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IPR PRESENTATIONS

Nephroblastomatosis—challenges for functional imaging

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The association among Wilms tumor, nephrogenic rests, and nephroblastomatosis makes the characterization of renal lesions clinically important. One of the major problems in nephroblastomatosis is making a confident differentiation vis-á-vis Wilms tumor, with imaging, but also histopathologically, since biopsies are often inconclusive. Imaging strategies that are commonly used for the evaluation of nephroblastomatosis include US, CT, and MRI.

MRI is an imaging modality that plays an important role in the evaluation of pediatric patients with cancer. MRI provides a wide range of anatomical and functional information that may support the evaluation of renal lesions. Nephroblastomatosis has variable signal intensity depending on cellularity and other histological characteristics on T2-weighted images. During the last decade, dynamic contrast-enhanced MRI has evolved as a non-invasive imaging modality that allows assessment of tumor neovascularity. Contrast administration is mandatory in the assessment for nephroblastomatosis with MRI. Additional applications for functional and multiparametric MRI imaging techniques, such as proton magnetic resonance spectroscopy (MRS) and diffusion-weighted imaging (DWI), can aid the differentiation of benign and malignant lesions. DWI provides information about the local micro-structural diffusivity characteristics of water molecules in tissues, which is quantified using the apparent diffusion coefficient; low values correlate with restricted diffusivity in the tissue. In general, both cancer and nephroblastomatosis, due to high cellularity, tend to have more restricted diffusion than does normal tissue; therefore, DWI can be used for additional lesion characterization. It has also been demonstrated that the additional application of MRS aids in the differentiation of benign and malignant lesions.

A well-known established imaging technique is positron emission tomography (PET) using the radiotracer ^{18}F-fluoro-2-deoxyglucose (FDG), which exploits the fact that glucose metabolism is generally accelerated in malignant tumors. FDG-PET plays a role in Hodgkin lymphoma and in sarcoma, but is also interesting in pediatric renal malignancies. Integrated PET-CT machines have shown advantages over PET alone.

Although CT provides high-resolution images, it has certain limitations compared to MRI. MRI provides superior soft-tissue contrast, can provide functional information, and, more importantly, children are not exposed to radiation. Therefore, in the coming years, it will become extremely important to combine the morphological and quantitative data provided by MRI (perfusion, diffusion) with the functional data offered by PET for more accurate diagnosis of nephroblastomatosis, in particular to identify any malignant components.

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