Introduction

High resolution pelvic MRI has been useful at our institution for the evaluation of local endometrial cancer recurrence in the vagina, typically detected at clinical examination. MRI findings of recurrent tumor location, extent of recurrence, and maximum tumor thickness help radiation oncologists in treatment planning and stratifying patients to external beam pelvic radiation with intracavitary vaginal cuff brachytherapy versus external beam pelvic radiation with interstitial brachytherapy.

Recurrence patterns of endometrial cancer

Endometrial cancer is the most common gynecologic malignancy in the United States; the overall rate of endometrial cancer relapse is approximately 15%.

1. Isolated local relapse to the vagina
   - Overall 3-year survival rate of 73%.
   - High-dose-rate brachytherapy in combination with external beam radiation therapy is the treatment of choice in radiotherapy-naive patients.

2. Regional relapse
   - Recurrence outside the vaginal vault but within the pelvis; manifested as isolated nodal disease and/or peritoneal disease.
   - 3-year survival rate dramatically drops to 8%.
   - Same treatment approach as for women presenting with isolated local vaginal recurrence.

3. Distant metastasis
   - 3-year survival rate of 14%.
   - Chemotherapy is the first-line treatment.

Diagnostic work-up

- 70% of patients with recurrence will be symptomatic.
- They most commonly present with vaginal bleeding, anorexia and weight loss.
- Examination consists of pelvic exam with biopsies of suspicious areas as needed.
- Imaging: pelvic MRI versus whole body CT or PET/CT depending on the level of suspicion of disease spread.
- Measurement of cancer antigen (CA) 125 levels.

Radiation options for vaginal recurrence

External beam pelvic radiation
Vaginal cuff brachytherapy via vaginal cylinder
Interstitial brachytherapy

Vaginal cuff brachytherapy

According to the American Brachytherapy Society recommendation for endometrial cancer vaginal recurrence, intracavitary vaginal cuff brachytherapy should be restricted to patients with normal/vaginal cuff brachytherapy (< 5 mm thick) disease.

Interstitial brachytherapy

Interstitial brachytherapy is used to treat patients with bulky (> 5 mm thick) disease.

Complicated implant
- General anesthesia.
- Not confined to body cavities.
- Performed at selected centers.
- Increased post-therapy complications.

Dosimetry has greater geometric freedom.

- Needles within tumor bulk can be preferentially loaded for asymmetric dosing and irregular isodose shells.

Integration of MRI findings with radiation therapy

<table>
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<tr>
<th>Biopsy proven vaginal recurrence</th>
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<td>Initial pelvic MRI: Vaginal tumor thickness &gt; 5 mm in maximal thickness.</td>
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<td>Yes</td>
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MRI Technique

High resolution non contrast and contrast enhanced pelvic MRI. Vaginal distension achieved with a combination of 75 cc of sterile ultrasound gel and a plastic vaginal dilator cylinder placed into the vagina once the patient is on the MRI table.

Scanning Protocol on 3T Siemens Verio (B17 Software)
- High Resolution 3 plane FSE T2 (FOV 160x180, Matrix 520x290, 3 mm slice thickness).
- Axial Diffusion Weighed (Echo Planar/SPAIR Fat Sat), b-values of 50, 400 and 800.
- Axial Fat Suppressed FSE T2.
- 3D Fat Suppressed GRE (VIBE) pre and post Multihance® contrast administration.
- Large FOV and Isotropic High Resolution (260x260, Matrix 256x256, 4.68, 1.77, 1 mm) multiplanar reformatted post contrast images generated.

Case 1: Pre-radiation pelvic MRI in a 57 year old woman with history of previously resected stage IIC high-grade endometrial adenocarcinoma, presenting with rapid postoperative recurrence.

A & B. Sagittal (magnified) and axial T2 FSE images demonstrate a large tumor mass (arrow) in the anterior vaginal wall, measuring 10 mm in maximum thickness. C. Axial T2 fat image (lower than B) also shows left lateral and posterior vaginal involvement (dotted arrow) closely abutting but not invading the urethra (curved arrow). D. Postcontrast T1 Fat Sat 3D GRE demonstrates early enhancement of the tumor (arrows) involving at least 270 degrees of the vaginal wall. E & F. DWI b value 800 and ADC map demonstrate restricted diffusion (arrows) within this lesion.

Case 2: Pre-radiation therapy pelvic MRI in a 58 year old woman with history of previously resected stage IIA endometrial adenocarcinoma, presenting with biopsy proven vaginal recurrence.

A. Sagittal (magnified), sagittal, and axial T2 FSE images demonstrate a small tumor nodule (arrow) at the left vaginal apex, measuring 6 mm in maximum thickness. D. Postcontrast axial T1 Fat Sat 3D GRE demonstrates mild enhancement of the tumor which is hypointense relative to enhancing vaginal mucosa. E. Diffusion weighted images (DWI) with b values of 50 and 800 and apparent diffusion coefficient (ADC) map demonstrate restricted diffusion within this lesion.

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Repeat pelvis MRI performed 1 month after pelvic external beam radiation and concurrent chemotherapy

A. C. Sagittal (magnified) and axial T2 FSE, and axial T2 postcontrast T1 Fat Sat 3D GRE images demonstrate nonvisualization of the tumor, indicating complete imaging response. The patient subsequently underwent vaginal cuff brachytherapy boost for salvage treatment.

Case 3: Pre-radiation pelvic MRI in a 69 year old patient with history of previously resected stage IIB clear-cell endometrial carcinoma, presenting with recurrent tumor at the vaginal apex.

A. C. Sagittal (magnified), coronal, and axial T2 FSE images demonstrate a large tumor (arrow) at the left vaginal apex, measuring 15 mm in maximum thickness. B. Sagittal postcontrast T1 Fat Sat 3D GRE shows the smaller mildly enhancing tumor. C. DWI b value of 800 and ADC map demonstrate persistent restricted diffusion within the tumor. According to our algorithm, the patient subsequently underwent vaginal cuff brachytherapy boost for salvage treatment.

Repeat pelvic MRI performed 2 months after pelvic external beam radiation therapy.

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