

Images in Nephrology
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Tracing chameleon: thallium-201 SPECT/CT for pheochromocytoma

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A 61-year-old woman, in receipt of haemodialysis for 11 years, was diagnosed with a high-grade papillary urothelial carcinoma of the urinary bladder. Thallium-201 single photon emission computed tomography/computed tomography (SPECT/CT) was performed during the cancer work-up (Figure 1). Unenhanced CT images of the SPECT/CT demonstrated a left adrenal mass (31.7 mm in size) with a homogeneous density of 62 HU. Scintigraphic SPECT images of the SPECT/CT showed an abnormal focus of increased radiotracer activity in the left upper quadrant of abdomen. The corresponding SPECT/CT fusion images confirmed the focus in the left adrenal medulla. The patient underwent a left adrenalectomy and the pathological findings indicated the histological characteristics of pheochromocytoma (Figure 2).

Pheochromocytoma is a rare catecholamine-secreting tumour with a potential for cardiovascular devastation if the diagnosis is overlooked. The tumour may present with a diversity of imaging features that result from various histological degenerations including fibrosis, calcification, congestion, haemorrhage, necrosis and cystic change. Therefore, pheochromocytoma is often referred to as an epithet 'imaging chameleon' [1]. An adrenal mass with attenuation value >10 HU on CT usually suggests a radiological diagnosis of pheochromocytoma. Thallium-201, a widely used radiotracer for myocardial perfusion scintigraphy, has been proved effective in the diagnosis

of various tumours through the mechanisms of increased vascularity and higher mitotic rate in tumour cells. Its uptake into tumour cells also reflects the cell membrane functions of the Na⁺/K⁺ ATPase pump, Tl⁺-Na⁺-2Cl⁻ cotransport system and calcium-dependent ion channel. We firstly report a long-term haemodialysis patient whose pheochromocytoma is visualized through thallium-201 uptake within the left adrenal medulla by means of real-time functional SPECT and anatomical CT fusion images in tracing the site of pheochromocytoma. Diagnosis of pheochromocytoma in long-term haemodialysis patients is quite difficult since symptoms and signs implying pheochromocytoma are easily attributed to haemodialysis effects or complications of chronic renal disease. Measurement of urinary catecholamines and their metabolites is not feasible in anuric patients. Plasma catecholamines are also unreliable due to the impact of haemodialysis. With the help of advanced imaging fusion science, integrated thallium-201 SPECT/CT could be a promising paradigm for the diagnosis of pheochromocytoma in haemodialysis patients [2].

Conflict of interest statement. None declared.

References

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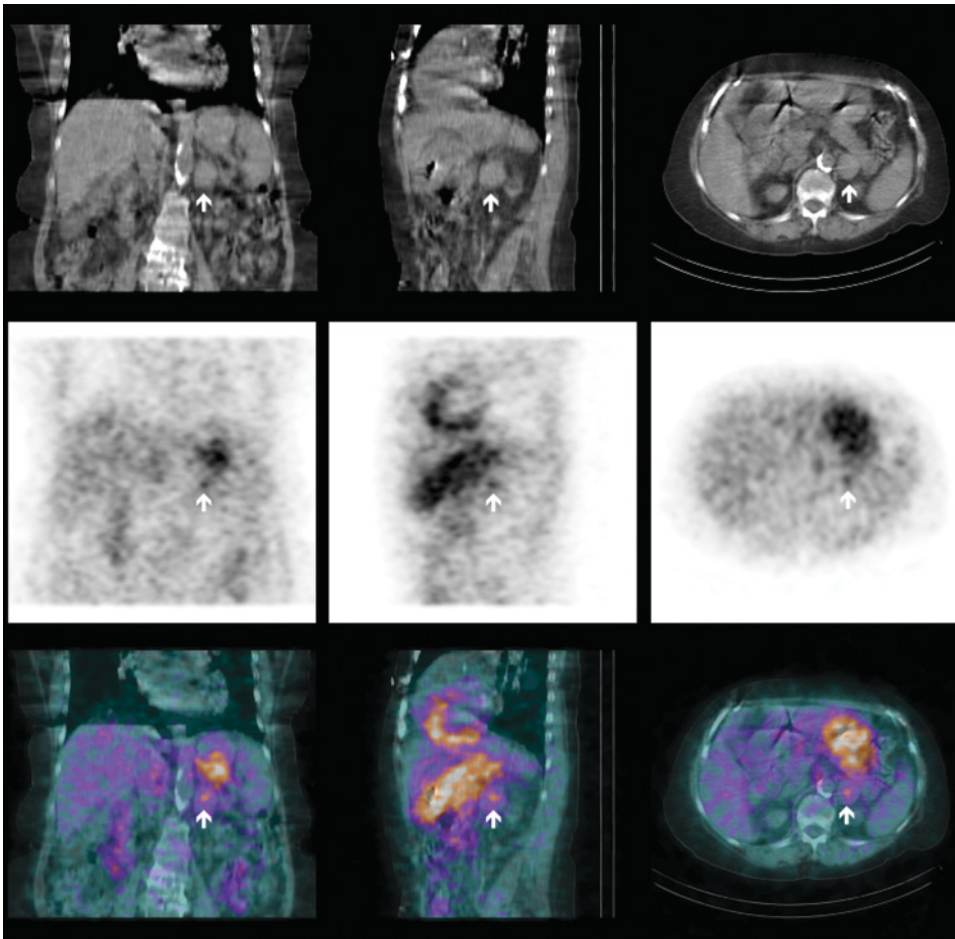


Fig. 1. New advance of image-rendering display: thallium-201 SPECT/CT. The coronal (left column), sagittal (middle column) and transaxial (right column) views of the CT images (top row) and corresponding SPECT images (middle row) fused to the SPECT/CT images (bottom row) are displayed. The arrows indicate the significant lesion in the left adrenal medulla.

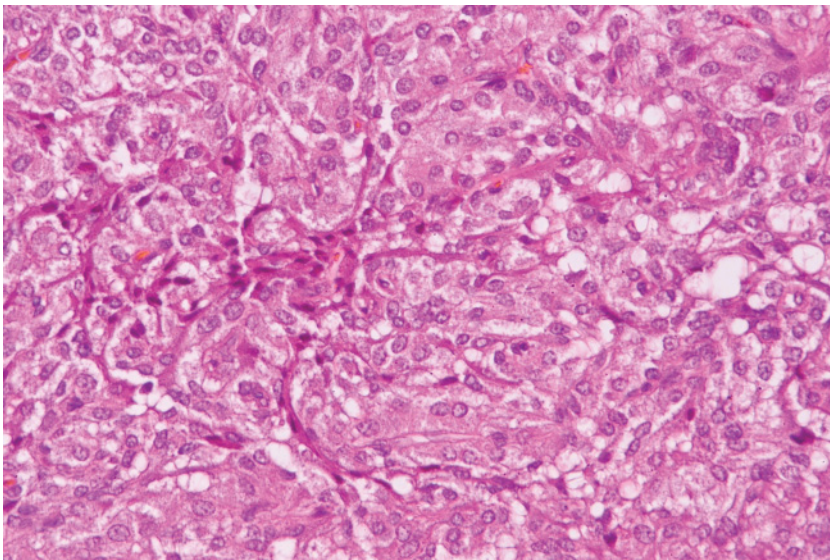


Fig. 2. A pathological section of the left adrenal gland revealed a uniform proliferation of medullary cells, showing a nesting (Zellballen) pattern composed of well-defined cell clusters with amphophilic cytoplasm surrounded by fibrovascular stroma (haematoxylin and eosin, original magnification $\times 400$).