografts, they may be less effective at treating methicillin-resistant *Staphylococcus aureus* and certain strains of *Staphylococcus epidermidis*.[25]

The NAIS procedure, first described by Clagett et al[26] in 1993 and constructed with femoropopliteal vein conduit, is another emerging option for repair, especially in cases of aortic infection. The advantages of the NAIS approach include low rates of recurrent infections (<2%) and decreased rates of aortic stump rupture that are associated with axillofemoral grafts.[27] The NAIS procedure may not be ideal in patients with a known virulent pathogen because of a higher risk for persistent graft infection and sepsis.[28] Another drawback is the length of time associated with NAIS reconstruction, on average 554 minutes.[27]

Overall, one of the most common complications of surgery in our analysis was acute kidney injury, probably secondary to preoperative exposure to contrast material and intraoperative suprarenal clamping. Higher rates of renal injury would be expected in patients with suprarenal aortic clamping; however, because of the small number of patients in this study, we found equal rates (28.6%) of renal injury in patients with aortic grafts (2/7) and axillobifemoral bypass grafts (2/7).

CONCLUSIONS

Excision and repair with homograft should be considered for definitive repair of *C. septicum* aortitis. Although the literature is limited on this treatment, given the rarity of *C. septicum* aortitis, this surgical option may be a safe alternative to the NAIS procedure and axillobifemoral bypass, especially in an emergent setting.

REFERENCES

1. Shah S, Whitehead D, Sampath K, Toor A. A case of Clostridium septicum aortitis with concomitant adenocarcinoma of the cecum. ACG Case Rep J 2015;2:230.
2. Ge PS, de Virgilio C. Clostridium septicum aortitis with associated sigmoid colon adenocarcinoma. Ann Vasc Surg 2012;26:280.e1-4.
3. Seder CW, Kramer M, Long G, Uzieblo MR, Shanley CJ, Bove P. Clostridium septicum aortitis: report of two cases and review of the literature. J Vasc Surg 2009;49:1304-9.
4. Asciutto G, Geier B, Marpe B, Hummel T, Mumme A. A case of contained ruptured aortitis due to Clostridium septicum infection in a patient with a colon malignancy. Chir Ital 2007;59:743.
5. Evans LT, Chey WD. Clostridial aortitis and colon cancer. Gastrointest Endosc 2004;60:803.
6. Liechti M, Schöb O, Kacl G, Caduff B. Clostridium septicum aortitis in a patient with colon carcinoma. Eur J Clin Microbiol Infect Dis 2003;22:632-4.
7. Sailors DM, Eidt JF, Gagne PJ, Barnes RW, Barone GW, McFarland DR. Primary Clostridium septicum aortitis: a rare cause of necrotizing suprarenal aortic infection: a case report and review of the literature. J Vasc Surg 1996;23:714-8.
8. Khalid M, Lazarus R, Bowler IC, Darby C. Clostridium septicum sepsis and its implications. BMJ Case Rep 2012 Sep 7;2012. doi: 10.1136/bcr-2012-006167.
9. Hurley L, Howe K. Mycotic aortic aneurysm infected by Clostridium septicum—a case history. Angiology 1991;42:585-9.
10. Al Hadi HI, Patel G, Rees MD. A rare case of Clostridium septicum mycotic aortic arch aneurysm following open right hemicolectomy for colorectal cancer. BMJ Case Rep 2014 Sep 26;2014. doi: 10.1136/bcr-2014-204636.
11. Morrison RC, Dimuzio PJ, Kahn M, Carabasi RA, Bailey W, Edie RN. Clostridial mycotic aneurysm of the thoracoabdominal aorta—a case report. Vasc Endovascular Surg 2001;35:303-10.
12. Müller BT, Wegener OR, Grabitz K, Pillny M, Thomas L, Sandmann W. 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.
13. Moseley B, Mwirigi NW, Bowen J. Clostridium septicum aortitis and cecal adenocarcinoma. Case Rep Med 2010;2010:121728.
14. Rucker CM, Menias CO, Bhalla S, Geraghty P, Heiken JP. Clostridium septicum infrarenal aortitis secondary to occult cecal adenocarcinoma. AJR Am J Roentgenol 2004;183:1316-8.
15. Ferreira J, Canedo A, Brandão D, Maia M, Braga S, Chaparro M, et al. Isolated iliac artery aneurysms: six-year experience. Interact Cardiovasc Thorac Surg 2010;10:245-8.
16. Laudito A, Gai V, Battista S, Garabello D, Limerutti G, Rinaldi M. Clostridium septicum arch aortitis. Circulation 2008;117:1609.
17. Cohen CA, Almeder LM, Israni A, Maslow JN. Clostridium septicum endocarditis complicated by aortic-ring abscess and aortitis. Clin Infect Dis 1998;26:495-6.
18. Brahan RB, Kahler RC. Clostridium septicum as a cause of pericarditis and mycotic aneurysm. J Clin Microbiol 1990;28:2377-8.

19. Messa C, Kulkarni M, Arous E. Double clostridial mycotic aneurysms of the aorta. Vascular 1995;3:687-92.
20. Koransky JR, Stargel MD, Dowell V. Clostridium septicum bacteremia. Its clinical significance. Am J Med 1979;66:63-6.
21. Vogt P, Pasic M, von Segesser L, Carrel T, Turina M. Cryopreserved aortic homograft for mycotic aneurysm. J Thorac Cardiovasc Surg 1995;109:589-91.
22. Lau C, Gaudino M, de Biasi AR, Munjal M, Girardi LN. Outcomes of open repair of mycotic descending thoracic and thoracoabdominal aortic aneurysms. Ann Thorac Surg 2015;100:1712-7.
23. Vogt PR, von Segesser LK, Goffin Y, Niederhäuser U, Genoni M, Künzli A, et al. Eradication of aortic infections with the use of cryopreserved arterial homografts. Ann Thorac Surg 1996;62:640-5.
24. Kerzmann A, Ausselet N, Daenen G, Linder J. Infected abdominal aortic aneurysm treated by in situ replacement with cryopreserved arterial homograft. Acta Chir Belg 2006;106:447.
25. Lew W, Moore W. Antibiotic-impregnated grafts for aortic reconstruction. Semin Vasc Surg 2011;24:211-9.
26. Clagett GP, Bowers BL, Lopez-Viego MA, Rossi MB, Valentine RJ, Myers SI, et al. Creation of a neo-aortoiliac system from lower extremity deep and superficial veins. Ann Surg 1993;218:239-48; discussion: 248-9.
27. Chung J, Clagett GP. Neoaortoiliac System (NAIS) procedure for the treatment of the infected aortic graft. Semin Vasc Surg 2011;24:220-6.
28. Ali AT, Modrall JG, Hocking J, Valentine RJ, Spencer H, Eidt JF, et al. Long-term results of the treatment of aortic graft infection by in situ replacement with femoral popliteal vein grafts. J Vasc Surg 2009;50:30-9.

Submitted Apr 27, 2017; accepted Dec 16, 2017.