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ASO Author Reflections: Fluorescent-Guided Surgery to Augment Pancreatic Cancer Surgery

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Past:

Extensive efforts are made to improve patient outcomes after oncologic resections. These improvements have mainly focused on the technical aspects of surgery. Although these efforts have made surgery safer, there has been marginal progress in improving real-time assessment of surgical margins. Molecular imaging could potentially improve the precision of oncologic surgery in this direction [1]. Technological advances in camera hardware, dye chemistry, and targeting molecules have rapidly developed into the field of molecular imaging. This has enabled the emergence of fluorescence-guided surgery (FGS) which has can provide high sensitivity, resolution, and real-time images [2]. This study aimed to report on the first-in-human use of molecular imaging for intraoperative detection of pancreatic cancer, tumor-bearing lymph nodes and distant metastases using cetuximab-IRDye800, a near-infrared fluorescent (NIRF) agent that binds to epidermal growth factor receptor [3].

Present:

In the field of FGS, the use of tumor-specific optical imaging agents has entered clinical trials, establishing safety and feasibility for several cancer types [4]. In our study, we have shown that cetuximab-IRDye800 can target pancreatic cancer and differentiate between cancer, pancreatitis, and normal pancreas. In addition, the optimal dose of the molecular dye in identifying tumor-positive lymph nodes and low-volume metastases was defined. In addition, recently multiple investigators have demonstrated safe and specific targeting in several studies for pancreas cancer, head and neck cancer, brain cancer and lung cancer [5]. There are several new agents entering phase II and III studies. Hurdles currently include the difficulties in running surgical trials and the unique nature of these agents from a regulatory perspective. Surgical clinical trials are complex to conduct in a controlled manner given the

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heterogeneity in tumor location and surgical care provided. However, several recent meetings with the FDA have begun to establish a pathway for eventual approval [6].

Future:

The increasing adoption of minimally invasive surgical techniques, such as robotic-assisted and laparoscopic surgery, will accelerate the use of cancer specific optical imaging strategies. Perhaps most importantly, optical imaging helps to substitute for the lack of tactile information. Furthermore, since these technologies require operating off a monitor, they are ideal for optical imaging technologies, especially those dependent on near-infrared light. Finally, minimally invasive technologies are usually in low light environments, also ideal for optical imaging strategies. Therefore, as the technology improves for minimally invasive surgery, one might expect parallel investment into fluorescence guided surgery – which includes hardware, software and imaging agents. Perhaps most importantly, for surgery to remain the mainstay for local and regional disease control, surgeons must continue to provide a cure with limited morbidity and improved outcomes. It is our belief that over the next decade this kind of technology – optical imaging-guided oncologic surgery – will be widely available and part of standard practice for multiple tumor types.

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