

Comparison of optimized endovaginal vs. external array coil T2-W and Diffusion-Weighted imaging techniques for detecting suspected early stage (Ia/Ib1) uterine cervical cancer

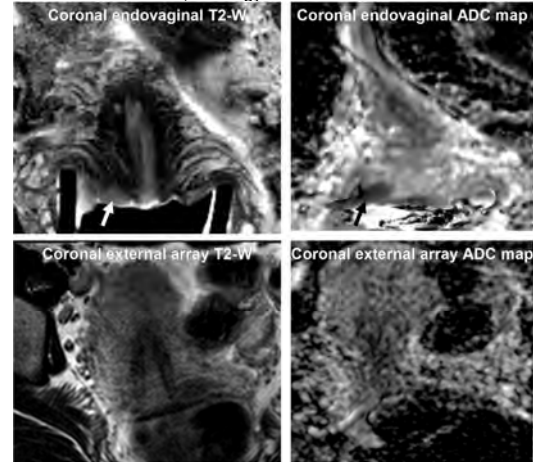
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**Background:** The introduction of cytological screening has led to the presentation of uterine cervical cancer at an early stage with small volume disease. Women are often referred for imaging following a diagnostic cone biopsy or LLETZ procedure, at which a significant proportion of the disease may have been excised. Identification of the presence of residual disease and defining its extent is crucial in planning management, especially if fertility-sparing procedures are to be considered. The use of an endovaginal receiver coil improves sensitivity and specificity of local staging<sup>1</sup>, particularly when T2-W imaging is combined with diffusion-weighted (DW) contrast because the apparent diffusion coefficient (ADC) of tumor is significantly lower than normal tissue<sup>2</sup>. However, DWI is low in SNR and its utility for detecting small lesions using an external array coil alone is questionable. The purpose of this work therefore was to compare the sensitivity and specificity of T2W and T2W+DWI obtained using an endovaginal coil with that using an external array coil for detecting small volume cervical tumors.

**Materials and Methods:** 51 consecutive patients with suspected Ia1/2 or Ib1 cervical cancer were imaged on a 3.0T Philips Achieva MR system (Philips Healthcare, Best, the Netherlands) using an endovaginal coil as part of a coil array with an externally placed flex-L coil. Hyoscine butyl bromide 20mg was administered intramuscularly to reduce peristalsis. T2W TSE images were obtained in 3 planes orthogonal to the cervix (FOV=100mm, TE=80ms, TR=3400ms, fat suppression (SPIR), 2 averages, acquisition matrix 238x238, 0.42mm in-plane resolution, image matrix 288x288, 0.35mm resolution, 24 slices, 2mm thickness). DWI sequences also were acquired in corresponding planes using a single shot SE EPI-based sequence (FOV=100mm, TE=52ms, TR=8000ms, SPIR fat suppression, 1 average, acquisition matrix 80x80, image matrix 224x224, b-values 0, 100, 300, 500 and 800mm<sup>2</sup>, 24 slices 2mm thick). To minimize the total scanning time the sagittal and transverse DW images were acquired with 3b-values 0, 100 and 800mm<sup>2</sup>, TR=5900. Following the endovaginal imaging, the coil was removed and T2W images were acquired in the sagittal and coronal planes using a SENSE XL torsocoil (T2W TSE TR=2100ms, TE=90ms, FOV 120x200mm, 16 slices, slice thickness 3mm, Matrix 120x195, DW images were acquired coronally, FOV=110x100mm, TE=53ms, TR=3230ms, SPIR fat suppression, left-right phase encoding, 2averages, acquisition matrix 88x79, image matrix 224x224, b-values 0, 100, 300, 500 and 800mm<sup>2</sup>, 16 slices with 3mm slice thickness and no gap). An independent radiologist first scored the anonymized coronal and sagittal T2W external coil images as positive or negative for tumor within the cervix; this was subsequently repeated with inclusion of the corresponding coronal ADC maps. At another occasion 2 weeks later to avoid memorization, the same observer scored randomized, anonymized coronal and sagittal T2W endovaginal images similarly, repeating scoring with addition of the corresponding coronal ADC maps.

**Results:** Of 51 patients, 38 had further tissue taken after MRI and were included in the sensitivity/ specificity analysis (13 further cone/ LLETZ, 10 trachelectomy, 9 hysterectomy, 6 biopsy prior to chemoradiotherapy). 11 patients had no further tissue taken (8 with complete tumor excision prior to negative MRI and 3 managed with chemoradiotherapy). Two patients were referrals from institutions elsewhere and no histological follow-up was available. 22 of 38 patients had tumor present on histology (maximum dimension median 10mm, LQ=6mm, UQ=16mm). Sensitivity, specificity, PPV and NPV using the external compared to the endovaginal coil technique are given (Tables) for T2W images alone and T2W+DWI together.

Figure 1: Ectocervical tumor on the right (arrows) is visualized on endovaginal images only. Tumor volume on MRI 0.8cm³. Maximum MRI dimension 1.9cm, histology dimension 1.7cm



T2W n=38	Sens %	Spec %	PPV %	NPV %
Endovaginal coil	87.0	80.0	87.0	80.0
External array	73.9	93.3	94.4	70.0
T2W+DWI n=38	Sens %	Spec %	PPV %	NPV %
Endovaginal coil	82.6	93.3	95.0	77.8
External array	65.2	93.3	93.8	63.6

**Discussion & Conclusions:** Sensitivity for detecting tumor within the cervix was higher with an endovaginal coil technique, although specificity was lower. Addition of DWI to T2W imaging gave a small reduction in sensitivity, but with a substantial improvement in specificity. Although less sensitive, specificity for tumor detection was high with the external array coil using T2W imaging; the addition of DWI in this case did not improve specificity, but merely reduced sensitivity, so that its utility remains as an adjunct to T2W imaging only if an endovaginal technique is used.

**References:** 1. deSouza NM et al, Gynaecol Oncol 2006; 2. Charles-Edwards et al, Radiology 2008  
**Acknowledgements:** Supported by the CR UK Cancer Imaging Centre in association with the MRC and Department of Health (England) grant C1060/A10334, also NHS funding to the NIHR Clinical Research Facility in Imaging and Biomedical Research Centre