

**Soft Tissue Masses
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
1. Binkovitz LA, Berquist TH, McLeod RA. Masses of the hand and wrist: detection and characterization with MR imaging. <i>AJR</i> 1990; 154(2):323-326.	10	38	Review MRI findings to assess the value of MRI in the detection, delineation, and characterization of mass lesions of the hand and wrist.	In most cases, MRI is accurate in the detection of mass lesions and can correctly distinguish benign from malignant tumors.	3
2. Jelinek JS, Kransdorf MJ, Shmookler BM, Aboulafia AJ, Malawer MM. Liposarcoma of the extremities: MR and CT findings in the histologic subtypes. <i>Radiology</i> 1993; 186(2):455-459.	13	48	Review findings on images of liposarcomas of the extremities in patients to correlate histologic type with radiologic findings. CT and MRI scans were used.	Moderate to marked heterogeneity is common in high-grade liposarcomas; myxoid liposarcomas tend to be homogeneous and may mimic cysts.	3
3. Vanel D, Shapeero LG, De Baere T, et al. MR imaging in the follow-up of malignant and aggressive soft-tissue tumors: results of 511 examinations. <i>Radiology</i> 1994; 190(1):263-268.	10	182	Retrospective double blinded study to present MRI results from 511 follow-up examinations of aggressive soft-tissue tumors.	T2-weighted imaging is useful for identifying recurrence of aggressive soft-tissue tumors, while gadolinium-enhanced imaging can be used to differentiate recurrences from hygromas and inflammatory change.	2
4. Weekes RG, Berquist TH, McLeod RA, Zimmer WD. Magnetic resonance imaging of soft-tissue tumors: comparison with computed tomography. <i>Magn Reson Imaging</i> 1985; 3(4):345-352.	9	27	To compare MRI with CT in the diagnosis of soft-tissue tumors.	<ul style="list-style-type: none"> • MRI was better than or equal to CT in defining the anatomic extent of the tumor in 26 patients. • It could be determined if major vascular structures were engulfed by the tumor in 80% of MRI but only in 62% of CT scans. • MRI and CT were both effective in determining the presence or absence of bony invasion. 	3
5. Sostman HD, Prescott DM, Dewhirst MW, et al. MR imaging and spectroscopy for prognostic evaluation in soft-tissue sarcomas. <i>Radiology</i> 1994; 190(1):269-275.	10	20 humans 10 dogs	Study the value of hydrogen-1 T2 and phosphorus-31 MR as indicators of prognosis in soft-tissue sarcomas.	A relationship exists between pre-therapy pH and T2 and ultimate tumor necrosis in humans and pre-therapy pH and time elapsed until local failure in dogs. Concludes that MRI and spectroscopy could help in the prognosis of patients with soft-tissue sarcomas before therapy is initiated.	3
6. Sundaram M, McGuire MH, Herbold DR. Magnetic resonance imaging of soft tissue masses: an evaluation of fifty-three histologically proven tumors. <i>Magn Reson Imaging</i> 1988; 6(3):237-248.	9	48	To evaluate confirmed soft-tissue masses in patients by comparing CT with MRO.	Although MRO is better in anatomically staging soft-tissue tumors however, like CT, it is of limited value in characterizing soft-tissue sarcomas.	2
7. Adler RS, Bell DS, Bamber JC, Moskovic E, Thomas JM. Evaluation of soft-tissue masses using segmented color Doppler velocity images: preliminary observations. <i>AJR</i> 1999; 172(3):781-788.	4	22	To report an experience with segmented color Doppler velocity-based estimates of tumor vascularity for different histologically proven soft-tissue masses.	Vascularity of soft-tissue masses can be assessed using Doppler US. For some malignancies high/heterogeneous vascularity may correlate with aggressiveness.	3

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8. Griffith JF, Chan DP, Kumta SM, Chow LT, Ahuja AT. Does Doppler analysis of musculoskeletal soft-tissue tumours help predict tumour malignancy? <i>Clin Radiol</i> 2004; 59(4):369-375.	10	148	To determine if tumor vascularity on Doppler US can differentiate benign from malignant lesions.	Patterns of vascularity cannot be reliably used to distinguish benign and malignant soft-tissue masses.	2
9. Cohen EK, Kressel HY, Perosio T, et al. MR imaging of soft-tissue hemangiomas: correlation with pathologic findings. <i>AJR</i> 1988; 150(5):1079-1081.	14	5	Retrospective review to correlate MRI of soft-tissue hemangiomas with pathologic findings to better understand MRI finding.	Histopathologic findings were uniform in all hemangiomas, but on MRI, lesions larger than 2 cm had the distinctive high-signal striated-septated appearance on spin echo (SE) TR/TE sequences; smaller lesions did not have this appearance, instead showing homogeneous high signal.	4
10. Panicek DM, Gatsonis C, Rosenthal DI, et al. CT and MR imaging in the local staging of primary malignant musculoskeletal neoplasms: Report of the Radiology Diagnostic Oncology Group. <i>Radiology</i> 1997; 202(1):237-246.	9	367	Multicenter trial to determine relative accuracy of CT and MRI for evaluation of primary malignant bone and soft-tissue tumor. 183 patients had primary bone tumors; 133 had primary soft-tissue tumors.	In determining tumor involvement of muscle, bone, joints, or neurovascular structures, CT and MRI were not statistically different. Concludes that CT and MR are equally accurate in the local staging of malignant bone and soft-tissue neoplasms in the specific anatomic sites studied.	1
11. Crim JR, Seeger LL, Yao L, Chandnani V, Eckardt JJ. Diagnosis of soft-tissue masses with MR imaging: can benign masses be differentiated from malignant ones? <i>Radiology</i> 1992; 185(2):581-586.	10	83 masses	Blinded, retrospective review to evaluate the ability of MRI to distinguish benign from malignant soft-tissue masses.	Mean sensitivity: 50% for benign and 80% for malignant masses. MRI can help to evaluate extent of soft-tissue masses, but most masses will require biopsy to determine if they are benign or malignant.	2
12. De Schepper AM, Ramon FA, Degryse HR. Magnetic resonance imaging of soft tissue tumors. <i>J Belge Radiol</i> 1992; 75(4):286-296.	10	164 tumors	To determine the value of MRI in histological classification of soft-tissue tumors. Retrospective study in 141 soft-tissue tumors (84 benign, 57 malignant) and prospective study in 23 patients.	<ul style="list-style-type: none"> Highest sensitivity was obtained for “absence of low signal intensity on T2” (100%), “mean diameter >33 mm” (90%) and “inhomogeneous signal on T1” (88%). Highest specificity was obtained for “evidence of necrosis” (98%), “bone or neurovascular involvement or metastases” (94%) and “mean diameter >66 mm” (87%). Association of best sensitivity (81%) and specificity (81%) was seen for “absence of low signal intensity on T2”, “signal inhomogeneity on T1” and “mean diameter of the lesion >33 mm”. In prospective study, sensitivity and specificity were reevaluated in predicting malignancy of all parameters. Excellent correlation with the results of the retrospective study was found. 	2

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13. Jones BC, Sundaram M, Kransdorf MJ. Synovial sarcoma: MR imaging findings in 34 patients. <i>AJR</i> 1993; 161(4):827-830.	10	34	Study MRI features of synovial sarcoma in patients to determine if MR findings can be used to suggest diagnosis.	Synovial sarcoma should be considered if MR findings depict a relatively well-defined but inhomogeneous hemorrhagic lesion near a joint and in contact with bone. Fluid-fluid levels and areas hyper-, hypo-, and iso-intense relative to fat (triple signal) on T2-weighted sequences support the diagnosis.	3
14. White LM, Wunder JS, Bell RS, et al. Histologic assessment of peritumoral edema in soft tissue sarcoma. <i>Int J Radiat Oncol Biol Phys</i> 2005; 61(5):1439-1445.	13	15	To assess whether tumor cells can be identified histologically in soft-tissue sarcoma and whether their presence correlates with increased T2-weighted signal intensity on MRI.	In 10 of 15 cases, sarcoma cells were identified histologically in the tissues beyond the tumor In 6 cases, tumor cells were located within 1 cm of the tumor margin, and in 4 cases, malignant cells were found at a distance >1 cm and up to a maximum of 4 cm. The location of tumor cells beyond the margin did not correlate with tumor size nor did it correlate with the location or extent of peritumoral changes.	3
15. Gielen JL, De Schepper AM, Vanhoenacker F, et al. Accuracy of MRI in characterization of soft tissue tumors and tumor-like lesions. A prospective study in 548 patients. <i>Eur Radiol</i> 2004; 14(12):2320-2330.	10	548	Prospective, multicenter study to evaluate the efficacy of MRI for differentiating soft-tissue tumors and soft-tissue tumor-like lesions.	<ul style="list-style-type: none"> • For differentiation between malignant and benign lesions: sensitivity 93%, specificity 82%, NPV: 98%, PPV 60% and accuracy of 85%. • For phenotype characterization (only first MRI diagnosis was taken into account): sensitivity 67%, specificity 98%, NPV 98%, PPV 70% and accuracy 96%. • For benign lesions: sensitivity 75%, specificity 98%, NPV 98%, PPV 76% and accuracy 97%. • Phenotype's definition of malignant soft-tissue tumors: sensitivity 37%, specificity 96%, NPV 96%, PPV 40% and accuracy 92%. 	1
16. Moulton JS, Blebea JS, Dunco DM, Braley SE, Bisset GS, 3rd, Emery KH. MR imaging of soft-tissue masses: diagnostic efficacy and value of distinguishing between benign and malignant lesions. <i>AJR Am J Roentgenol</i> 1995; 164(5):1191-1199.	10	222 225 masses	To evaluate the efficacy of MRI in predicting the pathologic diagnosis of soft-tissue masses and differentiating benign from malignant lesions.	Sensitivity 78%, specificity 89%, PPV 65%, and NPV 94% for a malignant diagnosis. When the diagnostic benign tumors were excluded, the specificity and NPV decreased to 76% and 86%, respectively, while the sensitivity and PPV remained the same. Accurate specific benign diagnosis made in 44%. Accuracy is influenced by prevalence of benign lesions that are often easy to classify on MRI.	1

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17. Panzarella MJ, Naqvi AH, Cohen HE, Damron TA. Predictive value of gadolinium enhancement in differentiating ALT/WD liposarcomas from benign fatty tumors. <i>Skeletal Radiol</i> 2005; 34(5):272-278.	10	32	To determine the predictive value of gadolinium enhancement on MRI in differentiating atypical lipomatous tumor/well-differentiated (ALT/WD) liposarcoma from benign fatty tumors.	<ul style="list-style-type: none"> Gadolinium enhancement showed 100% sensitivity, 71% specificity, 53% PPV and 100% NPV. Needle or incisional biopsy yielded 57% sensitivity, 100% specificity, 100% PPV and 63% NPV. Concludes that gadolinium enhancement is a sensitive screening tool to determine possible diagnosis of ALT/WD liposarcoma. Biopsy is specific but insensitive. 	3
18. Teo EL, Strouse PJ, Hernandez RJ. MR imaging differentiation of soft-tissue hemangiomas from malignant soft-tissue masses. <i>AJR</i> 2000; 174(6):1623-1628.	10	44	Retrospective review to determine whether MRI features can effectively differentiate hemangiomas from malignant soft-tissue masses.	Analysis of lesion morphology, signal intensity, and enhancement with gadolinium helps distinguish these lesions.	3
19. van der Woude HJ, Verstraete KL, Hogendoorn PC, Taminau AH, Hermans J, Bloem JL. Musculoskeletal tumors: does fast dynamic contrast-enhanced subtraction MR imaging contribute to the characterization? <i>Radiology</i> 1998; 208(3):821-828.	10	175	Prospective analysis of the value of dynamic subtraction MRI in the differentiation of musculoskeletal tumors.	<ul style="list-style-type: none"> Differentiation of benign from malignant soft-tissue masses: sensitivity 91%, specificity 72%. Peripheral diffuse enhancement: sensitivity 73%, specificity 97%. Progression of enhancement: sensitivity 86%, specificity 81%. Dynamic, contrast-enhanced, subtraction MRI is potentially useful. 	2
20. van Rijswijk CS, Geirnaerd MJ, Hogendoorn PC, et al. Soft-tissue tumors: value of static and dynamic gadopentetate dimeglumine-enhanced MR imaging in prediction of malignancy. <i>Radiology</i> 2004; 233(2):493-502.	10	140	To prospectively evaluate static and dynamic contrast enhanced MRI relative to non-enhanced MRI in differentiation of benign from malignant soft-tissue lesions and to evaluate which MRI parameters are most predictive of malignancy.	Static and dynamic contrast-enhanced MRI improved differentiation of benign and malignant soft-tissue masses compared to non-contrast MRI.	2
21. van Rijswijk CS, Kunz P, Hogendoorn PC, Taminau AH, Doornbos J, Bloem JL. Diffusion-weighted MRI in the characterization of soft-tissue tumors. <i>J Magn Reson Imaging</i> 2002; 15(3):302-307.	10	23 masses	To examine the potential of diffusion-weighted MRI for differentiating benign from malignant soft-tissue masses.	Diffusion-weighted MRI has potential for differentiating benign from malignant soft-tissue masses.	3
22. Wang CK, Li CW, Hsieh TJ, Chien SH, Liu GC, Tsai KB. Characterization of bone and soft-tissue tumors with in vivo 1H MR spectroscopy: initial results. <i>Radiology</i> 2004; 232(2):599-605.	10	36	To determine whether in vivo detection of choline by using hydrogen 1 (1H) MR spectroscopy (MRS) with dynamic contrast material-enhanced MRI can help differentiate benign from malignant musculoskeletal lesions.	In vivo 1H MRS: sensitivity 95%, specificity 82%, and accuracy 89%. 1H MRS can help differentiate tumors by revealing the presence or absence of water-soluble choline metabolites.	2

* See Last Page for Key

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23. Dewhurst MW, Sostman HD, Leopold KA, et al. Soft-tissue sarcomas: MR imaging and MR spectroscopy for prognosis and therapy monitoring. Work in progress. <i>Radiology</i> 1990; 174(3 Pt 1):847-853.	14	8	To examine the usefulness of 1H T2 measurements and phosphorus-31 MRS as indicators of prognosis and monitors of response to therapy soft-tissue sarcomas.	MRI and MRS may be useful in the evaluation of soft-tissue sarcomas before and during therapy.	4
24. Shin DS, Shon OJ, Han DS, Choi JH, Chun KA, Cho IH. The clinical efficacy of (18)F-FDG-PET/CT in benign and malignant musculoskeletal tumors. <i>Ann Nucl Med</i> 2008; 22(7):603-609.	10	91	To determine the ability of FDG-PET/CT to differentiate malignant from benign tumors. Characteristics and amount of FDG uptake in soft-tissue and bone tumors were analyzed.	<ul style="list-style-type: none"> • Significant difference in standardized uptake value [SUV(max)] between benign and malignant musculoskeletal tumors in total (P<0.002), soft-tissue tumors (P<0.05), and bone tumors (P<0.02). • Sensitivity, specificity, and diagnostic accuracy were 80%, 65.2%, and 73%, respectively, in total with cutoff SUV(max) 3.8, 80%, 68.4%, and 75%, respectively in the soft-tissue tumors with cutoff SUV (max) 3.8, and 80%, 63%, and 70%, respectively in the bone tumors with cutoff SUV(max) 3.7. • Many false-positive and false negative lesions. 	2
25. American College of Radiology. <i>Manual on Contrast Media</i> . Available at: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/contrast_manual.aspx .	15	N/A	Guidance document on contrast media to assist radiologists in recognizing and managing risks associated with the use of contrast media.	N/A	3

Evidence Table Key

Study Type Key

Numbers 1-7 are for studies of therapies while numbers 8-15 are used to describe studies of diagnostics.

1. Randomized Controlled Trial — Treatment
2. Controlled Trial
3. Observation Study
 - a. Cohort
 - b. Cross-sectional
 - c. Case-control
4. Clinical Series
5. Case reviews
6. Anecdotes
7. Reviews

8. Randomized Controlled Trial — Diagnostic
9. Comparative Assessment
10. Clinical Assessment
11. Quantitative Review
12. Qualitative Review
13. Descriptive Study
14. Case Report
15. Other (Described in text)

Strength of Evidence Key

- Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.
- Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.
- Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.
- Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.