

Evis Sala MD, PhD, FRCR

Adnexal Masses

Magnetic Resonance Imaging (MRI) is recommended as a second line investigation for characterization of complex adnexal masses indeterminate on US. MRI gives superb contrast resolution and involves non-ionizing radiation. Studies have shown high diagnostic sensitivity (67-100%) and specificity (77-100%). Typical protocols include both T1 and T2 weighted sequences, with imaging acquisition performed in 3 planes. High-resolution axial oblique fast spin-echo (FSE) T2 weighted images (WI) taken parallel to the “ovarian axis,” long axis of the uterus, are useful in assessing non-ovarian origin of a para-uterine mass (i.e. pedunculated uterine leiomyoma), whereas coronal FSE T2WI is very helpful in evaluating complex adnexal lesions. Presence of bridging vessels between the mass and the myometrium, or the claws of uterine myometrium are associated with uterine origin. Ovary beak sign may suggest the ovarian origin. Adnexal lesions can be characterized by their specific signal characteristics on T1WI and T2WI. Simple fluid has homogeneous low signal on T1WI and high signal intensity on T2WI. Fat and hemorrhage have high signal intensity on T1WI. Fat suppression (FS) on T1W sequences is utilized to differentiate these entities. If the adnexal lesion demonstrates low or intermediate signal intensity on T1WI and low signal intensity on T2WI, these characteristics suggest fibrotic and/or smooth muscle components. Such lesions include pedunculated leiomyoma, fibroma, fibrothecoma, cystadenofibroma and Brenner tumors.

Multi-phase contrast enhanced (CE) MRI after administration of intravenous gadolinium is very useful for characterization of adnexal masses. Solid components will demonstrate enhancement, enabling the distinction between debris or retracting clot in the cyst wall from papillary projections. Subtraction images are essential to evaluate enhancing nodules within a background of hyperintense T1W lesion. Gadolinium also improves detection of peritoneal and omental implants in case of ovarian carcinoma. Dynamic-CE (DCE)-MRI are not yet routinely performed in evaluation of adnexal masses. Preliminary studies have demonstrated the value of DCE-MRI in the characterization of ovarian epithelial tumors, with early enhancement patterns being able to distinguish benign, borderline and invasive tumors. The use of diffusion-weighted imaging (DWI) is debatable with one recent study showing that there was no significant difference in ADC values between malignant and benign adnexal lesions.

It is important to recognize that there are no MRI SI characteristics that are specific for malignant epithelial tumor, hence they must be distinguished based on morphologic criteria. The MRI features most predictive of malignancy are enhancing solid components or vegetations within a cystic lesion, presence of necrosis within a solid lesion as well as presence of ascites and peritoneal deposits. The presence of at least one of the primary criteria and an additional single criterion from the ancillary group correctly characterizes 95% of malignant lesions.

MRI cannot confidently differentiate between specific surface epithelial, germ cell, stromal cell or metastatic tumors. However, it is possible to suggest the histologic subtype of the epithelial cancer based on the imaging findings. Serous cystadenocarcinomas are frequently bilateral and usually appear as mixed solid and cystic masses with irregularly shaped solid components. The solid components show avid enhancement and areas of necrosis. Presence of ascites and peritoneal implants is common. Mucinous cystadenocarcinomas tend to be larger in size, more often unilateral and occur in an older age group. They are usually multiloculated and may be of higher SI on T1W images due to high protein concentration within the mucinous material. Presence of ascites and peritoneal implants is rare. Clear cell carcinoma accounts for only 5% of ovarian cancers and it is almost invariably malignant. It is associated with endometriosis in 30-35% of cases. The diagnosis should be considered when a nodule is seen within a predominantly cystic endometrioma. Endometroid carcinomas are usually bilateral and associated with endometrial hyperplasia or carcinoma in 20-30% of cases and endometriosis in 15-20% of cases. They are mainly solid with areas of necrosis and avid enhancement.

References:

1. Hricak H et al. Radiology 214:39-46, 2000.
2. Tempany CM et al. Radiology 215:761-7, 2000.
3. Fujii S et al. JMRI 28:1149-56, 2008.
4. Spencer JA et al. Eur Radiol 20:25-35, 2010.
5. Thomassin-Naggara I et al. Radiology 267:432-43, 2013.