



O-RADS MRI
Technical Guidance

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To obtain the cited positive predictive values for malignancy in the O-RADS MRI Risk Score table, the MRI protocol should conform to the below technical requirements. MRI scanning parameters should be adjusted for optimum image quality and resolution based on vendor and scanner type. Use the smallest field of view and highest spatial resolution possible while ensuring complete coverage of the lesion. For very large lesions changes in plane and slice thickness adjustments may be needed to assure coverage of the entire lesion, however small papillary projections may be missed. Deviations from the recommended minimum requirements listed below may result in differences in the diagnostic performance of the O-RADS MRI risk score. Dynamic contrast enhancement (DCE) with perfusion time intensity curves is preferred over non-dynamic DCE post-contrast imaging for risk assessment.

SPECIFICATIONS FOR MRI EXAMINATIONS

Recommended equipment	<ul style="list-style-type: none"> 1.5 or 3 Tesla with a multichannel array body surface coil 		
Sequences	Plane	Minimum slice thickness	Additional requirements/Comments
T2-weighted fast/turbo spin echo (FSE/TSE) without fat saturation	Sagittal or coronal	4 mm	
T2-weighted FSE/TSE without fat saturation	Axial	3 mm	
T1-weighted in- and opposed-phase gradient echo (GRE) or Dixon T1-weighted	Axial	3-4 mm	– Can use the in/out phase images from the 3D T1 WI pre-contrast if using the Dixon technique
Diffusion weighted echo planar imaging	Axial	4-5 mm	– Low B-values: 0 or 50 s/mm ² – High B-value: 1000 – 1200 50 s/mm ² – If 4mm slice thickness, skip 2mm; if 5mm, skip 1mm
Dynamic contrast enhanced (DCE) 3D T1-weighted GRE (Pre- and Post-contrast in same series)	Axial	3 mm	– Pre- and post-contrast in a single series are required to perform the subtraction series – Temporal resolution: ≤15 seconds – Continuous acquisition, starting with the pre-contrast phase, injection of contrast after the pre-contrast phase is acquired and continuing for a total of 3 minutes
Non-dynamic 3D T1WI GRE with fat sat (Pre- and Post-contrast in separate series, with similar scanning parameters to allow for subtraction)	Axial	3 mm	– Obtain one series pre-contrast – If not acquiring a DCE MRI, obtain a minimum of one phase scanned at 30-40 seconds after the end of the contrast injection; additional time points can be obtained at 30 second intervals as desired – If acquiring a DCE MRI, obtain a post-contrast series after the DCE is completed

Lesion Characterization and Technical Factors

1. Equipment monitoring should be in accordance with the ACR–AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Magnetic Resonance Imaging (MRI) Equipment.
2. T2 weighted imaging (WI) should be acquired with high resolution fast or turbo spin echo imaging (FSE/TSE) with a TE and TR appropriate for field strength in order that the signal intensity of CSF and bladder are markedly hyperintense.
3. At least two orthogonal planes including a true axial through the XY plane is recommended for T2 weighted FSE/TSE without fat suppression.
4. Slice thickness of 3 mm is recommended for axial T2 weighted imaging and T1 weighted fat suppressed pre/post contrast sequences including dynamic contrast enhanced (DCE) images to visualize small papillary projections.
5. For large lesions, adjustments in plane and slice thickness may be made to include coverage of the entire lesion with the caveat that small papillary projections may be missed.
6. In/opposed of phase imaging is important to include to identify both bulk fat and intra-voxel fat which may coexist in dermoid cysts.
7. Dixon sequences may be used in place of separate in/opposed phase images.
8. In diffusion weighted imaging (DWI), the high b-value should be between 1000-1200 s/mm² to ensure adequate suppression of fluid signal in the bladder.
9. Pre-contrast T1 weighted GRE is required for both DCE and non-DCE imaging with identical imaging parameters to the post contrast images to allow subtraction for differentiating hemorrhage and proteinaceous material with intrinsic signal hyperintensity on T1WI versus enhancing soft tissue.
10. DCE imaging is recommended over non-dynamic post contrast T1 weighted imaging to allow for stratification of O-RADS MRI 3 lesions containing solid tissue. Without the dynamic enhancement imaging, lesions with enhancing solid tissue can only be placed in either O-RADS MRI 4 or 5 categories, because a low-risk time intensity curve (TIC) cannot be demonstrated.
11. For DCE imaging, a minimal temporal resolution of 15 seconds is required to ensure accurate characterization of the TIC.
12. For patients without a uterus, DCE is preferred over non-DCE post contrast imaging because low-risk TICs do not have a plateau, which distinguishes them from intermediate/high-risk curves. Intermediate and high-risk curves cannot be differentiated from one another in patients without a uterus.

References:

1. American College of Radiology. ACR–AAPM technical standard for diagnostic medical physics performance monitoring of magnetic resonance imaging (MRI) equipment. Available at: <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/mr-equip.pdf?la=en>. Accessed August 28, 2023