CP4-7

Up-to-date radiologic diagnosis of urological cancers

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Recent technological advances in the areas of ultrasound (US), computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET)/CT have significantly improved urologic cancer detection, treatment planning and follow-up. Moreover, molecular imaging promises to open up new horizons in preclinical cancer detection and imaging assessment of tumor biology. This lecture will offer current imaging guidelines for the diagnosis of renal and adrenal cancers and describe the potential of molecular imaging for improving cancer care.

US and CT are replacing IVU in the initial detection of renal cancer. CT is significantly more accurate than US in detecting solid lesions smaller than 3cm. Lesion detection or characterization on contrast-enhanced MRI (90%—97%) is equivalent to that of CT (89—99%), but because CT is less expensive and more widely available, it has become the preferred cross-sectional imaging modality for the detection, characterization, and staging of renal lesions. MRI is reserved for those cases where CT or US are inconclusive, or in patients with contraindications for the use of iodinated contrast media.

CT is also the preferred modality for the initial detection of adrenal malignancies, identifying tumors as small as 5mm. Available methods of non-contrast, contrast enhanced, and delayed imaging improve lesion characterization and staging. MRI can also be used for detection of adrenal tumors but is usually employed to complement CT. While chemical shift MRI helps differentiate benign from malignant tumors, post-contrast MRI is especially useful for depicting the extent of tumor invasion to adjacent organs. Although US can detect adrenal tumors in thin patients, it is often hindered by bowel gas and high operator-dependence.

Radionuclide imaging provides additional functional information regarding adrenal tumors. 123I-MIBG is an especially effective radiopharmaceutical for the evaluation of neural crest tumors, such as pheochromocytoma or paraganglioma, and can detect metastatic and recurrent disease throughout the body. By showing abnormally increased 18FDG uptake, PET enables differentiation between benign and malignant tumors and can be used in staging to detect extra-adrenal cancer sites.

PET evaluation of 18FDG uptake is one clinical application of molecular imaging. The future will bring a much heavier emphasis and faster progress in the assessment of tumors on a molecular and physiological level. Molecular characterization of in vivo pathology will offer tremendous advantages in all phases of cancer care, from initial detection, to treatment planning, adjustment, and follow-up. Molecular imaging will also continue to aid in the development of new cancer drugs, not only through the assessment of therapeutic effectiveness, but by providing novel insights into cancer biology and phenotypic behavior.