

Diagnostic accuracy of T2 weighted MRI for planning MRI guided prostate biopsies – a correlation with whole-mount sections in 70 patients

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INTRODUCTION

Repeatedly negative prostate biopsies in individuals with elevated PSA levels can be frustrating for both the patient and the urologist. Additional rounds of conventional transrectal ultrasound (TRUS) biopsies do not seem to improve cancer detection rates in these patients, which on first, second, third and fourth round have been reported to be 14-22%, 10-15%, 5-10%, and 4%, respectively [1, 2]. In cases with previous negative TRUS-biopsies, persisting elevated PSA-levels and suspicious finding in MRI with an endorectal coil (endoMRI), the MRI guided prostate biopsy (MRI Bx) was found to increase the diagnostic performance [3, 4]. However, at the present state, the MRI Bx is relying on morphological changes. Purpose of this study was to evaluate the diagnostic performance of T2w endoMRI in detection and localization of tumors foci within the prostatic gland.

MATERIALS & METHODS

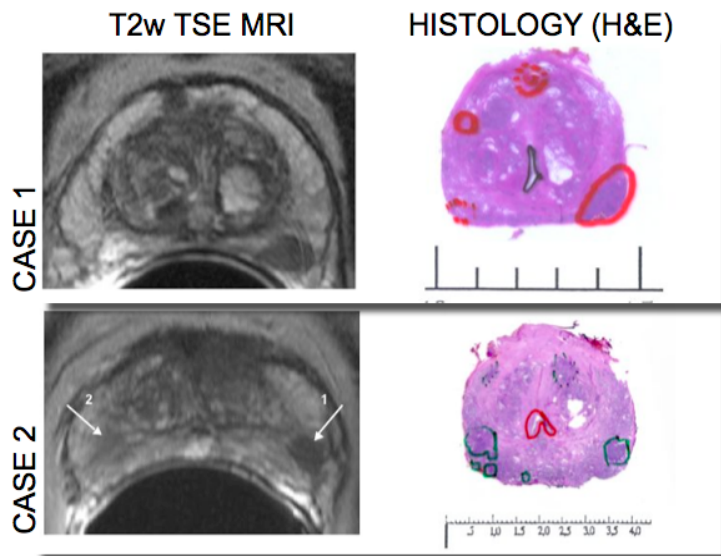
In total 70 patients with biopsy proven prostate cancer (PCa) were examined with endoMRI for therapy planning before radical prostatectomy. EndoMRI were performed on a standard 1.5T whole-body Scanner (Magnetom Sonata, Siemens Medical, Erlangen, Germany). For signal reception, the endorectal coil (Medrad Inc.; PA, USA) was applied with a combination of the integrated spine- and a surface-phased array coil. EndoMRI included coronal and transversal T2w turbo spin echo sequences (TSE). Sequence parameters for the highly resolved transversal T2wTSE were: TR/TE [ms] 9820/121, slices [n] / thickness [mm] 30 / 3, field of view [mm²] / matrix [px²] (169*200) / (216*512), resulting resolution [mm³] was (0.8*0.4*3). For evaluation of endoMRI, two highly experienced radiologists evaluated each tumor focus within the gland and documented localization, size and configuration on a standardized evaluation sheet. After radical prostatectomy, the prostates were prepared as whole-mount sections, according to the slice orientation and slice thickness of the transversal T2w TSE endoMRI. For each slice, tumor surroundings were marked on the whole-mount sections. Histology and endoMRI were compared for each slice. Mean +/- standard deviation for the patient's age at the time-point of radical prostatectomy was 63 +/- 6 a, time interval between endoMRI and radical prostatectomy was 8 +/- 21 days. Last documentet PSA value was 9 +/- 5 ng/ml, prostate volume was 36 +/- 16 cm³. Based on whole-mount section, 315 slices were evaluated. Totally, 533 tumor lesions were documented (8 +/- 5 lesions per patient). Histology revealed in 60 patientes a tumor stadium T2, in 10 a tumor stage T3a/b

RESULTS

Based on the T2w TSE endoMRI, 210 tumor lesions were described. In 130/211, histology could prove these lesions. For the other 423 histological confirmed also on a separate restrospective evaluation no clear demarcation of these lesions on T2w endoMRI was observed (compare figure). Additionally, the lesions were categorized according their maximal diameter on the whole-mount sections. EndoMRI was able to visualize 0 / 56 lesions with a maximum size of < 0.3 cm (detection rate 0%), between 0.3 – 0.5 cm 4 / 116 (3%), between 1 – 0.5 cm 22 / 169 (13%), between 2 – 1 cm 61 / 135 (45%) and for > 2cm 43 / 57 (75%). False positive endoMRI findings were: <0.3 cm 0, 0.5 – 0.3 cm 12, 0.5 – 1 cm 29, 1 – 2 cm 25 and > 2 cm 15. Overall detection rate for a isolated tumor lesion within the gland of the T2w TSE endoMRI was 24 %, for lesions larger than 1 cm in diameter 54 %. False positive findings for endo MRI were 38 %, respectively. Sensitivity / specificity of the T2w endoMRI for local tumor staging was 95 / 70 % for stage T2 and 70 / 95 % for stage T3a/b.

CONCLUSION

T2w endoMRI can be used for planning and conduction of MRI guided prostate biopsies. Especially tumor lesions down to 0.5 cm, which are not assessable by ultrasound guided transrectal biopsy, can be assessed by this method. However, further efforts have to be undertaken to include morphologic and metabolic information to increase the diagnostic performance of MRI for guidance of prostate biopsies.



FIGURE

Examples for the quality of the endoMRI and the correlation of the findings with whole-mount sections are given. As a morphological marker, the urethra was marked, too. Note the deformation of the prostatic gland by the endorectal coil and replacement of some tumor lesions by the coil. Also in case 2 a larger tumor region (marked with 2) is not clearly visible on T2w endoMRI because of its low contrast compared to the normal peripheral zone. However, the contralateral tumor lesion is well delineated.

REFERENCES

- [1] Djavan B, Milani S, Remzi M. Can J Urol 2005;12 Suppl 1:44-8
- [2] Lujan M, Paez A, et al. Prostate Cancer Prostatic Dis 2004;7:238-42.
- [3] Engelhard K, Hollenbach HP et al. Eur Radiol. 2006 Jun;16(6):1237-43
- [4] Anastasiadis A / Lichy MP et al. Eur Urol. 2006 Oct;50(4):738-48; discussion 748-9.