Depicting adoptive immunotherapy for prostate cancer in an animal model with magnetic resonance imaging.

Abstract:
Genetically modified natural killer (NK) cells that recognize tumor-associated surface antigens have recently shown promise as a novel approach for cancer immunotherapy. To determine NK cell therapy response early, a real-time, noninvasive method to quantify NK cell homing to the tumor is desirable. The purpose of this study was to evaluate if MR imaging could provide a noninvasive, in vivo diagnosis of NK cell accumulation in epithelial cell adhesion molecule (EpCAM)-positive prostate cancers in a rat xenograft model. Genetically engineered NK-92-scFv(MOC31)-? cells, which express a chimeric antigen receptor specific to the tumor-associated EpCAM antigen, and nontargeted NK-92 cells were labeled with superparamagnetic particles of iron-oxides (SPIO) ferumoxides. Twelve athymic rats with implanted EpCAM positive DU145 prostate cancers received intravenous injections of $1.5 \times 10^7$ SPIO labeled NK-92 and NK-92-scFv(MOC31)-? cells. EpCAM-positive prostate cancers demonstrated a progressive and a significant decline in contrast-to-noise-ratio data at 1 and 24 h after injection of SPIO-labeled NK-92-scFv(MOC31)-? cells. Conversely, tumor contrast-to-noise-ratio data did not change significantly after injection of SPIO-labeled parental NK-92 cells. Histopathology confirmed an accumulation of the genetically
engineered NK-92-scFv(MOC31)-? cells in prostate cancers. Thus, the presence or absence of a
tumor accumulation of therapeutic NK cells can be monitored with cellular MR imaging.
EpCAM-directed, SPIO labeled NK-92-scFv(MOC31)-? cells accumulate in EpCAM-positive prostate
cancers.