MRI - IMAGING OF THE FEMALE PELVIS: EVALUATION OF ADNEXAL LESIONS

With its high contrast resolution, its ability to provide good tissue characterization, and its multiplanar imaging capabilities, magnetic resonance imaging (MRI) is increasingly used to evaluate pelvic pathology. Ultrasound is no doubt the first imaging modality of choice for the female pelvis. However, there are some shortcomings with this modality, such as the limited field of view, obscuration of pelvic organs by the presence of bowel gas and inherent limitations dependent on patient size.

Hemorrhagic ovarian cyst: The accuracy of MRI for identifying lesions such as hemorrhagic cysts and endometriomas is higher than with transvaginal ultrasound imaging. Most ovarian cysts are functional in origin and occasionally can be complicated by intracystic haemorrhage.

The MRI characteristics can be variable in this situation, depending on the age and amount of the hemorrhagic component. Relatively high signal intensity on T1W images and of intermediate-to-high signal intensity on T2W images and frequently reveals a fluid-fluid level. Hemorrhagic cysts should remain of relatively high signal on T1W images with fat suppression, which helps to differentiate them from dermoid cysts in most situations. They tend to have thicker walls than do simple cysts and may exhibit wall enhancement on post contrast images.

Endometriosis: Endometriosis is the ectopic presence of functional endometrial glands and stroma outside the uterus. Although laparoscopy remains the standard for diagnosing and staging pelvic endometriosis, MRI can identify lesions obscured at laparoscopy by dense adhesions. MRI has a
sensitivity of 90%, a specificity of 98%, and an overall accuracy of 96% for the identification of endometriomas in patients with clinically suspected adnexal masses.

**Endometriosis:**

They are typically of high signal on T1W images and of intermediate-to-low signal intensity on T2W images.

This relatively lower signal intensity on T2W imaging, which is often referred to as “T2-shading,” is secondary to methemoglobin, protein, and iron from repeated episodes of haemorrhage.

Endometriomas are more frequently bilateral and usually exhibit multiplicity.

Endometriosis implants on serosal or peritoneal surfaces are identified on MRI by high T1 signal seen on nonenhanced fat-suppressed images.

Studies have also shown that the concentration of iron in an ovarian cyst helps in differentiating endometriomas from serous cystadenocarcinomas, which do not contain a high concentration of iron.

**Fallopian tube abnormalities:**

Dilated fallopian tube folds upon itself to form a sausage like C or S-shaped cystic mass.

Multiplanar capability of MR imaging can help determine whether a multilocular cystic structure is actually the dilated tube, which may be differentiated from an ovarian tumor or dilated bowel loops by its serpentine appearance. Identifying an ipsilateral ovary that is separate from a lesion also may assist in the differential diagnosis of hydrosalpinx and ovarian tumor.

Moreover, incomplete longitudinal folds (interdigitating mural septa) within tubular cystic structure represent partially effaced mucosal or submucosal plicae, which are a finding specific to hydrosalpinx. However, in severe cases, the plicae may be either flattened or absent.

**T1Wi axial:** Uniformly high signal intensity in Endometrioma on fat suppressed T1WI.

**T2Wi Sag:** Thickened walls of fallopian tube due to Pyosalpinx. Tuboovarian abscess is seen anteriorly (curved arrow), showing thick irregular walls.
Dermoids account for 95% of all ovarian germ cell tumours. MRI has a high sensitivity for the presence of fat within the sebaceous component, which is characteristic of nearly all these lesions. The sebaceous component is of very high signal intensity on T1W images and is somewhat variable on T2W images. Fat suppression can differentiate macroscopic fat from other hemorrhagic lesions that appear hyperintense on T1W images, such as hemorrhagic cysts and endometriomas. Mature cystic teratomas also commonly have a solid mural nodule that is referred to as a Dermoid plug or a Rokitansky nodule. Although rare, malignant transformation can occur in 1% to 2% of cases. In these cases, the women tend to be postmenopausal and the images are characterized by transmural extension of the solid component and often, by direct invasion of adjacent pelvic structures.

Hydrosalpinx may occur as an isolated adnexal lesion or as one component of a complex adnexal lesion that has caused distal tubal occlusion. The most common cause of distal tubal occlusion and hydrosalpinx is pelvic inflammatory disease. Other causes include endometriosis, peritubal adhesions from a previous operation, tubal cancer and tubal pregnancy.

**Nonovarian adnexal masses:**
Its relatively large field of view, also allows MRI to localize pelvic lesions and their origin more accurately. Identification of a pelvic mass separate from the uterus and ovary changes the differential diagnosis. Examples of such lesions that may be accurately diagnosed by MRI include peritoneal inclusion cysts, pedunculated fibroid, para-ovarian cysts, paratubal cysts, or lymphadenopathy.

**Ovarian neoplasms:**
MRI is superior to CT in the diagnosis of peritoneal implants and has superior accuracy in diagnosing ovarian malignancy compared with CT and Doppler sonography. Because of the inherent wide field of view of MRI relative to pelvic ultrasound, a single MRI examination can, not only characterize an ovarian mass but can also be used in staging when a mass is noted to have malignant features. The presence of ascites, peritoneal, or serosal metastases as well as hydrenephrosis may be detected.
T2Wi sag: Large cystic lesion in the ovary with daughter cysts within. Thickened septa is seen anteriorly.

A contrast-enhanced study is essential because it improves the diagnostic accuracy for ovarian malignancy. The primary criteria are (a) a solid mass or large solid component, (b) wall thickness greater than 3 mm, (c) septal thickness greater than 3 mm and/or vegetations or nodularity, and (d) necrosis. The ancillary criteria were also formulated as (a) involvement of pelvic organs or the side-wall; (b) peritoneal, mesenteric, or omental disease; (c) ascites; and (d) adenopathy. When these criteria are used, the sensitivity for classifying malignancy is 91%–100% and the specificity is 91%–92%.

Value of MRI:
- Since magnetic resonance imaging (MRI) offers high contrast resolution, provides good tissue characterization, and is capable of multiplanar imaging capabilities, it is becoming a useful tool for the evaluation of female pelvic pathology.
- MRI scores over CT scan in evaluation of female pelvic pathology and that too with nil exposure to radiation and also minimal cost difference in between CT scan and MRI.
- The high accuracy of MRI helps in identifying the origin of an adnexal mass and characterizing its solid, hemorrhagic, fatty and fibrous content and it may significantly contribute to the preoperative planning of a sonographically indeterminate mass.
- Since USG is a cost effective scan, MRI should be considered for the evaluation of adnexal pathology when sonographic characteristics are noninvasive to determine whether an adnexal mass is ovarian in origin and to determine the likelihood of malignancy.

Regards,

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N.B: These cases are authentic and from the archives of Radiance Diagnostics. For any queries / suggestions/feedback write to us at radiance@radiancediagnostics.in