Case Report

Successful Percutaneous Abscess Drainage and Irrigation for the Treatment of Infected Aortic Aneurysm Post—Thoracic Endovascular Aortic Repair

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ABSTRACT

Infected aortic aneurysm (IAA) is a rare, life-threatening disease with rapid progression and a high mortality rate. An 84-year-old man developed IAA caused by urosepsis owing to extended-spectrum β -lactamase-producing *Escherichia coli* infection. Considering surgical risk and perioperative mortality, the patient underwent computed tomography-guided percutaneous abscess drainage and continuous irrigation with optimal antibiotic therapy. We controlled his systemic inflammation without surgery; thus, he was discharged. Six months later, we confirmed that the abscess had almost disappeared in the follow-up computed tomography scan. Percutaneous abscess drainage and irrigation may be an effective therapeutic option for surgical high-risk patients with IAA.

RÉSUMÉ

L'anévrisme aortique infecté (AAI) est une affection rare menaçant le pronostic vital, qui évolue rapidement et est associée à un taux de mortalité élevé. Nous exposons le cas d'un homme de 84 ans présentant un AAI secondaire à un urosepsis, lui-même causé par une infection à *Escherichia coli* productrice de bêta-lactamases à spectre étendu. Compte tenu du risque associé à une intervention chirurgicale et du risque de mortalité périopératoire, nous avons procédé à un drainage percutané de l'abcès guidé par tomographie assistée par ordinateur et sous irrigation continue, puis prescrit une antibiothérapie optimale. Nous avons ainsi réussi à maîtriser l'inflammation générale sans intervention chirurgicale, et le patient a pu recevoir son congé de l'hôpital. Six mois plus tard, une tomodensitométrie de suivi a permis de confirmer la disparition presque complète de l'abcès. Le drainage et l'irrigation d'un abcès par voie percutanée peuvent donc être une option thérapeutique efficace dans le cas des patients présentant un AAI les exposant à un risque chirurgical élevé.

Infected aortic aneurysm (IAA) is a rare, life-threatening disease with rapid progression and a high mortality rate. The incidence of IAA is approximately 0.7%–2.6% of all cases of aortic aneurysm.¹ Medical management alone is generally inadequate because of potential persistent infection and subsequent aneurysm rupture.² The conventional IAA treatment

strategy consists of prompt surgical debridement; therefore, therapeutic management is much more challenging medically than surgically. However, surgery cannot always be performed for all patients with IAA, because of perioperative risk factors. We present a case of IAA caused by extended-spectrum β -lactamase (ESBL)-producing *Escherichia coli*, with very high surgical risk, successfully managed by performing computed tomography (CT)-guided percutaneous abscess drainage and continuous irrigation via a precordial approach.

Case

An 84-year-old man was admitted to our hospital for worsening heart failure and dyspnea. The patient had a history of hypertension, dyslipidemia, and ischemic cardiomyopathy, following coronary artery bypass graft surgery and

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See page 738 for disclosure information.

Novel Teaching Points

- Conventional strategy for IAA treatment consists of prompt surgical debridement and prolonged anti biotic therapy. Medical management alone for IAA is much more challenging than that combined with surgery.
- Percutaneous abscess drainage and irrigation combined with optimal antibiotic therapy may be an effective therapeutic option for surgical high-risk patients with IAA.
- Whether IAA is treated by surgery or not, it is more challenging to treat thoracic IAA than abdominal IAA. However, even such a case can be treated medically by CT-guided drainage via a precordial approach, if the abscess is located around the ascending aorta and aortic arch.

percutaneous coronary intervention of the left anterior descending artery. The patient had undergone total arch replacement and subsequent thoracic endovascular aortic

repair (TEVAR) for type-B dissecting aortic aneurysm, approximately 2 years before. The patient had undergone additional TEVAR due to type-3 endoleak about 4 months before. Laboratory tests indicated high levels of creatinine (1.37 mg/L) and brain natriuretic peptide (2105 pg/mL); the white blood cell (WBC) count and C-reactive protein (CRP) level were normal. After admission, the patient experienced a high fever (40 °C) and chills at night. Therefore, intravenous administration of antibiotics, including ceftriaxone, was started. ESBL-producing *E. coli* was detected in blood and urine cultures, indicating urinary tract infection and sepsis. The WBC count (30,100 cells/ μ L), CRP level (25.46 mg/dL), and procalcitonin level (>100 ng/mL) were elevated. Consequently, ceftriaxone 2.0 g/d was changed to meropenem 2.0 g/d. However, the patient showed a blunted treatment response. The patient's body temperature and inflammatory marker levels remained high (WBC count 9000-11000 cells/ μ L; CRP level 12-15 mg/dL) for 2 weeks. Enhanced CT revealed aortic wall thickening and ring enhancement surrounding the aortic arch and thoracic descending aorta on day 15 of hospitalization. Although antibiotic treatment was continued, an abscess formed around the stent grafts in the

Figure 1. Enhanced computed tomography of the chest demonstrating clinical course of decrease in the abscess size just below the aortic arch on days (A) 28 (red arrows), (B) 43 (red arrows), and (C) 50 of hospitalization (red arrows), with the (D) resolution of the abscess at the 6-month follow-up.

Figure 2. (A, B) Images of the computed tomography–guided drainage procedure. (C, D) Three-dimensional reconstructions of computed tomography imaging combined with gallium scintigraphy showing percutaneous insertion of drainage catheter in the abscess (**green area**).

thoracic aorta on day 28 (Fig. 1A; Video 1 [view video online](#)). A whole-body gallium scan showed gallium uptake at the site illustrated by the CT scan to indicate an abscess. It showed no other sites of infection or inflammation. The patient was diagnosed with IAA caused by urinary tract infection and sepsis. Although surgical debridement was initially considered, the patient eventually underwent CT-guided percutaneous abscess drainage on day 31, owing to surgical risk factors, including old age, frailty, and reoperation. To accomplish this, an 18-gauge needle was inserted into the abscess through the left sternum, and pus aspiration was performed, with the patient in the supine position. Then, an 8.5 Fr. universal curved drainage catheter was placed into the abscess cavity (Fig. 2, A-D). Later, another thin catheter was inserted to inject normal saline regularly and wash out the abscess. Percutaneous abscess drainage and irrigation were continued for 3 weeks. After confirming that blood and lavage fluid cultures were negative for infection, the catheters were removed on day 52. Serial CT scans showed a decrease in abscess cavity size (Fig. 1, B and C; Videos 2 and 3 [view videos online](#)), and laboratory tests indicated reduced systemic inflammation (WBC count 5800 cells/ μ L; CRP level 3.35 mg/dL). Intravenous antibiotic infusion was switched to an oral trimethoprim–sulfamethoxazole combination. The patient was discharged on day 68. Six months later, his inflammation marker levels further decreased (WBC count 5900 cells/ μ L; CRP level 2.43 mg/dL), and the follow-up CT

scan revealed that the abscess had almost disappeared (Fig. 1D; Video 4 [view video online](#)). The patient has been under follow-up observation for 1 year, and he is still alive and in good condition.

Discussion

IAA remains a lethal disease today, although surgical techniques have been improved, including endovascular aortic repair (EVAR) and antibiotic therapy. Early diagnosis, especially identifying the cause of pathogens, is very important for the selection of appropriate antibiotics for IAA. A systematic review reported that the most common pathogens involved in IAA are *Salmonella* species (33.4%), followed by *Staphylococci* (15.6%), *Streptococci* (10.4%), and *E. coli* (3.1%).² Aneurysms combined with gram-negative bacterial infections exhibit a greater probability of early rupture (84% vs 10%), and a higher mortality rate (84% vs 50%), than those with gram-positive bacterial infections.³ IAA caused by ESBL-producing *E. coli*, one of the most difficult pathogens to treat, has not been reported. Thus, it was essential to learn that it could be managed by conservative therapy. Surgical intervention plus prolonged antibiotic therapy is also essential for survival because nonsurgical management may be generally inadequate owing to potential persistent infection and the subsequent aneurysm rupture. Sörelis et al. reported that the 30–90–day mortality range for IAA of the infrarenal aorta and iliac arteries was

3%-9% for EVAR, and 5%-23% for open surgical repair.² The reported mortality varied depending on the aortic segment involved and the surgical approach adopted. Approximately 60% of all the IAAs were located below the renal arteries. In general, mortality data on IAA of the thoracic aorta are less common. The 30-90-day mortality range for IAA of the descending aorta was estimated at 15% for TEVAR and 7%-20% for open surgical repair. In contrast, 2 studies reported that hospital the mortality rate of IAA treated exclusively medically was 75%-100%, with all deaths attributed to aneurysm rupture.^{4,5} In IAA patients, 58% were treated with open surgery, and 39% with EVAR. Conversely, only 4% were treated with conservative therapy. Moreover, such cases demonstrated achievement of CT-guided percutaneous drainage only via a posterior approach, and not via a precordial approach, for thoracic descending or abdominal IAA. This difference may be due to the fact that accessing the abscess around the thoracic aorta (especially the ascending aorta and aortic arch) is more challenging technically than doing so around the abdominal aorta. Thus, conservative IAA treatment with antibiotics only or with antibiotics combined with drainage therapy has demonstrated very poor outcomes. However, surgery is not always a feasible therapeutic option for all patients with IAA, owing to risk factors, including old age, frailty, and comorbidities. In addition, surgical treatment of thoracic IAA usually carries a higher risk than that of abdominal IAA because hypothermic circulatory arrest is often required to treat thoracic IAA.⁶ Consequently, it is more challenging to treat IAA by surgical operation in such a case.

Conclusion

In the present case, we were able to percutaneously insert drainage and irrigation catheters into the abscess via a precordial approach, and then apply conservative therapy to treat IAA caused by ESBL-producing *E. coli*. Therefore, percutaneous abscess drainage and irrigation combined with

optimal antibiotic therapy is a potentially effective therapeutic option for surgical high-risk patients with IAA.

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Disclosures

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Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at <https://www.cjopen.ca/> and at <https://doi.org/10.1016/j.cjco.2020.08.008>.