
Purpose To evaluate utility of magnetic resonance (MR) imaging in local staging of soft-tissue sarcoma, with an emphasis on assessment of neurovascular encasement. Materials and Methods Institutional review board approval was obtained; informed consent requirement was waived. Preoperative MR images in 174 patients with soft-tissue sarcoma were analyzed by two readers. Tumor staging according to the American Joint Committee on Cancer/Union International Contre le Cancer and Enneking staging systems and analysis of osseous and articular invasion were performed. To assess neurovascular encasement, contact between tumor and arteries, between tumor and veins, and between tumor and nerves was classified (no contact, contact271°). Interobserver agreement was determined; imaging findings were correlated with intraoperative findings and/or histopathologic findings (Pearson correlation coefficient $r$ and Cohen $\delta$ coefficient). Results Intraoperative evaluation and/or histopathologic evaluation confirmed osseous, articular, and neurovascular invasion in 8.6%, 2.9%, and 25.3% of patients. Interobserver agreement was excellent for tumor staging (American Joint Committee on Cancer/Union International Contre le Cancer staging, $\kappa = 0.811$; Enneking
It was substantial for articular invasion ($\gamma = 0.794$). Sensitivity and specificity for osseous invasion were 100% and 98.7%, respectively (both readers). For articular invasion, sensitivity was 80% (both readers); specificities were 100% and 98.8% for readers 1 and 2, respectively. Interobserver agreement in quantifying contact between tumor and vessels and between tumor and nerves was excellent for arteries, veins, and nerves ($\gamma = 0.845, 0.892, 0.893$, respectively). Receiver operating characteristic analysis revealed optimal threshold of greater than 180° for prediction of arterial and venous encasement (both readers). For neural encasement, optimal threshold was greater than 180° (reader 1) and greater than 270° (reader 2). Sensitivities in diagnosing encasement for arteries, veins, and nerves were 84.6%, 84.6%, and 77.8% (reader 1) and 84.6%, 84.6%, and 72.2% (reader 2). Specificities for encasement of arteries, veins, and nerves, respectively were 97.5%, 97.5%, and 93.2% (reader 1) and 93.8%, 94.7%, 97.3% (reader 2). Conclusion MR imaging allows reliable and accurate local staging of soft-tissue sarcoma. Encasement of arteries, veins, and nerves should be diagnosed, if the contact between tumor and vascular or neural circumference exceeds 180°. (©) RSNA, 2015 Online supplemental material is available for this article.