

Successful endovascular treatment of abdominal aortic rupture secondary to bacillus Calmette-Guérin vaccine

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ABSTRACT

Bacillus Calmette-Guérin (BCG) vaccine has been successfully used to treat bladder cancer. However, sporadic cases of mycotic arterial aneurysms have been reported. These patients typically develop a *Mycobacterium bovis* infection of an existing aneurysm or graft. In the present report, we have described the case of a patient with a ruptured nonaneurysmal abdominal aorta years after intravesicular BCG therapy. Emergent aortic endograft repair was successful. After subsequent evaluation confirmed *M. bovis* infection, the patient was treated with a prolonged course of antimycobacterial therapy. Vascular surgeons should maintain suspicion for atypical aortic ruptures in patients with exposure to intravesicular BCG therapy. (J Vasc Surg Cases Innov Tech 2022;8:19-22.)

Keywords: BCG vaccine; EVAR treatment; Infected graft; Mycotic pseudoaneurysm; Prophylaxis

Bladder cancer is the sixth most common neoplasm in the United States. Tobacco abuse is the greatest risk factor.¹ Bacillus Calmette-Guérin vaccine is the standard of care to treat non-muscle-invasive bladder cancer after resection.^{2,3} It is a live, attenuated strain of *Mycobacterium bovis*.⁴ The BCG vaccine can activate specific immunologic cells and stimulate direct cytotoxicity of the mycobacterium, culminating in the death of tumor cells and sparing benign bladder urothelium.² Biot et al⁴ showed that after instillation of the BCG vaccine into the bladders of mice, the bacteria travel to the para-aortic lymph nodes to become primed and exert maximum effect. Although rare, cases of mycotic aneurysms becoming infected with mycobacterium after BCG vaccine have been reported.⁵⁻⁷ In the present report, we have described a case of presumed BCG-induced psoas abscess with subsequent erosion into a nonaneurysmal abdominal aorta treated with emergent endovascular stent graft repair. Our patient provided written informed consent for the report of his case details and imaging studies.

CASE REPORT

The patient was an 82-year-old man with a medical history of hyperlipidemia, tobacco abuse, and bladder cancer (GaT1). Treatment of the bladder cancer included multiple transurethral resections and intravesicular mitomycin C and BCG

vaccine ~5 years earlier. He had presented to a referring emergency department with low back pain and was discharged. One month later, he had returned with increasing lower abdominal and low back pain, with computed tomography (CT) findings shown in Fig 1. The diagnosis this was thought to be a retroperitoneal or intramuscular hematoma. No aortic pathology was noted, and he was referred for outpatient follow up.

Three days later, he had experienced a syncopal episode and was admitted. CT showed lytic lesions of the L2 and L3 vertebra (Fig 2). Empiric antibiotic therapy was started, a biopsy was taken, and it showed necrotic muscle with a minor granulomatous component with negative gram stain findings. The patient was discharged 9 days after admission with a prescription for ceftriaxone with cultures negative for bacterial growth.

Two days later, the patient had presented to the referring emergency department with increasing leg pain, difficulty walking, and abdominal pain with guarding and tenderness. He was afebrile but tachycardic and hypotensive. The complete blood count was notable for a hemoglobin of 5.3 g/dL (vs 11.1 g/dL 4 days previously) and a white blood cell count of $14.9 \times 10^3/\mu\text{L}$. CT showed active extravasation from the aorta (Fig 3). Large-bore intravenous access was obtained, a red blood cell transfusion was initiated, and the patient was transferred and underwent emergent endovascular aortic repair with a Gore bifurcated stent-graft (W.L. Gore & Associates, Flagstaff, Ariz).

The unusual progression of the patient's aortic rupture without a preexisting aneurysm prompted an infectious disease consultation. At the initial evaluation, a possible BCG-related infection was suspected, and a biopsy of the vertebral lesions was obtained. The prior cultures had been discarded without polymerase chain reaction testing. Broad-spectrum antibiotic therapy was initiated. The patient was discharged in stable condition on postoperative day 3. Empiric antituberculous therapy was started because of his history of BCG therapy and the absence of conventional bacterial growth. Ethambutol, isoniazid, and rifampin therapy with moxifloxacin was chosen. After 22 days, his cultures grew acid fast bacilli with speciation showing *M. bovis*.

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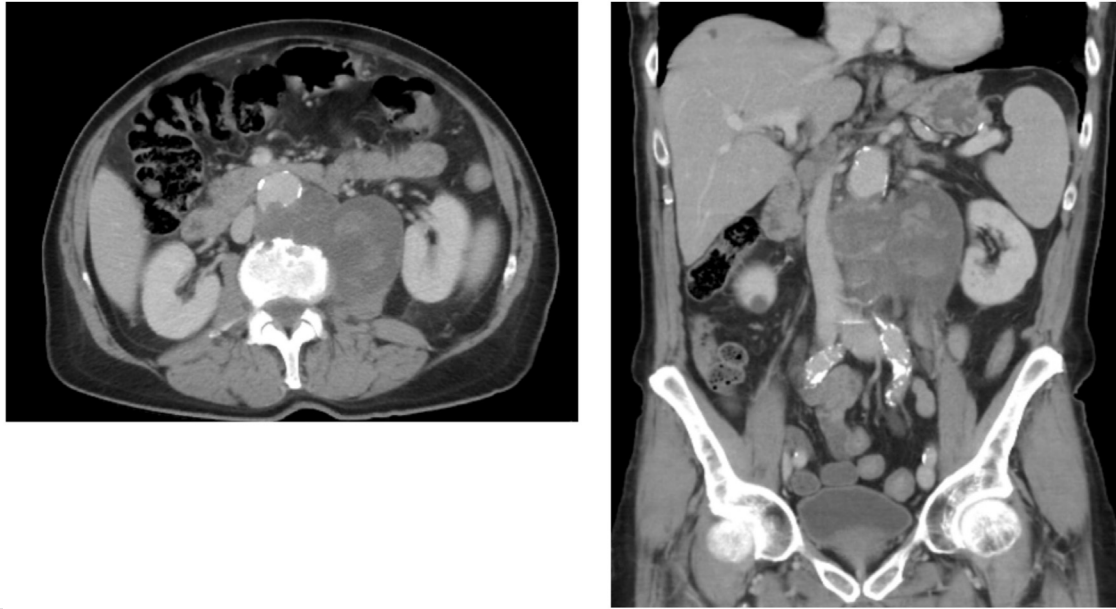


Fig 1. Computed tomography (CT) scan from second emergency department visit showing a loculated, heterogeneous hypodense structure measuring $9.2 \times 7 \times 12.5$ cm in the left psoas that was concerning for hematoma.



Fig 2. Computed tomography (CT) 3 days after the previous CT scan showing a reduction in the size of the left psoas suspected hematoma ($3.6 \times 7.1 \times 8.4$ cm) but with the development of a new 5-cm suspected hematoma lateral and inferior to the other mass. Lytic lesions were also noted in the vertebral bodies.

DISCUSSION

The existing literature contains ≥ 31 cases of BCG-related infection involving an existing aortic aneurysm or pseudoaneurysm. Most of these cases involved the infrarenal aorta, and the most common repair was aortic resection and an in situ prosthesis.⁷ In the few cases in which endovascular repair was involved, stent-grafts

had been placed to treat preexisting aortic aneurysms before any signs of *M. bovis* infection had developed. It has been hypothesized that these grafts might have ultimately acted as a nidus of infection.^{5,8-10} Only a few cases have been identified of nonaneurysmal abdominal aortic infection with *M. bovis*.¹¹ Long et al¹² proposed three mechanisms of tuberculous spread to the aorta: bacilli

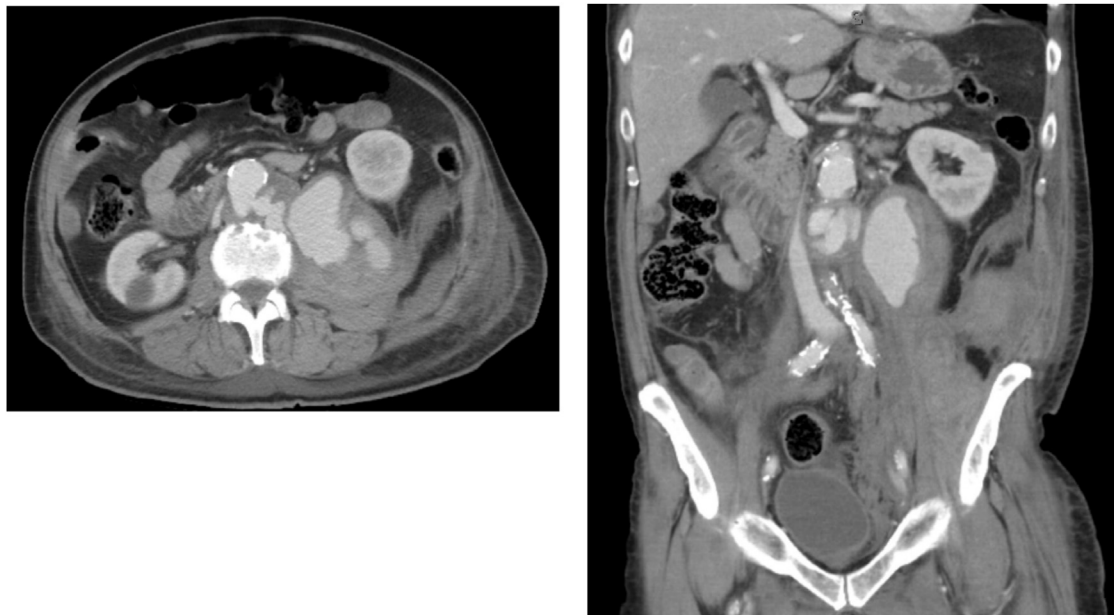


Fig 3. Transverse and coronal computed tomography (CT) images 14 days after the initial CT scan showing rupture of the posterior wall of abdominal aorta with a posterior saccular aneurysm ~1.4 cm with active extravasation into the left psoas muscle. Also present, was a 6.4 × 7.5 × 17.8-cm new retroperitoneal hematoma in the left iliac fossa (not shown).

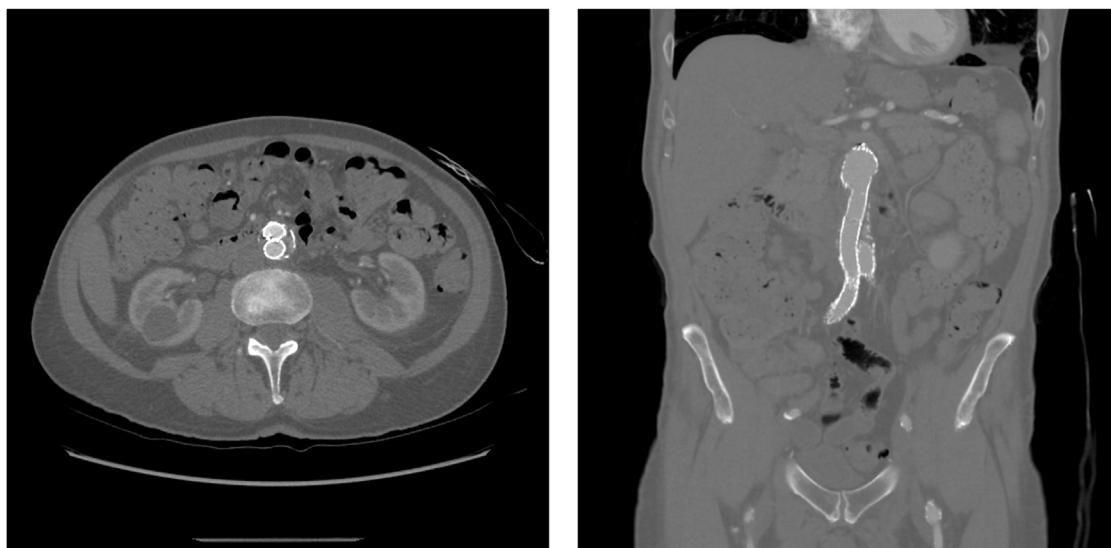


Fig 4. Postoperative computed tomography (CT) scan at 10 months after endovascular stent graft repair showing complete resolution of the left psoas mass.

spreading to the vessel wall, bacilli spreading via the vasa vasorum, and/or direct extension of a contiguous focus, such as an abscess. Owing to the lack of a preexisting aneurysm, we believe the cause of the rupture in our patient was from direct extension into the wall of a previously normal aorta from the adjacent infected lymphatic tissue.

Traditional treatment of infected aortic tissue involves resection of the involved aorta and retroperitoneal

tissues with either in-line or extra-anatomic reconstruction. Given the lack of knowledge about our patient's mycobacterial infection and because of his clinical presentation of hemorrhagic shock, an endovascular repair was chosen for our patient. Since his repair, his symptoms of back pain and leg weakness have resolved. He has not had fevers or other systemic signs of infection. His most recent postoperative CT scan was ~10 months after repair and showed no evidence of

infection (Fig 4). We had planned to follow-up with CT scans every 6 to 12 months. However, the patient developed stage 3 chronic kidney disease (glomerular filtration rate, 45 mL/min/1.73 m²; and creatinine, 1.4 mg/dL) after institution of antimycobacterial therapy. This could limit the use of contrast-enhanced imaging studies in the future. At his most recent follow-up, 14 months after repair, he had a normal white blood cell count, is riding a stationary bike daily, and living independently. Antituberculous therapy is planned for a total of 18 months.

Berchiolli et al¹¹ reported that no well-defined guidelines are available for the treatment of aortic endografts infected with *M. bovis*. The reference standard has been surgical excision with either in-line reconstruction or extra-anatomic bypass. However, these operations carry a high risk of complications and perioperative morbidity and mortality.¹¹

M. bovis is typically treated with a 9-month course (2 months of ethambutol, isoniazid, and rifampin, 7 months of ethambutol and isoniazid, and consideration of a fluoroquinolone if isoniazid resistant).^{13,14} No clear data exist on *M. bovis* treatment in the setting of a newly placed aortic endograft. A retrospective medical record review of prosthetic joints infected with *M. tuberculosis* found that an extended course of antibiotics (18 months) was effective and did not require removal of the joint.¹⁵ We believe that the best option for our patient is an extended course of antituberculous therapy (18 months), which we hope will eliminate the *M. bovis* infection and forego the need for major open aortic surgery (graft explant and revascularization).

CONCLUSIONS

We have presented the case of an 82-year-old man with a ruptured, nonaneurysmal infrarenal abdominal aorta secondary to *M. bovis* infection of the para-aortic tissues from prior intravesicular BCG vaccine. The progression of disease seen on CT was profound, and although aortic rupture is a very rare occurrence, the present case highlights the connection between intravesicular BCG treatment and atypical aortic pathology. We have planned close surveillance of the aortic repair and are hopeful that after an extended course of antimycobacterial therapy, our patient will not require future open aortic resection and revascularization.

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