Augmented Reality used for complex Pituitary Tumor Resection

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Introduction – The application of navigation integrated augmented reality (AR) in Neurosurgery is an emerging paradigm that may offer improved situational awareness for the surgeon. Here, we present a case of a pituitary lesion with bilateral carotid artery aneurysms and analyze how AR impacted structural delineation during approach, resection, and repair. That patient was a 65 year old male with 4-5 months of peripheral visual field loss discovered to have a large non-secreting cystic pituitary tumor.
Methods – The patient was prepared for computer-assisted volumetric resection. Standard pituitary sequence isotropic MRI and contrast CT sequences were obtained, loaded and fused into Brainlab Curve and Surgical Theater’s EndoSNAP for initial segmentation of operative pathology and critical structures. The EndoSNAP platform was co-registered with Brainlab navigation pre-operatively. Following a standard endoscopic approach, the integrated augmented reality was utilized to obtain maximal exposure while protecting bilateral carotid artery. The endoscopic view alongside the simulated view allowed the attending neurosurgeon to see past the visual field to the critical anatomy. The tumor was safely resected under concurrent endoscopic and AR visualization.
Results – Throughout the procedure, navigation integrated with AR was used to guide and update position information in real time to augment the surgical team’s awareness of the relative boundary locations of the lesion and aneurysms. Post-operative scans confirmed near complete resection and decompression of the optic chiasm, resulting in improved vision for the patient.
Conclusions – This case outlines the application of a current state-of-the-art augmented reality platform to the endoscopic resection of a tumor made especially challenging by the presence of confounding pathology, in this case bilateral carotid aneurysms. The use of these tools is expanding greatly due to their minimal impact on surgical workflow while providing augmented visual field information in the service of patient safety.
Summary Points –
This case outlined the use of AR in a complicated pituitary tumor case involving bilateral carotid aneurysms complicating the surgical approach.
The use of AR with a wide variety of vascular and oncologic intracranial pathologies can be utilized during multiple stages of surgery.