Abstract (AJ)

The three aims of the work were as follows:

1.   Comparison of prostate magnetic resonance (MR) examination results from 1.5 T and 3 T scanners in patients with prostate carcinoma (PCa). MR findings of 103 patients (ages 44-72 years) were compared with histopathological results after radical prostatectomy. The work was focused on the accuracy of predicting local cancer staging and determining prostate tumour location. Patients were divided into three groups (A, B and C) based on the type of MR scanner and protocol used. Patient groups A and B were examined in 1.5T and 3T MR scanners equipped with surface coils in the identical multiparametric MR imaging protocol included dynamic contrast examination (DCE). Patient group C was examined in a 3T MR scanner without DCE. The highest accuracy of predicting the stage of PCa was seen in patients examined in 3 T MR scanner with DCE included in the protocol, however, no significant differences were seen between results from 1.5 T and 3.T MR scanners. No significant difference was also found in the accuracy of determining the location of prostate tumour between 1.5 T and 3T MR examinations, however, there were significant differences between sequences used, with the highest accuracy attained by using a combination of T2 weighted sequences and diffusion weighted imaging.

2.   Evaluation of aging effect on prostate metabolite concentrations of citrate, choline, creatine and spermine in healthy volunteers using proton (^{1}H) MR spectroscopy. ^{1}H MR spectroscopy results included 36 examinations in 1.5 T and 3 T scanners of 52 volunteers (ages 19-71 years) were evaluated. Our work showed significant age dependence of concentrations of prostate metabolites, with the doubling of citrate and spermine concentrations between ages 20 to 70 years. We found a significant effect of all three factors (patient age, strength of the magnetic field, and position of voxel placement either in peripheral zone or central gland) on metabolite concentrations in prostate.

3.   Comparison of prostate MR examination results using the classification Prostate Imaging Reporting and Data System versions 1 and 2 (PI-RADS V1 and V2) for PCa detection in 167 patients with suspicion of PCa, without previous biopsy or with negative biopsy. Patients were examined in a 1.5 T MR scanner using a combination of endorectal and surface coils. MR results were compared to results from targeting and systematic biopsy. The accuracy of detection of PCa by both methods was evaluated using Receiver-operating characteristic curve (ROC) and the area underneath the curve (AUC). We found a significantly higher discriminative ability of PI-RADS V2 in comparison with PI-RADS V1. Using threshold of apparent diffusion coefficient (ADC) values with PI-RADS improved prediction of tumour presence.

Key words: prostate carcinoma, magnetic resonance, PI-RADS, ^{1}H MR spectroscopy