Endorectal MR Imaging and Proton Spectroscopy for Preoperative Evaluation of Clinical T1c Prostate Cancer

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Introduction/Background

With serum prostate specific antigen (PSA) screening, clinical stage T1c prostate cancer (defined as nonpalpable prostate cancer diagnosed by needle biopsy only, frequently due to an elevated PSA) has become the most commonly diagnosed prostate cancer. However, clinical stage T1c cancers are a heterogenous group, consisting of both clinically insignificant cancers, and cancers significant in size, grade and extent. The efficacy of the various treatment options for prostate cancer depends on the extent of disease. Therefore, to select the appropriate treatment option, an accurate and reliable assessment of disease stage is required. Currently preoperative evaluation of prostate cancer is routinely performed with a number of clinical parameters, including PSA, digital rectal examination, and transrectal ultrasound guided biopsy results. However, with the downward migration in prostate cancer volume and stage, these parameters have become less useful in stratifying patients.

Purpose

To assess the potential role of endorectal MRI in predicting prostate cancer stage and extent in patients of clinical stage T1c disease.

Materials and Methods

140 consecutive patients (median PSA 5.2, range 1.1 – 26) with clinical stage T1c prostate cancer who were referred for combined endorectal MRI and proton MR spectroscopy prior to radical prostatectomy were included in this study. Patients who received neoadjuvant hormonal therapy, neoadjuvant chemotherapy, or prior radiation treatment to the pelvis were excluded. MRI and MR spectroscopy imaging (MRSI) were performed on a 1.5 T scanner with combined pelvic phased array and endorectal coils. MR images were retrospectively analyzed by a radiologist who was unaware of the clinical and surgical/histological findings. The reader evaluated the MR exams for the presence and location of tumor in the prostate gland, the presence or absence of extracapsular extension (ECE), seminal vesical invasion (SVI), and pelvic lymphadenopathy. Readers also scored the extent of tumor based on MRI and MRSI on a scale of 1 to 4 (1, no cancer seen; 2, very low risk cancer < 0.5 cc; 3, indeterminate; 4, high risk cancer > 0.5 cc). Whole-mount step section pathology of the prostate was prepared after radical prostatectomy. The location and extent of prostate tumors were identified and mapped in each section by a genitourinary pathologist.

Results

Out of 140 patients, 2 patients (1%) had no cancer found on pathology, 15 (11%) had pathological stage T2a disease (AJCC 1997 staging system, tumor confined to the prostate and capsule involving one lobe), 79 (56%) had pT2b disease (tumor confined to the prostate and capsule involving both lobes), 11 (8%) had T2+ Disease (surgical margin was positive and presence of capsular transgression by tumor could not be assessed), 32 (23%) were pT3 disease (presence of extracapsular extension (ECE) or seminal vesical invasion), 1 (1%) pT4 disease (tumor invaded bladder neck). MRI and MRSI diagnosed 106 (76%) organ confined disease, 34 (24%) T3 disease, with an overall accuracy of 82% in staging. In addition, MR classified 10 patients (7%) as either no cancer seen or of very low risk cancer, with an accuracy of 80% when correlated with step-section pathology, using cancer volume < 0.5 cc and Gleason score = 6 as the definition for very low risk cancer.

Conclusion

In our series, more than 20% of clinical stage T1c patients had locally advanced disease, including extraprostatic extension, seminal vesical invasion and bladder neck invasion by tumor. On the other hand, approximately 10% of patients demonstrated no or very small volume of tumor on surgical pathology. The treatment options vary greatly for these patients. The former group may benefit from adjuvant therapy whereas deferred treatment may be a valid option for the latter group. Endorectal MRI and MRSI may have a potential role in stratifying these patients for individualized clinical management.

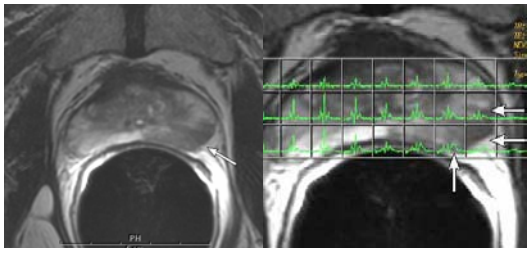

Fig 1. Multiple contiguous abnormal voxels on MRSI increases suspicion for ECE. *Left*, axial T2-weighted image demonstrates a focal area of low signal in left posterior peripheral zone, with mild capsular irregularity suggestive of possible ECE (arrow). *Right*, MR spectroscopy demonstrated 6 consecutive suspicious voxels (3 shown, arrows). Surgical pathology showed pT3a cancer.

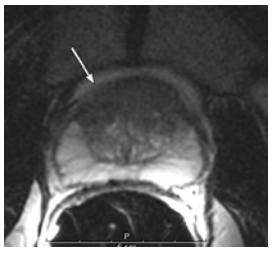

Fig 2. Prostate MR helps detect anterior tumors, which are not palpable by digital exam. Axial T2-weighted image demonstrates a focal area of homogeneous low signal in anterior transition zone, with interruption of the fibromuscular stroma. Surgical pathology confirmed pT3a cancer.

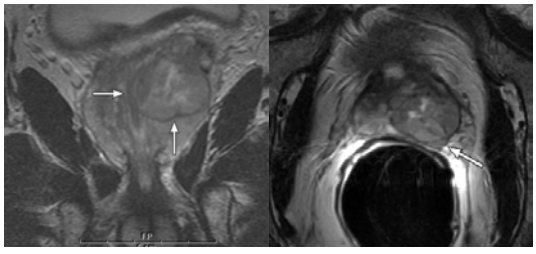

Fig 3. MRI and MRSI help diagnose atypical prostate tumors. Patient presented with hematuria. *Left*, coronal T2-weighted image demonstrates an encapsulated mass (vertical arrow) in left prostate lobe displacing and possibly eroding into the urethra (horizontal arrow). The encapsulated appearance is atypical for prostate cancer. However, MRSI demonstrated a corresponding large area of suspicious voxels with elevated coline. *Right*, the tumor causes focal bulging and narrowing of left rectoprostatic angle, indicative of ECE. Surgical pathology showed pT3a tumor with mucinous components.

References.

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