

# The added value of dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) in predicting depth of myometrial invasion and overall staging in patients with endometrial carcinoma

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## Introduction

Endometrial carcinoma is the fourth most common female cancer and the most common malignancy of the female reproductive tract. Patient's prognosis depends on a number of factors, including stage, depth of myometrial invasion, lymphovascular invasion, nodal status and histological grade. Preoperative evaluation of these prognostic factors helps in sub-specialist treatment planning. Imaging criteria for staging of endometrial cancer are based on FIGO classification. MRI is significantly superior to US and CT in the evaluation of both tumour extension into the cervix and myometrial invasion [1]. Routine use of dynamic I/V contrast enhancement improves the accuracy of assessment of depth of myometrial invasion (accuracy of 55%-77% for T2W images versus 85%-91% for DCE-MRI) [2-3]. The aim of this study is to assess the incremental value of multiphase DCE-MRI on local and overall staging of endometrial cancer.

## Methods:

Forty-three patients with histological diagnosis of endometrial carcinoma were included in this retrospective study. All patients underwent MRI and surgery. MRI examinations were performed on a 1.5T whole body MRI (Excite, GEHT, Milwaukee) with an 8-channel cardiac array. Each examination included pre-contrast, high resolution FRFSE sequences for optimal tumour localisation and delineation using T2W sagittal, axial and axial oblique planes, and T1W axial sequences of the pelvis and upper abdomen. DCE-MRI after administration of 0.1mmol gadolinium per kg of body weight was performed by using a multi-phase technique which enables acquisition of images at six phases (pre-contrast, and post-contrast at 25 sec, 1 min, 2 min, 3 min in the sagittal plane and 5 min in the axial oblique plane). Dynamic imaging was performed by using a 3D GRE T1W Liver Acquisition Volume Acceleration (LAVA) sequence. Imaging parameters were: TR/TE 3.6msec/1.75msec, 0.75 Nex, 288x192 matrix, FOV 36cm, 4mm sections interpolated to 2mm, BW 80Khz. MR images were independently analysed by 3 MRI radiologists with 2-15 years experience in reporting pelvic MRI. Unenhanced images (T2WI) were evaluated initially and local and overall staging was assigned for each case along with a 5 point scale confidence (ranging from 1=very unconfident to 5=very confident). An identical scoring system was used to evaluate the combination of DCE-MRI and unenhanced imaging (T2WI+DCE-MRI). The corresponding surgical histology was available in all cases and constituted the standard of reference. MRI findings were compared with surgicopathological results and the percentage of correctly identified cases was calculated for myometrial invasion, cervical invasion and presence of lymph node metastases.

## Results:

Table 1 shows the percentage of correctly identified patients with myometrial invasion, cervical stroma invasion and lymph node metastases compare to surgico-pathological findings for the three readers separately. The addition of DCE-MRI to conventional T2WI improves the accuracy detection of myometrial invasion for reader 1 and 3 but does not significantly change the accuracy of reader 2. Reader 1 correctly determined the local staging in 72% (31/43) on the cases on T2WI alone, whereas this percentage increased to 88% (38/43) with the addition of DCE-MRI. A similar observation was made in the case of the overall staging with the correctly identified percentages to be 67% and 86% with T2WI and T2WI+DCE-MRI respectively. These increases in correctly identified cases were found to be statistically significant. The difference in proportions were 16% (95% CI: 5% to 27%) and 19% (95% CI: 7% to 30%) for local and overall staging respectively. The addition of DCE-MRI to T2WI did not significantly change the local or overall staging accuracy of Readers 2 and 3. However the addition of DCE-MRI significantly improved the diagnostic confidence for all three readers.

Finding	Reader 1		Reader 2		Reader 3	
	T2WI	T2WI + DCE-MRI	T2WI	T2WI + DCE-MRI	T2WI	T2WI + DCE-MRI
<b>Myometrial Invasion</b>	94 (30/36)	100 (36/36)	91 (30/33)	83 (30/36)	78 (28/36)	89 (32/36)
<b>Cervical stroma invasion</b>	67 (4/6)	83 (5/6)	17 (1/6)	17 (1/6)	17 (1/6)	17 (1/6)
<b>Lymph node metastases</b>	100 (4/4)	100 (4/4)	100 (4/4)	100 (4/4)	50 (2/4)	50 (2/4)

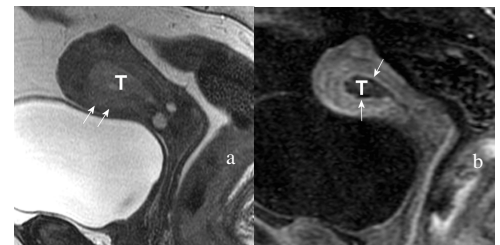
**Conclusions:** Our results indicate that the addition of multi-phase DCE-MRI to conventional T2WI may improve the accuracy of assessment of myometrial invasion as well as overall staging of endometrial cancer and it does significantly improve the diagnostic confidence. However there is a variation between different readers which may be explained by length of experience on MRI interpretation as well as pattern and intensity of training. This initial study will form the basis for a future study addressing these questions in a more robust prospective approach.

## References :

- [1] Kinkel et al. *Radiology* 1999;**212**:711-8
- [2] Yamashita et al. *Radiology* 1993;**186**:495-501
- [3] Manfredi et al. *Radiology* 2004;**231**:372-8

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**Figure 1:** Sagittal T2WI shows an endometrial tumour (T). Uterine zonal anatomy is indistinct (arrows, a) making accurate staging difficult. An intact band of SEE (arrows, b) seen on DCE-MRI (1 min) excludes myometrial invasion.