Imaging in Post Menopausal Bleeding

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Target Audience: Imagers with an interest in genito-urinary imaging.

Outcomes/objectives: To know the causes of post-menopausal bleeding; to be familiar with the role of imaging, and in particular, MRI in patients with PMB; to know the best technique for imaging endometrial and cervix cancer; to be familiar with the FIGO staging system; to recognize some of the pitfalls in MRI of endometrial and cervix cancer staging.

Background

Post-menopausal bleeding (PMB) is vaginal bleeding that occurs following one year without a period. This is a symptom that always requires investigation in order to rule out a serious underlying pathology, as well as to allow optimal treatment of benign conditions. The cause of bleeding may arise from a variety of anatomical locations as well as from a number of different pathologies. The most common causes are benign including: atrophy of the lining of the vagina or endometrium due to lower oestrogen levels; cervical or endometrial polyps; endometrial hyperplasia, particularly due to hormone replacement therapy or tamoxifen treatment. In a small proportion of women, the cause will be an underlying cancer of the endometrium or cervix or rarely this may be due to an ovarian neoplasm.

Initial investigations include a physical examination, possibly a cervical smear or swabs, and an ultrasound scan to evaluate the endometrial lining and the ovaries. Sampling of the endometrial lining may be obtained by pipelle sampling or hysteroscopy.

Following the initial investigations, MRI may be indicated in order to determine the stage of endometrial or cervical cancer or to further delineate the extent of benign conditions that are causing bleeding.

MRI in endometrial and cervical cancer

Once a histological diagnosis of endometrial or cervical cancer has been made, imaging may have a significant impact in patient management. The most widely used staging classification is that of the International Federation of Gynaecology and Obstetrics (FIGO), although TNM classification can be used. The FIGO staging classification will be presented in relation to the imaging findings on MRI.

MRI is the most widely used imaging tool for loco-regional staging of both endometrial and cervical cancer. Optimisation of the MRI sequences and protocols is essential in order to obtain the best staging results.

Patient preparation includes fasting for 4 to 6 hours in order to reduce artifact from bowel peristalsis. An anti-peristaltic agent may be administered prior to imaging. Ideally, the bladder should be emptied about 30 minutes prior to examination to allow limited partial filling. The patient is ideally imaged in the supine position with a pelvic multichannel phased array coil.

The standard sequences include a wide field of view axial T1 and T2W sequences from the renal hila to perineum to evaluate para-aortic and pelvic nodes and rule out hydronephrosis; sagittal T2W pelvis is ideally in the axis of the uterus; a small FOV oblique axial T2W sequence is set up to be perpendicular to either the endometrial cavity (in endometrial cancer) or cervical canal (in cervix cancer). The sagittal and oblique axial sequences are then be repeated using a diffusion weighted sequence and/or dynamic contrast enhancement in the case of endometrial cancer.

Endometrial cancer. MRI has been the workhorse of pre-operative staging in those centers that select patients for lymphadenectomy or nodal sampling. The standard treatment for patients with endometrial cancer is full surgical staging according to the FIGO classification, which includes hysterectomy, bilateral salpingo-oopherectomy and lymphadenectomy. However, full lymphadenectomy is a highly specialized procedure that increases the duration of the primary surgical procedure and increases the morbidity to the patient. In addition, there is considerable controversy over the benefit in terms of patient outcome following lymphadenectomy. The identification of patients that are unlikely to have lymph node metastases could potentially obviate the need for surgical lymphadenectomy and help to direct adjuvant radiotherapy. Histologic grade is an important risk factor and this is available pre-operatively. However, other risk factors for lymph node involvement include the depth of myometrial invasion, the presence of cervical involvement and tumour volume.

MRI has been shown to be accurate in the assessment of the depth of myometrial invasion and in detecting or ruling out cervical invasion. The most widely validated sequences are high resolution T2-weighted and dynamic contrast enhanced sequences. DWI is gaining acceptance as providing additional information concerning detection of drop metastases as well as in determining the depth of myometrial invasion. Tumour volume as measured by MRI has also been found to be of significance in predicting nodal involvement. Information from MRI may allow triage of patient care: in low grade tumours, if there is no deep myometrial invasion or cervical involvement, a patient may be triaged to surgery in their local cancer unit, without lymphadenectomy; conversely, if deep myometrial invasion or cervical involvement is demonstrated on MRI, the patient should be triaged for treatment in a gynecologic oncology centre where lymphadenectomy and adjuvant therapies may be considered.

Cervix cancer. The main role at the time of initial diagnosis is to triage patients into either operable treatment (radical surgery) in patients with early stage disease or non-operable therapy (chemoradiation) in patients with large tumours size or parametrial invasion (FIGO stage IIb) or higher stage tumour. MRI has been shown to be the optimal imaging tool to determine the position, size and depth of cervical stromal invasion. Parametrial invasion can be ruled out with a high negative predictive value.

Nodal metastases. The diagnostic performance of MRI for the diagnosis of nodal metastases is relatively poor. A high specificity for nodal metastases can be achieved using a short axis diameter cut-off of 10mm or greater, and some morphological features can indicate metastatic involvement (such as necrosis). However, the sensitivity for detection of metastases in nodes less than 10mm in short axis diameter remains relatively poor. The evidence in support of DWI will be discussed.

MRI of benign conditions causing PMB

Acute presentation of a pedunculated submucous fibroid may occur, particularly if torsion develops. The appearances of uterine sarcoma can overlap with those of benign leiomyomas, and this can be a diagnostic and clinical challenge.

Adenomyosis is commonly seen but is does not cause PMB. It may be found in conjunction with endometrial carcinoma and may cause some difficulty in accurate staging of the depth of myometrial invasion.

Endometrial hyperplasia or the presence of a benign endometrial polyp may result in widening and abnormal signal intensity within the endometrium. Inflammatory conditions of the endometrium include pyometria and endometritis. In the presence of a coil, actinomycosis may rarely develop and result in pelvic retroperitoneal fibrosis. A short review of the benign causes for PMB will be presented.

Reference list

Pecorelli S. Revised FIGO staging for carcinoma of the vulva, cervix, and endometrium. Int J Gynaecol Obstet 2009; 105(2):103-104.

Creasman W. Revised FIGO staging for carcinoma of the endometrium. Int J Gynaecol Obstet 2009; 105(2):109.

Kitchener H, Swart AM, Qian Q, Amos C, Parmar MK. Efficacy of systematic pelvic lymphadenectomy in endometrial cancer (MRC ASTEC trial): a randomised study. Lancet 2009; 373(9658):125-136.

Benedetti PP, Basile S, Maneschi F, Alberto LA, Signorelli M, Scambia G et al. Systematic pelvic lymphadenectomy vs. no lymphadenectomy in early-stage endometrial carcinoma: randomized clinical trial. J Natl Cancer Inst 2008; 100(23):1707-1716.

Tirumani SH, Shanbhogue AK, Prasad SR. Current concepts in the diagnosis and management of endometrial and cervical carcinomas. Radiol Clin North Am. 2013 Nov;51(6):1087-110.

Todo Y, Choi HJ, Kang S, Kim JW, Nam JH, Watari H, Tamakoshi A, Sakuragi N. Clinical significance of tumor volume in endometrial cancer: a Japan-Korea cooperative study. Gynecol Oncol. 2013 Nov;131(2):294-8.

Freeman SJ, Aly AM, Kataoka MY, Addley HC, Reinhold C, Sala E. The revised FIGO staging system for uterine malignancies: implications for MR imaging. Radiographics. 2012 Oct;32(6):1805-27.

Levy A, Medjhoul A, Caramella C, Zareski E, Berges O, Chargari C, Boulet B, Bidault F, Dromain C, Balleyguier C. Interest of diffusion-weighted echo-planar MR imaging and apparent diffusion coefficient mapping in gynecological malignancies: a review. J Magn Reson Imaging. 2011 May;33(5):1020-7

Sala E, Rockall AG, Freeman SJ, Mitchell DG, Reinhold C. The added role of MR imaging in treatment stratification of patients with gynecologic malignancies: what the radiologist needs to know. Radiology. 2013 Mar;266(3):717-40.

Sala E, Rockall A, Kubik-Huch RA. Advances in magnetic resonance imaging ofendometrial cancer. Eur Radiol. 2011 Mar;21(3):468-73.

Sala E, Rockall A, Rangarajan D, Kubik-Huch RA. The role of dynamic contrast-enhanced and diffusion weighted magnetic resonance imaging in the female pelvis. Eur J Radiol. 2010 Dec;76(3):367-85.

Beddy P, Moyle P, Kataoka M, Yamamoto AK, Joubert I, Lomas D, Crawford R, Sala E. Evaluation of depth of myometrial invasion and overall staging in endometrial cancer: comparison of diffusion-weighted and dynamic contrast-enhanced MR imaging. Radiology. 2012 Feb;262(2):530-7.