IMAGING

Prostate cancer: apparent diffusion coefficient map with T2-weighted images for detection - a multireader study

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Purpose: To retrospectively assess the incremental value of an apparent diffusion coefficient (ADC) map combined with T2-weighted magnetic resonance (MR) images compared with T2-weighted images alone for prostate cancer detection by using a pathologic map as the reference standard.

Materials and Methods: This retrospective study was approved by the institutional review board; informed consent was waived. The study included 52 patients (mean age, 65 years +/- 5 [standard deviation]; range, 48-76 years) who underwent endorectal MR imaging and step-section histologic examination. Three readers with varying experience levels reviewed T2-weighted images alone, the ADC map alone, and T2-weighted images and ADC maps. The prostate was divided into 12 segments. The probability of prostate cancer in each segment on MR images was recorded with a five-point scale. Areas under the receiver operating characteristic curve (AUCs) were compared by using the Z test; sensitivity and specificity were determined with the Z test after adjusting for data clustering.

Results: AUC of T2-weighted and ADC data (reader 1, 0.90; reader 2, 0.88; reader 3, 0.76) was greater than that of T2-weighted images (reader 1, 0.79; reader 2, 0.75; reader 3, 0.66) for all readers (P < .0001 in all comparisons). AUC of T2-weighted and ADC data was greater for readers 1 and 2 than for reader 3 (P < .001). Sensitivity of T2-weighted and ADC data (reader 1, 88%; reader 2, 81%; and reader 3, 78%) was greater than that of T2-weighted images (reader 1, 74%; reader 2, 67%; reader 3, 67%) for all readers (P = .01 for reader 1; P = .02 for readers 2 and 3). Specificity of T2-weighted and ADC data was greater than that of T2-weighted images for reader 1 (88% vs. 79%, P = .03) and reader 2 (89% vs. 77%, P < .001).

Conclusion: The addition of an ADC map to T2-weighted images can improve the diagnostic performance of MR imaging in prostate cancer detection. (c) RSNA, 2008.

Editorial Comment

Nowadays there is a worldwide tendency to perform a multiparametric endorectal magnetic resonance imaging evaluation of patients suspected or having prostate cancer. On multiparametric MRI evaluation, prostate cancer appears as an area with reduced T2 signal intensity on conventional T2-weighted images, increased choline and decreased citrate and polyamines on magnetic resonance spectroscopic imaging, decreased diffusivity on diffusion weighted-imaging (DWI), and increased uptake on dynamic contrast enhanced (DCE) imaging. All techniques are accomplished in a complete, one-stop shop examination that takes place in about 60-min. Each complementary method has inherent advantages and disadvantages; therefore, they should be combined. The best way to combine these techniques however still needs to be determined. The authors found that the addition of DWI (which is quantified by the apparent diffusion coefficient map-ADC) to the conventional T2-weighted images further improves the performance of MRI in prostate cancer detection.

The results of this work support that the best characterization of prostate cancer in individual patients will most like result from a multiparametric examination that combines conventional MRI, spectroscopy, diffusion-weighted images and dynamic contrast enhanced technique.

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Angiomyolipoma with minimal fat on MDCT: can counts of negative-attenuation pixels aid diagnosis?

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Objective: The purpose of this study was to determine whether counts of pixels with subzero attenuation on CT scans can aid in the diagnosis of renal angiomyolipoma with minimal fat.

Materials and Methods: Of 33 angiomyolipomas identified among 719 renal masses resected from 702 patients over 4 years, 15 masses in 15 patients were prospectively diagnosed on the basis of the presence of fat at MDCT. The 18 patients with minimal-fat angiomyolipoma and a matched (age, sex, tumor size) cohort of patients with renal cell carcinoma were included in this study. Three radiologists independently counted the number of pixels with attenuation less than -10, -20, and -30 HU. Receiver operating characteristic analysis of the number of pixels at each cutoff was used to calculate sensitivity, specificity, and positive predictive value with the following criteria: 1, more than 10 pixels less than -20 HU; 2, more than 20 pixels less than -20 HU; 3, more than 5 pixels less than -30 HU.

Results: Using criterion 1, reader A identified six angiomyolipomas; reader B, five; and reader C, two. The combined sensitivity was 24%; specificity, 98%; and positive predictive value, 69%. Using criterion 2, reader A identified three angiomyolipomas; reader B, four; and reader C, two. The combined sensitivity was 17%; specificity, 100%; and positive predictive value, 100%. Using criterion 3, reader A identified four angiomyolipomas; reader B, four; and reader C, two. The combined sensitivity was 18%; specificity, 100%; and positive predictive value, 100%.

Conclusion: CT findings of more than 20 pixels with attenuation less than -20 HU and more than 5 pixels with attenuation less than -30 HU have a positive predictive value of 100% in detection of angiomyolipoma, but most angiomyolipomas with minimal fat cannot be reliably identified on the basis of an absolute pixel count.

Editorial Comment

Adequate preoperative imaging characterization of small angiomyolipoma (AML) is essential since 3-7% of suspicious renal masses resected are found to be AML. AML is characterized by the presence of variable amount of fat within a renal mass. From the practical point of view (evidence based medicine), all renal mass containing fat are considered AML. The use of thin-section (2-5 mm) unenhanced CT is the best method for detecting even small amounts of fat. Previous reports have been shown that if fat within a mass is not visually obvious, pixel mapping can be performed, which may reveal the fat as clustered pixels with negative CT numbers (defined as at least 3 adjacent pixels with attenuation -20 HU) (1). The drawbacks of these previous reports are lack of pathologic confirmation and absence of a control group. The authors of this manuscript found that in a study with pathologic correlation the CT findings of more than 20 pixels with attenuation less than -20 HU and more than 5 pixels with attenuation less than -30 HU have a positive predictive value of 100% in detection of angiomyolipoma. These AMLs presented at pathologic examination more than 10% of fat.

AMLs containing less than 10% of fat at pathologic examination could not be characterized on the basis of an absolute pixel count. Perhaps, for the sake of clarity, we should call AMLs with minimal fat those with tiny amount of visible fat and those in which only CT pixel mapping is able to demonstrate negative attenuation. AMLs with less than 10% of fat should be called AMLs without radiologic evidence of fat. The latter category is indistinguishable from renal cell carcinoma and for this reason, imaging guided percutaneous biopsy is indicated.

Reference

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PATHOLOGY

Gleason grading of prostatic adenocarcinoma with glomeruloid features on needle biopsy

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Glomerulations in prostatic adenocarcinoma are characterized by dilated glands containing intraluminal cribriform structures with a single point of attachment, resembling a renal glomerulus. On prostate biopsy, glomerulations are exclusively associated with carcinoma and not associated with benign mimickers. However, the Gleason grading of carcinoma with glomerulations on needle biopsy remains controversial. We prospectively collected 45 prostate needle biopsies containing carcinoma with glomeruloid features from our consult files for a 9-month period and examined the association between glomerulations and the presence of concurrent high-grade carcinoma. Glomerulations were overwhelmingly associated with high-grade cancer on the same core, composed of either Gleason pattern 4 (n = 36, 80% of cases) or Gleason pattern 5 (n = 2, 4% of cases). Only a minority of glomerulations were surrounded exclusively by pattern 3 cancer (n = 7, 16% of cases) on the same core. Most of the cases with surrounding pattern 4 cancer were scored as 3 + 4 = 7 (n = 24, 66%), whereas a smaller fraction were scored as 4 + 3 = 7 (n = 9, 26%), and only a minority were 4 + 4 = 8 (n = 3, 9%). In most cases, glomeruloid change was present on the same core as the highest Gleason score carcinoma of the case. None of the pattern 3 cases and only a minority of the pattern 4 cancers had higher Gleason score carcinoma on additional cores (n = 5, 14%). Glomeruloid structures are a rare but diagnostic feature of prostatic carcinoma on needle biopsy. Our data indicate that glomerulations are overwhelmingly associated with concurrent Gleason pattern 4 or higher-grade carcinoma. In several cases, transition could be seen among small glomerulations, large glomeruloid structures, and cribriform pattern 4 cancer. These data suggest that glomerulations represent an early stage of cribriform pattern 4 cancer and, until follow-up data are available, are best graded as Gleason pattern 4.

Editorial Comment

      The grading of prostatic adenocarcinoma with glomeruloid structures is controversial (1-3). Some urological pathologists do not assign a grade to this pattern and just grade the surrounding tumor. Other experts in the field feel that all glomeruloid structures should be assigned a Gleason pattern 4.

      The glomeruloid feature in adenocarcinoma of the prostate refers to an architectural pattern of growth that mimics the renal glomerulus (1,3,4). Glomeruloid structures have been described in Wilm's tumor (5) probably representing differentiation of neoplastic cells toward a primitive form of renal glomerulus and are sometimes present in gliomas (6). In a rare case of adenoma (hamartoma) of bladder in siblings, spaces, often