PET/CT for Infection. What is the Evidence?

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FDG accumulation

- Infection
- Inflammation
- Autoimmune diseases
- Granulomatous diseases
  - Inflammatory cells produce an excess of glycolytic enzymes and over-express glucose transporter GLUT-1 and GLUT-3.
  - Decreased uptake by hyperglycemia
Respiratory Infections

• Inflammatory response to low-dose endotoxin: 18 volunteers, quantified (FDG)

• Bleomycin Toxicity: One of the main causes of death in HD treated with ABVD

• Multiple myeloma: 99/165 infections
Axial unenhanced CT image with lung windows (A) in a 29 y/o woman with Hodgkin’s disease after Bleomycin-containing chemotherapy shows prominent interstitial changes in both lower lobes (arrows). Corresponding axial PET image (B) shows increased FDG activity in both lungs, predominantly in the posterior aspect of both lower lobes. Diffusely increased FDG uptake is seen in both lungs (arrows) in the coronal PET MIP image (C), as well as in the bone marrow due to use of colony-stimulating factors.

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(continued)
After 4 cycles ABVD

After 2 cycles AVD
Fungal Infections

- Pulmonary Cryptococcosis: > SUV on delay

- Invasive mold infections

- Candida lung Abscess

- Invasive aspergillosis
60 year old patient with CLL

• Previously treated with chemotherapy
• 3 months post allogenic marrow transplant
• No fever, no neutropenia
• Follow up evaluation
CT one month before PET
A cell block preparation shows fungal hyphae with a wide width and no septa (suggesting Mucor), but fungal forms thinner in profile and displaying 45 degree branching are seen on the direct smears and GMS stain (suggesting Aspergillus).
Therapy

• After intolerance to amphotericin B
• Patient treated with posaconazole for five months.
Abdominal infections, FUO

- FDG PET contributes to final diagnosis in 25-69% of cases
- FUO – infections, autoimmune, collagen vascular disease or neoplasm
- IBD, sarcoidosis, vasculitis, thyroiditis
Musculoskeletal

Psoas abscess

Axial unenhanced CT (A) and axial dynamic LAVA MRI (B) images show an abscess involving the right psoas muscle (arrows). Corresponding axial (C) and coronal (D) fused PET CT images show ring-like increased FDG activity, with a maximum SUV of 14.4.
Abdomen

Perihepatic abscess

Axial contrast-enhanced CT image (A) in a 71 y/o man shows a peripherally enhancing subcapsular fluid collection (arrow). Ring-like increased FDG uptake is noted in the corresponding axial (B) and coronal (C) fused PETCT images (arrows), with a maximum SUV of 11.3.

(continued)
Abdomen

Perihepatic abscess

Axial (D) and coronal (E) fused PET CT images after treatment of abscess with percutaneous drainage show interval resolution of abnormal FDG uptake.
Pelvis

Inflammatory bowel disease (Crohn’s disease)

Axial unenhanced CT image (A) in a 63 y/o woman with active Crohn’s disease shows diffuse wall thickening in the sigmoid colon (arrow). Corresponding axial fused PET CT image (B) shows intense FDG activity with a maximum SUV of 14.0 (arrow). Involvement of the colon is evident in the coronal PET MIP image (C).

(continued)
Axial unenhanced CT (D), axial fused PET CT (E) and coronal PET MIP (C) images in the same patient obtained 2 months after treatment show interval resolution of inflammatory changes and abnormal FDG uptake.
Fludeoxyglucose F 18 positron emission tomography 3-dimensional volume-rendered image, frontal (A) and oblique (B) projections

Immunocompromised patients

- Distinguish toxoplasmosis from CNS lymphoma

- Neonates:

- HIV: immunovirological status, lipodystrophy from HAART, opportunistic infections
  - Sathekge, Eur J Nucl Med Mol Imaging. 2009 Apr 7
HIV infection

Liposdystrophy after HAART

Sathekge, M et al., Eur J Nucl Med Mol Imaging. 2009 Apr 7
Infected prosthesis

• PET/CT to detect latent infections in prosthetic hips and in interim hip spacers.

• Meta analysis: sensitivity and specificity for hip or knee joint were 82.1% and 86.6%,

• PET/CT accurate in identifying vascular prosthesis infections
Axial contrast-enhanced CT image (A) in a 57 y/o man shows a right external iliac vein endovascular stent (arrow). Corresponding axial fused PET-CT image (B) shows focally increased FDG activity in the stent, likely due to reactive changes or inflammation.
FDG PET in Infections

- Fever of Unknown Origin
  - Localize infection, direct drainage, monitor
- Inflammatory conditions
  - Extent, monitor response
- Immunocompromised patients
  - Opportunistic infections
- Identify infected prosthesis