

Case Report

Infected Rastelli Conduit in an Immunocompromised Patient That Was Not Visible on Transthoracic Echocardiogram

Simon Parlow, MD,^a Paul Beamish, MD,^a Isabelle Desjardins, MD,^a John Fulop, MD,^b Gyaandeo Maharajh, MD,^c and Lana Castellucci, MD, MSc^{d,e,f}

^a Department of Medicine, University of Ottawa, Ottawa, Ontario, Canada

^b Division of Cardiology, Department of Medicine, University of Ottawa, Ottawa, Ontario, Canada

^c Division of Pediatric Cardiac Surgery, Department of Surgery, University of Ottawa, Ottawa, Ontario, Canada

^d Division of Hematology, Department of Medicine, University of Ottawa, Ottawa, Ontario, Canada

^e School of Epidemiology and Public Health, University of Ottawa, Ottawa, Ontario, Canada

^f Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada

ABSTRACT

An 18-year-old man with a history of right ventricle to pulmonary artery conduit implantation for repair of congenital heart disease and vasculitis requiring chronic immunosuppression with azathioprine presented to the University of Ottawa with bacteremia. A transthoracic echocardiogram revealed no abnormalities at the site of the conduit. A fludeoxyglucose positron emission tomography scan was subsequently obtained that demonstrated an infected right ventricle to pulmonary artery conduit. It is important to remember that, as is true for classic valve endocarditis, an unremarkable transthoracic echocardiogram does not rule out an infected conduit in this population, and nuclear imaging may have important diagnostic utility.

RÉSUMÉ

Un homme de 18 ans, chez qui on avait implanté un conduit ventricule droit-artère pulmonaire (VD-AP) pour réparer une cardiopathie congénitale et qui avait des antécédents de vascularite nécessitant une immunosuppression continue par l'azathioprine, s'est présenté à l'hôpital affilié à l'Université d'Ottawa pour une bactériémie. Une échocardiographie transthoracique n'a révélé aucune anomalie au site du conduit. Elle a été suivie d'un examen de tomographie par émission de positrons (TEP) au fludésoxyglucose, qui a mis en évidence une infection du conduit VD-AP. Il est important de retenir que, comme dans le cas d'une endocardite valvulaire classique, un échocardiogramme transthoracique sans particularité ne permet pas d'exclure une infection de conduit dans cette population, et que l'imagerie nucléaire peut être d'une grande utilité diagnostique.

Case Description

An 18-year-old man presented to the University of Ottawa's emergency department with a 4-day history of fevers, chills, and rigors. He had a history of congenital heart disease and was born with d-transposition of the great vessels (d-TGA), ventricular septal defect (VSD), and right ventricular outflow tract (RVOT) obstruction. On his first day of life, he underwent the Rastelli procedure, involving implantation of a right ventricular to pulmonary artery (RV-PA) conduit to bypass the RVOT obstruction. In 2008, he was diagnosed with antineutrophil cytoplasmic antibody-associated systemic vasculitis with

rapidly progressive glomerulonephritis resulting in stage III chronic kidney disease. His vasculitis has since remained quiescent with chronic azathioprine therapy for immunosuppression. He had no history of intravenous drug use or other high-risk behaviours.

On presentation, the patient was hypotensive, tachycardic, and febrile. He had normal neurological examination results. His precordial examination revealed a loud S2 and a III/VI crescendo-decrescendo systolic murmur heard loudest at his left upper sternal border with no radiation. He had normal dentition. In the emergency department, he underwent chest radiography and urine microscopy testing. The results were normal, and the patient was empirically administered vancomycin and piperacillin-tazobactam. On the first day of admission, his blood cultures returned positive for methicillin-sensitive *Staphylococcus aureus*, and his antibiotic choice was narrowed to intravenous cloxacillin. He then underwent transthoracic echocardiography (TTE) to assess for infective endocarditis (IE) as a source for his bacteremia, and no vegetations were seen on his native valves or his RV-PA conduit

Received for publication July 10, 2019. Accepted August 12, 2019.

Ethics Statement: The research reported in this article has adhered to all relevant ethical guidelines.

Corresponding author: Dr Simon Parlow, Department of Medicine, University of Ottawa, 737 Parkdale Ave, Ottawa, Ontario K1Y 4E9, Canada.

E-mail: sparlow@toh.ca

See page 326 for disclosure information.

Novel Teaching Point

- In patients with suspected IE of a surgical prosthesis implanted for repair of congenital heart disease, nuclear imaging may play an important role in the diagnosis by improving sensitivity of echocardiography alone.

in long-axis view (Fig. 1). On day 5 of admission, computed tomography scans of his head, abdomen, and pelvis were obtained and did not reveal any source of infection. Repeat blood cultures were persistently positive, and because suspicion for endocarditis remained high, he was referred for a fludeoxyglucose positron emission tomography (FDG-PET) scan. This test was chosen instead of transesophageal echocardiography (TEE) because the team believed it would be of higher diagnostic yield given his complex cardiac anatomy. The FDG-PET scan showed significant radiotracer uptake at the site of the RV-PA conduit, consistent with active conduit infection (Fig. 2).

After 9 weeks of intravenous antibiotics, most of which were given in the inpatient setting, he was taken electively to the operating room for replacement of his RV-PA conduit. He was discharged to his home in stable condition after a brief admission to the cardiac surgery intensive care unit.

Discussion

The Rastelli procedure was initially described by Rastelli and colleagues¹ in 1969 and remains the procedure of choice for surgical repair of d-TGA associated with VSD and RVOT obstruction. It involves baffling of the VSD to the aorta and bypass of the RVOT using an extracardiac conduit. IE after a Rastelli operation is rare. Morris et al.² followed a population-based registry of all patients in the state of Oregon who had congenital heart disease that was surgically repaired from 1958 to 1998, and cumulative incidence of IE at 20 years after surgery in all patients with surgically repaired d-TGA was 4%.

Although TEE plays an important role in the diagnosis of IE and is recommended by the American Heart Association and American College of Cardiology in patients who have persistently positive blood cultures despite negative TTE results,³ nuclear medicine technology (NMT) remains an important alternative diagnostic tool for clinicians to consider in this case. NMT can aid in the diagnosis of IE when echocardiography is inconclusive and has been shown to have high sensitivity for detecting IE in the setting of congenital heart disease.⁴ In a recent meta-analysis, FDG-PET improved the diagnostic sensitivity of prosthetic valve IE to greater than 80% when used as an adjunct to echocardiography,⁵ and in a cohort of 39 patients with suspected infected cardiac prosthesis despite an inconclusive TEE, FDG-PET definitively diagnosed 14 patients.⁶ In addition, recent data have led the European Society of Cardiology to recommend the use of PET imaging in the diagnosis of prosthetic valve endocarditis.⁷ However, it should be noted that the diagnostic sensitivity of NMT can be affected by the adequate preparation of the patient before the image is acquired and the methodology used for image interpretation,⁸ and currently no guidelines exist outlining criteria for either of these 2 factors.

Conclusion

To our knowledge, we present the first case report of a patient with previous RV-PA conduit placement who was immunosuppressed and subsequently developed IE. His diagnosis was eventually confirmed using NMT. As is true for valvular endocarditis, a negative TTE should never be used to definitively rule out infection of an implanted conduit, and further diagnostic modalities such as TEE may be necessary to confirm the diagnosis. NMT also should be considered as a method of improving diagnostic sensitivity in this population by improving sensitivity of echocardiography alone.

Acknowledgements

The authors thank the University of Ottawa's Department of Medicine for its support in the preparation of this case report.

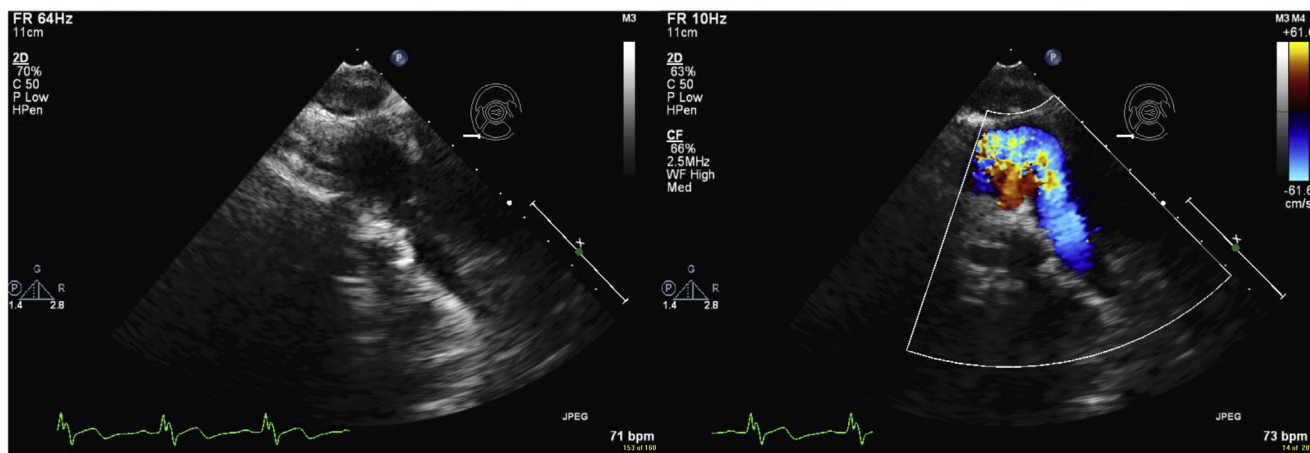


Figure 1. Transthoracic echocardiogram showing the right ventricular to pulmonary artery (RV-PA) conduit without (L) and with (R) colour Doppler flow displaying no identifiable vegetation.

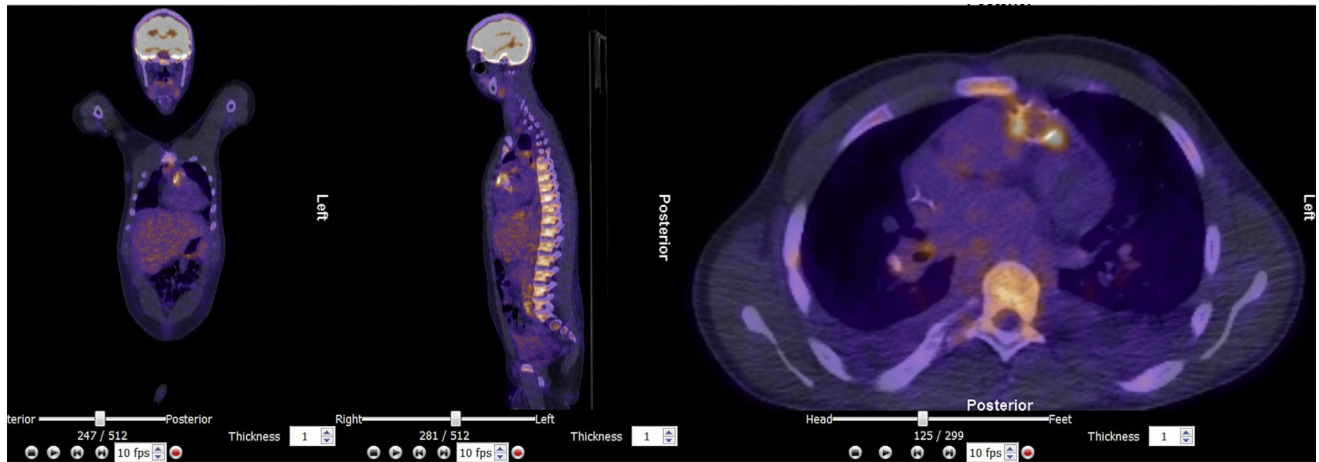


Figure 2. Significant radiotracer uptake at the site of the RV-PA conduit seen on positron emission tomography (PET) scan in coronal (L), sagittal (C), and transverse (R) views.

Disclosures

The authors have no disclosures to declare.

References

1. Rastelli GC, Wallace RB, Ongley PA. Complete repair of transposition of the great arteries with pulmonary stenosis. A review and report of a case corrected by using a new surgical technique. *Circulation* 1969;39:83-95.
2. Morris CD, Reller MD, Menashe VD. Thirty-year incidence of infective endocarditis after surgery for congenital heart defect. *JAMA* 1998;279:599-603.
3. Nishimura RA, Otto CM, Bonow RO, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2014;63:e57-185.
4. Meyer Z, Fischer M, Koerfer J, et al. The role of FDG-PET-CT in pediatric cardiac patients and patients with congenital heart defects. *Int J Cardiol* 2016;220:656-60.
5. Mahmood M, Kendi AT, Ajmal S, et al. Meta-analysis of 18F-FDG PET/CT in the diagnosis of infective endocarditis. *J Nucl Cardiol* 2019;26:922-35.
6. Rouzet F, Chequer R, Benali K, et al. Respective performance of 18F-FDG PET and radiolabeled leukocyte scintigraphy for the diagnosis of prosthetic valve endocarditis. *J Nucl Med* 2014;55:1980-5.
7. Jiménez-Ballvé A, Pérez-Castejón MJ, Delgado-Bolton RC, et al. Assessment of the diagnostic accuracy of 18F-FDG PET/CT in prosthetic infective endocarditis and cardiac implantable electronic device infection: comparison of different interpretation criteria. *Eur J Nucl Med Mol Imaging* 2016;43:2401-12.
8. Habib G, Lancellotti P, Antunes MJ, et al. 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC). Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM). *Eur Heart J* 2015;36:3075-128.