

Pulmonary Radiotracer Emboli on PET/CT: Mechanism, Imaging Features, and Key Diagnostic Pitfalls

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Learning Objectives

1. Describe the mechanism underlying pulmonary radiotracer emboli on PET/CT
2. Recognize characteristic PET and CT imaging features of pulmonary radiotracer emboli
3. Differentiate radiotracer emboli from pulmonary metastases and other mimics
4. Apply key imaging clues to avoid false-positive interpretation and disease upstaging

Background

Pulmonary radiotracer emboli are uncommon but important iatrogenic artifacts encountered on PET/CT imaging.

They result from embolization of radiotracer material into the pulmonary vasculature during intravenous injection and manifest as focal or branching pulmonary tracer uptake without a corresponding CT abnormality.

This entity has been described with multiple PET radiotracers, including:

- ¹⁸F-FDG
- ⁶⁸Ga-DOTATATE
- PSMA-based agents

It may closely mimic pulmonary metastases or infection if unrecognized.

Awareness of this benign phenomenon is essential to prevent diagnostic errors, inappropriate disease upstaging, and unnecessary interventions.

Mechanism

Pulmonary radiotracer emboli represent a vascular phenomenon rather than parenchymal disease. Proposed mechanisms include:

- Radiotracer aggregation or protein binding during preparation or injection
- Formation of microclots at the injection site
- First-pass embolization into pulmonary arterioles and capillaries

These emboli lodge transiently within the pulmonary vasculature without tissue invasion or mass formation and typically resolve spontaneously.

Imaging Findings

PET Characteristics

- Focal, linear, or branching tracer uptake
- Peripheral or subsegmental vascular distribution
- Moderate to high intensity uptake
- Solitary or multiple foci

CT Characteristics

- No pulmonary nodule or mass
- No ground-glass opacity or consolidation
- Normal lung parenchyma and vessels on diagnostic CT

Teaching Pearl

Pulmonary PET uptake without a CT-visible lesion should **not** be presumed metastatic.

Tracer-Specific Examples

FDG Lung Emboli

- Most commonly reported
- Linear or wedge-shaped FDG uptake
- Frequently mistaken for infection or metastasis
- Typically resolve on follow-up imaging



Figure 1. FDG Pulmonary Radiotracer Embolus

DOTATATE Lung Emboli

- Less common but well documented
- Occur in neuroendocrine tumor imaging
- Particularly problematic due to high tumor-to-background contrast
- No corresponding SSTR-expressing lung lesion on CT

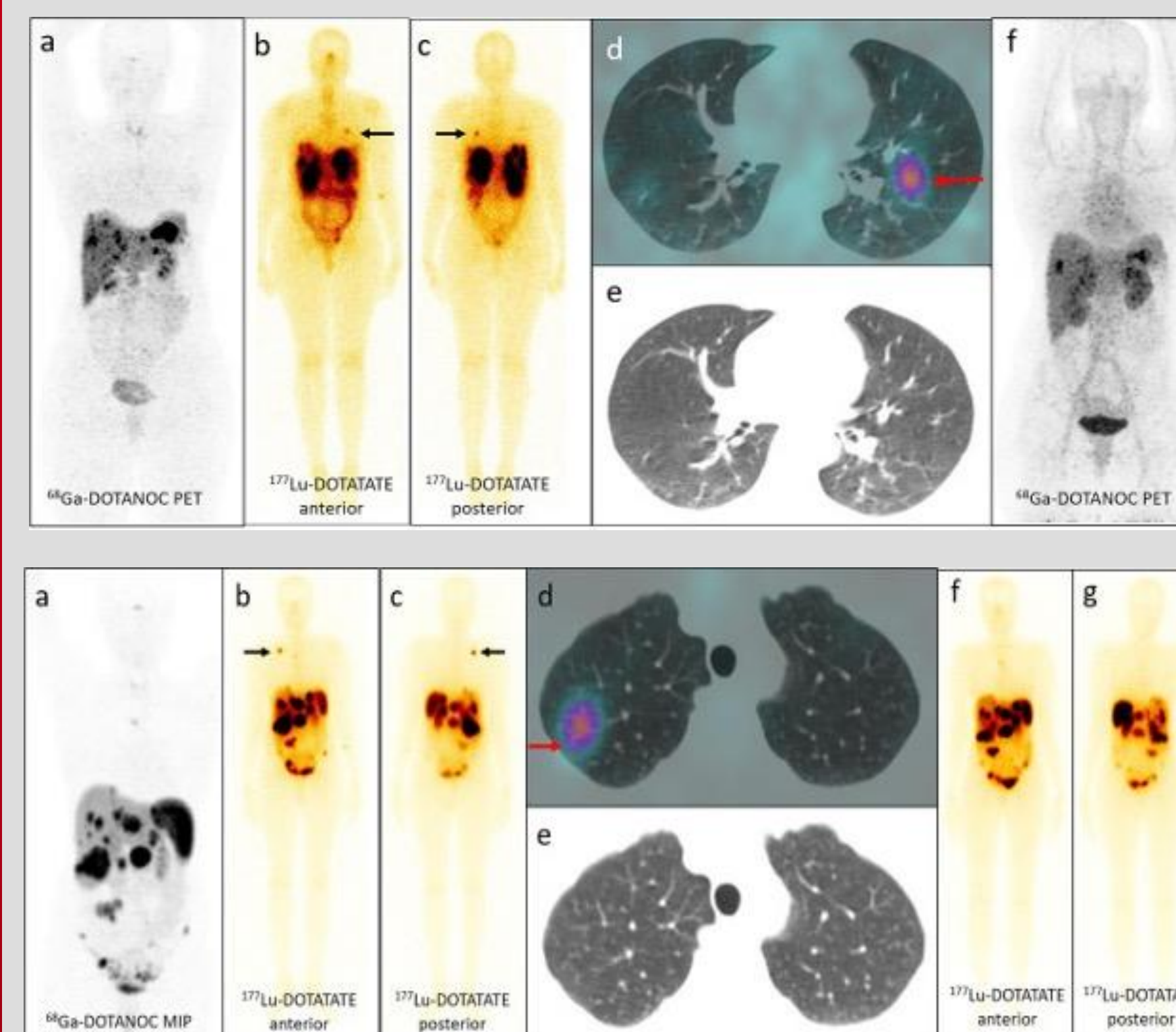


Figure 2. DOTATATE Pulmonary Radiotracer Embolus

PSMA Lung Emboli

- Recognized pitfall in prostate cancer imaging
- Focal pulmonary PSMA uptake without CT correlate
- May falsely upstage disease if misinterpreted
- Often disappear on repeat PET/CT

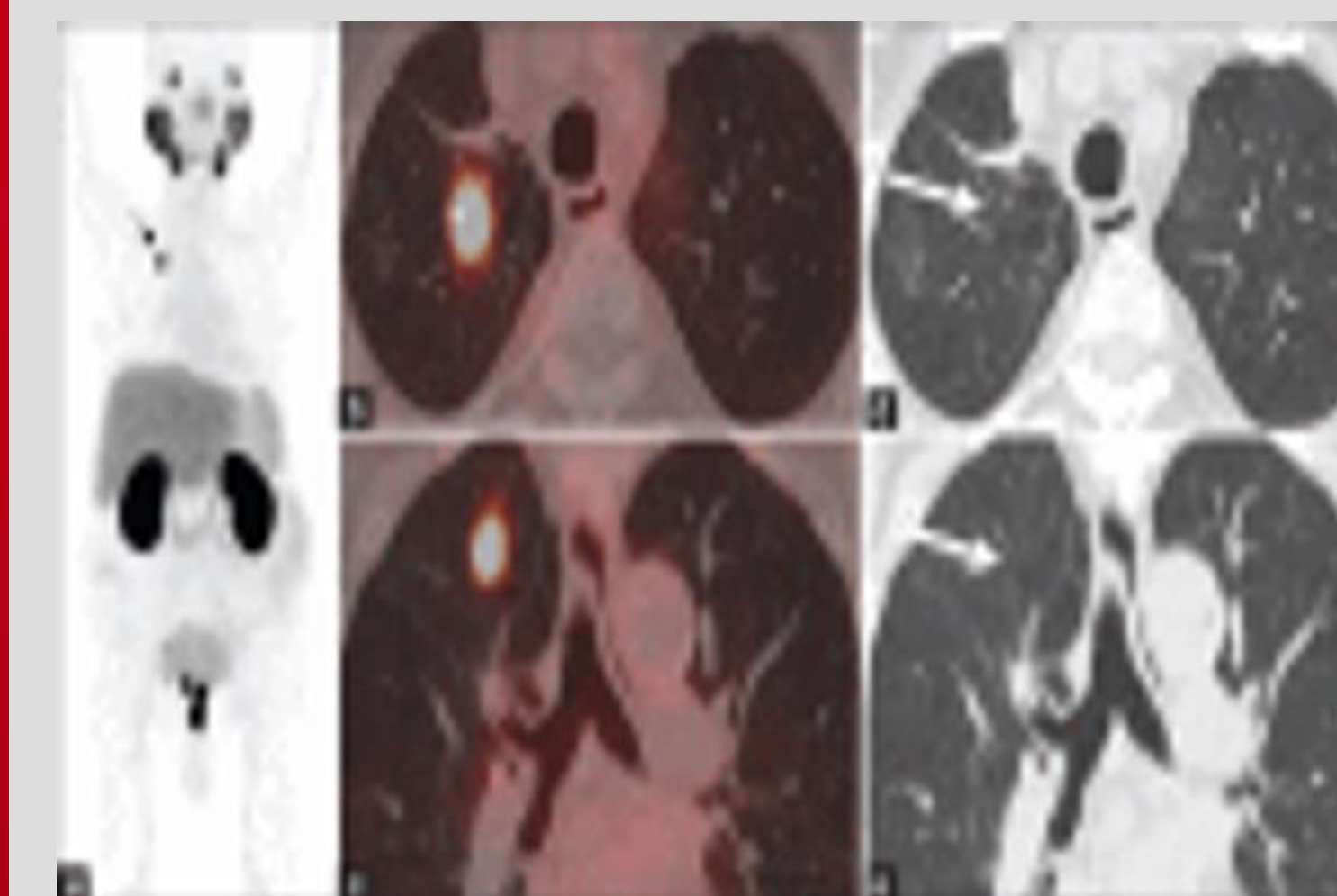


Figure 3. PSMA Pulmonary Radiotracer Embolus

Differential Diagnosis

Entity	PET Uptake	CT Correlate	Distribution
Radiotracer embolus	Focal / linear	None	Vascular
Pulmonary metastasis	Focal	Nodule	Random
Septic emboli	FDG-avid	Nodules	Peripheral
Tumor emboli	FDG-avid	± Vascular defect	Vascular

Key Distinguishing Features

- Absence of a CT-visible pulmonary lesion
- Branching or vascular configuration
- Lack of clinical symptoms
- Resolution on short-interval follow-up imaging

Teaching Points

1. Pulmonary PET uptake without a CT lesion is not a lung nodule
2. FDG, DOTATATE, and PSMA can all produce lung radiotracer emboli
3. Always correlate PET findings with CT anatomy
4. When uncertain, short-interval follow-up confirms resolution

Summary

Pulmonary radiotracer emboli represent a benign but clinically significant PET/CT pitfall characterized by focal pulmonary tracer uptake without a corresponding CT abnormality.

Recognition of this entity across FDG, DOTATATE, and PSMA imaging is critical to prevent false-positive interpretation, disease upstaging, and unnecessary clinical intervention.

Careful correlation with CT findings and awareness of vascular uptake patterns are essential for accurate PET/CT interpretation.

