MRI-guided Prostate Biopsy For Individuals with Elevated or Increasing PSA Levels after Negative TRUS-Biopsy

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INTRODUCTION

With the widespread introduction of the PSA testing, the characteristics of prostate cancer (PCa) have changed dramatically within the last fifteen years. But elevated PSA levels can also be present in case of benign prostate hyperplasia (BPH) or in case of chronic prostatitis. Also histological confirmation of PCa is essential not only for initiating therapy – information about tumor load, extension and viability (grading, Gleason score) is required for individual optimized treatment planning. But repeated negative prostate biopsies in individuals with elevated PSA levels can be frustrating for both the urologist and the patient because of the lack of definitive exclusion / detection of PCa. However, information provided by MRI with endorectal coil (endoMRI) cannot be translated without major problems to transrectal ultrasound guided (TRUS) guided prostate. Therefore efforts were taken to perform prostate biopsy with direct control of the probe placement – the MRI-guided biopsy, either in dedicated ("interventional") low-field systems [1] or clinically widely available mid-to-high-field MRI scanners (1.0-1.5 Tesla field strengths) [2]. The latter provides high T2w contrast within acceptable measurement times – a precondition for visualization of PCa during biopsy. Purpose of this study was therefore to establish MRI-guided biopsy for individuals with elevated or increasing PSA levels after negative TRUS- biopsy and suspicious (endo)MRI findings.

MATERIALS & METHODS

A total of 26 patients with elevated PSA-levels and former negative TRUS-biopsy were included so far. Mean age was 64 a (median: 66 a; range: 76-53 a), mean PSA ± standard deviation at the time-point of endoMRI was 10.8 ± 5.8 ng/dl.

All MRI-guided biopsies were performed on a conventional 1.5Tesla MR scanner (Magnetom Avanto, Siemens Medical, Germany). Images were acquired with combined body-phased coils. For guidance of the 16-gauge fully automatic biopsy gun (TSK Laboratory, Japan / MRI Devices Daum GmbH, Schwerin, Germany), a needle guide filled with a Gd-chelat doted gel for better visualization on T1w and T2w imaging was used. For fixation and adjustment of this needle guide, a biopsy devise previously described by Beyersdorff, Winkel et al. [2] was used (MRI Devices Daum GmbH, Schwerin, Germany). The patients were placed all in a prone position and the needle guide was inserted after a digital rectal examination. Neither medications for bowel movement reduction nor local anesthetics were used. Also no sedatives were administered routinely. Before MRI-guided biopsy, coronal and axial T2w as well as an axial T1w MR imaging was obtained to visualize the prebiopsy MRI findings. The needle guide was positioned according to the image findings and the position was reported after each repositioning by T2w images. T2w MRI was adopted in double oblique orientation, parallel according to long axis of the needle guide. In all cases, prebiopsy endoMR images and reports were available during the whole biopsy procedure. Interpretation of MRI, placement of the needle guide and the biopsy were performed in consensus by an experienced radiologist and urologist. In case of different appearances of the suspect finding in the endoMRI and during biopsy, a sample was taken from the former and from the new suspicious areas (hypointens lesions on T2w).

RESULTS

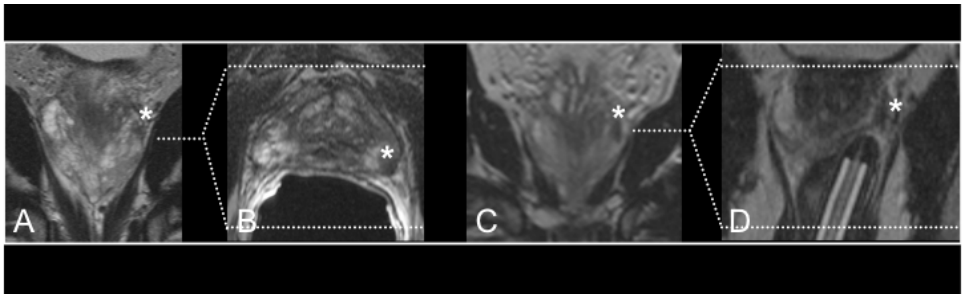
MRI-guided biopsy of the prostate could be successfully in all patients. No major and minor complications were observed and the procedure was well tolerated in all cases. No local anesthesia was required. Mean prostate volume (based on an elliptical shape) was 49 cm^3 (median: 39 cm^3; range: 19-136 cm^3). Based on endoMRI findings, mean volume of the suspicious lesions (defined as T2w hypointense area) was 1 cm^3 (median: 0.8 cm^3; range: 0.2–3.8 cm^3). Total rooming time including MRI for confirmation of prebiopsy endoMRI was in the range of 50 to 100 minutes. A learning curve considering the required time for biopsy was obvious.

PCa was detected in 14 out of 26 cases (54%). In all cases, 2-3 probes from the T2w suspicious area could be taken and as a function of prostate volume, additional probes covered the whole prostate systematically. The major diagnosis in endoMRI suspicious areas but with negative histology was prostatitis.

CONCLUSION

MRI-guided biopsy of the prostate is a save and clinically feasible procedure. Based on our initial results it is a very promising method for tumor detection in individuals with elevated or increasing PSA-levels and negative former TRUS-biopsies.

FIGURE



A) Coronal and B) transversal planes of the T2w endoMRI examination are shown. The suspicious area (*) is clearly visualized. Patient age was 69 a, estimated prostate volume was 31 cm^3, volume of the T2w hypointense area 0.2 cm^3 (0.7cm*0.9cm*0.6cm). PSA was 7.98 ng/dl at the time-point of endoMRI. Interval between endoMRI and MRI-guided biopsy (C), D)) was 25 d. A total of 3 samples were taken (2 samples from the suspicious area in 2D), one from the right gland). In both samples within the suspicious area, histology revealed a low- to mid-grade differentiated adenocarcinoma (30% volume in each sample). Gleason score was 7 (3+4).

REFERENCES

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