¹⁸Fluorine fluorodeoxyglucose positron emission tomography diagnosis of an aortic thoracic prosthesis infection by slow-growing bacteria

Geraldine Celine Bera, Patrick Farahmand, Françoise Cavailloles, Charlotte Lepoutre-lussey

ABSTRACT

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CASE REPORT

A 66-years-old male with a history of aortic root aneurysm and bicuspid aortic valve underwent aortic root replacement with a Bentall procedure in 2009. Four years later, he presented to the emergency department with a fever and general malaise. Serial blood cultures were negative and a transthoracic echocardiogram showed no evidence of vegetations or an aortic root abscess. Although there was no evidence to support a diagnosis of infective endocarditis (IE) empirical antibiotic therapy, comprising vancomycin, gentamicin and rifampicin, was commenced. Two weeks later, a ¹⁸fluorine-fluorodeoxyglucose positron emission tomography (¹⁸[F]-FDG PET) was performed under a diet (low-carbohydrate and high-fat during 24-hours) designed to suppress myocardial activity. One hour after

the injection of 295MBq of ¹⁸F-FDG radioisotope, 3 foci were highlighted around the aortic prosthesis ($SUV_{max} = 6$, graft-to-mediastinum ratio $SUV_{max} = 3.2$) (Figures 1–A, D, E) with additional uptake within mediastinal lymph adenopathies ($SUV_{max} = 2.6$) (Figure 1B). There was no pathological uptake noticed around the adjacent aortic valve prosthesis (Figure 1C). This result was highly suggestive of an infection of the aortic tubular prosthesis and so surgery was undertaken to replace the aortic tubular prosthesis with a mechanical valve. During surgery, macroscopic examination confirmed the presence of pus inside the envelope surrounding the prosthesis. Cultures were taken during the surgery and analysis via polymerase chain reaction revealed the growth of *Kingella kingae*, the fifth member of the HACEK (*Haemophilus*, *Aggregation bacter*, *Cardiobacterium hominis*, *Eikenella corrodens* and *Kingella species*) bacteria group.

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Figure 1: (A) Maximum intensity projection showing pathological mediastinal uptake and no uptake suggestive of septic emboli throughout the rest of the body, (B) Regional analysis of ¹⁸F-FDG uptakes point out on mediastinal lymphadenopathies, one on left latero-tracheal posterior area of upper mediastinum, (C, D) Typical uptake pattern around aortic thoracic prosthesis, and (E) Simultaneous computed tomography allow accurate localization.

DISCUSSION

The HACEK microorganisms, commensal residents of the oropharynx, are responsible for ~3% of cases of IE. They have an incidence of ~2–3 cases per 100,000 of population per annum and their mortality can reach up to 14%. These gram-negative bacilli are slow-growing, likely explaining the frequently negative blood cultures [1]. Diagnosis of cardiovascular prosthesis infections can be challenging with 30% having normal or inconclusive echocardiographic findings [2]. This often leads to a serious delay in instigating medical and, more importantly, surgical treatment. Saby et al. [2] have demonstrated that if used as a major criterion ^{18}F -FDG PET increased the sensitivity of the modified Duke classification from 80–97%, without compromising its specificity. Thoracic aortic prosthetic graft infection is particularly rare and associated with very high morbidity and mortality [3]. Its diagnosis by conventional imaging is difficult due to non-specific nature of the findings and the sensitivity of magnetic resonance imaging remains unclear [2–4]. This report shows a high added value of ^{18}F -FDG PET in the diagnosis of a sub-acute endocarditis even after fifteen days of a broad-spectrum antibiotic therapy. Focal ^{18}F -FDG uptake around the cardiovascular prosthesis has a sensitivity of 93%, specificity of 91%, positive predictive value of 88% and negative predictive value of 96% for the diagnosis of prosthetic vascular graft infection [4]. A non-homogeneous uptake pattern around the cardiovascular prosthesis is described as a poor diagnostic marker [4]. While SUV_{mean} and graft-to-mediastinum ratio represent the overall metabolic activity in the whole graft more accurately than SUV_{max} , [4] a $\text{SUV}_{\text{max}} > 8$ in the surrounding graft area has been described as a potential cut-off value for distinguishing infected from non-infected grafts with sensitivity and specificity of 100% and 80%, respectively [3].

CONCLUSION

This report illustrates that ^{18}F -FDG PET with a characteristic uptake pattern (focal uptake), a $\text{SUV}_{\text{max}} \geq 6$ and a graft-to-mediastinum ratio $\text{SUV}_{\text{max}} \geq 3.2$, allowed the detection of a cardiovascular prosthesis infection due to a slow-growing bacteria even following 2 weeks of antibiotic treatment.

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The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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