Hybrid imaging of cardiovascular infections

Mª José García Velloso
Servicio de Medicina Nuclear
Clínica Universidad de Navarra
Spain

Millar BC. International J Cardiol. 2013

\( ^{18} \text{FDG}-\text{positron emission tomography (PET) has a role to play in the diagnosis and therapy of infective endocarditis and cardiac device infection} \)

B. Cerie Millar, Bernard D. Prendergast, Abass Alavi, John E. Moore
APPLICATION of FDG PET/CT:
- Infective endocarditis
- Vascular graft infection
- CIED infection
- Emboli
- Metastatic infection
- Monitoring of therapeutic treatment of IE

<table>
<thead>
<tr>
<th>Topic of paper</th>
<th>No. of sources</th>
<th>Type of paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vascular &amp; infected cardiac infection</td>
<td>12</td>
<td>Case report</td>
</tr>
<tr>
<td>Endocardial valve infection</td>
<td>1</td>
<td>Retrospective study</td>
</tr>
<tr>
<td>CIED device infection</td>
<td>7</td>
<td>Case report</td>
</tr>
<tr>
<td>Metastatic infection</td>
<td>3</td>
<td>Original study</td>
</tr>
<tr>
<td>Complications associated with IE (emboli &amp; metastatic infection)</td>
<td>1</td>
<td>Case report</td>
</tr>
<tr>
<td>Basic Science (an animal model to study IE)</td>
<td>1</td>
<td>Original study</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td></td>
</tr>
</tbody>
</table>
Detection of aortic graft infection by FDG-PET: Comparison with CT findings

Prospective, 33 patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>CT findings</th>
<th>Positive/negative</th>
<th>Good/not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>0.84 (0.68-0.88)</td>
<td>0.93 (0.81-1.00)*</td>
<td>0.91 (0.81-1.00)*</td>
</tr>
<tr>
<td>Specificity</td>
<td>0.86 (0.74-0.98)</td>
<td>0.64 (0.48-0.80)</td>
<td>0.95 (0.88-1.03)*</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.79 (0.65-0.93)</td>
<td>0.73 (0.58-0.88)</td>
<td>0.94 (0.86-1.02)</td>
</tr>
<tr>
<td>PPV</td>
<td>0.70 (0.54-0.86)</td>
<td>0.50 (0.39-0.63)</td>
<td>0.91 (0.81-1.01)*</td>
</tr>
<tr>
<td>NPV</td>
<td>0.83 (0.70-0.96)</td>
<td>0.93 (0.84-1.02)</td>
<td>0.95 (0.88-1.02)</td>
</tr>
</tbody>
</table>

Table III. Diagnostic performances of CT and FDG-PET for differentiation between infected and noninfected vascular grafts.
Femoropopliteal bypass graft

Prospective, 39 patients

S: 93% - Sp: 91% - PPV: 88% - NPV: 96%

Infected surgical wound

Prosthetic Vascular Graft Infection: The Role of $^{18}$F-FDG PET/CT

47-year-old male. Dissection of the thoracic aorta. Aortic valve replacement (metal prosthesis) and implementation of two tubes of aortic Dacron.
Septic pulmonary embolisms and metastatic infections from methicillin-resistant *Staphylococcus aureus* endocarditis on FDG PET/CT

In 11/25 (44%) of cases, FDG detected a clinically occult focus.

18F-FDG PET/CT diagnosis of unexpected extracardiac septic embolisms in patients with suspected cardiac endocarditis

17/71 (24%) of cases, leading to changes in therapeutic management.

High $^{18}$F-FDG Uptake in Synthetic Aortic Vascular Grafts on PET/CT in Symptomatic and Asymptomatic Patients

Retrospective, 16 patients

Leukocyte scintigraphy

FDG uptake in 15/16 vascular grafts without graft infection
Diagnostics of “non-acute” vascular prosthesis infection using $^{18}$F-FDG PET/CT: our experience with 96 prostheses

Prospective, 76 patients: focal FDG uptake and irregular graft boundary - Acc>95%
Univ. Groningen - Bruggink JLM. Eur J Vasc Endovasc Surg 2010

Accuracy of FDG-PET–CT in the Diagnostic Work-up of Vascular Prosthetic Graft Infection

Retrospective, 25 patients, 15 had a proven infection – S:93% – Sp:70%

Visual scale:
1. Background
2. Low
3. Moderate
4. High

71-year-old man
Fever
Bacteriemia S. aureus
FDG PET/CT: mitral valve

65-year-old man
Fever
group B Streptococcus bacteraemia
FDG PET/CT: aortic valve


The value of 18F-FDG PET/CT in diagnosing infectious endocarditis

Standard patient preparation:
Sensitivity: 39%
Specificity: 93%

71-year-old man
Fever
Bacteriemia S. aureus
FDG PET/CT: mitral valve

65-year-old man
Fever
group B Streptococcus bacteraemia
FDG PET/CT: aortic valve
FDG PET/CT: VARIABLE CARDIAC UPTAKE

Preadministration of unfractionated heparin: 45 min before F18-FDG injection (50 IU/kg)
Preadministration of unfractionated heparin: 45 min before F18-FDG injection (50 IU/kg)
**CONCLUSIONS:**
1) Clinical evaluation, laboratory tests and EC
2) FDG PET/CT could help in unclear cases
3) Total body examination: distant infective foci
4) SUV to assess therapy response

**PROTOCOL:**
- The day before imaging: a very-low-carbohydrate, high-fat diet and then to fast overnight.
- 45 min before F18-FDG injection: a high-fat, low-carbohydrate beverage.

---

**LETTER TO THE EDITOR**

**Factors influencing the sensitivity of \(^{18}\)F-FDG PET/CT in the detection of infective endocarditis**

**Giorgio Treglia, Francesco Bertagna**

**PROTOCOL:**
- The day before imaging: a very-low-carbohydrate, high-fat diet and then to fast overnight.
- 45 min before F18-FDG injection: a high-fat, low-carbohydrate beverage.

**CONCLUSIONS:**
1) Clinical evaluation, laboratory tests and EC
2) FDG PET/CT could help in unclear cases
3) Total body examination: distant infective foci
4) SUV to assess therapy response