Iron Administration Before Stem Cell Harvest Enables MR Imaging Tracking after Transplantation

To monitor successful engraftment and recognize complications such as graft failure or tumor formation, marrow-derived mesenchymal stem cell (MSC) therapies require in vivo tracking of the transplanted stem cells with noninvasive imaging technologies. In a study published in the October issue of Radiology (RSNA.org/Radiology), to determine whether intravenous ferumoxytol can be used to effectively label MSCs in vivo and for tracking of stem cell transplants, Aman Khurana, M.D., of Stanford School of Medicine, and colleagues injected Sprague-Dawley rats with ferumoxytol 48 hours prior to extraction of MSCs from bone marrow. Ferumoxytal uptake by these MSCs was evaluated with fluorescence, confocal and electron microscopy and compared with results from traditional ex vivo labeling procedures. The in vivo-labeled cells were subsequently transplanted in osteochondral defects of 14 knees of seven athymic rats and evaluated with MR imaging up to four weeks after transplantation. In vivo ferumoxytol-labeled MSCs, harvested from bone marrow and transplanted into osteochondral knee defects, showed significantly shortened T2 relaxation times compared with unlabelled control cells (11.459 vs. 24.423 msec; P = 0002). Histologic examination confirmed the presence of iron in labeled transplants and defect remodelling. “We developed an immediately available, potentially clinically applicable approach for in vivo stem cell labeling with an FDA-approved iron supplement,” the authors write. “We evaluated this FDA-approved iron supplement ex vivo and in vivo in athymic rats and evaluated with MRI up to four weeks after transplantation.” Radiology 2013;269;1:186–197 ©RSNA, 2013. All rights reserved. Printed with permission.

Assessment of Liver Tumor Response to Therapy: Role of Quantitative Imaging

The substantial recent progress in nonsurgical therapeutic options for malignant primary and metastatic liver tumors has created a new challenge for radiologists who must assess the response of liver tumors to therapy. During the costly and time-consuming steps of clinical trials to obtain regulatory approval of drugs and for the efficacy evaluation of new interventional therapies for hepatic malignancies, imaging biomarkers can provide reliable quantitative assessment of tumor treatment response by acting as surrogate endpoints to the traditional survival-based endpoints. Accurate evaluation of the efficacy of new therapies at earlier stages is crucial to avoid potential toxic reactions, unnecessary interventions and costly failure. In an article in the October Special Issue of Radiographics (RSNA.org/Radiographics), Fernanda D. Gonzalez-Guindalini, M.D., of Northwestern Memorial Hospital, Northwestern University, Feinberg School of Medicine, Chicago, and colleagues review the current quantitative criteria used in the evaluation of treatment response in liver tumors, summarizing their indications advantages and disadvantages, and discuss future directions with newer methods that have the potential for assessment of treatment response. “Quantitative imaging allows robust evaluation of hepatic tumor response. In addition to size changes, various biologic and functional parameters can be quantified by using new imaging technologies,” the authors write. “Measurement of these parameters is especially important for the evaluation of tumor response to novel targeted therapies, in which change in functional status sometimes precedes anatomic modification.”

Dysplastic nodule in segment V of the liver in a 61-year-old man with cirrhosis. Axial image from MR elastography demonstrates that the dysplastic nodule has lower stiffness (green), compared with the adjacent cirrhotic liver parenchyma (red). Radiographics 2012;32;1701–1802©RSNA, 2013. All rights reserved. Printed with permission.