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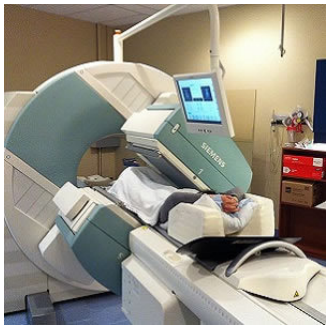
Molecular Imaging for Renal Mass Characterisation



Several studies have laid the foundation for the widespread use of molecular imaging for renal mass characterisation. Additional prospectively collected data as well as research in quantitative imaging methods and the development of novel radiotracers could usher in an era of non-invasive renal mass characterisation, according to an Editorial published in the European Journal of Nuclear Medicine and Molecular Imaging Research.

The majority of enhancing renal masses cannot be effectively characterised as benign or malignant using standard cross-sectional imaging modalities including multiphase computed tomography (CT) and magnetic resonance imaging (MRI). This is particularly unfortunate because of the steady increase in the incidence of these lesions, many of which are discovered incidentally on imaging studies performed for nonurologic indications. Moreover, it has been estimated that upwards of 5,600 unnecessary partial and radical nephrectomies are performed each year in the USA for the false presumption of cancer.

In light of these data, recently, there has been a growing interest in the use of molecular imaging to characterise the aggressiveness of renal masses. Several reports have been published on the ability of 99mTc-sestamibi planar and single photon emission computed tomography (SPECT)/CT imaging to differentiate mitochondrial-rich benign and indolent renal masses such as oncocytomas and hybrid oncocytic/chromophobe tumours (HOCTs) from more aggressive renal tumour histologies including the clear cell subtype of renal cell carcinoma (RCC).

The work of Tzortzakakis and colleagues, published in the same issue of EJNMMI Research, adds to the growing body of evidence on the potential of 99mTc-sestamibi SPECT/CT. The authors reported that 11 of 12 (92%) oncocytomas and 3 of 3 (100%) HOCTs demonstrated 99mTc-sestamibi uptake, while all other lesions were negative for uptake with the exception of mild uptake in a single papillary RCC. These findings are concordant with earlier studies and dramatically increase the number of 99mTc-sestamibi positive oncocytomas and HOCTs reported in the literature.

However, the promise of 99mTc-sestamibi SPECT/CT must be tempered by the fact that an imaging test that uses a single radiotracer can provide only limited information for characterising indeterminate renal masses, the Editorial points out. "Indeed, while 99mTc-sestamibi uptake appears to allow for the reliable identification of benign/indolent oncocytomas and HOCTs, not all masses that fail to accumulate 99mTc-sestamibi will behave in an aggressive manner (e.g., chromophobe RCC and low-grade papillary RCCs). As such, the use of other radiotracers in addition to 99mTc-sestamibi may allow for more complete risk stratification."

For example, the radiolabelled monoclonal antibody 124I-girentuximab has been used in a phase III clinical trial to identify clear cell RCCs using positron emission tomography (PET) imaging through binding to carbonic anhydrase IX (CAIX), a cell surface enzyme that is not expressed in normal renal tissue or by other renal tumour histologies. Moreover, new small molecule SPECT and PET radiotracers that target carbonic anhydrase IX are in preclinical development.

"The refinement of molecular imaging techniques for renal mass characterisation should be a priority for nuclear medicine, as this has the potential to greatly benefit patients by sparing many of the morbidity of invasive procedures in addition to unnecessary renal surgery," the article concludes.

Source: EJNMMI Research
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