

# ESMI Study Group on *“Intra-operative Imaging”* Relevance, Scope, and Goals

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The study group Intra-operative Imaging focuses on the surgical optical imaging of cancer. Surgical decision making is still mostly based on the physicians vision and experience, however studies show that oncological surgical procedures often lack accuracy and completeness. Improvements in the resection technique are therefore highly sought to improve survival, decrease functional loss, and increase the quality of life of the patient.

We believe that surgical vision enhanced by molecular imaging has the potential to shape the future of surgical procedures by improving the sensitivity, accuracy and contrast of tumor delineation and lymph node interrogation. Fluorescent dyes such as fluorescein and indocyanine green (ICG) have been used for many year in clinical practice. They can outline the vascular system and help to identify areas of high perfusion or permeability. Recently, targeted fluorescent probes emerged as another class of promising contrast agents. Antibody, peptide, and minibody-based fluorescent probes can improve the detection ability of tumor margins or metastatic microfoci by attaching to upregulated cancer receptors. Similarly, engineered probes can capitalize on tumor-specific physiological or molecular parameters. The use of labeled molecules with tissue specificity is expected to become a crucial platform in the propagation of fluorescence surgical imaging into the clinic. A first successful translation of such targeted probes, together with their real-time intra-operative imaging, has already been reported for ovarian carcinomas.

Furthermore, magneto-fluorescent particles offer the possibility for multi-modal imaging by combining fluorescence with the whole-body imaging capability of MRI. Such novel magnetic resonance-based molecular imaging techniques can help to detect the early responses of tumors to therapy, with a view to translating these into clinical application.

The study group aims to further advance the development and clinical translation of such probes, as well as the corresponding imaging modalities from intra-operative or endoscopic use. This encompasses the development of imaging systems that are able to acquire and process multispectral and possibly multi-modal information in real-time and are adapted to the clinical needs.

We aim to develop advanced molecular imaging techniques and translate them into clinical practice. Meeting the need for improved contrast in tumor visualization will help to improve surgical and endoscopic procedures and hence the patient’s health.

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