

Molecular-Guided Surgery: Molecules, Devices, and Applications

Brian W. Pogue
Sylvain Gioux
Editors

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Introduction

The field of Molecular-Guided Surgery using optical techniques has been growing exponentially over the last decade, and is now recognized as one of the most promising fields that can have an impact on patient care in the near future. As such, the number and the quality of the contributions presented at the conference for its first edition were outstanding. The conference covered a wide range of topics from endogenous to exogenous contrast methods, all the way from the bench to the bedside. Every session included invited presentations from the top research groups in the world that complemented outstanding contributed presentations through the entire conference stream. Importantly, participants from different research horizons were present – mainly scientists, engineers and clinicians – and contributed to enrich the conference content by sharing their perspectives and experiences about Molecular-Guided Surgery.

On the side of emerging technologies, the field is witnessing the rise of new and promising tools using endogenous molecular contrast for guiding surgery, a rising topic in the field due to its fast translational potential and its established sensitive and specific diagnostic capabilities. While it was clear that such an approach is very promising, several groups also highlighted the fact that this topic has to mature and solve significant problems related to integrating the technology into clinical workflow, and providing real-time wide-field images for macroscopic applications. These difficulties, mainly related to technology and methods, however, are balanced with the relative ease for taking imaging systems by themselves into the clinic, in a short term, due to the simplicity of the approval process as compared to methods that make use of contrast agents.

Fluorescence-guided surgery has played a leading role in pulling the field forward, and both the diversity and the originality of the research clearly demonstrate its potential clinical impact. From the device side, more ergonomic tools adapted for clinical scenarios are being designed and translated into practice, with a particular emphasis on endoscopic devices, both in rigid and flexible formats. From the methods aspect, original approaches to increase the sensitivity and the specificity – such as pulsed illumination, attenuation correction or dual tracer imaging – are being developed and demonstrate promise during preclinical implementations.

Finally, on the contrast agent side, the field is seeing two main parallel progresses: on one side, the use of non-specific off-label use of FDA approved contrast agents such as indocyanine green and methylene blue; and on the other, several research groups and industries are developing novel specific contrast agents. The latter is clearly the most awaited and draws significant attention and excitement, especially as these developments take place in the perspective of

clinical trials and first-in-human studies, a long-standing milestone for the field of fluorescence-guided surgery to achieve.

Altogether, the field of Molecular-Guided Surgery is certainly making a significant impact on the translation of optical methods to solve real clinical problems that need immediate and decisive feedback to surgeons. While both endogenous and exogenous methods exhibit distinct features and differ greatly in nature, it is anticipated that each method should be able to address niche needs in the clinic. This conference – bringing together speakers on the technology, molecules and applications – is an ideal forum in which to carry out these discussions.

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