Yumiko Oishi Tanaka · Takeshi Yoshizako
Masato Nishida · Rie Minami · Masayuki Yamaguchi
Yuji Itai

Predicting microscopic extrauterine spread of endometrial carcinoma with MRI to support less invasive therapy

Received: July 13, 1999 / Accepted: February 14, 2000

Abstract

Background. Magnetic resonance imaging (MRI) provides precise staging of endometrial carcinoma. However, we have sometimes experienced patients with microscopic extrauterine extension in whom MRI showed the disease as being limited to the uterus. We studied indirect MRI signs for microscopic extrauterine spread of endometrial carcinoma which outwardly seemed to be limited to within the uterus.

Methods. MRI studies and the clinical records of 100 patients with surgically proven endometrial carcinoma were retrospectively reviewed. We evaluated: (1) MRI staging, (2) tumor growing at the orifices of the fallopian tube in the uterine fundus, (3) hydrosalpinx, and (4) ascites, in each MRI study.

Results. Surgical specimens showed that 12 of the 100 patients had extrauterine spread, with 1 patient showing both ovarian extension and omental metastasis; there ovarian extension in 3, extension to the fallopian tubes in 3, omental metastasis in 1, and positive peritoneal cytology in 4. Tumor growing at the orifices of the fallopian tubes with deep myometrial invasion showed higher accuracy for predicting microscopic intrauterine spread (82.0%) although it was not significantly different from the accuracy of deep myometrial invasion anywhere within the uterus (75.0%). However, tumor growing at the orifices of the fallopian tubes in a patients with stage Ia disease showed a high negative predictive value (89.7%). Hydrosalpinx had the highest specificity (98.9%) and accuracy (88.0%); however, it did not seem to be practical because it was observed in only 2 patients. Ascites in postmenopausal patients showed higher specificity (93.5%), although it was not considered to be useful in the premenopausal patients.

Conclusion. Tumor extension at the orifices of the fallopian tubes in patients with stage Ia disease, and ascites in postmenopausal patients on MRI seemed to be predictive factors for microscopic extrauterine spread.

Key words Endometrial carcinoma · MRI · Diagnosis · Minimally invasive therapy

Introduction

Endometrial carcinoma is one of the most common malignant tumors to affect women. With advances in the development of preoperative diagnostic tools, especially magnetic resonance imaging (MRI), preoperative staging diagnosis has become more accurate, leading towards satisfactory but less invasive treatment for each stage of the disease. However, gynecologists occasionally experience patients with microscopic extrauterine spread which, outwardly, seems to be limited to within the uterus. As things stand, the prediction of microscopic extrauterine spread is necessary to avoid incomplete treatment for ‘early advanced’ disease. Our goal was to predict the extrauterine spread of endometrial carcinoma with indirect findings on MRI.

Patients and methods

We experienced 106 consecutive patients with pathologically proven endometrial carcinoma who underwent preoperative MRI from April 1991 to December 1997. Four patients with apparent extrauterine spread (2 with direct invasion to the bladder, 1 with ovarian metastasis, and the other with obvious peritoneal implant) and 2 patients with
only non-contrast MRI were excluded from the study and the remaining 100 patients (aged 28–80 years; mean age, 55.1 years) were included in this study. Fifty-six patients were postmenopausal, 28 were of reproductive age, and the remaining 16 patients could not be judged because of lack of data, or were considered to be perimenopausal. Preoperative MRI staging diagnoses, according to the literature, were Ia in 42 patients, Ib in 29, Ic in 19, IIa in 7, IIb in 1, and IIIc in 2. The two patients with stage IIIc disease were diagnosed with intrapelvic lymph nodes larger than 10 mm in minimum diameter. However, as their primary lesions seemed to be limited to within the uterus, they were included in this study. The histological subtypes were endometrioid adenocarcinoma in 86 patients, adenocanthoma in 7, adenosquamous carcinoma in 3, serous adenocarcinoma in 3, and mixed serous and clear cell adenocarcinoma in 1.

MRI examinations were performed with a 0.5-T superconducting magnet (MRT 50A; Toshiba, Tokyo, Japan) in 3 patients, a 1.0-T superconducting magnet (Magnex 100; Shimadzu, Kyoto, Japan) in 4 patients, and two 1.5-T superconducting magnets (Signa; GE Medical Systems, Milwaukee, WI, USA, and Gyroscan S15/ACSII; Best, Netherlands) with body coils in 93 patients. Sagittal T2- and T1-weighted images (WI) of 5-mm thickness and with a 0.5 to 2.0-mm intersection gap were obtained in all patients. Additional coronal or axial T2WI were sometimes performed. To reduce intestinal peristalsis, no medication was given. After the intravenous administration of 10ml of gadopentetate dimegulmine (Magnevist; Japan Schering, Osaka, Japan), single level dynamic studies were performed every 10–14s for 3min in 98 patients. The planes selected for dynamic studies were mid-sagittal in most of the patients. Contrast sagittal and coronal or axial T1WI in static phase were obtained in all patients.

The MRI findings were retrospectively analyzed by two trained radiologists (Y.O.T and T.Y.). The parameters evaluated were: MRI staging, presence of tumor at the orifice of the fallopian tube, hydrosalpinx, and ascites, according to the criteria below. MRI staging was conducted according to the published data. When the normal high signal intensity at the orifice of the fallopian tube was obscured by the tumor on T2WI (Fig. 1), or enhanced tumor was present there on contrast-enhanced T1WI (Fig. 2), we evaluated it as positive tumor presence. The depth of myometrial invasion was analyzed, giving highest priority to the dynamic contrast study and higher priority to contrast T1WI than to T2WI, as some T2WI were obtained by the conventional spin-echo method, in which the spatial resolution was very poor because of the longer scan time. In addition, it has been reported that dynamic contrast studies show higher accuracy for myometrial invasion. Hydrosalpinx was considered to be positive when a tortuous tubular-shaped cystic structure was seen beside the uterine fundus (Fig. 3). Ascites was judged as a small amount when it was present only in the small pelvis, and as a large amount when it accumulated beyond the small pelvis (Fig. 4).

When the results for the two radiologists were different, consensus reading after discussion was adopted.

Fig. 1. Positive tumor presence at the orifice of the fallopian tube on T2-weighted magnetic resonance image. A bulky tumor with intermediate intensity is present at the orifice of the left fallopian tube, and the hyperintense line which indicates normal endometrium is not seen on axial T2-weighted image (arrow; fast spin echo [FSE], repetition time [TR]/echo time [TE] = 2076/130). Peritoneal cytology was revealed to be positive after the surgery in this patient (patient 10)

Fig. 2. Positive tumor presence at the orifice of the fallopian tube on contrast-enhanced T1-weighted image. Weakly enhanced tumor invades the orifice of the right fallopian tube with thinning of the myometrium (curved arrow; coronal enhanced T1-weighted image; spin echo [SE], TR/TE = 398/15). Omental metastases were found in this patient (patient 12)

Total hysterectomy and peritoneal cytology were performed in all patients within 1 month after the MRI examination. Intrapelvic lymph node resection was also performed in 93 patients, and paraaortic lymph node resection or biopsy was added in 14 of these patients. In the remaining 7 patients, lymph node dissection was not