

MRI: Extremity for Soft Tissue Evaluation

Image quality in the multicenter setting can be greatly influenced by variances in acquisition protocols. These variances may be related not only to equipment manufacturer and model, but also technique.

The study may permit imaging per institutional standard-of-care. However, aligning image acquisition to established standards is essential for robust quality data.

Extremity MRI exams for soft tissue evaluation can be acquired, using a variety of magnet designs (closed-bore or open-bore whole body, dedicated extremity) and a variety of field strengths. Regardless of system design, efforts should be made to maximize signal-to-noise (SNR) ratios.

Gadolinium contrast may be helpful to differentiate cysts from solid masses and may provide additional details of the imaging features of bone and soft-tissue masses. The table below is provided as a guideline and overview for MRI Extremity exams at 1.5T. Some modification may be needed to ensure similar SNR in the resulting images. Please refer to your site's specific MRI manufacturer's imaging protocols for the optimal scanning protocol.

The MRI Extremity exam should contain, at a minimum, the following series:

1. 3-plane localization scan
2. T1w **pre-contrast**
3. T2w
4. T1w **post-contrast**

Exam and Patient Preparation

Magnet Strength	1.5T	When imaging bone and soft-tissue tumors at field strengths less than 1.5T, imaging parameters, such as the receiver bandwidth and number of acquisitions, will require modification to ensure adequate spatial and contrast resolution for confident diagnosis.
Coil	Vendor coil appropriate for anatomy that produces most uniform magnetic field	Select the best coil for the anatomic area.
FOV	Per institution standards	For all sequences, select the most appropriate FOV and slice coverage that completely encompasses the anatomic area.
Patient Position	Most appropriate for anatomic area and patient comfort	
Contrast Injection	Dual-chamber power injector recommended Contrast Bolus = 0.1 mmol/kg Bolus Rate = 2 mL/s Saline Flush = 20 mL	Insertion of intravenous catheter in upper extremity prior to the start of imaging.
Slice Plane	Axial/Coronal/Sagittal planes (orthogonal to area of interest)	Scan direction based on site preference.

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Image Acquisition

Localization Scan	3-plane localization scan	
T1w pre-contrast	Slice thickness = 3–5 mm FOV = per anatomy Matrix = per anatomy TR = 500–700 ms TE = 10–15 ms	Site-standard acquisition parameters. The imaging matrix should balance the intravoxel SNR with desired in-plane spatial resolution
T2w	Slice thickness = 3.0 mm FOV = per anatomy TR = 2400–4500 ms TE = 70–130 ms	Site-standard acquisition parameters T2-weighted sequence with or without fat-suppression techniques (fat-saturation, fluid-sensitive, or short tau inversion-recovery sequences).
T1w post-contrast	Slice thickness = 3–5 mm FOV = per anatomy Matrix = per anatomy TR = 500–700 ms TE = 10–15 ms	Site standard acquisition parameters, matching location from T1w pre-contrast series.

References

1. ACR–SPR–SSR Practice Parameter for the Performance and Interpretation of Magnetic Resonance Imaging (MRI) of Bone and Soft Tissue Tumors, Res. 5 – 2015. <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/MR-SoftTissue-Tumors.pdf>, accessed February 22, 2021.