^{18}F-FDG Gallbladder Uptake: Observation from a Total-Body PET/CT Scanner

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Introduction

- **Long axial field of view PET/CT scanners** are characterized by higher signal collection efficiency and greater spatial resolution.
- The gallbladder is not usually visualized as an ^{18}F-FDG-avid structure in routine clinical PET/CT studies, unless affected by an infective, inflammatory, or neoplastic process.
- In this study we report visualization rates and characteristics of **gallbladder ^{18}F-FDG uptake** observed in both healthy and oncologic subjects on EXPLORER PET/CT system.

Methods

- Scans from 73 participants (48 **healthy** and 25 with newly diagnosed **lymphoma**) who underwent ^{18}F-FDG total-body PET/CT were retrospectively reviewed.
- Subjects were scanned at **multiple timepoints up to 12 hours post-injection**. High-fat high-protein meal was provided after the 180-minute timepoint (N=15 healthy volunteers).
- **Gallbladder ^{18}F-FDG uptake was graded** using liver uptake as a reference, and the pattern was qualified as present in the wall, lumen, or both.
- Participants' characteristics, such as age, sex, BMI, blood glucose, and other clinical parameters, were collected to assess for any significant correlation with gallbladder ^{18}F-FDG uptake.

Results

- All 73 subjects showed gallbladder uptake at one or more imaging timepoints and the detection rate for **gallbladder ^{18}F-FDG uptake was 100% at 120- and 180-minute post-injection scans**.
- In the 15 subjects scanned up to 12 hours, no uptake was observed after the 180-minute scan, when a high-fat high-protein meal was provided.
- **Increased uptake intensity overtime** was observed up until the 180-minute scan, and gallbladder **wall uptake** was also detected in a significant number of patients (44/73, 60%), especially at early timepoint scans, whereas **luminal activity** was detected in 71/73 (97%) subjects, especially at later timepoint scans (**Figure 1**).
- No significant correlation was found between gallbladder uptake intensity/pattern and subjects' characteristics.
- Luminal ^{18}F-FDG activity with a characteristic distribution was observed in 3 patients, suggesting the presence of **biliary sludge** (**Figure 2**).

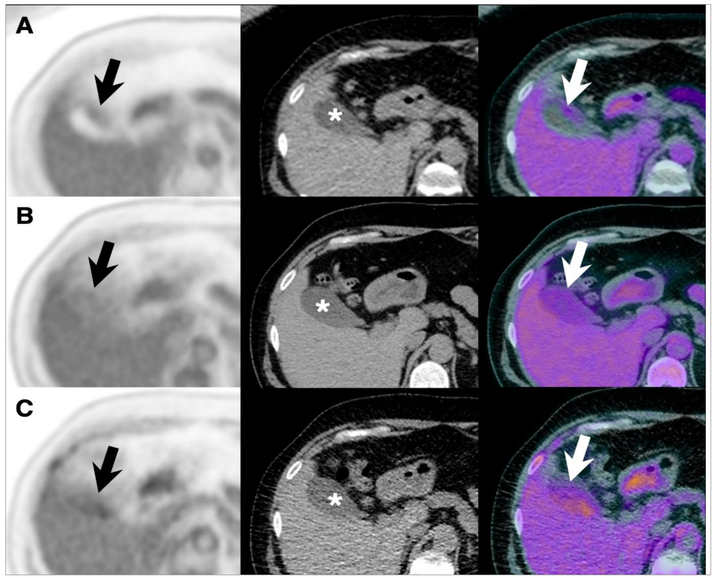

Figure 1 : Changes in the intensity and pattern of gallbladder ^{18}F-FDG uptake on serial total-body PET/CT acquisitions. Axial PET, CT and fused images acquired after i.v. injection of 389 MBq in a 53 y/o healthy female participant. (A) images at 40-minute timepoint showing wall activity, equal to the liver background; (B) images at 90-minute timepoint showing luminal uptake, equal to the liver uptake; and (C) images acquired at 180-minute post-injection showing increased luminal uptake, higher than that of the liver background. The gallbladder lumen is indicated by an asterisk (*) in the CT images.

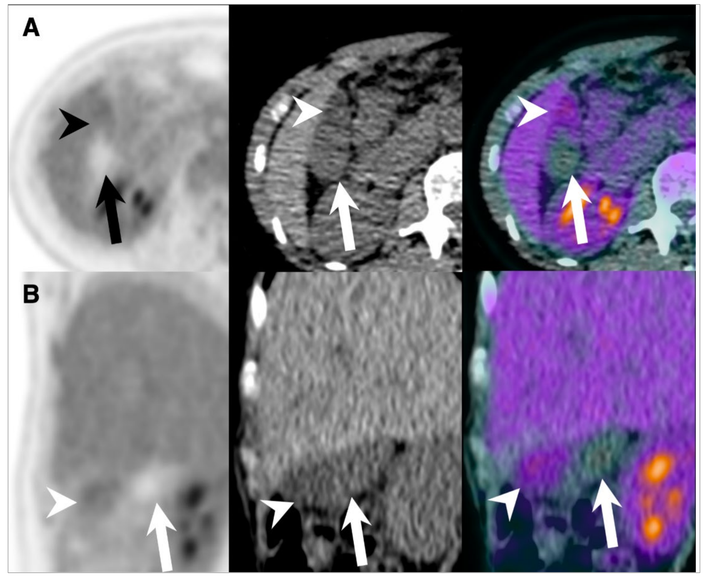

Figure 2 : Axial (A) and sagittal (B) PET, CT and fused PET/CT images of a 61 y/o healthy female participant, scanned at 90-minute post-injection of 334 MBq of ^{18}F-FDG. Images show distribution of ^{18}F-FDG uptake in the gallbladder: one portion shows uptake with lower attenuation on the corresponding CT (arrowhead), while the other portion shows no uptake and higher attenuation on the corresponding CT (arrow). These findings suggest the presence of different luminal content.

Conclusions and Future Directions

- The consistent visualization of gallbladder in **both healthy subjects and oncologic patients** can be described as a **physiologic finding** and should not be mistaken for pathology.
- Tracer accumulation **increased with time** up to 180-minute scans and tracer uptake was more evident in the gallbladder **wall at earlier timepoint scans**, whereas **luminal** activity was more prevalent in **delayed images**. This supports the idea that ^{18}F-FDG **builds up** and accumulates inside the gallbladder over time, until it gets excreted by **physiological gallbladder emptying**.
- Glucose and 2-FDG biliary metabolic pathways involve two different transporters located on cholangiocytes and responsible for their reabsorption into the bloodstream, **GLUT-1** (which binds both glucose and 2-FDG on the basolateral membrane) and **SGLT-1** (which only binds Glucose on the apical membrane) (*1*). This could explain why ^{18}F-FDG ends up in the gallbladder instead of being reabsorbed back into circulation.
- A future consideration can be made about anti-hyperglycemic drugs used for the treatment of type 2 diabetes mellitus, known as **SGLT inhibitors** (*2*). The interplay between these drugs and changes in the distribution of other SGLT-specific isoforms of glucose (e.g., 4-Me-FDG (*3*)) may provide insights into previously unexplored pathophysiologic processes.

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References:

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