

Serial PET-CT Scans Can Help Determine Duration of Antibiotic Therapy After Endovascular Mycotic Thoracic Aortic Aneurysm Repair

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ABSTRACT: Mycotic aortic aneurysm is a rare vascular condition, with high-risk for fatal complications. In cases of bacterial infection, prolonged antibiotic therapy is administered. There is no consensus on duration of antibiotic therapy and close follow-up is recommended following surgical and endovascular interventions.

We report a case of a patient, who was diagnosed with mycotic aneurysm and underwent successful endovascular repair. Extended post-operative antibiotic treatment was administered. The duration was determined by sequential Fluorine-18 fluorodeoxyglucose positron emission tomography-computed tomography (PET-CT) scans over a period of 6 months.

KEYWORDS: Aortic aneurysm; Mycotic; endovascular; *Haemophilus influenzae*; PET-CT

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Introduction

Mycotic aortic aneurysm (MAA) is a rare life-threatening condition¹ due to its tendency to enlarge rapidly and rupture. Several bacteria have been reported as etiology for MAA, predominantly *Salmonella* and *Staphylococcal* species. *Haemophilus influenzae* is among the less common agents.²

In case of bacterial infection, antibiotic therapy is given before and after surgical reconstruction or endovascular repair. However, there is no consensus on the duration of postoperative antibiotic treatment. In selective cases, antibiotic is recommended for life.^{3,4}

We report a case of a patient diagnosed with a mycotic thoracic aortic aneurysm (MTAA) caused by *Haemophilus influenzae* infection, who consequently underwent successful endovascular aortic repair. Postoperative antibiotics were given based on antibiogram sensitivity. Sequential positron emission tomography-computed tomography (PET-CT) scans were performed to assess the status of infection until complete resolution. Thus, the PET-CT aided in determining the duration of antibiotic treatment.

Case Report

A 76-year-old female was admitted for fever of unknown origin lasting several weeks. She was a smoker in the past, and her medical record included osteoporosis and rheumatoid arthritis with chronic methotrexate treatment.

Two months prior to her admission, she had a *Haemophilus influenzae* cellulitis infection in her right leg. Complete resolution of cellulitis was attained following antibiotic treatment with Augmentin (amoxicillin/clavulanate potassium).

Following admission, the patient remained pyrexial, with daily peak fever of 39°C and experienced chills. In addition, she reported new onset of mid-back pain and epigastric discomfort, which

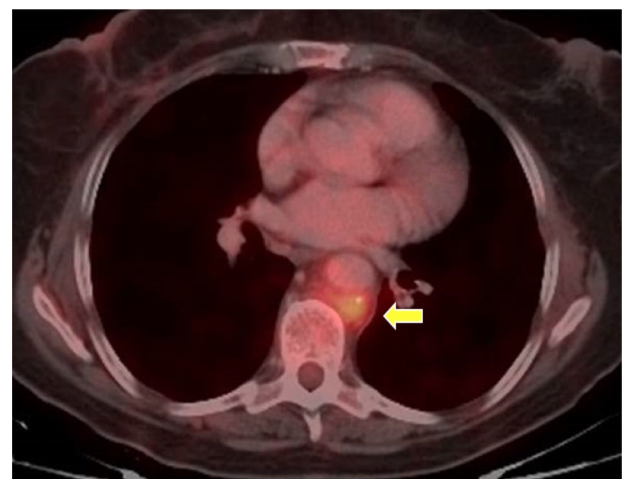


Figure 1. PET-CT scan depicts uptake in the posterior wall of the aorta due to MAA (arrowed). PET-CT indicates positron emission tomography-computed tomography.

continued to worsen. White blood count was 14×10^9 per liter and C-reactive protein level was 7 mg/L. Repeated blood cultures were negative. Chest and abdomen CT and transesophageal echo were subsequently performed, without significant findings.

Further investigation included a PET-CT scan, which demonstrated an MTAA of 4 cm in diameter, with a ruptured aortic plaque in the posterior wall of the descending thoracic aorta (Figure 1), which was not demonstrated in previous CT scans.

Treatment included cessation of methotrexate, high-dose broad-spectrum antibiotics, and the planning of an endovascular repair. After improvement in her clinical status and inflammatory blood parameters within 48 hours, she underwent endovascular repair, with deployment of a 26 mm \times 26 mm \times 125 mm Captiva Graft (Medtronic, Minneapolis, MN, USA).



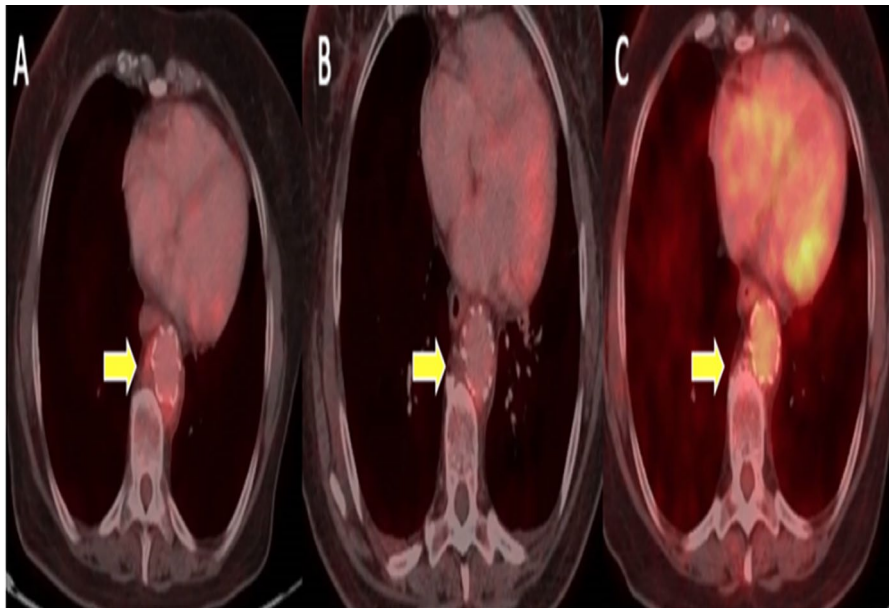


Figure 2. (A) PET-CT scan 3 weeks after the endovascular repair. High activity areas with the presence of infection (arrowed). (B) PET-CT scan 3 months after the endovascular repair. Improvement with a mild activity area of infection (arrowed). (C) PET-CT scan 6 months after the endovascular repair indicates resolution of infection (arrowed). PET-CT indicates positron emission tomography–computed tomography.

Postoperative antibiotic treatment was changed to ceftriaxone according to additional blood culture results, which were positive for *Haemophilus influenzae*.

The infectious diseases specialists recommended to continue the antibiotic treatment (according to the literature) until complete resolution of the infection, which we confirmed by PET-CT.

After 3 weeks of antibiotic treatment, an additional PET-CT scan showed that no fluorodeoxyglucose (FDG) uptake was demonstrated in the aorta (Figure 2A). There was evidence of shrinkage of inflammatory lesion with FDG uptake. The patient was monitored by PET-CT scans every 6 weeks, which depicted a gradual diminution of inflammatory/infectious process (Figure 2B and C). Once there was no evidence of persistent infection, antibiotic therapy was ceased. Total treatment duration was 6 months. Neither evidence of an infection nor inflammation was demonstrated by CT angiography a year later (Figure 3). Follow-up 2 years later was uneventful.

Discussion

Mycotic aortic aneurysms are very uncommon and comprise 2% of all aortic aneurysms in western countries.^{1,5}

Treatment options include open surgery or, in recent years, endovascular repair. Surgery was the gold standard of care, including resection and repair of the aneurysm with aggressive debridement. Due to the morbidity and high mortality rate of the surgical approach, the endovascular repair of MAA has become more common in recent years.^{6,7} In cases of mycotic abdominal aortic repair, a rare complication of

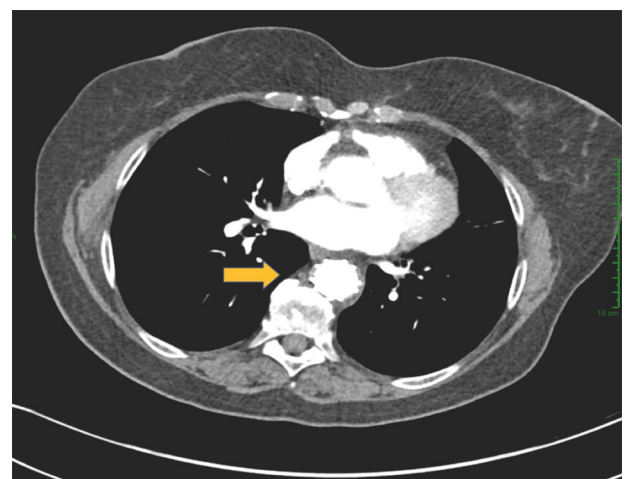


Figure 3. CT angiography scan, with no signs of infection. Stent graft is in place with no evidence of endo-leaks. CT indicates computed tomography.

aorto-enteric fistula (AEF) can occur. AEFs do not occur in the thoracic aorta.⁸

Long-term antibiotic treatment is given following endovascular repair of MAA, especially in cases of aggressive pathogen such as *Haemophilus influenzae*.^{9,10} Currently, there is no consensus on the duration of antibiotic therapy. Many reports recommend a minimum of 6 weeks. Cessation of therapy is recommended only after ensuring that the infection has cleared.¹¹ In severe cases, lifelong antibiotic therapy is advised.⁴

PET-CT is considered an effective tool for the diagnosis and surveillance of vascular diseases and inflammation,^{12,13} as well as for cancer follow-up and surveillance.^{14,15} As in the case presented,

we recommend sequential PET-CT scans to assess inflammation status and to dictate the duration of antibiotic treatment accordingly. Potential long-term outcomes without proper antibiotic duration can result in mortality. Long-term antibiotic therapy without indication can provoke antibiotic resistance.

In conclusion, we suggest that PET-CT scans can prevent long-term morbidity and mortality.


Author Contributions

JW Author, AS Consultant and advisor, SM Image analysis, MA Case Report Data provider, and SF Overall manager and advisor.

Informed Consent

A consent for the patient information and images to be published was provided by the patient.

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REFERENCES

- Reddy DJ, Shepard AD, Evans JR, Wright DJ, Smith RF, Ernst CB. Management of infected aortoiliac aneurysms. *Arch Surg*. 1991;126:873-878, discussion 878-879.
- Whitfield CG, Lonsdale RJ, Rahbour G, Parsons H, Dodd PD. Infective abdominal aortic aneurysm due to *Haemophilus influenzae* identified via the polymerase chain reaction. *Eur J Vasc Endovasc Surg*. 2008;36:28-30. doi:10.1016/j.ejvs.2008.01.020.
- Sörelius K, Wanhainen A, Wahlgren C-M, et al. Nationwide study on treatment of mycotic thoracic aortic aneurysms. *Eur J Vasc Endovasc Surg* 2018;57:239-246. doi:10.1016/j.ejvs.2018.08.052.
- Gomes MN, Choyke PL. Infected aortic aneurysms: CT diagnosis. *J Cardiovasc Surg (Torino)*. 1992;33:684-689.
- Bandyk D. *Vascular Infections* (ed. L Greenfield). 1st ed. Philadelphia, PA: J. B. Lippincott; 1993.
- Vallejo N, Picardo NE, Bourke P, et al. The changing management of primary mycotic aortic aneurysms. *J Vasc Surg*. 2011;54:334-340. doi:10.1016/j.jvs.2010.12.066.
- Sörelius K, Wanhainen A, Furebring M, Björck M, Gillgren P, Mani K. Nationwide study of the treatment of mycotic abdominal aortic aneurysms comparing open and endovascular repair. *Circulation*. 2016;134:1822-1832.
- Hollander JE, Quick G. Aortoesophageal fistula: a comprehensive review of the literature. *Am J Med*. 1991;91:279-287.
- Hsu R-B, Chang C-I, Wu I-H, Lin F-Y. Selective medical treatment of infected aneurysms of the aorta in high risk patients. *J Vasc Surg*. 2009;49:66-70. doi:10.1016/j.jvs.2008.08.004.
- Sörelius K, Wanhainen A, Furebring M, et al. Nationwide study of the treatment of mycotic abdominal aortic aneurysms comparing open and endovascular repair. *Circulation*. 2016;134:1822-1832. doi:10.1161/CIRCULATIONAHA.116.024021.
- Malouf JF, Chandrasekaran K, Orszulak TA. Mycotic aneurysms of the thoracic aorta: a diagnostic challenge. *Am J Med*. 2003;115:489-496. doi:10.1016/s0002-9343(03)00394-2.
- Chrapko BE, Chrapko M, Nocun A, Stefaniak B, Zubilewicz T, Drop A. Role of 18F-FDG PET/CT in the diagnosis of inflammatory and infectious vascular disease. *Nucl Med Rev Cent East Eur*. 2016;19:28-36. doi:10.5603/NMR.2016.0006.
- Choi SJ, Lee JS, Cheong MH, Byun SS, Hyun IY. Role of F-18 FDG PET/CT in the management of infected abdominal aortic aneurysm due to salmonella. *Nucl Med Mol Imaging*. 2007;41:570-573.
- Goel R, Moore W, Sumer B, Khan S, Sher D, Subramaniam RM. Clinical practice in PET/CT for the management of head and neck squamous cell cancer. *AJR Am J Roentgenol*. 2017;209:289-303. doi:10.2214/AJR.17.18301.
- Sheikhbahaei S, Mena E, Yanamadala A, et al. The Value of FDG PET/CT in treatment response assessment, follow-up, and surveillance of lung cancer. *AJR Am J Roentgenol*. 2017;208:420-433. doi:10.2214/AJR.16.16532.