

MRI-based identification of undifferentiated cells: looking at the two faces of Janus

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Dear editor

We have read with great interest the paper of Ketkar-Atre et al,¹ in which they have developed a new way of tracking stem cells after transplantation using a magnetic resonance imaging (MRI)-based method. They have proven using high resolution electron microscopy that various types of undifferentiated cells, also known as stem cells, have a differentiation uptake of iron oxide nanoparticles according to their size and proliferation rate. Due to its super-paramagnetic properties, iron oxide is slowly finding its way from the laboratory to the clinic. When combined with MRI, it can very efficiently track a stem cell in vivo, as in the case of autologous transplantation,^{2,3} but also for other conditions such as Duchenne muscular dystrophy.

Undifferentiated cells are slowly changing the way we treat various diseases and transplantation is currently the standard-of-care in hematology and ophthalmology, but these cells are not always the solution for therapy. Sometimes, undifferentiated cells are the cause of disease initiation, progression and resistance to therapy. This is the case of stem-like cells, that have been isolated from a wide variety of malignancies⁴⁻⁶ and have been proven to be responsible for resistance to both chemotherapy and radiation oncology treatment. This most often leads to a dismal prognosis for the patient. Various nanotechnology-based approaches have been developed to specifically target these stem-like cells,^{7,8} but so far little real progress has been made in the clinic because of late diagnosis of malignancy relapse.

Using iron oxide nanoparticles combined with an MRI or positron emission tomography (PET) scan, we may actually identify a very small cluster of stem-like malignant cells and diagnose a tumor relapse before clinical, or preclinical investigations show it. This method has already been published by Marotta et al,⁹ but further investigation must be carried out in the field.

Disclosure

The authors report no conflicts of interest in this communication.

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