MedicalXpress

Novel radioguided brain surgery technique could help pinpoint cancerous tissue

January 27 2015

A novel radioguided surgery technique could quickly and effectively identify residual cancer cells during brain tumor surgery, with low radiation exposure for both patients and surgeons. The study, featured in the January 2015 issue of the *Journal of Nuclear Medicine*, reports that Y-90 DOTATOC, a beta-minus-emitting tracer, can effectively delineate the margins of meningiomas and high-grade gliomas.

Radioguided surgery (RGS) allows the surgeon to evaluate the completeness of a tumor resection while minimizing the amount of healthy tissue removed. During the procedure, a surgeon is provided with vital and real-time information on the location and extent of the lesion that allows better assessment of the resection margins. The technique uses a radiolabeled tracer preferentially taken up by the tumor to discriminate cancerous tissue from healthy organs, as well as a probe sensitive to the emission released by the tracer, to identify in real time the targeted tumor focus. The radiopharmaceutical is administered to the patient before surgery.

"This research relates to a completely innovative radioguided surgery technique: the use of a beta-minus-emitting tracer," states lead researcher Riccardo Faccini. "This is a change in paradigm because RGS currently uses only gamma and beta-plus-emitting isotopes. The new technique uses Y-90-labeled DOTATOC—a tracer that traditionally is used for molecular radiotherapy—for diagnostic purposes."

In the study, uptake and background from healthy tissues were estimated

on Ga-68 DOTATOC positron emission tomography (PET) scans of 11 meningioma patients and 12 high grade glioma (HGG) patients. A dedicated statistical analysis of the images was completed and validated. The feasibility study was performed using full simulation of emission and detection of the radiation, accounting for the measured uptake and background rate. All meningioma patients but one, who had an atypical extracranial tumor, showed high uptake of DOTATOC. Uptake of Y-90 DOTATOC in meningiomas was high in all studied patients. Uptake in HGGs was lower than in meningiomas but was still acceptable for RGS. Funding for the study was provided by Italian institutions Universita' di Roma La Sapienza, Istituto Nazionale di Fisica Nucleare, Istituto Italiano di Tecnologia, Centro Fermi Museo Storico della Fisica, and Istituto Europeo di Oncologia.

"We are setting up clinical tests of RGS with beta-minus radiation on meningiomas, based on their known high receptivity for DOTATOC," Faccini said. "This study suggests that the next step will be to try the technique on gliomas, which will be more challenging, but feasible and definitely clinically interesting. In parallel with this technique, we are also developing a surgical probe customized for the problem, which could in the future extend the applicability of the method to endoscopy or laparoscopy."

Meningiomas are tumors that grow on the delicate outer covering of the brain. According to the Brain Science Foundation, meningiomas account for approximately 33.8% of all primary brain tumors, making them the most common type. Gliomas, which are malignant tumors that commonly invade adjacent tissue and spread through the central nervous system, represent about 17.1% of all primary brain tumors and about 70.5% of all astrocytomas.

More information: "Toward Radioguided Surgery with β? Decays: Uptake of a Somatostatin Analogue, DOTATOC, in Meningioma and

High-Grade Glioma" *Journal of Nuclear Medicine*, 2015.