FDG-PET Identification of Infected Pulmonary Artery Conduit Following Tetralogy of Fallot (TOF) Repair

Yuyang Zhang¹ · Hadyn Williams¹ · Darko Pucar¹

Received: 15 March 2016 / Revised: 3 May 2016 / Accepted: 19 May 2016 / Published online: 8 June 2016
© Korean Society of Nuclear Medicine 2016

Abstract Tetralogy of Fallot (TOF) is one of the most common forms of cyanotic congenital heart disease usually managed by serial surgical repairs. The repaired prosthetic valve or conduit is susceptible to life-threatening infection. FDG-PET is an effective alternative to evaluate the source of infection when other examinations are inconclusive. We report an unusual case of an infected pulmonary artery conduit after TOF repair although the echocardiogram was negative for vegetation, which was later confirmed by surgery and pathology. The case highlights the role of FDG-PET as a problem-solving tool for potential endocarditis and cardiac device infection cases after complex cardiac surgery.

Keywords Tetralogy of Fallot (TOF) · Pulmonary artery conduit · FDG PET/CT · Infection

Introduction

The placement of a system of pulmonary shunts or reparative surgery of tetralogy of Fallot (TOF) often requires a prosthetic valve or conduit, which is the major risk factor for the development of infection. Infection of a prosthesis and infective

endocarditis are life-threatening complications post-TOF repair [1]. The routine workup of endocarditis includes echocardiography and blood culture. However, when the workup is inconclusive, [18 F] D-glucose positron emission tomography (FDG PET/CT) can be an effective alternative [2].

Case Report

A 9-year-old female with a history of DiGeorge syndrome, also known as 22q11.2 deletion syndrome, and TOF status post repair with a ventricular septal defect patch and right ventricle-pulmonary artery conduit at 14 months old presented with persistent fever and methicillin-resistant *Staphylococcus aureus* bacteremia despite IV antibiotics. An echocardiogram demonstrated no vegetation. An FDG PET/CT was performed to evaluate the source of infection, which demonstrated abnormal FDG uptake of the pulmonary artery conduit suspicious for the source of infection (Fig. 1). After a cycle of antibiotics, there was decreased FDG avidity of the focus but without complete resolution (Fig. 2). The conduit was replaced surgically, and a subacute course of infection was identified in the xenograft. The patient completed a course of antibiotics with complete resolution of signs and symptoms.

Discussion

Our current case illustrates an infected conduit after TOF repair with an unrevealing echocardiogram that was accurately localized by FDG PET/CT and proved by surgery and pathology. FDG is an analog of glucose that enables the assessment

This article has not been published before and is not under consideration for publication elsewhere. It has been approved by all co-authors.

✉ Darko Pucar
dpucar@gru.edu

¹ Department of Radiology, Medical College of Georgia, Augusta, GA 30912, USA

Fig. 1 A focus of increased FDG uptake is seen in the mediastinum with SUVmax of 4.2 corresponding to the pulmonary conduit on CT. FDG activity in the right axilla is the injection site

of high metabolic conditions in cancer, inflammation and infection [3]. FDG PET/CT is superior to traditional infectious scintigraphy, such as ^{111}In -WBC and Ga^{67} scans, because of the high resolution, sensitivity and accuracy for the detection of low-grade infection and infection of the complex skeleton [4]. In a large retrospective study to evaluate the role of FDG PET/CT in fever with unknown origin (FUO), FDG PET/CT was found to have the highest sensitivity for the tumor group (100 %), followed by the infection (89 %), arthritis, vasculitis (65 %) and unknown groups (0 %). FDG PET/CT is considered to be helpful in 51 % of cases [5]. FDG PET/CT has also been broadly applied to the search for the source of cardiovascular infection including vascular graft infection, mechanical valve infection, vasculitis, endocarditis, etc., and to monitoring of the effect of treatment, for example, for Takayasu's arteritis. A case of prosthetic valve dysfunction in repaired TOF revealed by FDG PET/CT has been reported [6]. The major disadvantage of FDG PET/CT in localizing

cardiac-related infection is the uptake of infection cannot always be reliably differentiated from the physiological uptake of the myocardium. Caution should be taken when interpreting positive PET findings in patients who have undergone recent surgery. Overall, FDG PET/CT has emerged as an effective alternative to the currently available diagnostic modalities for the evaluation of cardiac infection including endocarditis and infection of a prosthetic valve and conduit after TOF repair.

Compliance with Ethical Standards

Conflict of Interest Yuyang Zhang, Hadyn Williams and Darko Pucar declare that they have no conflict of interest.

Ethical Statement No institutional review board approval or the equivalent was required for the manuscript. There was no requirement of informed consent for the case report.

Funding No funding support of the project.

Fig. 2 Upon the completion of one cycle of antibiotics, there is an interval decrease of FDG uptake of the focus compared with the prior image without complete resolution

References

1. Dodo H, Child JS. Infective endocarditis in congenital heart disease. *Cardiol Clin*. 1996;14:383–92.
2. Millar BC, Prendergast BD, Alavi A, Moore JE. 18FDG-positron emission tomography (PET) has a role to play in the diagnosis and therapy of infective endocarditis and cardiac device infection. *Int J Cardiol*. 2013;167:1724–36.
3. Kouijzer IJ, Bleeker-Rovers CP, Oyen WJ. FDG-PET in fever of unknown origin. *Semin Nucl Med*. 2013;43:333–9.
4. Bleeker-Rovers CP, Boerman OC, Rennen HJ, Corstens FH, Oyen WJ. Radiolabeled compounds in diagnosis of infectious and inflammatory disease. *Curr Pharm Des*. 2004;10:2935–50.
5. Kubota K, Nakamoto Y, Tamaki N, Kanegae K, Fukuda H, Kaneda T, et al. FDG-PET for the diagnosis of fever of unknown origin: a Japanese multi-center study. *Ann Nucl Med*. 2011;25:355–64.
6. Yamasaki Y, Nagao M, Sakamoto I, Yonezawa M, Honda H. Prosthetic valve dysfunction in repaired tetralogy of Fallot: assessment by FDG-PET and 256-slice 4D-CT. *Eur Heart J Cardiovasc Imaging*. 2014;15:1303.