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Ectopic Kidney

- A renal ectopia is a birth defect in which the developmental of the kidney is characterized by abnormal anatomical location (arrest or exaggeration of normal caudal-to-cranial ascent of the kidney). The incidence is about 1/900 people.
- Patients are most often asymptomatic. Normal pathology can affect ectopic kidneys, but because of the ectopic position, patients could refer nonclassical abdominal pain or urinary disorders.
- Most common associations in patients with renal ectopia are multicystic dysplasia in a fused or unfused crossed kidney, ureterocele, ectopic ureteric orifice, and vesicoureteric reflux (*see vesicoureteric reflux*).
- Ectopic kidney is often an incidental finding at abdominal ultrasonography. Around 50 % remain unrecognized throughout life.
- Contrast-enhanced CT of the abdomen and pelvis shows the abnormalities in patients with renal ectopia.

- MRI shows detailed anatomic position of dysplastic kidneys and eventually ectopic ureteral insertions and/or other associated malformations, in cases where other modalities, which use ionizing radiation or nephrotoxic contrast agents, have failed. One of the disadvantages of MRI includes the need for sedation or general anesthesia in most children.

Ejaculatory Dysfunction, MR of

- MRI with an endorectal coil has been used in man with ejaculatory dysfunction to identify developmental abnormalities of the prostate and seminal vesicles.
- Prostatic cysts along the course of the ejaculatory ducts, seminal vesicle cysts associated with ipsilateral seminal vesicle and renal agenesis, and seminal vesicle calculi can be identified. Evidence of hemorrhage is often seen in the seminal vesicles (short T1 of fluid) in men with hemospermia.
- The normal seminal vesicles measure about 3 cm in length and about 1.5 cm in diameter, with a normal volume of about 13.7 mL. The walls of the seminal vesicles are normally 1–2-mm thick at MR imaging. The ampullae of the vas deferens measure $0.4\text{ cm} \pm 0.1$ in diameter. The ejaculatory ducts measure approximately 4–8 mm in diameter.
- Utricle cysts are pear-shaped structures that, unlike Müllerian duct cysts, do not extend above the base of the prostate. They communicate freely with the prostatic urethra.
- Müllerian duct cysts result from focal failure of regression and focal saccular dilatation of the mesonephric duct. They appear as teardrop-shaped midline cysts extending above the prostate. They do not communicate with the posterior urethra whereas utricle cysts do. These cysts may also cause ejaculatory impairment by obstructing the ejaculatory duct in the midline.

Endometrial Carcinoma

- Cancer of the endometrium is the most common invasive gynecological malignancy in Europe and the United States. The median age of occurrence is 63 years, though 12 % of cases are present in premenopausal women.
- Clinical presentation commonly is a postmenopausal bleeding.
- The most common histological type is endometrioid adenocarcinoma (75 %); less common types are papillary serous carcinoma, clear cell carcinoma, adenosquamous carcinoma, and undifferentiated carcinoma.
- Staging of endometrial carcinoma is based on the FIGO staging system, which uses a surgical and pathological staging following total abdominal hysterectomy, salpingo-oophorectomy, lymphadenectomy, and peritoneal washings. Tumors are staged on the basis of depth of myometrial invasion.
- US signs of endometrial cancer include heterogeneity and irregular endometrial thickening. Polypoid tumors tend to cause more diffuse and irregular thickening than a polyp and more heterogeneity than endometrial hyperplasia. A uterine fluid collection should raise the concern of underlying malignancy.
- CT is most commonly used to study extent of spread of endometrial cancer, but it's necessary to administer oral, rectal, and IV contrast material. CT findings may include the following:
 - Hypoattenuated mass in the region of the endometrial cavity, which may show uniform attenuation or may be heterogeneous, with or without a contrast-enhanced component
 - Polypoid mass surrounded by endometrial fluid

- Heterogeneous soft tissue mass/masses and fluid expanding the endometrial cavity
- Fluid-filled uterine cavity marginated by mural tumor implants

The reported overall accuracy of CT staging ranges from 84 to 88 %. A dedicated pelvic MRI protocol is valuable in the evaluation of endometrial cancer. The imaging protocol consist of using a phased-array coil, administering antiperistaltic agents, using high-resolution sagittal and axial T2-weighted sequences, and using axial T1-weighted spoiled gradient-echo images for lymph nodes study and sagittal T1-weighted spoiled gradient-echo sequences following IV injection of paramagnetic contrast material.

- MRI has proven to be an important tool for the staging of known endometrial carcinoma: MRI can differentiate between superficial and deep-muscle-invasive tumors, such important information for surgical management.
- MR imaging findings may show focal or diffuse endometrioid thickening, which is irregular in thickness, configuration, and mass or widened by polypoid tumor. The signal intensity of the tumor has variable patterns on T1-weighted and T2-weighted images:
 - Unenhanced T1-weighted images: Hypo- to isointense to normal endometrium.
 - T2: Hyperintense or heterogeneous relative to normal endometrium.
 - T1 + (Gd): Carcinoma tissue will enhance less than normal endometrium.

MRI is considered superior to CT for local staging, and post-contrast MRI improves accuracy in detecting the depth of myometrial invasion. If the normal low-signal-intensity junctional zone is intact, myometrial invasion can most likely be excluded.

Endometrial Polyp

- Endometrial polyps are benign small, soft growths on the lining of the uterus.
- They may be single or multiple (20 %), sessile or pedunculated, and much more commonly localized towards the fundal and cornual regions within the uterus. They are most frequently found in patients receiving tamoxifen.
- Endometrial polyps often are asymptomatic although they can be a common cause of postmenopausal bleeding (30 % of cases). In menstruating women, they may cause intermenstrual bleeding, metrorrhagia, and infertility.
- Ultrasound signs of endometrial polyp consist of echogenic, smooth, focal mass in the endometrial canal outlined by fluid.
- Polyps may also be seen at hysterosalpingography as pedunculated filling defects in the uterine cavity.
- Pelvic MRI findings: Endometrial polyps are of intermediate signal intensity on T1W images (but often iso-signal intensity to endometrium) and of low-to-high signal intensity on T2W images; the presence of a central focus of low signal intensity on T2W images indicates a fibrous core, which suggests the diagnosis of an endometrial polyp. Use of contrast enhancement improves lesion detection, but enhancement patterns do not reliably distinguish endometrial carcinoma from other lesions.

Endometrioma

- An endometrioma is a localized form of endometriosis: a benign, estrogen-dependent cyst located outside the uterus, found in women of reproductive age. It usually involves the ovaries and it is bilateral in 1/3 of the cases. Malignant transformation of endometriosis is very rare.

- MRI findings of endometriomas are variable and depend on the concentration of iron and protein in the fluid, products of blood degradation. In fact, the cyst contains altered blood that varies from the usual viscous “chocolate” material to the watery fluid; instead, the wall of these cysts is usually thick and fibrotic, but it may be attenuated. MRI can distinguish endometriomas from most other ovarian masses. It cannot accurately detect superficial implants and adhesions.

On T1W images, MRI of fat-suppressed “chocolate cyst” demonstrates very high signal intensity that becomes relatively hypointense in T2W sequences. This pattern of signal intensities is rarely seen in other masses of any type.

Endometriosis

- Endometriosis is an estrogen-dependent disease classically defined as the presence of functional endometrial tissue outside the uterine cavity and has an estimated prevalence of 5–10 % of women per year. This is distinct from adenomyosis, in which endometrial tissue is confined to the uterine musculature. Endometriosis is divided into superficial and deep and comprises nodules, cysts, and secondary scarring.
- It is mainly found in the abdominal cavity, most commonly on the surface of the ovaries. Less common locations include C-section scars, deep subperitoneal tissues, gastrointestinal tract, bladder, chest, and subcutaneous tissues.
- Endometriosis may be asymptomatic. Common symptom is pelvic pain, including dyspareunia, dysmenorrhea, chronic pelvic pain, urinary symptoms and rectal discomfort, and dyschezia.
- MRI has high sensitivity and specificity for evaluating deep disease and lesion characterization. Lesions usually

demonstrate low to intermediate signal intensity on T2- and T1-weighted images. Typically, the lesions that can be detected with MRI are those that contain degraded blood products and high concentration of protein. T2-shading is the classic MR feature of an endometrioma and is defined as a cystic lesion with hyperintense signal on T1-weighted images that demonstrates T2 shortening resulting in relative hypointensity on T2-weighted images. The cul-de-sac is the most common site of deep pelvic involvement, and the differentiation between normal anatomy and presence of endometriosis in this site is readily made using MRI.

In cases of suspected malignancy, T1- and T1-fatsat sequences before and after the administration of intravenous gadolinium may supplement this protocol.

- Limitations of MRI: Superficial endometriosis (Sampson's syndrome) is most often not visible; nonpigmented lesions will not be hyperintense on T1 and thus harder to detect; small foci may have variable signal intensity; plaque-like implants are difficult to delineate.

Endometritis

- Endometritis refer to an inflammation of the endometrium; it may be acute or chronic. Acute endometritis most commonly occurs in the puerperium and is characterized by the presence of microabscesses or neutrophils within the endometrial glands; chronic endometritis is secondary to the use of intrauterine devices and is distinguished by variable numbers of plasma cells within the endometrial stroma. Cesarean section and multiple vaginal examinations are important risk factors.

- In acute endometritis, symptoms include lower abdominal pain, fever, and abnormal vaginal bleeding or discharge. Chronic disease may be asymptomatic or may occur with intermenstrual bleeding or pain.

CT plays little role in the diagnosis of endometritis.

- MRI appearance: Uterus with medium signal intensity on T1 and high signal intensity on T2, with loss of the normal uterine zonal anatomy (the uterus can be enlarged). Postcontrast images show intense uniform enhancement because of the hypervascular inflammatory changes and zonal anatomy is not appreciated.

Epididymo-orchitis

- Epididymo-orchitis is the sudden inflammation of the epididymis and testis. It is usually due to infection, most commonly from a urine infection or a sexually transmitted organism. The infection usually begins in the tail of the epididymis and spreads to the body and head. Approximately 20–40 % of cases of epididymitis are associated with orchitis, which is thought to be due to direct extension of infection into the testicular parenchyma.
- Clinical evaluation alone serves to identify most infectious disease affecting the male genitalia, and US is in general the imaging modality of choice. However, MR imaging can be useful as a problem-solving tool when sonographic findings are equivocal.
- At MR imaging, epididymo-orchitis generally demonstrates heterogeneous areas of low signal intensity on T2-weighted images. The epididymis may be enlarged and hyperenhancing on contrast-enhanced T1-weighted images. The testis often demonstrates evidence of orchitis as patchy areas of lower signal intensity on T1-weighted images (inhomogeneous

enhancement). The fluid usually evident in the scrotal sac may outline the bare area of the testis. Visualization of this structure helps to exclude testicular torsion. If fluid within the hydrocele is other than simple fluid (i.e., has very long T1 and T2), the presence of hemorrhage or infection of the fluid is suggested. Gadolinium-enhanced images may be valuable in this regard to demonstrate necrotic or infarcted areas of the testis as nonenhancing areas.

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