The role of Conventional and Functional endorectal MRI in the decision of whether to preserve or resect the neurovascular bundles during radical retropubic prostatectomy.

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Introduction & objectives

Because the recovery of erectile function and the avoidance of positive surgical margins are important but competing outcomes, the decision whether to preserve or resect a neurovascular bundle (NVB) during radical prostatectomy (RP) is based on information concerning mostly the presence and location of extracapsular extension (ECE). Conventional endorectal MRI (e-cMRI) and Functional endorectal MRI (e-fMRI) of the prostate nowadays provide an excellent depiction of the pelvic and prostate anatomy, and have also exhibited usefulness in predicting the presence of prostate cancer (PCa) as well as ECE, seminal vesicle involvement (SVI) and NVB involvement. Their prediction however have shown a significant interobserver variability. The purpose of this study is to report our own accuracy using e-cMRI and e-fMRI, and additionally to assess their value in making the decision whether to preserve or resect the NVBs during RP.

Patients & Methods

From 2004 to 2007, 75 consecutive patients with a biopsy-proven PCa, a satisfying erectile function and who were scheduled to undergo RP were subjected to e-cMRI and e-fMRI prior to surgery. Interpretation was performed by a highly experienced radiologist blinded to patient clinical data. All patients underwent RP and a nerve sparing (NS) procedure was considered appropriate if the tumor did not extend outside the capsule in the posterolateral region of the prostate as assessed by the images.

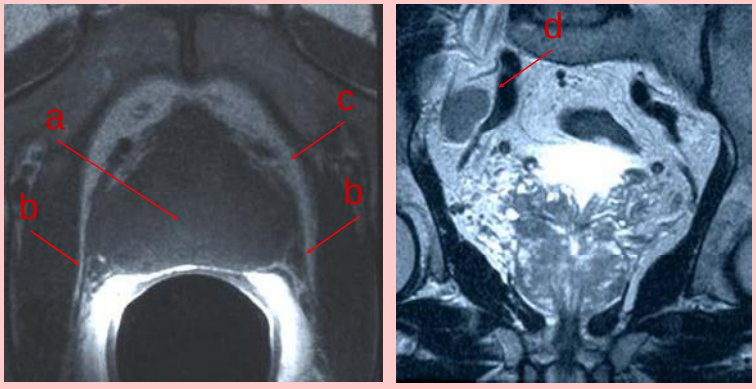
Results

A NSRP was performed in 78,7% of patients. Based on the e-cMRI and e-fMRI findings, the operative strategy was changed in 44% of patients. The findings favoured NVB preservation in 67% of patients with a high clinical probability of ECE, and opposed NVB preservation in 33% of patients with a low clinical probability of ECE. Based on the final histopathologic findings, the surgical plan was successfully changed in all patients. The sensitivity, specificity and accuracy rate were 92%, 100%, and 100% for ECE, SVI and NVB involvement, respectively, results which are higher than all other published international standards in this matter.

Conclusions

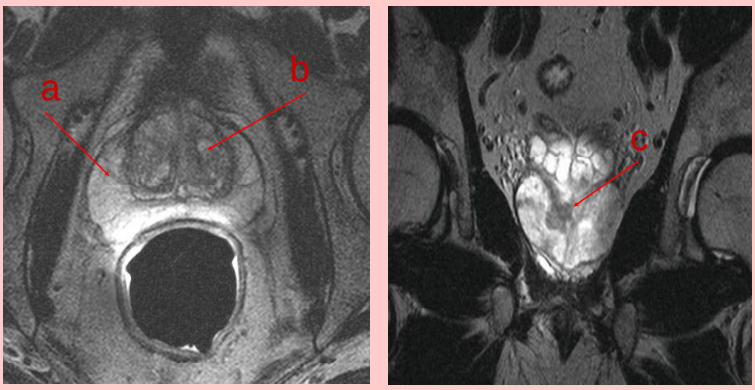
e-cMRI and e-fMRI are a sufficient modality in detecting PCa, ECE, SVI and NVB involvement. This technique seems to one of the most sensitive preoperative clinical staging method for selective patients, and extremely useful for identifying candidates for a NSRP. When a patient with a satisfying erectile function is scheduled to undergo RP but his clinical probability of ECE disease is high, a preoperative staging with e-cMRI and e-fMRI should be performed and the results should be considered.

Conventional endorectal MRI (e-cMRI)
Morphological information using T1-weighted images

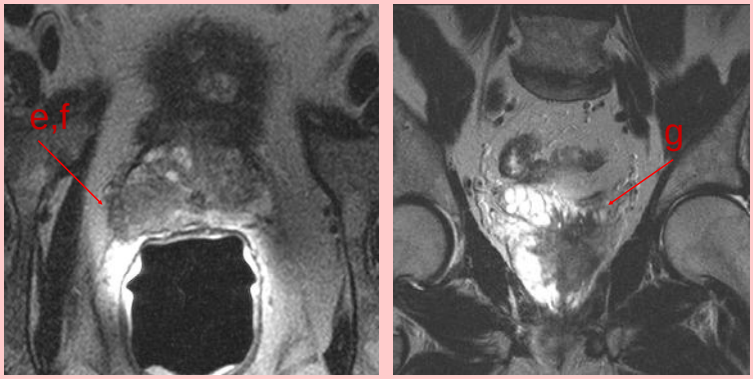


- uniform intermediate signal intensity (a)
- zonal anatomy cannot be clearly identified (a)
- visualization of the NVB (b)
- visualization of probable tumor into the periprostatic fat (c)
- detection of lymph nodes (d)

Conventional endorectal MRI (e-cMRI)
Morphological information using T2-weighted images

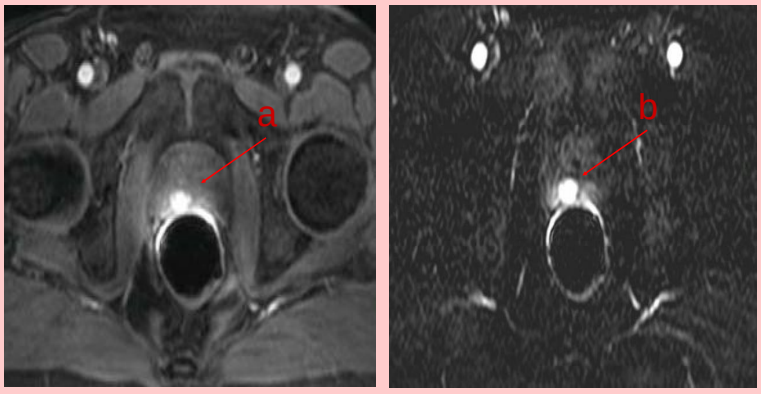


- high signal intensity of the peripheral (a) and a low signal intensity of the central and transitional zones (b)
- low signal area in the peripheral zone due to tumor (c)



- displacement or vanishing of the NVB due to tumor (e)
- ECE involvment(f)
- SVI involvment (g)

Functional endorectal MRI (f-cMRI): e-dceMRI and DWI
Morphological information using T1 and T2-weighted images



- early contrast enhancement of tumors on dynamic T1-weighted images (a)
- restricted diffusion of tumors in T2-weighted images (b)
- Applies for cT2a-T4 prostatic tumors as well as for N+

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