Soft-Tissue Masses
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
1. Manaster BJ. Soft-tissue masses: optimal imaging protocol and reporting. AJR Am J Roentgenol. 2013;201(3):505-514.	Review/Other-Dx	N/A	To discuss optimal imaging protocols and reporting of soft-tissue masses.	No results stated in abstract.	4
2. American College of Radiology. ACR Appropriateness Criteria®: Soft-Tissue Masses. Available at: https://acsearch.acr.org/docs/69434/Narrative/.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for soft-tissue masses.	N/A	4
3. Kransdorf MJ, Murphey MD. Imaging of Soft-Tissue Musculoskeletal Masses: Fundamental Concepts. Radiographics. 2016;36(6):1931-1948.	Review/Other-Dx	N/A	To address application of the current imaging methods to assessment of soft-tissue musculoskeletal masses, emphasizing fundamental concepts.	No results stated in abstract.	4
4. Roberts CC, Kransdorf MJ, Beaman FD, et al. ACR Appropriateness Criteria Follow-Up of Malignant or Aggressive Musculoskeletal Tumors. J Am Coll Radiol. 2016;13(4):389-400.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for follow-up of malignant or aggressive musculoskeletal tumors.	No results stated in abstract.	4
5. Fletcher CDM, World Health Organization., International Agency for Research on Cancer. WHO classification of tumours of soft tissue and bone. 4th ed. Lyon: IARC Press; 2013.	Review/Other-Dx	N/A	To provide an international standard for oncologists and pathologists and will serve as an guide for use in the design of studies monitoring response to therapy and clinical outcome.	N/A	4

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6. Mankin HJ, Mankin CJ, Simon MA. The hazards of the biopsy, revisited. Members of the Musculoskeletal Tumor Society. J Bone Joint Surg Am. 1996;78(5):656-663.	Review/Other-Dx	632 patients	To re-examine the hazards of biopsies of connective-tissue tumors.	The results were essentially the same as those in the earlier study. The rate of diagnostic error for the total series (in which cases from referring institutions and treatment centers were combined) was 17.8 percent. There was no significant difference in the rate of patients for whom a problem with the biopsy forced the surgeon to carry out a different and often more complex operation or to use adjunctive irradiation or chemotherapy (19.3 percent in the current study, compared with 18 percent in the previous one). There was also no significant differences in the percentage of patients who had a change in the outcome, such as the need for a more complex resection that resulted in disability, loss of function, local recurrence, or death, attributable to problems related to the biopsy (10.1 percent in the current study, compared with 8.5 percent in the 1982 study). Eighteen patients in the current study had an unnecessary amputation as a result of the biopsy, compared with fifteen in the previous study. Errors, complications, and changes in the course and outcome were two to twelve times greater ($p < 0.001$) when the biopsy was done in a referring institution instead of in a treatment center.	4
7. Mankin HJ, Lange TA, Spanier SS. The hazards of biopsy in patients with malignant primary bone and soft-tissue tumors. J Bone Joint Surg Am. 1982;64(8):1121-1127.	Review/Other-Dx	329 patients	To describe the frequency with which problems with biopsy occur and the impact of these problems on the patient's course and ultimate outcome; And to offer some suggestions to physicians who care for such patients, to aid them in avoiding the hazards inherent in the biopsy procedure.	Sixty (18.2 per cent) major errors in diagnosis and thirty four (10.3 per cent) non-representative or technically poor biopsies. Problems arose in the skin, soft tissue, or bone of the biopsy wounds of fifty-seven patients (17.3 per cent), and the optimum treatment plan had to be altered as a result of problems related to the biopsy in sixty patients (18.2 per cent). In fifteen patients (4.5 per cent) an unnecessary amputation was performed as a result of problems with the biopsy, and in twenty eight patients (8.5 per cent) the prognosis and outcome were considered to have been adversely affected.	4

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8. Leffert RD. Lipomas of the upper extremity. J Bone Joint Surg Am. 1972;54(6):1262-1266.	Observational-Dx	122 patients and 141 lipomas.	To present a comprehensive view of lipomas of the upper extremity and to re-examine several commonly held clinical concepts of it.	Review of the preoperative diagnoses of the series revealed that 85 per cent of the lesions were correctly identified prior to surgery by physical examination alone. The most commonly advanced misdiagnosis was of a gangl ion.	3
9. Gartner L, Pearce CJ, Saifuddin A. The role of the plain radiograph in the characterisation of soft tissue tumours. Skeletal Radiol. 2009;38(6):549-558.	Observational-Dx	1,058 patients	To present the radiographic findings of a large series of soft tissue tumours referred to a specialist orthopaedic oncology service over a period of 8 years, highlighting the radiographic features.	Of the cohort of 1,058 individuals with a proven soft tissue tumour, 454 had had a radiograph taken of the affected area. Of these, 281 (62%) patients had a positive radiographic finding. The most common findings were a visible soft tissue mass (n = 141), the presence of calcification (n = 76), fat (n = 32) and evidence of bone involvement (n = 62). More than one finding was sometimes present in the same patient. These findings were present in both benign and malignant tumours.	4
10. Bermejo A, De Bustamante TD, Martinez A, Carrera R, Zabia E, Manjon P. MR imaging in the evaluation of cystic-appearing soft-tissue masses of the extremities. Radiographics. 2013;33(3):833-855.	Review/Other-Dx	N/A	To review various types of fluid-filled and cystlike solid lesions in terms of imaging approach and the MR imaging features of the most common lesions in each of the aforementioned categories.	No results stated in abstract.	4

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11. Lakkaraju A, Sinha R, Garikipati R, Edward S, Robinson P. Ultrasound for initial evaluation and triage of clinically suspicious soft-tissue masses. Clin Radiol. 2009; 64(6):615-621.	Observational-Dx	358 consecutive patients	To evaluate the efficacy of ultrasound as a first-line investigation in patients with a clinical soft-tissue mass.	Two hundred and eighty-four of the 358 (79%) lesions were classified as benign (categories 1-5). On follow-up 15 of the 284 patients were re-referred but none (284/284) had a malignancy on follow-up (24-30 months). Overall at ultrasound 33 lesions were larger than 5 cm, 42 lesions were deep to deep fascia with 20 showing both features. In this subgroup of 95 patients there were six malignant tumours with the rest benign. Seventy-three of the 358 patients underwent MRI; the results of which indicated that there were 60 benign or non-tumours, 10 possible sarcomas, and three indeterminate lesions. Overall six of 12 (6/358, 1.68% of total patients) lesions deemed to represent possible sarcomas on imaging were sarcomas. Ultrasound is an effective diagnostic triage tool for the evaluation of soft-tissue masses referred from primary care.	3
12. DiDomenico P, Middleton W. Sonographic evaluation of palpable superficial masses. Radiol Clin North Am. 2014;52(6):1295-1305.	Review/Other-Dx	N/A	To review the capabilities of ultrasonography in evaluating superficial soft tissue lesions and the sonographic appearance of disease entities.	No results stated in abstract.	4
13. Hung EH, Griffith JF, Ng AW, Lee RK, Lau DT, Leung JC. Ultrasound of musculoskeletal soft-tissue tumors superficial to the investing fascia. AJR Am J Roentgenol. 2014;202(6):W532-540.	Observational-Dx	714 ultrasound examinations including 247 tumors with a pathologic diagnosis.	To evaluate the diagnostic accuracy of ultrasound in assessing musculoskeletal soft-tissue tumors superficial to the investing fascia.	Overall the accuracy of ultrasound examination for assessing superficial soft-tissue masses was 79.0% when all differential diagnoses were considered and 77.0% when only the first differential diagnosis was considered. The sensitivity and specificity of the first ultrasound diagnosis were 95.2% and 94.3%, respectively, for lipoma; 73.0% and 97.7% for vascular malformation; 80.0% and 95.4% for epidermoid cyst; and 68.8% and 95.2% for nerve sheath tumor. Reduced observer awareness of specific tumor entities tended to contribute to underdiagnosis more than poor specificity of ultrasound findings. Most tumors (236/247, 96%) were benign. The sensitivity and specificity of ultrasound for identifying malignant superficial soft-tissue tumors was 94.1% and 99.7%, respectively.	3

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14. Bui-Mansfield LT, Chen DC, O'Brien SD. Accuracy of ultrasound of musculoskeletal soft-tissue tumors. AJR Am J Roentgenol. 2015;204(2):W218.	Review/Other-Dx	N/A	To comment on the article by Hung et al. on the topic of sonography of musculoskeletal soft-tissue tumors. Hung EHY, Griffith JF, Ng AW, Lee RK, Lau DT, Leung JC. Ultrasound of musculoskeletal softtissue tumors superficial to the investing fascia. AJR 2014; 202:[web]W532–W540	No results stated in abstract.	4
15. Carra BJ, Bui-Mansfield LT, O'Brien SD, Chen DC. Sonography of musculoskeletal soft-tissue masses: techniques, pearls, and pitfalls. [Review]. AJR Am J Roentgenol. 202(6):1281-90, 2014 Jun.	Review/Other-Dx	N/A	To review the appropriate use of ultrasound in the workup of soft-tissue masses of the extremities.	No results stated in abstract.	4
16. Inampudi P, Jacobson JA, Fessell DP, et al. Soft-tissue lipomas: accuracy of sonography in diagnosis with pathologic correlation. Radiology. 2004;233(3):763-767.	Observational-Dx	39 patients	To retrospectively determine the accuracy of sonography in helping todistinguish soft-tissue lipomas from other soft-tissue masses by using histologicproof as the reference standard.	Histologic examination yielded 25 lipomas and 14 nonlipomas. The echogenicity of lipomas ranged from hypoechoic to hyperechoic relative to muscle, although most were isoechoic or hyperechoic. Az values were 0.79 for reader 1, 0.56 for reader 2, and 0.77 for reader 3. There was no significant difference between the Az for each reader and for chance. Interobserver agreement was fair, with a k value of 0.35 among the three readers. Sensitivities were 52%, 40%, and 52%, and accuracies were 64%, 49%, and 64% for readers 1, 2, and 3, respectively.	2
17. Subhawong TK, Fishman EK, Swart JE, Carrino JA, Attar S, Fayad LM. Soft-tissue masses and masslike conditions: what does CT add to diagnosis and management? AJR Am J Roentgenol. 2010;194(6):1559-1567.	Review/Other-Dx	N/A	This article provides an overview of the CT evaluation of soft-tissue masses, emphasizing a differential diagnosis based on these CT features.	No results stated in abstract.	4
18. 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. Radiology. 1997;202(1):237-246.	Experimental-Dx	316 patients	To assess the relative accuracies of CT and MRI in the local staging of primary malignant bone and soft-tissue tumors. The CT images were obtained with and without contrast. No contrast was used in the MR images.	There was no statistically significant difference between CT and MRI in determining tumor involvement of muscle, bone, joints, or neurovascular structures. The combined interpretation of CT and MRI did not statistically significantly improve accuracy. Inter-reader variability was similar for both modalities.	2

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
19. Cohen EK, Kressel HY, Perosio T, et al. MR imaging of soft-tissue hemangiomas: correlation with pathologic findings. AJR. 1988; 150(5):1079-1081.	Review/Other-Dx	5 patients	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
20. 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? Radiology. 1992; 185(2):581-586.	Observational-Dx	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.	3
21. De Schepper AM, De Beuckeleer L, Vandevenne J, Somville J. Magnetic resonance imaging of soft tissue tumors. Eur Radiol. 2000;10(2):213-223.	Review/Other-Dx	N/A	To outline the ability of MR imaging in staging, grading, tissue characterization, and posttherapeutic surveillance of soft tissue tumors.	No results stated in abstract.	4
22. Jelinek JS, Kransdorf MJ, Shmookler BM, Aboulafia AJ, Malawer MM. Liposarcoma of the extremities: MR and CT findings in the histologic subtypes. Radiology. 1993; 186(2):455-459.	Review/Other-Dx	48 patients	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.	4
23. Jones BC, Sundaram M, Kransdorf MJ. Synovial sarcoma: MR imaging findings in 34 patients. AJR. 1993; 161(4):827-830.	Observational-Dx	34 patients	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.	4
24. Wignall OJ, Moskovic EC, Thway K, Thomas JM. Solitary fibrous tumors of the soft tissues: review of the imaging and clinical features with histopathologic correlation. AJR. 2010; 195(1):W55-62.	Observational-Dx	34 cases	To review imaging findings with clinicopathologic correlation of solitary fibrous tumors.	he finding of a large, solid, vascular tumor, particularly with prominent feeding vessels or a visible fatty component, should alert the radiologist to the possible diagnosis of solitary fibrous tumor. Percutaneous biopsy carries minimal risk and should be used for definitive diagnosis of these lesions, which in many cases are curable with surgery. The prognosis is good for patients with benign tumors but variable for those with malignant tumors.	3

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25. 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. Eur Radiol. 2004; 14(12):2320-2330.	Observational-Dx	548 lesions 930 consecutive patients	Prospective, multicenter study to evaluate the efficacy of MRI for differentiating soft-tissue tumors and soft-tissue tumor-like lesions.	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%.	3
26. Myhre-Jensen O. A consecutive 7-year series of 1331 benign soft tissue tumours. Clinicopathologic data. Comparison with sarcomas. Acta Orthop Scand. 1981;52(3):287-293.	Review/Other-Dx	1331 benign soft tissue tumors; 72 sarcomas	To analyze soft tissue tumors and compare with the data of sarcomas.	Lipoma was the most frequent benign tumour entity, accounting for almost half of the entire series. Different entities had different male to female ratios and preferred locations and, furthermore, differed from sarcomas in this regard. The factors which discriminated most in the clinical differential diagnosis benign vs. malignant were tumour size and location.	4

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27. Rydholm A. Management of patients with soft-tissue tumors. Strategy developed at a regional oncology center. Acta Orthop Scand Suppl. 1983;203:13-77.	Review/Other-Dx	326 cases	To compare and analyze clinical and morphologic variables in soft-tissue sarcomas and lipomas.	The annual incidence of sarcoma was 1.4/10(5) with a 30 per cent male preponderance. The mean age was 58 years. The most common histologic types were malignant fibrous histiocytoma, liposarcoma and leiomyosarcoma. Twenty-three per cent were histologically classified as low-grade malignant (Grades I and II), 33 per cent as Grade III and 44 per cent as Grade IV tumors. Slightly more than one half of the tumors were deep and these had a median size of 8 cm compared to 4 cm for the superficial tumors. One third of the tumors were located in the thigh. The annual clinical incidence of solitary subcutaneous lipoma was estimated to 1/10(3). Four fifths of the lipomas were smaller than 5 cm and they were most common in the trunk, shoulder and upper arm. By comparing clinical data for benign tumors and sarcomas it was found that a tumor 5 cm or larger or a deep tumor is relatively more likely to be a sarcoma. Patients with tumors of that size and depth should be referred before surgery. The probability of a benign cytodiagnosis being correct was 0.97 while that of a malignant one was 0.85. For a cytodiagnostic report of sarcoma the probability of correct diagnosis was 0.84.	4

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28. Kransdorf MJ. Benign soft-tissue tumors in a large referral population: distribution of specific diagnoses by age, sex, and location. AJR Am J Roentgenol. 1995;164(2):395-402.	Review/Other-Dx	31,047 patients	To determine the specific diagnoses, relative prevalence, and the age, sex, and skeletal distribution of benign soft-tissue tumors and to ascertain the relative frequency of these tumors in specific anatomic locations and age groups among a population of patients in a large pathologic consultation service.	Approximately two thirds of soft-tissue tumors were classified into seven diagnostic categories: lipoma and lipoma variants (16%), fibrous histiocytoma (13%), nodular fascilitis (11%), hemangioma (8%), fibromatosis (7%), neurofibroma (5%), and schwannoma (5%). Approximately 80% of all benign tumors were placed in seven diagnostic categories for each age and location. In the retroperitoneum, for example, approximately half the benign lesions in the 16- to 25-year old group were fibromatosis (20%), schwannoma (14%), and neurofibroma (13%). For the same location in children 5 years old or younger, almost two thirds of the benign tumors were lipoblastoma (37%) or lymphangioma (26%).	4
29. Kransdorf MJ. Malignant soft-tissue tumors in a large referral population: distribution of diagnoses by age, sex, and location. AJR Am J Roentgenol. 1995;164(1):129-134.	Review/Other-Dx	31,047 patients	To determine the relative prevalence, age at presentation, sex distribution, and skeletal distribution of malignant soft-tissue tumors and to ascertain the relative frequency of these tumors in specific anatomic locations and age groups among a population of patients in a large pathologic consultation service.	More than 80% of malignant tumors were classified into eight diagnostic categories: malignant fibrous histiocytoma (24%), liposarcoma (14%), leiomyosarcoma (8%), malignant schwannoma (6%), dermatofibrosarcoma protuberans (6%), synovial sarcoma (5%), fibrosarcoma (5%), and sarcoma, not classified further (12%). Approximately 79% of all malignant tumors were classified into five diagnoses for each age and location. With the distal upper extremity (hand and wrist) as an example, 50% of malignant lesions in the 16-25-year-old group were classified as epithelioid sarcoma (29%), malignant fibrous histiocytoma (13%), and synovial sarcoma (8%). For the same location but for children 5 years old or younger, almost 50% of malignant tumors were classified as infantile fibrosarcoma	4

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30. De Schepper AM, Ramon FA, Degryse HR. Statistical analysis of MRI parameters predicting malignancy in 141 soft tissue masses. Rofo. 1992;156(6):587-591.	Observational-Dx	131 patients	To assess the reproducibility of a recent study (Berquist et al).	Highest sensitivity was obtained for "absence of low signal intensity on T2" (100%), "mean diameter greater than 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 greater than 66 mm" (87%). Association of best sensitivity and specificity was seen for "absence of low signal intensity on T2", "signal inhomogeneity on T1", and "mean diameter of the lesion greater than 33 mm" (81 and 81%).	2
31. Beltran J, Chandnani V, McGhee RA, Jr., Kursunoglu-Brahme S. Gadopentetate dimeglumine-enhanced MR imaging of the musculoskeletal system. AJR Am J Roentgenol. 1991;156(3):457-466.	Review/Other-Dx	N/A	We reviewed the potential value of gadopentetate-dimeglumine-enhanced MR imaging in the spine, bone and soft-tissue tumors, joints, and inflammatory and infectious conditions of the musculoskeletal system.	No results stated in abstract.	4
32. Erlemann R, Reiser MF, Peters PE, et al. Musculoskeletal neoplasms: static and dynamic Gd-DTPA--enhanced MR imaging. Radiology. 1989;171(3):767-773.	Observational-Dx	69 patients	To investigate the possibility of using Gd-DTPA for improved differentiation of tumor from normal tissue in a fairly large patient group.	T1-weighted spin-echo (SE) imaging after intravenous administration of gadolinium diethylenetriaminepentaacetic acid (DTPA) improved the differentiation of necrotic from viable areas; the contrast-to-noise ratio (C/N) between tumor and muscle was an average of 44% lower compared with that in T2-weighted SE imaging. The C/N between tumor and bone marrow or fatty tissue was 43% and 37% lower, respectively, compared with that in nonenhanced T1-weighted SE imaging. Dynamic changes of signal intensity (SI) after Gd-DTPA enhancement were assessed with fast low-angle shot imaging. Of malignant tumors, 84.1% exhibited slopes higher than 30% per minute; 72% of benign tumors showed slopes lower than 30% per minute. The dynamic technique enabled assessment of the malignant potential of a tumor with some overlap (accuracy, 79.7%).	2

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33. Bischoff M, Bischoff G, Buck A, et al. Integrated FDG-PET-CT: its role in the assessment of bone and soft tissue tumors. Arch Orthop Trauma Surg. 2010; 130(7):819-827.	Observational-Dx	80 patients	To evaluate prospectively, whether integrated 2-deoxy-2-[(18)F]fluoro-D: -glucose positron emission tomography-computed tomography (FDG-PET-CT) is more accurate for determination musculoskeletal tumors compared with separate interpretation of CT and FDG-PET, because most of the current clinical data come from patients studied with PET.	Assuming that equivocal lesions are benign, performance of diagnostic tests was as follows: sensitivity, specificity and accuracy for CT alone was 81, 84, 83%, for PET 71, 82, 76, and for PET-CT 80, 83 and 86%. Assuming that equivocal lesions are malignant, sensitivity, specificity, and accuracy for CT was 61, 100, 70%, for PET 69, 100, 79, and for PET-CT 69, 100 and 79%. Combined FDG-PET-CT reliably differentiates soft tissue and bone tumors from benign lesions. The value of the information provided by FDG-PET-CT for planning surgical procedures must be evaluated in further studies.	3
34. 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. Ann Nucl Med. 2008; 22(7):603-609.	Observational-Dx	91 patients	To analyze the clinical efficacy of FDG-PET/CT in a relatively large group of patients with musculoskeletal tumors.	Final diagnosis revealed 19 benign soft tissue tumors (mean SUV(max) 4.7), 27 benign bone tumors (5.1), 25 malignant soft tissue tumors (8.8), and 20 malignant bone tumors (10.8). There was a significant difference in 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% in total with cutoff SUV(max) 3.8, 80%, 68.4%, and 75% in the soft tissue tumors with cutoff SUV(max) 3.8, and 80%, 63%, and 70% in the bone tumors with cutoff SUV(max) 3.7.	3

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35. Benz MR, Dry SM, Eilber FC, et al. Correlation between glycolytic phenotype and tumor grade in soft-tissue sarcomas by 18F-FDG PET. J Nucl Med. 2010; 51(8):1174-1181.	Observational-Dx	102 patients	To evaluate the correlation between glycolytic phenotype and tumor grade in soft-tissue sarcomas by 18F-FDG PET.	More than 90% of STSs (93/102) exhibited a strong glycolytic phenotype (SUVmax, 2.7-52.2 g/mL). Tumor SUVmax differed significantly among tumor grades ($P < 0.001$ for the 3- and 2-tier grading systems). The FNCLCC and 2-tier grading systems predicted tumor grade with similar accuracy (area under the curve, 0.83 and 0.85, respectively; $P = 0.35$). SUVmax differed significantly among histologic subtypes ($P = 0.03$) in the entire population but not when high-grade STSs were analyzed separately ($P = 0.31$). The tumor glycolytic phenotype correlated significantly with histologic grade as determined by both the FNCLCC and 2-tier (high vs. low) grading systems. (18)F-FDG PET cannot be used to reliably distinguish among grade 2 and 3 STSs (by FNCLCC) and the various subtypes.	3
36. Jackson T, Mosci C, von Eyben R, et al. Combined 18F-NaF and 18F-FDG PET/CT in the Evaluation of Sarcoma Patients. Clin Nucl Med. 2015;40(9):720-724.	Observational-Dx	21 patients	To report the sensitivity and specificity of the combined 18F-FDG/18F-NaF PET/CT (combined PET/ CT) versus individual 18F-FDG PET/CTand 18F-NaF PET/CT scans for detecting skeletal and extraskeletal metastases in the initial and/or subsequent treatment strategies in patients with newly diagnosed or recurring STS and BS.	A total of 13 patients had metastatic disease on F-NaF PET/CT, F-FDG PET/CT, and combined F-NaF/F-FDG PET/CT. Skeletal disease was more extensive on the F-NaF PET/CT scan than on the F-FDG PET/CT in 3 patients, whereas in 1 patient, F-FDG PET/CT showed skeletal disease and the F-NaF PET/CT was negative. Extraskeletal lesions were detected on both F-FDG and combined F-NaF/F-FDG PET/CT in 20 patients, with 1 discordant finding in the lung.	3
37. Ward WG, Sr., Rougraff B, Quinn R, et al. Tumors masquerading as hematomas. Clin Orthop Relat Res. 2007;465:232-240.	Review/Other-Dx	31 patients	To describe a series of patients in whom tumors diagnostically masqueraded as hematomas.	The diagnoses included soft tissue sarcomas (27), metastatic cancers (three), and lymphoma (one). History of subcutaneous ecchymosis was positive in only five patients (three of whom had trauma), negative in 18, and unknown in eight. Ecchymosis was present in two patients, absent in 20, and unknown in nine. Previous treatments included observation and reassurance (21), aspiration (11), incision and drainage (10), unplanned resections (seven), physical therapy (seven), medication administration (six), and arthroscopy (one).	4

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38. Mori T, Fujii M, Akisue T, Yamamoto T, Kurosaka M, Sugimura K. Three-dimensional images of contrast-enhanced MDCT for preoperative assessment of musculoskeletal masses: comparison with MRI and plain radiographs. Radiat Med. 2005;23(6):398-406.	Observational-Dx	68 patients	To evaluate the diagnostic capability of contrast-enhanced multidetector computed tomography (MDCT) for the preoperative assessment of musculoskeletal masses, in comparison with magnetic resonance imaging and plain radiographs (MRI+X-p).	In 32 bone lesions, MDCT was superior/equal/inferior to MRI+X-p regarding histological properties in 4/10/18, vascularity in 0/11/21, neurovascular involvement in 0/26/6, calcification/ossification in 15/17/0, and cortical/marrow involvement in 29/3/0 cases, respectively. In 36 soft-tissue lesions, MDCT was superior/equal/inferior to MRI+X-p with histological properties in 1/18/17, vascularity in 0/12/24, neurovascular involvement in 1/24/11, calcification/ossification in 8/28/0, and cortical/marrow involvement in 7/29/0 cases, respectively. The MDCT evaluation of both calcification/ossification and cortical/marrow involvement in bone lesions was superior to that in soft-tissue lesions ($p<0.05$). There were no statistically significant differences between benign and malignant lesions in the evaluation of each of the five items.	3
39. Bamberg F, Dierks A, Nikolaou K, Reiser MF, Becker CR, Johnson TR. Metal artifact reduction by dual energy computed tomography using monoenergetic extrapolation. Eur Radiol. 2011;21(7):1424-1429.	Observational-Dx	31 patients	To assess the performance and diagnostic value of a dual energy CT approach to reduce metal artefacts in subjects with metallic implants.	Image quality was rated superior to the standard image in 29/31 high energy reconstructions; the diagnostic value was rated superior in 27 patients. Image quality and diagnostic value scores improved significantly from 3.5 to 2.1 and from 3.6 to 1.9, respectively. In several examinations decisive diagnostic features were only discernible in the high energy reconstructions. The density of the artefacts decreased from -882 to -341 HU.	3

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EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
40. Peltola EK, Koskinen SK. Dual-energy computed tomography of cruciate ligament injuries in acute knee trauma. Skeletal Radiol. 2015;44(9):1295-1301.	Observational-Dx	18 patients	To examine dual-energy computed tomography (DECT) in evaluating cruciate ligament injuries.	A total of 18 patients who had an acute knee trauma, DECT and MRI were found. On MRI, six patients had an ACL rupture. DECT's sensitivity and specificity to detect ACL rupture were 79% and 100%, respectively. The DECT vs. MRI intra- and interobserver proportions of agreement for ACL rupture were excellent or good (kappa values 0.72-0.87). Only one patient had a PCL rupture. In GSI images, the optimal keV level was 63 keV. GSI of 40-140 keV was considered to be the best evaluation protocol in the majority of cases.	3
41. Reagan AC, Mallinson PI, O'Connell T, et al. Dual-energy computed tomographic virtual noncalcium algorithm for detection of bone marrow edema in acute fractures: early experiences. J Comput Assist Tomogr. 2014;38(5):802-805.	Review/Other-Dx	4 cases	To report initial experiences with the use of a DECT bone marrow algorithm to assess for bone marrow edema.	No results stated in abstract.	4
42. Chen H, Jia M, Xu W. Malignant bone tumor intramedullary invasion: evaluation with dual-energy computed tomography in a rabbit model. J Comput Assist Tomogr. 2015;39(1):70-74.	Observational-Dx	30 New Zealand white rabbits	To investigate the usefulness of dual-energy computed tomography (CT) spectral imaging for differentiating intramedullary microscopic invasion from simple marrow edema in a rabbit VX2 carcinoma model.	The slope of the spectral curve in the transition area (7.78 +/- 3.40) was significantly greater than that in the macroscopic tumor area (3.71 +/- 2.15) and smaller than that in the normal marrow area (12.88 +/- 4.12) ($P < 0.001$). Regarding the transition area, the slope of the spectral curve of the microscopic tumor invasion zone (10.87 +/- 2.69) was greater than that of the simple bone marrow edema zone (5.84 +/- 2.11) ($P < 0.001$).	3
43. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: http://www.acr.org/~/media/ACR/Documents/AppCriteria/RadiationDoseAssessmentIntro.pdf.	Review/Other-Dx	N/A	Guidance document on exposure of patients to ionizing radiation.	N/A	4

Evidence Table Key

Study Quality Category Definitions

- *Category 1*: The study is well-designed and accounts for common biases.
- *Category 2*: The study is moderately well-designed and accounts for most common biases.
- *Category 3*: There are important study design limitations.
- *Category 4*: The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:
  a) the study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
  b) the study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
  c) the study is an expert opinion or consensus document.
- M = Meta-analysis

Dx = Diagnostic

Tx = Treatment