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**Clinical cell therapy imaging using a perfluorocarbon tracer and fluorine-19 MRI.**

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**Public Summary:**

**PURPOSE:** Cellular therapeutics are emerging as a treatment option for a host of serious human diseases. To accelerate clinical translation, noninvasive imaging of cell grafts in clinical trials can potentially be used to assess the initial delivery and behavior of cells. **METHODS:** The use of a perfluorocarbon (PFC) tracer agent for clinical fluorine-19 ((19) F) MRI cell detection is described. This technology was used to detect immunotherapeutic dendritic cells (DCs) delivered to colorectal adenocarcinoma patients. Autologous DC vaccines were labeled with a PFC MRI agent ex vivo. Patients received DCs intradermally, and (19) F spin-density-weighted MRI at 3 Tesla (T) was used to observe cells. **RESULTS:** Spin-density-weighted (19) F images at the injection site displayed DCs as background-free "hot-spot" images. (19) F images were acquired in clinically relevant scan times (<10 min). Apparent DC numbers could be quantified in two patients from the (19) F hot-spots and were observed to decrease by approximately 50% at injection site by 24 h. From 3T phantom studies, the sensitivity limit for DC detection is estimated to be on the order of approximately 10(5) cells/voxel in this study. **CONCLUSION:** These results help to establish a clinically applicable means to track a broad range of cell types used in cell therapy.

**Scientific Abstract:**

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