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## Tc-99m-HMPAO-Labeled Leukocyte SPECT/CT in Pediatrics: Detecting *Candida albicans* Tricuspid Endocarditis

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An immunocompromised 12-year-old girl with a third episode of recurrent severe sepsis and endocarditis suspicion was referred to our center to undergo <sup>99m</sup>Tc-HMPAO radiolabeled autologous granulocyte scintigraphy (WBC scan).

The patient was treated for cortico-resistant ulcerative colitis with immunosuppressive drugs (infliximab and aziathropine) for 3 months. For 1 month, she received a large probabilistic multiple antibiotic therapy for the two first episodes of severe sepsis. The first one was due to a gram-negative bacillus and yeast, with a right jugular catheter infection. The right jugular catheter was removed, and a second catheter in the left jugular vein was then placed. The second severe sepsis was due to enterobacter and *Pseudomonas aeruginosa*.

No deep infection center was found: abdominal US, renal US, abdomino-pelvic injected CT (deep abscess suspicion), bone scan, cervical MRI (spondylodiscitis suspicion), jugular vein Doppler US (left jugular catheter thrombosis infection suspicion) and transthoracic echocardiography all remained negative. Transesophageal echocardiography (TEE) was avoided because of the young age [1]. The blood count showed leukocytosis (14 g/l) with neutrophilia (8.3 g/l).

Planar images obtained 4 h (a, b) and 24 h (c, d) after injection of 360 MBq of <sup>99m</sup>Tc-HMPAO radiolabeled autologous granulocytes, according to the guidelines from the European Association of Nuclear Medicine [2], showed no focal pathological uptake (Fig. 1).

Thoracic SPECT-CT performed 24 h after injection showed focal uptake in the projection of the tricuspid valve (e, f, g, h). Multiple bilateral and peripheral pulmonary micronodules were seen on SPECT-CT with the lung window setting (i, j), without significant associated activity. Multiple bilateral peripheral subpleural distribution and lower zone predilection, feeding vessel sign, pleural effusions, poor margination and variation in size of the micronodules, which is a reflection of repeated episodes of embolic shower, were CT signs suggesting septic emboli [3]. The absence of activity in the micronodules can be explained by the low spatial resolution of SPECT. Indeed, the lung CT anomalies are more traducing distal small infarcts caused by septic emboli than infectious lung destruction [3].

These results led to performing TEE, which showed tricuspid vegetation. Blood cultures were then positive to *Candida albicans*. Control blood cultures and TEE performed 6 weeks later after adapted antifungal therapy remained negative.

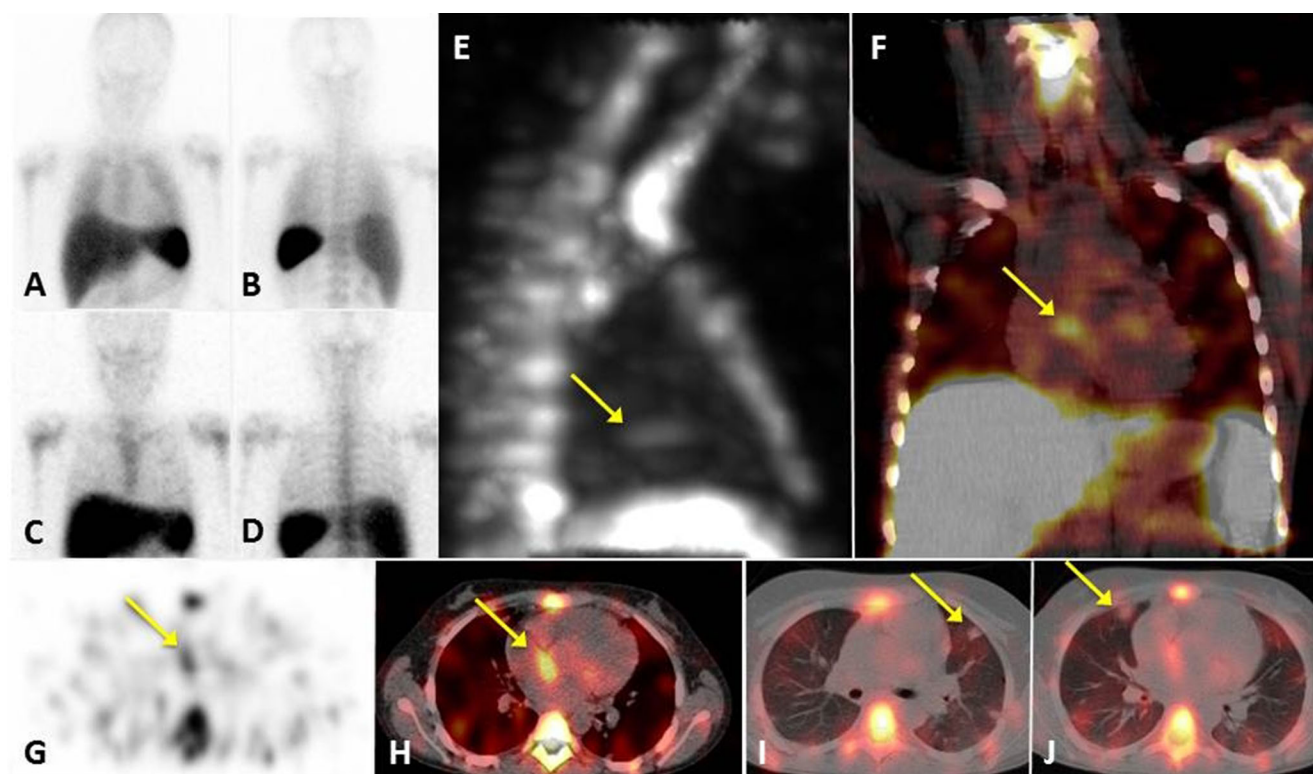
Pediatric fungal tricuspid endocarditis is a rare and severe pathology that can provide negative blood cultures, false-negative echocardiography and also false negative WBC scans [4, 5]. In the study of Erba et al. [4], the false-negative findings for *Candida* or *Enterococcus* species, which may be explained by the ability of these microorganisms (and others such as *Staphylococcus epidermidis*) to form a biofilm resulting in resistance to antimicrobial treatment, altered neutrophil recruitment and escape from the host defense mechanisms.

However, in this child with several identified risk factors such as a vascular line, multiantibiotic use and

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**Fig. 1** The  $^{99m}\text{Tc}$ -HMPAO radiolabeled autologous granulocyte scintigraphy. (a, b) 4 h planar images. (c, d) 24 h planar images. (e, f, g, h) 24 h SPECT-CT images showing focal uptake (arrows) in the

tricuspid valve. (i, j) SPECT-CT images with lung window setting showing multiple pulmonary nodules (arrows)

immunodeficiency [6], the WBC scan allowed establishing an indication of pediatric TEE and thus modified the therapy strategy.

In accordance with the results of Erba and al. [4], this case illustrates the usefulness of late (+24 h) thoracic SPECT-CT acquisition of a WBC scan in a patient with high clinical suspicion of endocarditis and identified risk factors but inconclusive echocardiographic findings.

This case also shows that a WBC scan can be positive for *Candida* infection even though the WBC scan sensitivity is reduced for this microorganism.

**Conflict of Interest** Jérémie Calais, Agathe Edet-Sanson, Stéphane Gaucher, Pierre Vera and Joseph Le Cloirec declare that they have no conflict of interest and no disclosure of funding to declare.

**Informed Consent** All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and the Helsinki Declaration of 1975, as revised in 2000.

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