2021 ACG-IRG Pilot Grant

Tissue Modeling in Transoral Robotic Cancer Surgery

Ryan K Orosco, MD (MCC)

Abstract:

Oropharyngeal cancer (OPC) caused by the human papillomavirus (HPV) is a modern epidemic in the United States, and worldwide. In this modern era, robotic surgery has been a transformative medical advance that has revolutionized the way we manage OPC through TORS (transoral robotic surgery). Refined robotic instrumentation and dexterous motion capabilities are incredible strengths of today's state-of-the-art in oncologic robotic surgery, but there is great need to improve capabilities through surgical navigation. Before a TORS or other robotic cancer operation, surgeons study pre-operative radiographic imaging. During the procedure, they use cameras look at the tissues, but cannot see the pre-operative images as they are operating. Although they can pause their surgical maneuvers and look at the scans, the anatomic configuration they are working on is usually quite different than that of the static pre-operative scans—three-dimensional tissue navigation is not available to help guide intraoperative decisions. Early work toward TORS soft tissue navigation has yielded simple static 2D/3D image overlays, but the clinical utility of these is curtailed because the images are obtained in a different position from how the patient is configured during surgery. Little is known about how a patient's anatomy (tumor and blood vessels) changes when they are in the TORS surgical position. If we better-understand the way that anatomy changes when we take a patient to surgery, we will be able to work on technologies to improve the safety and effectiveness of cancer surgery. I propose TORS as a clinically-relevant oncologic use case to advance the field of tissue modeling and surgical navigation by: building a realistic pre-clinical model that incorporates tumor and vascular anatomy (Aim 1) and developing a model for predicting static TORS tissue distortion for both tumor and vascularity (Aim 2), This proposal works to improve surgical navigation for patients with the knowledge gathered through this work is expected apply broadly to wide range of robotic cancer surgeries.