

Bilateral Pulmonary Thromboembolism Detected by PET Angiography in a Patient With Contraindications for Contrast Agent Imaging



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A 60-year-old multi-morbid male patient with polycystic kidney disease and secondary chronic renal insufficiency stage G5 A3 according to Kidney Disease: Improving Global Outcomes (KDIGO) classification was referred to our hospital with radiological differential diagnoses of sarcoidosis, ectasia of the pulmonary arteries, lymphoma, or central bronchial carcinoma with contralateral hilar lymph node metastases. He had concomitant arterial hypertension, manifest osteoporosis due to renal osteopathy, secondary compensated renal hyperparathyroidism, compensated metabolic renal acidosis, and diabetes mellitus type 2. The patient presented with dyspnoea New York Heart Association (NYHA) III and had a relevant history of alcohol and nicotine abuse. Before referral, computed tomography (CT) had shown partially calcified bilateral hilar enlargements (Figure 1A), however the exam was performed without contrast agent because of the renal contraindications, and the results were unclear. After admission, a transthoracic echocardiogram showed signs of chronic thromboembolic pulmonary hypertension (CTEPH) with a pulmonary artery pressure (PAP) >60 mmHg, however a ventilation/perfusion scintigraphy (V/Q scan) performed according to the diagnostic algorithm for CTEPH was unremarkable and thereby ruled out peripheral perfusion deficits in consequence of occlusive thromboembolic masses (Figure 1B/C).

Subsequently, the patient underwent whole-body F-18-fluorodeoxyglucose (FDG) positron emission tomography (PET)/CT to exclude malignancy and inflammation. The

standard PET scan, acquired 60 minutes after intravenous injection of FDG, showed very low glucose metabolism rates within the bilateral hilar masses, an atypical finding for inflammatory and neoplastic processes. A subsequent endobronchial ultrasound (EBUS) bronchoscopy did not show nodular masses, but indicated the presence of “apparently very large vascular structures”.

The gold standards for the assessment of mediastinal vessels are computed tomography pulmonary angiogram (CTPA) and pulmonary angiography (PA) [1]. The sensitivity, specificity, and diagnostic accuracy of CTPA, PA, and V/Q scan are very high (87–97%, 86–99%, and 96–98%, respectively) [1–5], but CTPA examinations require the use of contrast agents, which was contraindicated in this patient because of the severe renal condition.

Positron emission tomography (PET) angiography has been recently proposed as a novel approach to evaluate large arteries without the need for contrast agents [6]. Dynamic PET acquisitions within the first 180 seconds after intravenous injection of a radiotracer, followed by PET/CT reconstruction methods, allow the assessment of the arterial flow similarly to contrast-enhanced angiography. PET angiography has no known contraindications besides pregnancy and breastfeeding, and it can be safely performed in patients with contraindications for contrast agents, e.g., poor renal function, contrast agent allergy, or severe hyperthyroidism.

Thus far, the use of PET angiography has been limited to the assessment of diseases or anomalies of large arteries

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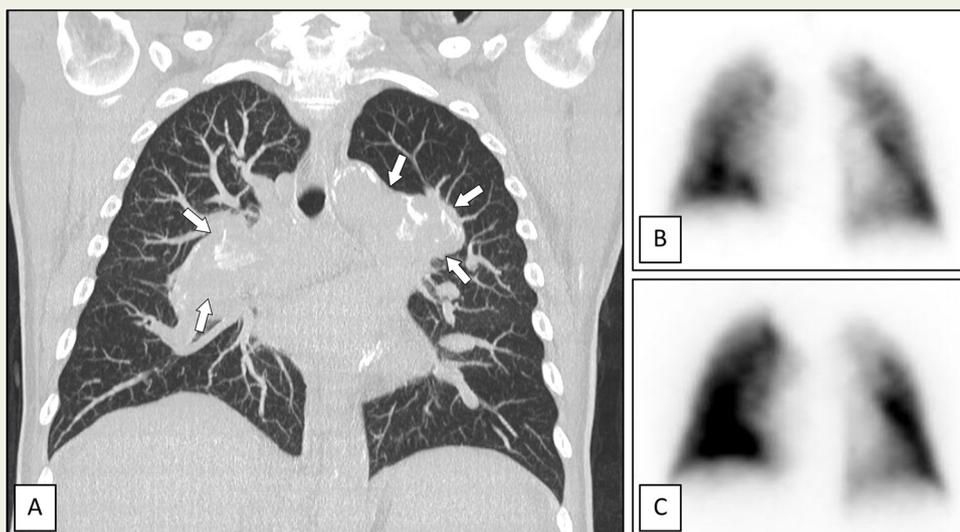


Figure 1 A Coronal computed tomography (CT) of the mid thorax. Unclear, partially calcified bilateral hilar enlargements (white arrows). B/C: Ventilation/perfusion scintigraphy of the lung (posterior-anterior). No evidence of pulmonary perfusion deficits.

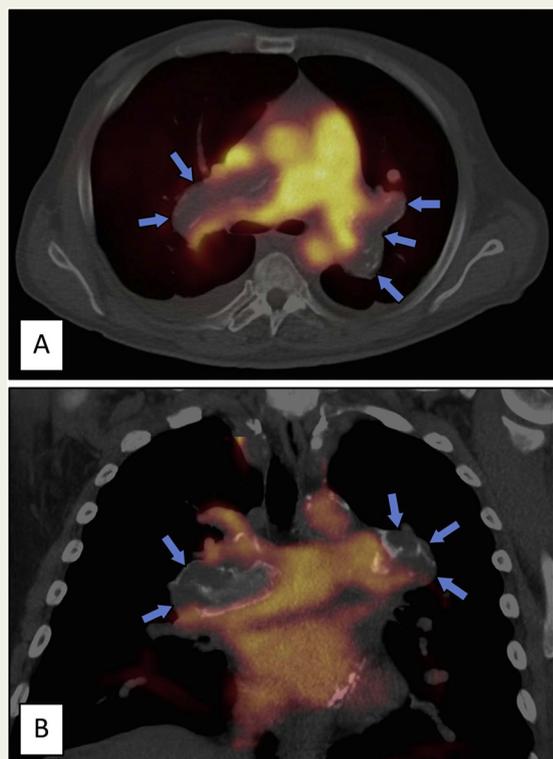


Figure 2 A/B Axial/coronal FDG-PET/CT of the mid thorax, early dynamic positron emission tomography (PET) acquisition (20–45 seconds after intravenous injection of F-18-fluorodeoxyglucose). The partially missing tracer flow within the dilated central pulmonary arteries indicated non-occlusive bilateral central thromboemboli in the severely dilated pulmonary arteries (blue arrows). PET angiography confirmed that the mass-like hilar enlargements were caused by vascular ectasia.

within the systemic circulation [6,7]. In the present case, the limited diagnostic options and the clinical urgency led us to the decision of using PET angiography in the pulmonary system. The investigation allowed an unambiguous diagnosis of chronic non-occlusive pulmonary thromboembolism by showing a partially missing tracer flow within the dilated central pulmonary arteries (Figure 2; Supplement 1 and Supplement 2).

In conclusion, this case report demonstrates the potential of PET angiography as an additional option in the diagnostic algorithm of CTEPH in patients with contraindications for standard CTPA and PA, e.g., contrast agent intolerance, renal failure, or severe hyperthyroidism. The diagnostic accuracy of PET angiography in comparison with established modalities remains to be determined.

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Conflicts of interest

The authors declare no conflicts of interest.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.hlc.2018.11.011>.

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