CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP130412

Project Title:
Image-Guided Ultrafast Laser Scalpel for Precise, Selective, and Minimally Invasive Cancer Surgery

Award Mechanism:
Individual Investigator

Principal Investigator:
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Entity:
The University of Texas at Austin

Lay Summary:

In the treatment of cancer, the fundamental surgical goal is to remove all local cancerous cells while preserving healthy tissue. Preserving healthy tissue is crucial for retaining as much of the healthy functionality as possible while speeding up the recovery. This issue becomes especially important when dealing with delicate tissue, such as vocal folds, prostate, female reproductive system, brain, spinal cord, etc. To reduce damage to the healthy tissue during surgery and thus preserve functionality, the surgeons are in constant search for new surgical techniques and technologies that can remove the cancerous tissue with very high precision. Through technical innovation, a new generation of ultrafast lasers now offers the ultimate precision cutting tool for clinical surgery. While conventional lasers are currently gaining acceptance in cancer surgery, they however remove the unwanted tissue violently through heating, which causes damage to the surrounding healthy tissue by unwanted mechanical and thermal side effects – often evidenced by carbonization due to the literal burning of the tissue. On the other hand, ultrafast lasers work gently, evaporating only the target in the confined focal volume and thus removing tissue with nearly negligible heating and damage to the surrounding healthy tissue. Here, we propose to develop a "smart scalpel" that will allow surgeons to cut away malignant growth and clean-up tumor margins while minimizing damage to healthy tissue. We will achieve this goal by developing flexible, handheld femtosecond laser microsurgery probes and integrating equally precise optical imaging capabilities to guide this ultra-precise surgery. By minimizing collateral tissue damage normally associated with surgical procedures, the new disruptive technology will suppress scar formation, healing time, and post-surgery pain, thereby helping to preserve anatomic functionality at the surgical treatment site and improve cancer patients' care.