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Functional sequences for imaging cancer in the prostate

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Prostate MR has come to play a key role in managing patients with prostate cancer. It has traditionally relied on T1 and T2 weighted imaging to image the prostate gland and tumors within the prostate gland. These sequences can be used to identify and stage the tumor. More recently, functional imaging sequences have been added to image tumor within the gland. These consist of diffusion weighted imaging, which analyzes diffusion of primarily water within each voxel that makes up an image. More restricted motion is used a sign of cancer and increased restriction is thought to be related to the degree of cellularity and integrity of cell membranes when higher B-values are used during the diffusion acquisition. Apparent diffusion coefficient images reduce the "T2 shine through" of the image and are commonly read instead of the direct diffusion weighted image to eliminate this confounding variable. Another technique is dynamic contrast enhanced imaging. In this case, an intravenous MR contrast agent is injected and the rate of uptake of this lesion is used either directly to generate uptake curves or this is converted to physiologic parameters such as K^{trans}, a measure similar to permeability, and these are used to predict tumor location. A third approach is spectroscopy. In this case the amount of certain molecules in a voxel is compared such as choline and creatine to citrate. Alterations in the levels of these molecules are used to identify areas suspicious for cancer. There is a debate as to the relative gain in information that each of these parameters may provide. There is also debate as to the amount of additional information adding one, two, or more of the functional images may provide compared to T2 imaging alone. These may be assessed in individual papers and in meta-analysis. For example, utility of DWI imaging in prostate cancer may be assessed by meta-analysis and will be presented. Functional imaging can aid prostate MR sensitivity and specificity for detecting cancer in the prostate gland.

Biography

Vikas Kundra completed his M.D. and Ph.D. from Harvard Medical School and Harvard University. He then did a research and clinical residency followed by a research and clinical fellowship with a concentration on MR at Brigham and Women's Hospital in Boston. He then joined the faculty at U.T.-M.D. Anderson Cancer Center where he is now Professor of Radiology and Director of Molecular Imaging. He has a joint appointment in the Department of Experimental Diagnostic Imaging. His clinical work and research focuses on body imaging and laboratory research focuses on molecular imaging, including imaging gene expression, and imagable models of disease.

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