Magnetic Resonance Imaging of Prostate Cancer: Pelvic Phased-array Coils versus Integrated Endorectal Pelvic Phased-Array Coils

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Purpose
The goal of this study was to compare staging accuracy and anatomic detail obtained with the pelvic phased-array coil and the integrated endorectal pelvic phased-array coil for MR-staging of prostate cancer.

Introduction
Prostate cancer is the second most frequent cause of cancer deaths in American men. Treatment is dependent on the local extent of cancer at the time of diagnosis. Curative radical prostatectomy is considered only an option if no seminal vesicle invasion (svi) or extracapsular extension (ece); (stage ≤ T2) (1) is present.

Initial staging accuracies for detection of ece and svi for transrectal sonography and body coil MRI have been disappointing; 46% and 57% respectively for clinically localized disease (2). Since then a variety of studies have been performed in order to increase staging accuracies using endorectal surface coils (erc) with variable results; 51%-82% (3,4). Only one study so far has combined the endorectal surface coil with a pelvic phased-array coil (ppa-coil) and compared this with the ppa alone (5). This study concluded that the integrated endorectal ppa-coil is better for evaluation of local prostatic cancer than the ppa-coil alone. In the current study we want to validate these results and assess staging accuracies and anatomic detail obtained with the integrated endorectal ppa-coil and compare the results with the ppa-coil.

Methods
MR imaging was performed on patients (n=14) with prostate cancer, prior to radical prostatectomy on a Siemens vision 1.5 Tesla clinical scanner. Transverse fast spin echo images of the prostate were obtained using (1) a ppa-coil and (2) in combination with an endorectal surface coil (Medrad) using identical scanning parameters (TR/TE: 4.400/132, fa: 180°, fov: 28 cm, ma: 180°•512). MR-images were retrospectively evaluated by one observer (J.B.) according to anatomic detail, image artifacts and local extent (ece and svi) without knowledge of histology. Imaging results and results of histology were compared.

Results
Anatomic detail of the prostate was significantly better with the endorectal ppa-coil (p<0.05). Erc-related artifacts interfering with diagnosis were 'straight-line artifacts' (n=2; 14%). Flare and rectal movement did not interfere with diagnosis.

<table>
<thead>
<tr>
<th>T2</th>
<th>T3</th>
<th>Total</th>
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<tr>
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<td>5</td>
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<tr>
<td>PT3</td>
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Table 1a: ppa-coil Table 1b: endorectal ppa-coil
Staging accuracy, specificity and sensitivity for the ppa-coil; 43%, 44% and 40% (table 1a). For the endorectal-ppa-coil the accuracy, specificity and sensitivity were; 71%, 89% and 40% (table 1b) (p; not significant).

<table>
<thead>
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<th>Ece+</th>
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<tr>
<td>Pce+</td>
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Table 2a: ppa-coil Table 2b: endorectal ppa-coil
The accuracy, specificity and sensitivity for ece were for the ppa-coil; 55%, 83% and 20% (table 2a). For the endorectal ppa-coil the accuracy, specificity and sensitivity were; 64%, 100% and 0% (table 2b) (p; not significant). In three patients ece could not be evaluated by ppa-coils due to poor image quality. Endorectal ppa-coils gave correct results in these patients.

<table>
<thead>
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<tr>
<td>Psvi+</td>
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</table>

Table 3a: ppa-coil Table 3b: endorectal ppa-coil
Accuracy, specificity and sensitivity for svi were for the ppa-coil; 43%, 50% and 0% (table 3a). For the endorectal-ppa-coil the accuracy, specificity and sensitivity were; 79%, 83% and 50% (table 3b) (p; not significant). Figures 2a and b demonstrate the decreased sensitivity for ece with the endorectal ppa-coil, however for svi sensitivity and specificity are increased using the endorectal-ppa coil which is demonstrated in figs. 1a and b.

Discussion and Conclusion
Use of the integrated endorectal surface coil results in significant improvement of anatomic detail of prostate images. Staging accuracy is increased mainly due to increased sensitivity and specificity for seminal vesicle infiltration.