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Original Article

C-reactive protein levels can predict positive ^{18}F-FDG PET/CT findings that lead to management changes in patients with bacteremia

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Abstract *Background/purpose:* Bacteremia portends high rates of morbidity and mortality. Although ^{18}F-fluorodeoxyglucose positron emission tomography and computed tomography (^{18}F-FDG PET/CT) imaging has clinical value in assessing fever of unknown origin, its usefulness in bacteremia has not been entirely elucidated. We therefore designed the current single-center retrospective study to investigate 1) the clinical value of ^{18}F-FDG PET/CT imaging in assessing bacteremia and 2) the association between laboratory data and imaging findings.
Methods: We examined 102 patients with bacteremia who had undergone ^{18}F-FDG PET/CT imaging. The patients' clinical and laboratory data were reviewed and analyzed in relation to ^{18}F-FDG PET/CT findings. Patients showing positive results underwent quantitative measurements of ^{18}F-FDG uptake.
Results: Positive ^{18}F-FDG PET/CT findings were identified in 74 (72.5%) patients, and 40 (54.1%) underwent modified treatment or management because of the imaging results ($p = 0.003$). Positive ^{18}F-FDG PET/CT findings were significantly associated with higher white blood cell

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(WBC) counts and C-reactive protein (CRP) levels ($p = 0.012$ and < 0.001, respectively). Notably, CRP levels accurately predicted (area under curve = 0.752; $p < 0.001$) positive ^{18}F-FDG PET/CT findings (optimal cut-off point: 54.025 mg/L).

Conclusion: A majority (54.1%, n = 40) of the patients with positive ^{18}F-FDG PET/CT results underwent treatment modifications; they accounted for most cases (87%) of management changes in our cohort. Leukocytosis and increased CRP levels are significantly associated with positive ^{18}F-FDG PET/CT findings in patients with bacteremia. CRP levels >54.025 mg/L were accurate predictors of positive ^{18}F-FDG PET/CT results.

Introduction

Bacteremia—defined as the presence of bacteria in the bloodstream—remains a major cause of morbidity and mortality despite advances in supportive care and the availability of broad-spectrum antibiotics. Bacteremia invariably represents dissemination from a primary infection focus. Thus, prompt identification of an originally occult focus of infection is desirable and may significantly reduce mortality.[1]

Even there were some parameters or bacteria carrying specific gene could provide as a prognosis factor. For example, in cases of monomicrobial *Pseudomonas aeruginosa* bacteremia, a short time-to-positivity (TTP) (≤13 h) provides prognostic information,[2] and for patients with *Citrobacter freundii* bacteremia, carrying the bla_{TEM-1} resistance gene was an independent risk factor for 28-day mortality.[3] Imaging studies are clinically valuable to localize an unknown focus of infection in patients with bacteremia. ^{18}F-fluorodeoxyglucose positron emission tomography and CT (^{18}F-FDG PET/CT) imaging offers significant advantages over computed tomography (CT), including 1) no risk of contrast-induced nephropathy and 2) the ability to facilitate whole-body scanning in a unique investigation. Despite its higher costs, the usefulness of ^{18}F-FDG PET/CT imaging for identifying occult foci of infection has been previously demonstrated in patients with sepsis of unknown origin and in those with end-stage renal disease (ESRD) undergoing maintenance hemodialysis.[4,5] Another study has shown that ^{18}F-FDG PET/CT imaging can identify foci of metastatic dissemination in patients with methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia.[6] Although recent guidelines suggest that ^{18}F-FDG PET/CT can be used to evaluate metastatic infections in high-risk patients with bacteremia,[7] the optimal timing for its use in this clinical context remains unclear. Moreover, reliable biomarkers that may guide the decision to perform such imaging examinations are still lacking.

To address these questions, we designed the current single-center retrospective study that aimed to investigate 1) the clinical value of ^{18}F-FDG PET/CT imaging in patients with bacteremia and 2) the association between laboratory data and imaging findings. Patients with positive results underwent quantitative measurements of ^{18}F-FDG uptake.

Methods

Setting

This retrospective study was conducted at the Chang Gung Memorial Hospital (CGMH) at Linkou—a 3715-bed university-affiliated tertiary-care Taiwanese medical center with 308 intensive care unit beds. The study protocol was approved by the Institutional Review Board of the CGMH at Linkou (number 104—7091C).

Patient selection and data collection

Between January 1, 2016 and December 31, 2016, we identified a total of 102 patients with bacteremia who underwent 18F-FDG PET/CT imaging within one week of diagnosis. Patients with known malignancies and/or serum glucose levels ≥200 mg/dL before 18F-FDG injection were excluded. The following data were collected from clinical records: age, sex, sources of bacteremia, blood isolates, sequential organ failure assessment (SOFA) scores, laboratory and imaging findings, antimicrobial treatment, and clinical outcomes. The presence of comorbidities, including diabetes mellitus (DM), hepatic cirrhosis, ESRD, chronic obstructive pulmonary disease (COPD), and cerebral vascular disease (CVD), was investigated on admission in all participants.

Definitions

Polymicrobial bacteremia was considered to be present in patients who showed at least two different bacterial isolates in blood cultures. In keeping with the recommendations of the Society of Critical Care Medicine (SCCM) and the European Society of Intensive Care Medicine (ESICM), sepsis was defined by an increase of at least two points in the SOFA score.[8] Septic shock was considered to be present in patients with a SOFA score ≥ 2 who required a vasopressor and showed lactate levels > 22 mmol/L (>18 mg/dL) despite adequate fluid resuscitation.[8]

Positive ^{18}F-FDG PET/CT findings were classified in relation to the affected organ/tissue systems as follows: vertebral osteomyelitis/spondylodiscitis, arthritis/joint prosthesis infections, non-vertebral osteomyelitis, skin and soft tissue infections, psoas abscess, lung/spleen/liver/

gallbladder/biliary tract/kidney infections, endocarditis/endovascular infections, and pericarditis/mediastinitis. ^{18}F-FDG PET/CT findings were considered negative in presence of the following criteria: 1) unidentifiable focus of primary infection and/or 2) other findings that were not supportive of the presence of an infection in any of the anatomical districts listed above.

PET/CT acquisition, processing, and interpretation

All of the ^{18}F-FDG PET/CT scans were performed on a Biograph mCT PET/CT system (Global Siemens Healthcare, Erlangen, Germany) 60 min after intravenous injection of 18F-FDG (dose range: 370–444 MBq; 10–12 mCi). All patients were required to fast for at least 6 h before the examination. Patients with type 1 DM were scheduled to undergo their scan at noon and were given an adequate dose of insulin before starting their fast. Patients were imaged from the head to the mid-thigh, the only exception being patients with lower limb coinfections or peripheral artery disease (who underwent whole-body scanning). CT data were used for both attenuation correction and fusion with attenuation-corrected PET images. All of the images (PET, CT, and PET/CT) were displayed in the axial, coronal, and sagittal views. PET data were also displayed in a rotating maximum intensity projection. Areas of ^{18}F-FDG activity that were of greater intensity than the background uptake were considered as positive lesions. Quantification of metabolic activity was performed on PET images. Volumes of interest (VOIs) of different shapes and sizes were drawn manually to avoid margins and adapted to different organs and tissues. VOIs were mainly defined on PET images using CT data for reference. The mean hepatic standardized uptake value (SUV) was obtained by averaging ^{18}F-FDG uptake values measured on VOIs (volume: 20–50 cm^3) positioned at the center of the left and right liver lobes. The mean splenic SUV was calculated by averaging ^{18}F-FDG uptake values measured on three elliptical VOIs (volume: 4–8 cm^3) located in different parts of the organ. The mean muscle SUV was obtained by averaging ^{18}F-FDG uptake values measured on elliptical VOIs located in the right and left shoulder muscles (volume: 25–50 cm^3), in both the psoas muscles (volume: 5–10 cm^3), and in the right and left gluteal muscles (volume: 25–50 cm^3). The mean bone marrow SUV was determined by averaging the ^{18}F-FDG uptake values measured on elliptical VOIs located in both the iliac crests (volume: 2–5 cm^3) and spherical VOIs (volume: 1–1.5 cm^3) for the lumbar vertebral body. In the presence of compression or extensive spondylosis, this value was excluded. The mean adrenal gland SUV was calculated by averaging ^{18}F-FDG uptake values measured on elliptical VOIs (volume: 1–1.5 cm^3) located bilaterally in the adrenal glands. A team of two experienced nuclear medicine physicians manually delineated all VOIs and interpreted all images. Any discrepancies were resolved through a consensus.[9]

Statistical analysis

Categorical variables are expressed as counts and percentages and analyzed with the χ^2 test or the Fisher's exact test, as appropriate. Continuous variables are expressed as medians and ranges and compared using the Mann–Whitney *U* test. Correlations between continuous variables were tested using the Spearman's rank correlation coefficient. Receiver operating characteristic (ROC) curve analysis was applied to investigate the prediction accuracy. Optimal cut-off points that maximized prediction were determined using the Youden's index. All calculations were performed using the SPSS statistical software (version 22.0; IBM, Armonk, NY, USA). Two-tailed p values < 0.05 were considered statistically significant.

Results

The general characteristics of patients with bacteremia stratified according to positive or negative ^{18}F-FDG PET/CT findings are summarized in Table 1. The two groups did not differ significantly in terms of sex, sepsis, mortality rate, and comorbidities (including hypertension, CVD, coronary artery disease, chronic kidney disease, ESRD, hepatic cirrhosis, and COPD), although the negative ^{18}F -FDG-PET findings group showed a significantly higher percentage of DM ($p = 0.004$). Forty-six patients (45.1%) underwent changes in their clinical management because of ^{18}F-FDG PET/CT findings, mainly because of positive results (n = 40, 87%; $p = 0.003$; Table 1). The detailed ^{18}F-FDG PET/CT positive results are listed in Table 2.

Of the 102 study patients, 54 (52.9%) had Gram-positive bacteremia; 41 (40.2%), Gram-negative bacteremia; and 7 (6.9%), polymicrobial bacteremia. Methicillin-susceptible *S. aureus* (MSSA) was the most commonly isolated pathogen (n = 28, 27.5%), whereas MRSA infections were identified in only seven patients (6.9%). The second and third most commonly isolated species were *Escherichia coli* (n = 14, 13.7%) and *Klebsiella pneumoniae* (n = 10, 9.8%), respectively. Streptococcal infections were identified in 12 patients (11.8%) as follows: group B beta-haemolytic streptococci (n = 5), *Streptococcus gallolyticus* (n = 2), *Streptococcus oralis* (n = 1), *Streptococcus anginosus* (n = 1), *Streptococcus mitis* (n = 1), *Streptococcus pneumoniae* (n = 1), and *Streptococcus salivarius* (n = 1). Other isolated species included *Salmonella enterica* group D (n = 4; 3.9%), *P. aeruginosa* (n = 3; 2.9%), *Enterococcus faecalis* (n = 3; 2.9%), *Serratia marcescens* (n = 2; 2.0%), and some rare pathogens (i.e., *Abiotrophia defectiva, Acinetobacter baumannii, Aggregatibacter aphrophilus, Bacteroides thetaiotaomicron, Bacillus cereus, Enterobacter cloacae, Enterobacter aerogenes, Listeria monocytogenes, Pantoea* spp., and *S. enterica* group E). Each of these strains was isolated in one patient only.

We found significant associations between positive results on ^{18}F-FDG PET/CT and both higher white blood cell (WBC) counts and C-reactive protein (CRP) levels ($p = 0.012$ and < 0.001, respectively). In contrast, we failed to identify associations with platelet count, serum creatinine, alanine aminotransferase, and bilirubin levels, although a borderline significant difference for lower hemoglobin concentrations was evident ($p = 0.082$). Through procalcitonin level had showed reasonable discriminative power in predicting of bloodstream infection in burn patients.[10] In this retrospective study, we could not collect enough data for analysis

Table 1 Baseline characteristics of patients with bacteremia showing positive or negative ^{18}F-FDG-PET/CT findings.

Variable, n (%)	Entire cohort (n = 102)	Positive findings (n = 74)	Negative findings (n = 28)	*p*-value
Male sex	59 (57.8)	40 (54.1)	19 (67.9)	0.208
Age (years), median (range)	65 (6–94)	63.5 (6–94)	74 (28–91)	0.134
Gram-positive bacteremia	54 (52.9)	42 (56.7)	12 (42.9)	0.209
Gram-negative bacteremia	41 (40.2)	27 (36.5)	14 (50.0)	0.214
Polymicrobial bacteremia	7 (6.9)	5 (6.8)	2 (7.1)	0.945
Comorbidities				
- Diabetes mellitus	39 (38.2)	22 (29.7)	17 (60.7)	0.004*
- Hypertension	45 (44.1)	30 (40.5)	15 (53.6)	0.237
- Cerebrovascular disease	14 (13.7)	7 (9.5)	7 (25)	0.042
- Coronary artery disease	8 (7.8)	5 (6.8)	3 (10.7)	0.681
- Chronic kidney disease	9 (8.8)	6 (8.1)	3 (10.7)	0.703
- End-stage renal disease	13 (12.8)	12 (16.2)	1 (3.6)	0.107
- Liver cirrhosis	15 (14.7)	12 (16.2)	3 (10.7)	0.755
- Chronic obstructive pulmonary disease	7 (6.9)	4 (5.4)	3 (10.7)	0.559
Sepsis (according to the SOFA score)	27 (26.5)	21 (28.4)	6 (21.4)	0.478
Septic shock (according to the SOFA score)	5 (4.9)	4 (5.4)	1 (3.6)	>0.999
Change in clinical management after ^{18}F-FDG PET/CT imaging	46 (45.1)	40 (54.1)	6 (21.4)	0.003*
- Arrangement of other imaging studies	29 (28.4)	25 (33.8)	4 (14.3)	0.051
- Changes in antibiotic treatment	8 (7.8)	5 (6.8)	3 (10.7)	0.681
- Escalation of antibiotic treatment	3 (2.9)	3 (4.1)	0	0.560
- De-escalation of antibiotic treatment	5 (4.9)	2 (2.7)	3 (10.7)	0.126
- Surgery after imaging	6 (5.9)	5 (6.8)	1 (3.6)	>0.999
- Drainage after imaging	5 (4.9)	5 (6.8)	0	0.319
Mortality rate	7 (6.9)	6 (8.1)	1 (3.6)	0.670

*p value < 0.05. Abbreviation: SOFA, sequential organ failure assessment.

because procalcitonin level is not a routine test in patients with bacteremia. The laboratory parameters of patients with bacteremia showing positive or negative ^{18}F-FDG-PET/CT findings are listed in Table 3.

Table 2 Detailed ^{18}F-FDG PET/CT results in patients with bacteremia.

Type and/or localization of the detected lesion	Number of patients (%)
Vertebral osteomyelitis/spondylodiscitis	21 (20.6)
Arthritis/joint prosthesis	8 (7.8)
Non-vertebral osteomyelitis	5 (4.9)
Skin and soft tissue	7 (6.9)
Psoas abscess	1 (1)
Lung	21 (20.6)
Spleen	0 (0)
Liver/gallbladder/biliary tract	4 (3.9)
Kidney	1 (1)
Endocarditis/endovascular infection	6 (5.9)
Pericarditis/mediastinitis	0 (0)
Negative findings [a]	28 (27.5)
Entire cohort	102 (100)

[a] Negative ^{18}F-FDG-PET/CT findings were considered to be present in patients without any obvious infection focus or in those with other findings not suggestive of infections in any of the anatomical locations listed above.

We then analyzed the correlations between the mean SUV values measured on ^{18}F-FDG PET/CT images at the liver, spleen, bone marrow, muscle, and adrenal gland sites and the 1) WBC counts, 2) CRP levels, and 3) hemoglobin concentrations (Table 4). CRP levels were positively associated with mean SUV values measured at the spleen and muscle levels ($p = 0.038$ and 0.023, respectively). A similar trend was seen for higher WBC counts, albeit not significantly so ($p = 0.054$ and 0.072, respectively). In contrast, hemoglobin concentrations did not show any significant association with spleen, muscle, liver, adrenal gland, and bone marrow SUV values.

Finally, ROC curve analysis revealed that CRP levels accurately predicted (area under curve = 0.752, $p < 0.001$; Fig. 1) positive ^{18}F-FDG PET/CT findings (optimal cut-off point: 54.025 mg/L).

Discussion

Identification of occult focal sites of infection is paramount for the management of bacteremia of unknown origin. Accordingly, precise localization of these sites may reduce morbidity, relapse rates, and mortality through different mechanisms (e.g., prolongation of antibiotic treatment, switching between different antibiotics, abscess drainage, or surgical intervention).[5] Previous studies have shown that an increased ^{18}F-FDG uptake on ^{18}F-FDG PET/CT images (which mainly reflects enhanced glycolysis and

Table 3 Laboratory parameters of patients with bacteremia showing positive or negative ^{18}F-FDG-PET/CT findings.

Variable, median (range)	Positive findings (n = 74)	Negative findings (n = 28)	*p*-value
White blood cells (1000/μL)	13.4 (2–27)	10.75 (2.9–19.4)	0.012*
Hemoglobin (g/dL)	11.55 (4.8–16.1)	11.85 (7.3–16.2)	0.082
Platelet count (1000/μL)	173 (18–415)	171.5 (61–442)	0.705
C-reactive protein (mg/L)	135.4 (0.7–405.4)	35.2 (1.6–262.89)	<0.001*
Creatinine (mg/dL)	1.18 (0.2–11.7)	1.16 (0.46–8.9)	0.616
Alanine aminotransferase (U/L)	25.5 (5–313)	20 (9–737)	0.471
Total bilirubin (mg/dL)	1.1 (0–9.1)	0.95 (0.3–2.2)	0.408

*p value < 0.05.

Table 4 Correlations between SUV values in different anatomical districts (as measures of ^{18}F-FDG uptake) and laboratory parameters.

		Spleen	Muscle	Liver	Adrenal glands	Bone marrow
White blood cells	Correlation	0.230	0.215	0.071	0.147	0.101
	p-value	0.054	0.072	0.554	0.222	0.400
Hemoglobin	Correlation	−0.017	−0.121	−0.190	0.051	0.103
	p-value	0.885	0.313	0.113	0.673	0.392
C-reactive protein	Correlation	0.273	0.299	−0.178	0.092	0.140
	p-value	0.038[a]	0.023[a]	0.182	0.491	0.296

[a] Spearman's rank correlation coefficient, p value < 0.05.

overexpression of glucose transporters in inflammatory cells) may be useful as an imaging biomarker in several inflammatory and infectious disorders.[11,12] In our study cohort, ^{18}F-FDG PET/CT imaging could identify the infection source in 74 of 102 patients (72%), a detection rate much higher than that obtained when the traditional Gallium 67-citrate scan (21%) and CT scan (14%) were used for the same purpose.[13,14]

Forty-six of the 102 study patients underwent changes in their clinical management on the basis of ^{18}FDG PET/CT findings, mainly (87%, n = 40) because of positive results. Although patients with and without positive PET findings did not show differences in their mortality rate, the patient group with positive findings included 13 patients who received more aggressive management including antibiotic escalation, surgery, and drainage. Instead, among patients showing negative PET imaging findings, most patients received maintenance therapy or de-escalated antibiotic therapy. Only one patient who was eventually found to have brain abscess underwent an operation. As for patients who showed positive PET findings but did not undergo any management modifications, this could be attributable to the lack of a need to change the treatment strategies, such as in infective spondylodiscitis without paraspinal abscess formation or neurological compression signs, incidental finding of early pneumonia from PET without clinical condition deterioration, or uncomplicated skin and soft tissue infections.

Interestingly, we found significant associations between positive ^{18}F-FDG PET/CT findings and both higher WBC counts and CRP levels. Because leukocytosis and increased CRP concentrations are well-known indicators of acute inflammation, their association with positive ^{18}F-FDG PET/CT findings is not surprising.[15]

A further aim of our study was to investigate the associations between mean SUV values in different anatomical districts and laboratory findings in patients with positive ^{18}F-FDG PET/CT results. We identified significant positive correlations between CRP concentrations and mean splenic and muscle SUV values ($p = 0.038$ and 0.023, respectively; Fig. 2). The spleen—the largest lymphoid organ—is a site of continuous interaction between immune cells. It has been

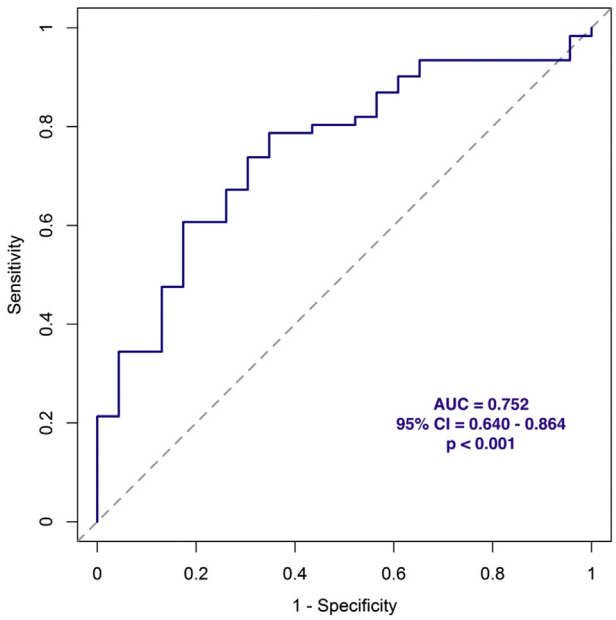

Figure 1. Receiver operating characteristic curve of C-reactive protein levels for the prediction of ^{18}F-FDG PET/CT positivity (comparison with an AUC OF 0.5).

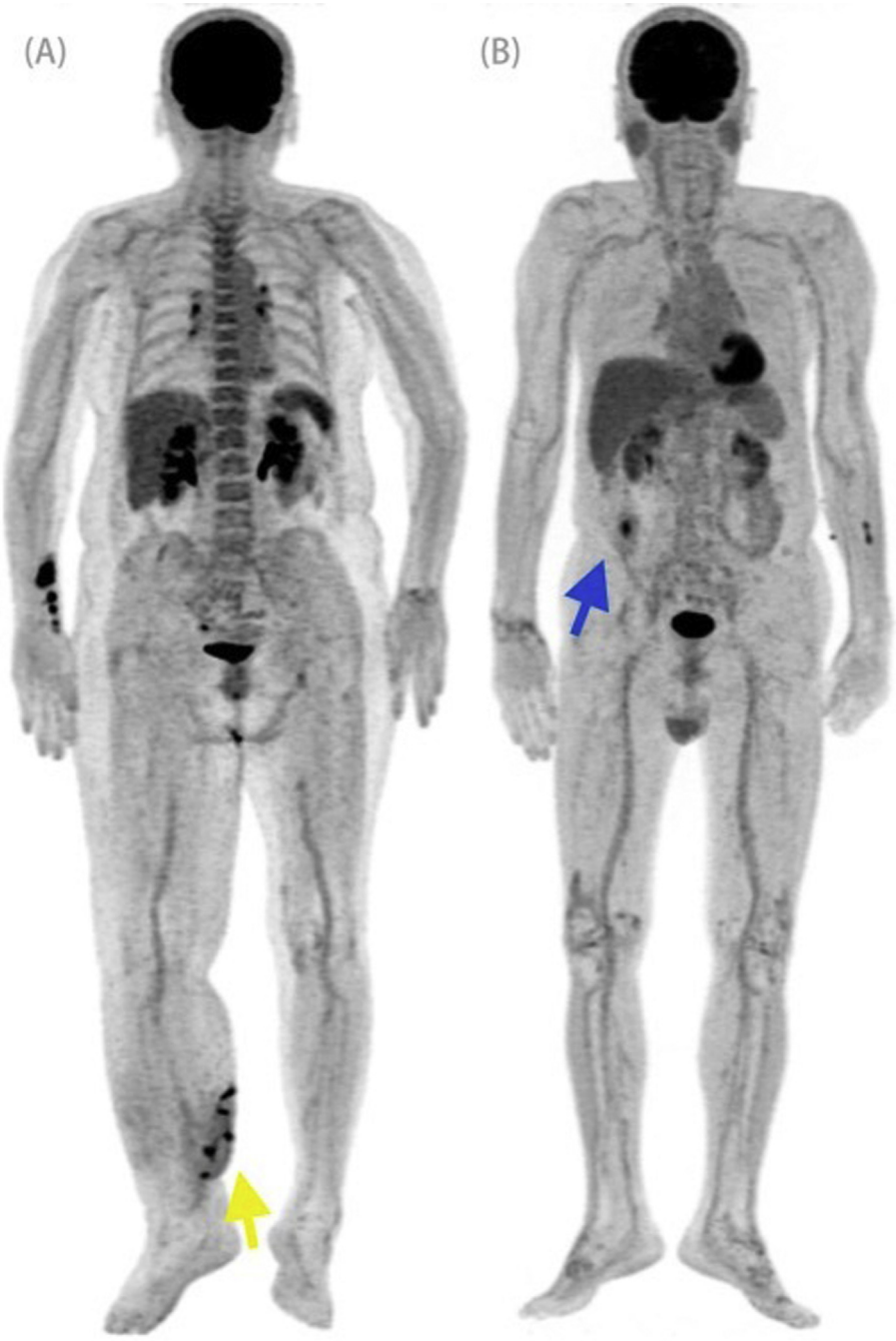

Figure 2. ^{18}F-FDG PET coronal views of two patients with positive findings and different spleen FDG uptake intensities. (A) A 67-year-old female patient presented with high CRP levels (75 mg/L) at admission. ^{18}F-FDG PET revealed prominent splenic uptake accompanied by avid focal ^{18}F-FDG uptake in the right calf (yellow arrow). (B) A 73-year-old male patient presented with low CRP levels (2.6 mg⁄L) at admission. The splenic uptake of ^{18}F-FDG was less prominent than that observed in the liver; in addition, focal ^{18}F-FDG uptake in the right ascending colon was evident (blue arrow).

previously shown that ^{18}F-FDG uptake may be clinically useful to assess spleen immunometabolism in systemic inflammation.[16] Moreover, the monitoring of spleen energy metabolism is valuable for assessment of disease activity in systemic inflammatory disorders, as well as in guiding metabolism-targeted therapy.[17] However, no published studies to date have specifically focused on the significance of spleen ^{18}F-FDG uptake in patients with bacteremia. Skeletal muscle ^{18}F-FDG uptake can occur in either physiological conditions or in a variety of different disorders.[18] Further studies are necessary to investigate the clinical implications of the positive associations between CRP levels and ^{18}F-FDG uptake in the spleen and skeletal muscles.

From the previous literature, neither DM nor hyperglycemia were considered as contraindications for ^{18}F-FDG PET/CT in patients with infection.[19] Moreover, mild to

Table 5 Relationship between positive ^{18}F-FDG PET/CT imaging findings and changes in management protocols sub-grouped by the optimal CRP cut-off point.

CRP value[a]	N (%)	Finding of ^{18}F-FDG PET/CT imaging	N (%)	Management modified	N (%)
>54.025 mg/L	56 (66.7%)	Positive	48 (85.7%)	Yes	26 (54.2%)
				No	22 (45.8%)
		Negative	8 (14.3%)		
<54.025 mg/L	28 (33.3%)	Positive	13 (46.4%)	Yes	6 (53.8%)
				No	7 (46.2%)
		Negative	15 (53.6%)		

[a] CRP data for 18 patients could not be recorded at the time of the FDG PET/CT exam; CRP, C-reactive protein.

moderate hyperglycemia will not decrease the sensitivity of lesion detection in this technique.[20] Thus, only patients with blood glucose levels higher than 200 mg/dL were excluded from our cohort analysis.

The decision to perform ^{18}F-FDG PET/CT imaging in clinical practice remains problematic. Our present results demonstrate that CRP levels accurately predicted positive ^{18}F-FDG PET/CT findings (optimal cut-off point: 54.025 mg/L, sensitivity: 78.7%, specificity: 65.2%). Interestingly, a previous report has shown that increased CRP concentrations are an independent marker of severity in community-acquired pneumonia.[21] Based on the current data, we hypothesize that increased CRP concentrations may also serve as a laboratory biomarker to guide the decision to perform ^{18}F-FDG PET/CT imaging in patients with bacteremia. Although WBC counts also reached significance in ROC curve analysis (area under the curve = 0.662, $p = 0.012$), their optimal cut-off point (13,900/μL) showed lower sensitivity (47.3%) when compared to the cut-off CRP level (54.025 mg/L; 78.7%). Since the goal of setting a cut-off value was to predict positive findings for ^{18}F-FDG PET/CT imaging as frequently as possible under acceptable conditions, we only suggest the optimal CRP cut-off point in our study.

Table 5 lists the relationship between positive 18F-FDG PET/CT imaging findings and changes in clinical management sub-grouped by optimal CRP cut-off points. The findings show a significant possibility of positive scan findings in patients with CRP levels greater than 54.025 mg/L (85.7% vs. 46.4%, $p < 0.001$). However, actual changes in clinical management are still based on imaging findings because the rate of management change was not different in the subgroups divided by the optimal CRP cut-off value.

Some limitations of our study merit comment. First, our study design was retrospective and had a relatively small sample size (n = 102), potentially resulting in reduced statistical power. Second, generalizations from this observational study should be made with caution, as data were based on a single-center experience. Third, we acknowledge that ^{18}F-FDG PET/CT imaging was performed at the attending physician's discretion, potentially resulting in a selection bias. Finally, this study was not specifically designed to assess the cost-effectiveness of ^{18}F-FDG PET/CT in patients with bacteremia. However, there is evidence to suggest that changes in clinical management elicited by abnormal findings on ^{18}F-FDG PET/CT may be cost-effective.[22]

In conclusion, the results of our study indicate that leukocytosis and increased CRP levels are significantly associated with positive ^{18}F-FDG PET/CT findings in patients with bacteremia. A CRP level >54.025 mg/L was an accurate predictor of positive ^{18}F-FDG PET/CT results. More than half (54.1%, n = 40) of the patients with positive ^{18}F-FDG PET/CT results underwent treatment modifications; these patients accounted for most cases (87%) of management changes in our cohort. ^{18}F-FDG PET/CT may be indicated under specific scenarios to achieve the maximum clinical impact.

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