Real-time, observable MRI delivery updated to improve stem cell therapy for Parkinson's

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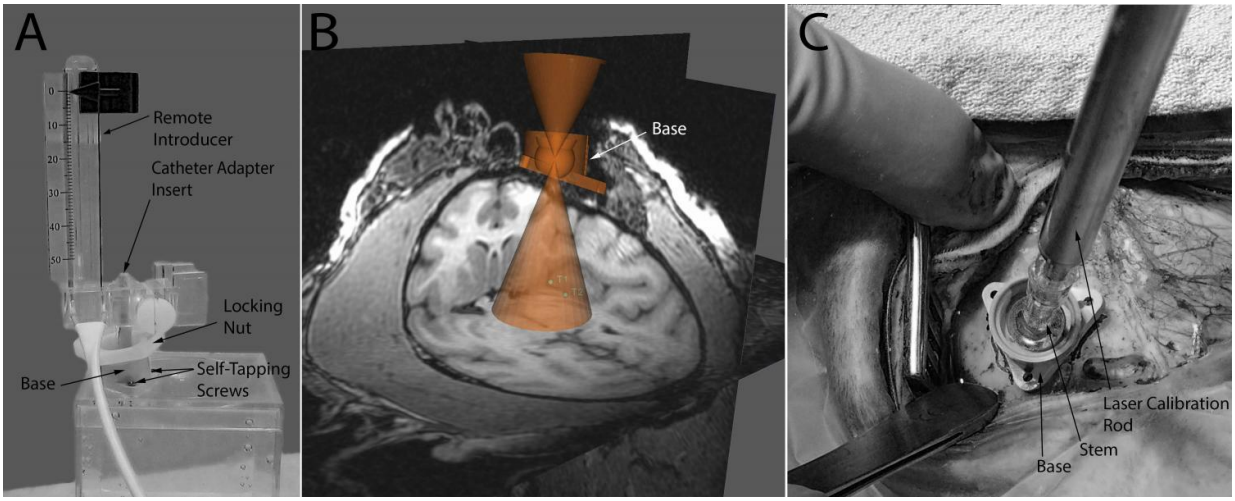

Technology and methodology involved in MRI-guided transplantation of neural stem cells into the Parkinsonian brain. Credit: Figure 4 from: Vermilyea SC et al. Real-time intraoperative MRI intracerebral delivery of induced pluripotent stem cell-derived neurons. *Cell Transplant*. 2016; [epub ahead of print].

In a study using Real-time intraoperative magnetic resonance imaging (RT-IMRI) to guide the transplantation of induced pluripotent stem cell (iPSC)-derived neurons into the brains of non-human primates modeled with Parkinson's disease, researchers found that RT-IMRI guidance not only allows for better visualization and monitoring of the procedure, but also helps cell survival.

The study will be published in the upcoming special American Society for Neural Therapy and Repair (ASNTR) issue of *Cell Transplantation*.

Induced pluripotent stem cells, a type of stem cell that can be generated directly from adult cells, offer great benefits for regenerative medicine as they propagate indefinitely and can differentiate into a variety of cell types, such as neurons, heart, pancreatic, and liver cells.

In previous studies, the researchers have found that while iPSC-derived neurons provide great opportunities for cell replacement they also present challenges.

"Our team developed an MRI-compatible trajectory guidance system that has been successful for intraoperative MRI," said study lead author Dr. Marina E. Emborg, Preclinical Parkinson's Research Program Center, Wisconsin National Primate Research Center University of Wisconsin-Madison. "We recently upgraded the system for real-time targeting and guidance and, as a result of the improvements, the procedure provides several advances for cell delivery."

The researchers report that the advancements allow for real-time pressure readings that can prevent clogging during cell delivery. They also found a way to prevent exposure to air during the procedure. Both advancements, in addition to real-time observation by MRI, add to the procedure's efficacy and safety.

Using post-mortem brain analysis, the researchers found that the transplanted cells grafted and survived well in the test animals after transplantation.

"The application of the RT-IMRI system for intracerebral targeting and delivery of iPSC-derived neuroprogenitors is feasible and presents and the advantage of allowing monitoring of cell uploading and infusion,"

concluded the researchers. "These methods will be particularly valuable for clinical application where safety and efficacy of the treatment is defined by the accurate delivery of cells."

"Cell therapy is the cornerstone of regenerative medicine for neurodegenerative disease," said Dr. Paul R. Sanberg, Distinguished Professor at the University of South Florida, in Tampa, FL and Co-Editor-in-Chief for *Cell Transplantation*. "With the advent of iPSCs, the field has made significant advances. The current study expounds upon those advances by addressing logistical concerns regarding cell administration and tracking. This method has wide applicability and may be relevant for not only Parkinson's disease, but other neurodegenerative conditions as well."

More information: , Real-Time Intraoperative MRI Intracerebral Delivery of Induced Pluripotent Stem Cell-Derived Neurons, *Cell Transplantation* (2016). DOI: 10.3727/096368916X692979

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