CT Attenuation Values Can Help Estimate Nonsolid Lung Tumor Growth

An easy-to-use method employs CT attenuation to estimate the proportion of tumor within nonsolid lung nodules. In a study of images from CT and pathologic examination of 15 patients who had undergone resection of nonsolid lung cancer, Zhang and colleagues found a significant linear relationship between attenuation and histologic findings, thus allowing for estimation of internal tumor growth. A simple approach to measuring change in internal tumor volume on account of change in attenuation is to consider that each 100-HU increase in nodule attenuation represents about a 10% increase in tumor volume of a lung cancer manifesting as a nonsolid nodule, the researchers concluded.

Differentiation of M massiliense and M abscessus Disease at CT is Crucial for Estimating Antibiotic Response

Although Mycobacterium massiliense and Mycobacterium abscessus diseases share common CT findings, patients with M massiliense show a markedly better response to antibiotic therapy. In 34 patients with M massiliense, Kim and colleagues found that 88% showed a decrease in overall CT score at 12-month therapy and all had sputum conversion during treatment, while only 33% of 24 patients with M abscessus showed a decrease and 50% had sputum conversion. Because patients with M massiliense disease show a good response to antibiotic therapy, in both sputum conversion and on CT studies, accurate differentiation is crucial, the researchers concluded.

Stable Krypton as a Ventilation Contrast Agent May be a Viable Option for Functional Evaluation with Dual-Energy CT of Patients with Chronic Obstructive Pulmonary Disease

Stable krypton may be a viable option as a ventilation CT contrast agent. In a study of 32 patients with severe emphysema, Hachulla and colleagues found that inhalation of a mixture of 80% krypton and 20% oxygen had no severe or clinically substantial side effects and delivered a mean radiation dose of 387.1 mGy × cm, which is in the range of that for a single-source spiral CT examination. Combined analysis of structural changes and regional ventilation from a single examination with use of krypton as an inhalational agent has the potential to help in understanding the functional alterations in patients with chronic obstructive pulmonary disease, the researchers concluded.

Subject-specific Measurements Can Identify Functional Changes in Cognitively Impaired Patients with Parkinson Disease

Use of a native-space method to compare resting functional MR correlations, or functional connectivity, can demonstrate functional changes in patients with Parkinson-related dementia (PRD), even in the absence of significant changes in structural morphology. In 18 patients with PRD, 19 cognitively unimpaired elderly individuals, and 19 cognitively unimpaired patients with Parkinson disease (PD), Seibert et al found that relative to healthy aging, PRD patients exhibited decreased resting functional MR correlation between a priori selected corticostriatal regions. Interregional default-network correlations, cortical thickness, and striatal volume were similar between all patients. PRD was associated with selective disruption of corticostriatal resting functional MR correlations, which suggests that resting functional MR imaging analyzed in subject-native space may be a useful biomarker in PD.

Tomosynthesis Increases Sensitivity for Detection of Osteophytes and Cysts in Arthritic Knees

Digital tomosynthesis improves detection of osteophytes in the tibiofemoral joint in persons with or without osteoarthritis. In 40 subjects older than 40 years, Hayashi et al found that tomosynthesis depicted more osteophytes and subchondral cysts than did standard radiography. Subjects with tomosynthesis-depicted osteophytes in all locations and subchondral cysts in medial locations were more likely to feel pain than those without such lesions; however, radiography-depicted osteophytes were more strongly associated with pain. They concluded that tomosynthesis might have some clinical relevance for depicting osteoarthritis-related features that are associated with pain in the knee.
MR Pulmonary Angiography Techniques Deliver Accurate Pulmonary Embolism Detection without Breath Holding or Need for Contrast Material

Detection of pulmonary embolism (PE) is maximized when three imaging sequences are combined in contrast to any single imaging sequence alone. In a study of 22 patients with CT diagnosis of PE who underwent standard bolus-triggered contrast-enhanced breath-hold MR pulmonary angiography, nonenhanced free-induction cardiac-gated and respiratory-triggered true fast imaging with steady-state precession, and contrast-enhanced recirculation-phase low–flip angle 3D gradient-echo sequence, Kalb et al found that the sensitivities for PE detection were 55%, 67%, and 73%, respectively. Combining all three sequences improved overall sensitivity to 84%. Nonstandard MR pulmonary angiography methods can provide sensitive detection of PE and can help bypass the need for accurately timed arterial phase contrast enhancement or breath holding, or obviate contrast material altogether, the researchers concluded. Page 271

Dynamic Contrast-enhanced MR Can Predict Peptide Receptor Response in Liver Metastases

Dynamic contrast-enhanced (DCE) MR imaging may help assess and predict peptide receptor therapy response in patients with liver metastases from neuroendocrine tumors. In a study of 20 patients treated with yttrium 90-labeled octreotide, Miyazaki et al found that a lower pretreatment whole liver distribution volume and higher tumor arterial flow fraction were associated with better response to radiolabeled octreotide treatment. DCE imaging showed an increase in liver distribution volume and tumor distribution volume in responding patients treated with radiolabeled octreotide therapy. DCE MR imaging may be used to monitor the effects of peptide receptor radiolabeled targeted therapy in patients with neuroendocrine tumor liver metastases, the researchers concluded. Page 139

MR Imaging Method Can Help Differentiate Angiomyolipoma from Renal Cell Carcinoma

An MR imaging method measuring T2 signal intensity (SI) ratio and arterial-to-delayed enhancement ratio can accurately differentiate angiomyolipoma (AML) without visible fat from renal cell carcinoma (RCC). In a study of 111 patients, Sasiwimonphan and colleagues found that combination of T2 SI ratio less than 0.9 and ([SI index > 20% and T1 SI ratio > 1.2] or arterial-to-delayed enhancement ratio > 1.5) had sensitivity, specificity, and accuracy of 73%, 99%, and 96%, respectively, for differentiating AML without visible fat from RCC. The researchers concluded that small renal masses showing both T2 SI ratio less than 0.9 and ([SI index > 20% and T1 SI ratio > 1.2] or arterial-to-delayed enhancement ratio > 1.5) are more likely to be AML rather than RCC and could be treated conservatively in selected patients. Page 160

Dual-Source Radiofrequency Transmission Delivers Better Cardiac Imaging Quality

Compared with conventional radiofrequency (RF) transmission, dual-source parallel RF transmission with patient-adaptive local RF shimming significantly improves image quality and diagnostic confidence at 3.0-T cardiac MR imaging. In a study of 28 patients, Mueller et al found that the method decreased B1 inhomogeneity and image artifacts. The quality of steady-state-free precision (SSFP) and turbo spin-echo (TSE) black-blood images of left and right ventricles showed significant improvement with respect to image homogeneity and diagnostic confidence. Off-resonance artifacts were significantly reduced on SSFP images. Dual-source parallel RF transmission significantly improves image homogeneity, image contrast, and diagnostic confidence compared with conventional RF transmission of cardiac SSFP and TSE black-blood sequences, the researchers concluded. Page 77

PET/CT and Dynamic Contrast-enhanced MR Can Help Predict Chemotherapeutic Response in Breast Cancer

In patients with breast cancer, fluorodeoxyglucose (FDG) PET/CT and dynamic contrast-enhanced (DCE) MR imaging performed after two cycles of neoadjuvant chemotherapy can help predict pathologic complete response. In a study of 142 women, Tateishi and colleagues found that the diagnostic accuracy of FDG PET/CT was superior to that of DCE MR imaging in the prediction of pathologic complete response. The sensitivities of the parameters evaluated for the two methods were not acceptable, but the specificities were high for stratification of pathologic complete response cases in breast cancer, the researchers concluded. Page 53