SURG-19. CLINICAL TRANSLATION OF A NOVEL VIDEO IMAGING SYSTEM FOR NEAR-INFRARED FLUORESCENCE GUIDED RESECTION OF BRAIN TUMORS
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RATIONALE: Fluorescence guided resection (FGR) of malignant primary brain tumors using tumor-specific fluorescent molecules has the potential to improve the extent of resection while minimizing injury to healthy brain. Currently available clinical NIR visualization devices lack sensitivity to detect low levels of fluorescence often observed with ligand-conjugated NIR dyes. With the advancement of these agents into clinical trials there is a concomitant need to improve intraoperative imaging devices for these applications. METHODS: We designed and implemented an imaging system to detect low-nanomolar concentrations of NIR dyes and display these NIR images superimposed on high-definition white light images. The system (SIRIS) uses synchronized pulsed white light and NIR laser for excitation, and a proprietary algorithm for image reconstruction and overlay. A series of validation experiments were performed to support clinical translation of the SIRIS. RESULTS: Key performance features including video capture at > 15 Mbps, full HD resolution, uniform field of view, and 100 micron resolution in both NIR and visible images were achieved in the laboratory setting. To demonstrate clinical feasibility, ex vivo imaging of tissue samples from glioma patients participating in a Phase 1 study of the tumor-specific NIR molecule BLZ-100 was performed. BLZ-100 fluorescence was detected in all pathologically confirmed tumor samples, and was absent in non-tumoral tissues. The device demonstrated markedly greater detection sensitivity than a commercially available unit (FLuobeam®800), and was felt easy to use by operating surgeons for surgical visualization. Qualitatively, merged color/NIR imaging at high resolution enabled features such as focal necrosis to be distinguished in excised samples. CONCLUSIONS: The SIRIS system delivers the required sensitivity, image resolution, white light capabilities, and small footprint required for FGR resection of brain tumor. In situ SIRIS imaging has been initiated in conjunction with our ongoing Phase I BLZ-100 trial, with preliminary results to be reported.