Letter of intent

File number 175.2021.031
Grant 2021/2022

Applicant

Title
Integrated MRI-hyperthermia platform for simultaneous tumor heating and monitoring of relevant markers of the tumor microenvironment in pelvic and abdominal tumors during hyperthermia treatment

Abstract
Relevant NWO domain: Netherlands Organisation for Health Research and Development (ZonMw)

Relevant research fields:
21.20.00 Biophysics, clinical physics
21.50.00 Histology, cell biology
21.70.00 Physiology
21.90.00 Life sciences, other
23.30.00 Medical specialisms

The requested investment is for a form of personalized medicine by creating a combined MRI-hyperthermia platform capable of performing hyperthermia treatment of pelvic and abdominal tumors, guided by simultaneous real-time monitoring of the effect of treatment on important tumor markers. Funding will be requested for hyperthermia and MRI systems suitable for an integrated platform.

Hyperthermia involves heating a tumor to 40-43°C, to achieve a tumor-selective sensitization of chemotherapy and radiotherapy. Poor tumor perfusion and tumor hypoxia contribute to tumor resistance against chemotherapy, radiotherapy and other oncological treatments. Combining chemotherapy and radiotherapy with hyperthermia is thought to increase perfusion and oxygenation, which overcomes these unfavorable conditions to thus improve outcome. This will prove particularly relevant for tumors with poor prognosis with best standard of care, like pancreatic tumors and also other abdominal or pelvic tumors including cervical and rectal tumors, where hypoxia is known to preclude effective treatment. In this project we will focus on using hyperthermia to induce reperfusion and reoxygenation in the tumor microenvironment, to establish relationships between treatment parameters and the magnitude of these effects, and to establish whether changes in the tumor micro environment are indeed associated with improved clinical outcome. Pre-treatment and online monitoring of tumor markers permits identification of those patients who are likely not to respond to standard treatment and likely to benefit from adding hyperthermia, and whether patients respond to hyperthermia treatment: effectively personalized medicine. Multi-modality treatment combinations of hyperthermia, chemotherapy, radiotherapy and immunotherapy will be compared, translational research results will be linked to (pre)clinical study results. The platform will also be used to combine hyperthermia with targeted agents, e.g. using drugs encapsulated in temperature sensitive liposome capsules, enabling targeted drug release limited to the heated tumor region. Novel MR sequences and techniques will be developed for advanced imaging of tumor markers in the pelvis and abdomen, where imaging is challenging due to motion artefacts.

The researchers involved represent an interdisciplinary network (physicists, clinicians, preclinical researchers) from relevant departments (medical oncology, radiotherapy, surgical oncology, radiology, medical physics) from various academic centers in the Netherlands.

We will seek alignment with 2 groups in the LSRI Roadmap: ‘Life sciences and ‘enabling’ technology’ and ‘Medical sciences (including imaging, biomed, tissue models)’

Organisation responsible for the application
Confirm letter of intent
With submitting this form via ISAAC I declare to have filled in this form completely and truthfully.

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Applicant