CASE REPORT

Role of MRI in uterine didelphys with co-existing endometrial carcinosarcoma

JILL MCGREGOR, MB, BCH, BAO and GILLIAN THOMPSON, MB, BCH, BAO, MRCP, FRCP

1Emergency Medicine Department, Ulster Hospital Dundonald, Belfast, UK
2Imaging Department, Western Health and Social Care Trust, Londonderry, UK

Address correspondence to: Dr Jill McGregor
E-mail: jmcgregor48@hotmail.co.uk

BACKGROUND
Uterine didelphys is an uncommon finding and is very rarely complicated by carcinosarcoma. There are few cases reported to date of these conditions co-existing. The rare anomaly of didelphys uterus is estimated in 1/3000 females.1 Fibroids and benign tumours are relatively common findings in uterine didelphys; however there are few recorded cases of sarcoma, the malignant mesenchymal tumour.2 A literature search was carried out of didelphys uterus and carcinosarcoma and there appears to be only two other cases similar to ours described.

Risk factors for endometrial cancer include oestrogen replacement, obesity, polycystic ovarian syndrome, null parity, tamoxifen and diabetes mellitus.3 The most common presentation is post-menopausal bleeding, as is the case with our patient.

CLINICAL PRESENTATION
A 77-year-old female (para 9) presented with post-menopausal bleeding for 1 month. She has had three sets of twins by caesarean section.

Past medical history included myocardial infarction, primary coronary intervention with stent insertion, hypertension and hypercholesterolemia.

On examination, clinical obesity was noted and bimanual palpation did not reveal a pelvic mass. On speculum examination, two cervixes were identified.

DIFFERENTIAL DIAGNOSIS
The differential diagnosis for post-menopausal bleeding includes endometrial atrophy, endometrial polyps, submucosal fibroids, endometrial hyperplasia, endometrial carcinoma (approx. 10%) and oestrogen withdrawal.1

INVESTIGATION/IMAGING FINDINGS
Initially she underwent trans-vaginal ultrasound scan at gynaecology outpatient clinic, which was diagnostic for uterine didelphys, with two distinct endometrial cavities and separation of the uterine fundi. The left endometrium measured 2 mm (within normal limits for post-menopausal female) and the right endometrium measured 10 mm, raising the suspicion of endometrial pathology.

The patient then proceeded to outpatient hysteroscopy which revealed stenosis of the left cervix. The right cervix and cavity showed a vascular suspicious appearing endometrium, which was subsequently biopsied. It was not possible to sample the left endometrium due to the cervical stenosis.
Pathology report revealed fragments of carcinosarcoma (malignant mixed mullerian tumour - MMMT), with automatic grading of Grade III endometrial carcinoma.

Following this, the female was discussed at local gynaecological-oncology multidisciplinary meeting and after clinic review to discuss the diagnosis, she proceeded to staging MRI scan of the gynaecological pelvis.

Care pathway for endometrial cancer was followed using Northern Ireland Cancer Network (NICaN) clinical guidelines—within 28 days patients should undergo ultrasound scan, hysteroscopy, patient consultation to discuss diagnosis before MRI and discussion at multidisciplinary team meeting with a decision to treat being made. This female had imaging using an Magnetom Aera 1.5T MRI scanner with sequence protocol as per NICaN imaging guidelines using Gadovist 7.5 ml (Bayer) (Table 1).

The MRI demonstrated abnormal widening of the right endometrial cavity with invasion into the myometrium beyond the junctional zone. The pathological signal extended from the uterine fundus to the internal os without cervical stromal involvement.

No parametrial or adnexal extension shown on post-contrast sequences. No significant lymphadenopathy or evidence of distant metastatic spread.

Northern Ireland Cancer Network imaging guidelines for histologically proven endometrial cancer. These guidelines help to standardise the imaging modalities and protocols used therefore making regional multidisciplinary meetings more uniform.

Table 1. NICaN imaging guidelines

| CT        | Area scanned         | Oral contrast | IV contrast vol/sec | Delay(s) | Max slice thickness | Notes                        |
|-----------|----------------------|---------------|---------------------|----------|---------------------|------------------------------|
| CT        | abdomen and pelvis   | 1 Ltr 2%      | 100 ml at 3 ml sec⁻¹ | 70 s portovenous phase | 5 mm reformat from 1.25 mm slices (32 slice MDCT) |                              |
| MRI       | Abdomen and pelvis   | T1W           | Axial LFOV          |          | Case dependnt       | At least cover from renal hilum down |
| MRI       | Pelvis               | T2W           | Axial LFOV          |          |                     |                              |
| PET       | PET is not useful in endometrial carcinoma |               |                     |          | 20 s delay           |                              |

LFOV, long field of view; PET, positron emission tomography; SFOV, short field of view.; T1W, T₁ weighted; T2W, T₂ weighted.

Figure 1. MRI T₂ sagittal image illustrating thickened endometrium and myometrial invasion (see arrow) within the right uterus.
TREATMENT

Following staging and regional multidisciplinary team discussion, this female underwent surgery, which included laparoscopically assisted vaginal hysterectomy and bilateral salpingo-oophorectomy. She was deemed unfit for pelvic node dissection. Post-operative complication of a heavy per-vaginum bleed proceeded to a further post-operative CT showing vault haematoma.

Pathology from surgical specimen showed FIGO stage IIIa due to tumour within blood vessels of parametrium and right ovary.

Figure 2. MRI T₂ sagittal image demonstrating left uterus with normal dimensions of the post-menopausal endometrium (see arrow). Compare with Figure 1 above.

Figure 3. MRI T₂ coronal oblique image illustrating didelphys uterus with two uterine fundi. The right endometrial cavity (see arrow) is distended with pathologically proven carcinosarcoma, compared to the normal post-menopausal left endometrial cavity (see arrowhead).

Figure 4. MRI T₂ axial oblique image showing the abnormal intermediate signal tumour occupying the right endometrial cavity and invading the adjacent myometrium.

Figure 5. MRI T₁ starvibe axial oblique post-gadolinium image showing the non-enhancing endometrial tumour with myometrial invasion (see arrow), in comparison with the normal enhancing myometrium within the left uterus.
There was myometrial invasion of >50% with extensive lymphovascular permeation.

She proceeded to adjuvant radiotherapy but was unfortunately not medically fit enough for palliative chemotherapy. She continues to have regular gynaecological-oncology follow up and is currently approximately 8 months post surgery.

DISCUSSION

Anatomical uterine abnormalities such as our case of uterine didelphys may be diagnosed using multiple imaging modalities such as ultrasound, MRI, fluoroscopy and CT. Local uterine malignancy staging is most accurately performed with dedicated MRI protocol. Both this female’s uterine anomaly and malignant pathology are detailed, staged and beautifully illustrated with dedicated pelvic MRI.

Ultrasound scanning is widely available and is a useful first imaging technique in patients with post-menopausal bleeding.

Table 2. The International Federation of Gynaecology and Obstetrics MRI staging for endometrial cancer

| Stage | Description |
|-------|-------------|
| I     | Tumour confined to the uterus |
| IA    | <50% invasion of the myometrium |
| IB    | ≥50% invasion of the myometrium |
| II    | Tumour invades the cervical stroma but does not extend beyond the uterus |
| III   | Local or regional spread of tumour |
| IIIA  | Serosal or adnexal invasion |
| IIIB  | Vaginal or parametrial involvement |
| IIIC  | Metastasis to pelvic or para-aortic lymph nodes |
| IIIC1 | Pelvic lymph node involvement |
| IIIC2 | Para-aortic lymph node involvement (with or without pelvic nodes) |
| IV    | Extension to the pelvic wall, lower one-third of the vagina, or hydronephrosis or non-functioning kidney |
| IVA   | Invasion of bladder or bowel mucosa |
| IVB   | Distant metastases, including abdominal, or involvement of inguinal lymph nodes |

There was myometrial invasion of >50% with extensive lymphovascular permeation.

As shown in this case, MRI provides excellent anatomical detail and characterisation of both normal anatomy and co-existing pathology. MRI is a non-invasive, safe (with accurate check-listing) and usually well tolerated method of imaging with excellent results and good pathological correlation in staging of gynaecological malignancies. This correlation between MRI and pathological FIGO staging is regularly audited in our department to maintain recommended standards.

MRI is an essential part of the care pathway and management protocol for patients with uterine malignancy such as in this case of carcinoma.

The radiologist is then able to fully participate and enhance each patient’s multidisciplinary meeting discussion to guide appropriate treatment. In our case of uterine didelphys and in another anatomical anomalies it is essential for the surgeon to be aware of the relevant anatomy before embarking on definitive surgery. MRI images as shown clearly demonstrate the variants in this patient. MRI is particularly useful in distinguishing between different uterine malformations and is in most cases superior in this regard in comparison to ultrasound and hysterosalpingography. For example, without detail regarding the fundal wall and endometrial cavities, it can be difficult to distinguish between bicornuate and septate uterine anomalies.

Safety issues, patient compliance, poor renal function and movement artefact including bowel peristalsis may limit MRI staging. Image interpretation is also subject to limitations in spatial resolution. In this case report the difference in MRI and pathological FIGO staging (i.e. 1b versus IIIa) is perhaps explained by the inability of MRI to assess early lymphovascular invasion. Diffusion-weighted imaging is evolving as a useful technique in MRI for assessing tumour invasion. It is not currently part of our NICaN imaging guidelines but should be considered for future inclusion, perhaps precluding the need for gadolinium.

MRI report, including FIGO staging, along with pathological grading help provide the clinician and the patient with information regarding the planned treatment, risk stratification and likely prognosis. MRI can provide information with regard to myometrial invasion, cervical stromal involvement, serosal breech, adnexal and lymph node involvement, all of which are necessary to accurately stage any grade of endometrial cancer.

In our case, this female had Grade III endometrial carcinoma, also referred to as endometrial carcinosarcoma or malignant mixed mullerian tumour. Endometrial carcinoma may also be graded as I or II, both of which carry a better prognosis than the high grade carcinosarcoma, which carries a poor prognosis.

However, MRI is superior in its ability to not only stage myometrial invasion in endometrial malignancy but also assess invasion into the adjacent structures such as cervix, bladder and rectum. Demonstration of potential nodal involvement is also of benefit.

Figure 6. (a) MRI diffusion-weighted images. Apparent diffusion coefficient map (b) b800 reference image showing diffusion restriction pattern confirming the likely malignant nature of the right uterine tumour (see arrow).
of 40% three year survival.\footnote{Dave KS, Chauhan A, Bhansali R, Arora R, Purohit S. Uterine carcinosarcomas: 8-year single center experience of 25 cases. \textit{Indian J Med Paediatr Oncol} 2011; 32: 149–53. doi: https://doi.org/10.4103/0971-5851.92814} The prognosis is further reduced because of our patients medical co-morbidities she was unable to have the recommended pelvic node clearance at the time of pelvic surgery.

**LEARNING POINTS**

1. MRI is the most useful imaging modality in staging uterine malignancies such as carcinosarcoma. In this case anatomy is also well outlined and MRI is an excellent imaging technique for defining Mullerian tract anomalies.

2. Patient care and treatment should be guided by gynaecological-oncology multidisciplinary meeting and review of staging MRI images.

3. It is essential for the surgeon to be aware of the relevant anatomy before embarking on definitive surgery. MRI images as shown clearly demonstrate the anatomical variants in this patient.

**REFERENCES**

1. Grimbizis GF, Camus M, Tarlatzis BC, Bontis JN, Devroye P. Clinical implications of uterine malformations and hysteroscopic treatment results. \textit{Hum Reprod Update} 2001; 7: 161–74. doi: https://doi.org/10.1093/humupd/7.2.161

2. Iavazzo C, Kokka F, Sahdev A, Singh N, Reynolds K. Uterine carcinosarcoma in a patient with didelphys uterus. \textit{Case Rep Obstet Gynecol} 2013; 2013: 1–4. doi: https://doi.org/10.1155/2013/401962

3. Impey L, Child T. The uterus and its abnormalities. In: \textit{Obstetrics and gynaecology}, 4th Edition. Sussex, UK: Wiley-Blackwell; 2012. pp. 21–30.

4. Nalaboff KM, Pellerito JS, Ben-Levi E. Imaging the endometrium: disease and normal variants. \textit{Radiographics} 2001; 21: 1409–24. doi: https://doi.org/10.1148/ radiographics.21.6.g01nv211409

5. Tamai K, Koyama T, Saga T, Umeoka S, Mikami Y, Fujii S, et al. Diffusion-weighted MR imaging of uterine endometrial cancer. \textit{J Magn Reson Imaging} 2007; 26: 682–7. doi: https://doi.org/10.1002/jmri.20997

6. Duncan KA, Drinkwater KJ, Frost C, Remedios D, Barter S. Staging cancer of the uterus: a national audit of MRI accuracy. \textit{Clin Radiol} 2012; 67: 523–30. doi: https://doi.org/10.1016/j.crad.2011.10.019

7. Dykes TM, Siegel C, Dodson W. Imaging of congenital uterine anomalies: review and self-assessment module. \textit{AIR Am J Roentgenol} 2007; 189(3 Suppl): S1–S10. doi: https://doi.org/10.2214/AJR.06.0821

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. \textit{Radiographics} 2012; 32: 1805–27. doi: https://doi.org/10.1148/rg.326125519

9. Beddy P, O’Neill AC, Yamamoto AK, Addley HC, Reinhold C, Sala E. FIGO staging system for endometrial cancer: added benefits of MR imaging. \textit{Radiographics} 2012; 32: 241–54. doi: https://doi.org/10.1148/rg.321115045

10. 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. \textit{Radiology} 2013; 266: 717–40. doi: https://doi.org/10.1148/ radiol.12120315

11. Dave KS, Chauhan A, Bhansali R, Arora R, Purohit S. Uterine carcinosarcomas: 8-year single center experience of 25 cases. \textit{Indian J Med Paediatr Oncol} 2011; 32: 149–53. doi: https://doi.org/10.4103/0971-5851.92814