Introduction

While transabdominal or transvaginal ultrasound remain the imaging modalities of first choice for the initial evaluation of any suspected pathologic condition of the female genital tract, technical advances in cross-sectional imaging have opened up many diagnostic applications in female pelvic pathology. Computed tomography (CT) is usually employed in an emergency situation, such as in an acute abdomen caused by ovarian torsion, as well as for the diagnosis of metastatic spread in oncologic patients. Compared to CT, magnetic resonance imaging (MRI) provides improved soft tissue contrast and is thus better suited to evaluate female genital organs. Further advantages of MRI over CT include that it does not employ ionizing radiation and has no teratogenic effects. MRI is thus well suited for imaging women of reproductive age and especially during pregnancy, e.g., for MR pelvimetry and, more recently, as an adjunct to sonography for fetal imaging. MRI nowadays plays an increasing role in preoperative characterization and staging of gynecologic tumors and is also used as a problem-solving tool in benign conditions, e.g., in patients with uterine malformations or leiomyoma, or to select appropriate candidates for therapies such as myomectomy and uterine embolization.

Normal MR Anatomy of the Female Genital Organs

The uterus is best depicted using T2-weighted sagittal sequences. In women of reproductive age, the uterus is approximately 6-9 cm in length. In the premenopausal woman, three distinct zones are recognized: (1) the high-signal intensity endometrium of varying thickness, depending on the menstrual cycle; (2) the hypointense junc-tional zone, anatomically corresponding to the innermost layer of the myometrium; and (3) the outer layer of the myometrium of intermediate signal intensity. Four zones are distinguished in the cervix by high-resolution MRI: (1) the hyperintense mucous within the endocervical canal, (2) the cervical mucosa of intermediate to high signal intensity, (3) the hypointense cervical stroma surrounding the mucosa, and, (4) an additional layer of intermediate signal intensity in continuity with the uterine myometrium representing smooth muscle (Fig. 1). In postmenopausal patients, the uterine corpus, but not the cervix, regresses and decreases in size.

Fig. 1. Normal MR anatomy (T2-weighted images) of the uterus and cervix. a Three zones are recognized in the uterus: the hyperintense endometrium, the hypointense junctional zone (arrow) and the outer layer of the myometrium of intermediate signal intensity. b Four zones are distinguished in the cervix: the hyperintense mucous within the endocervical canal, the cervical mucosa, the hypointense cervical stroma (arrowheads), and an additional layer of smooth muscle.
Normal ovaries measure between 1.5 and 3 cm during reproductive age while their size decreasing after menopause. They can be easily diagnosed by the presence of T2-weighted hyperintense follicles (Fig. 2).

**Congenital Anomalies of the Uterus**

Congenital malformations of the uterus, also termed Müllerian duct anomalies (MDA), are a relatively uncommon, but often treatable, cause of infertility. The incidence of congenital MDA among women of reproductive age is estimated to be up to 0.5%. However, since normal pregnancies can occur in women with MDA and the anomalies are discovered in most cases in patients presenting with infertility, the reported prevalence of MDA in the general population is probably underestimated. Uterine malformations can be associated with subfertility, pregnancy wastage, and menstrual disorders. Congenital malformations of other organ systems may be present - most frequently renal malformations like renal agenesis or ectopia - whereas bony malformations, such as fusion of the vertebral column, are less commonly seen. Whereas transvaginal ultrasound and hysterosalpingography are the primary imaging modalities, MRI is currently used as a problem-solving modality in inconclusive cases, e.g., in the differentiation between septate and bicornuate uterus, and is widely accepted as the leading imaging modality for further surgical planning. MRI provides high resolution images of the entire uterine anatomy (internal and external contour) and allows diagnosis of secondary findings like renal malformation. If possible, patients undergoing MRI for suspected MDA should be scheduled in the second half of the menstrual cycle, since the thickness of the endometrial stripe increases during the follicular and secretory phase and thus the normal zonal anatomy of the uterus can be better appreciated.

According to the classification of the American Fertility Society, MDAs can be classified into seven different classes (Fig. 3, 4, 6). The classification describes

![Fig. 2. Normal MR anatomy (coronal T2-weighted image) of ovaries. Multiple follicular cysts are seen in both ovaries](image)

![Fig. 3. Classification system of Müllerian duct anomalies according to the American Fertility Society](image)

![Fig. 4. A 28-year-old woman with a history of infertility. a Hysterosalpingography. b Axial T2-weighted MR image. An unicornuate uterus with a rudimentary left horn without endometrial cavity (arrow) is seen](image)