A Novel Radio-Guided Surgery for Complete Tumor Resection

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TREND

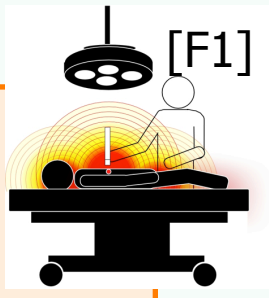
RADIO GUIDED SURGERY(RGS)

In oncology, patient life expectation after surgery is strictly correlated to the completeness of tumor resection. To identify the tumor different RGS techniques have been developed using γ **emitters** (F1):

* A radio-tracer capable to carry a radio-nuclide selectively to tumor is injected before surgery

* An intraoperative probe detects small residuals or affected lymph-nodes

RGS cannot currently be used in abdomen, brain and pediatric tumors due to the large penetration of γ radiation.



Attempts to use β^- **radiation** limited by:

* cumbersome dual detectors

* large dose to patients and medical personnel

PRESENT ACTIVITY

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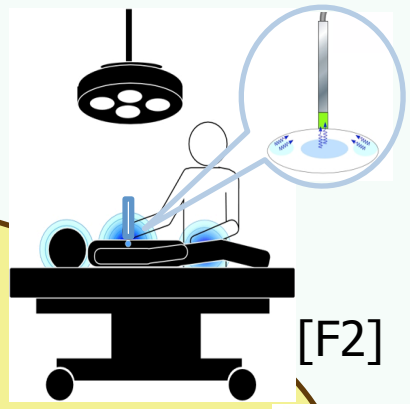
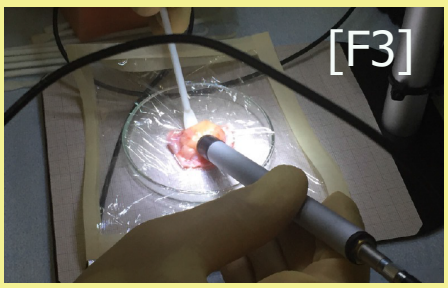
CHANGE IN PARADIGM [1]

Using β^- radiation allows for (F2)
* less noise from healthy organs
* more compact probe
* less dose to medical personnel and patients



PROBE PROTOTYPE [2]

Small (5 mm) doped p-terphenyl [3] scintillating crystal read out by SiPM.
Features:
* good sensitivity to electron;
* low sensitivity to γ;
* thin housing adaptable to surgeron needs



CLINICAL APPLICATIONS [3]

Best β^- radio-isotope is ^{90}Y → possible radiotracer DOTATOC:
* meningioma
* low grade glioma
* NeuroEndocrine Tumors

Clinical Collaborators

EX-VIVO TESTS ON MENINGIOMA [F3] DEMONSTRATED PROOF OF PRINCIPLE

DREAMS

EXTENTION TO OTHER TUMORS

This project will extend the possibility to use RGS to more tumors (cerebral, abdominal and pediatric)

- expected reduction of recidivism
- identification of lymph-nodes in complex environment

WISHES

CERTIFIED PROTOTYPE

Need to perform tests in the surgical room
→ risk assessment and certification

CLINICAL TRIALS

Need to perform in-vivo clinical trials:
* identify the largest number of pathologies of interest
* perform trials

NEW RADIOTRACERS

Extension to more tumors requires new tracers
* with ^{90}Y
* with other β^- emitting isotopes
→ production?

Papers

[1] A novel radioguided surgery technique exploiting β^- decays, Sci. Rep. 4, 4401 (2014)
[2] Properties of para-therphenyl as detector for α, β and γ radiation, Nuclear Science, IEEE Transactions, Vol:61, (2014)
[3] DOTATOC uptake in meningioma and glioma, J Nucl Med, 56 (2015); Time evolution of DOTATOC Uptake In Neuroendocrine Tumors, , J Nucl Med, 56 (2015);

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