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18F-FDG-PET/CT in Staphylococcus aureus bacteraemia: an important diagnostic tool

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Background: Metastatic infection is an important complication of Staphylococcus aureus bacteraemia (SAB). Early diagnosis of metastatic infection is crucial, as specific treatment is required. However, metastatic infection can be asymptomatic and difficult to detect. 18F-fluorodeoxyglucose positron emission tomography combined with computed tomography (18F-FDG-PET/CT) has been described to improve the detection of these silent metastatic foci. In this study, we investigated the role of 18F-
FDG-PET/CT in patients with SAB for detection of metastatic infection and its consequences for treatment and outcome.

**Material/methods:** All patients with SAB at the Radboud university medical center were included between January 2013 and April 2016. Clinical data and results of $^{18}$F-FDG-PET/CT and other imaging techniques including echocardiography were collected. Data were analyzed for metastatic infection detection, treatment modification, and outcome. Primary outcomes were newly diagnosed metastatic infection by $^{18}$F-FDG-PET/CT, subsequent treatment modifications and outcome.

**Results:** A total of 184 patients were included, and $^{18}$F-FDG-PET/CT scans were performed in 105 patients. Of these 105 patients, 97 patients had a high risk bacteremia as defined previously. $^{18}$F-FDG-PET/CT detected metastatic infectious foci in 71.4% of patients. In 54/105 (51.4%) patients the $^{18}$F-FDG-PET/CT was the first imaging modality to detect metastatic infectious foci. Mortality at three months was higher in high risk bacteremia patients without $^{18}$F-FDG-PET/CT performed compared to those in whom $^{18}$F-FDG-PET/CT was performed (32.7% versus 12.4%, $p<0.05$). In a multivariate analysis, $^{18}$F-FDG-PET/CT was the only factor independently associated with reduced mortality. $^{18}$F-FDG-PET/CT led to a total of 106 treatment modifications in 75 patients: shorter treatment duration in 25 patients, surgical or radiological intervention in 19 patients, prolonged intravenous antibiotic therapy in 16 patients, addition of a second drug in 10 patients and extension of total treatment duration in 36 patients.

**Conclusions:** $^{18}$F-FDG-PET/CT is a valuable technique for early detection of metastatic infectious foci, treatment optimisation and associated with significantly reduced three-month mortality.
Figure 1. Transversal ¹⁸F-FDG-PET/CT images at the level of the celiac trunk (left) and maximum intensity projection (MIP) image (right) of a 60-year-old man who was admitted because of a septic arthritis of his right knee.

Blood cultures grew methicillin-susceptible Staphylococcus aureus. A transesophageal echocardiography was negative for endocarditis. Besides an arthritis of his right knee ¹⁸F-FDG-PET/CT also showed a mycotic aneurysm of the celiac trunk and multiple small abscesses in liver and spleen. This patient underwent a surgical repair of the celiac trunk and was successfully treated with flucloxacillin intravenously for six weeks after surgery.