

## Female Pelvis: Tips and Tricks for Pelvic Imaging

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### Highlights :

- Pelvic MR imaging protocol has to be adapted to clinical indications
- Common imaging artifacts must be known, recognized and remedied in order to get good quality images

Target audience: Radiologists and MRI technologists

### Objectives:

- To adapt a pelvic MR imaging protocol to specific clinical indications
- To recognize some artifacts observed on pelvic MR and apply ways to remedy them

Pelvic MR is an invaluable tool, often serving as a problem-solving modality in gynecologic pathology. 1.5T and 3.0 T magnets both allow excellent quality pelvic imaging. The use of multichannel phased array coil system allows high signal-to-noise ratio imaging at high spatial resolution to be obtained. T2W sequences form the mainstay of the assessment of the uterus and adnexa in any pelvic imaging protocol due to the exquisite contrast resolution allowing evaluation of the uterus and ovaries. High resolution T2W sequences must be obtained in the axial and sagittal plane, and depending on the pathology, additional planes with thinner slice thickness may be obtained. The use of a high matrix (512 X 256) with a small FOV (18-24 cm) allows high spatial resolution. These 2D spin echo or fast spin echo sequences are time consuming, and newly developed 3D T2WI sequences are interesting in allowing acquisition of a single plane, and from there reformatting of the other needed planes, without significantly lowering the accuracy of the imaging modality. In order to obtain tissue specific imaging, T1W sequences without and with fat suppression are routinely obtained, allowing identification of hemorrhagic and fatty components in lesions. These sequences may be obtained using spin echo or fast gradient recalled echo. DWI is interesting in the setting of neoplasm, knowing that most cancers will cause diffusion restriction. These sequences are useful in the initial identification of tumors as well as treatment response evaluation, especially in the setting of adnexal and uterine malignancy. The use of dynamic contrast-enhanced imaging (DCE-MRI) after a bolus of gadolinium has an added value. Although not proven necessary for all indications, it is used for evaluation of adnexal masses, as well as uterine corpus malignancies. 3D or multislice 2D acquisitions with fat suppression pre- and post-gadolinium may be used.

These sequences form a basic pelvic imaging protocol, which must be adapted to specific indications. In cases of müllerian congenital anomalies, the evaluation will require additional T2W sequences in the long and short axis of the uterine corpus as well as a large FOV scan of the abdomen to assess concomitant renal anomaly. Cervical carcinoma staging will necessitate long

and short axis planes of the uterine cervix. Endometrial carcinoma staging requires short axis acquisition of the uterine corpus. In the setting of malignancy, the T1W sequence should cover up to the renal hilum to assess for adenopathy. In ovarian carcinoma, delayed post-contrast coronal imaging with fat suppression covering the whole abdomen allows evaluation of peritoneal implants. Whole abdomen diffusion weighted imaging has also been proven useful for peritoneal implants. In adnexal mass characterization, in- and opposed-phase imaging has an added-value in the diagnosis of lipid-poor mature cystic teratoma.

Pelvic imaging presents with specific artifacts. Most of them are related to motion. The length of the T2W spin echo or fast spin echo sequences necessitate free breathing, which introduces artifacts from the moving abdominal wall. Its proximity to the coil and high signal of the subcutaneous fat may make the related artifact important. A stand-off pad is then useful, with adequate fixation of the coil to the patient as well as in-FOV saturation bands to decrease the propagation of this artifact in the phase encoding direction. If the artifact persists, switching the phase and frequency encoding directions may move the artifact away from the structure being imaged. Bowel peristalsis will also cause blurring of the image, this is why a 6 hour fasting period is suggested prior to imaging as well as the use of an antiperistaltic agent which may be given iv or im. Hyoscine butylbromide at dosages of 20-40 mg may be used, as well as Glucagon 1mg in cases of contra-indications such as glaucoma or unstable angina. Bladder emptiness is also suggested to decrease movement and ghosting through to the image. Other common artifacts are vascular ghosts on DCE-MRI that can mimic enhancing lesions. These are important to know to avoid misdiagnosis.

In conclusion, both the MR technologist and the interpreting radiologist must be familiar with the imaging requirements of specific clinical indications in order to perform efficient pelvic MR imaging.

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