Preoperative functional mapping with functional MRI and awake craniotomy with intraoperative mapping of speech and motor function have improved the safety and efficacy of surgery for LGG. We sought to expand the ability of preoperative fMRI to identify centers of functional eloquence by utilizing more sophisticated functional testing paradigms through the design of an MRI-compatible electronic tablet, which enables us to perform advanced language and motor testing during fMRI. RESULTS: Group analysis of healthy subjects produced activation in predicted locations (Broca's area for rhyming, Broca and Wernike's area for semantic decisions and the superior parietal lobule for word copying). Imaging results for the brain tumor patient showed bilateral language activation with active areas touching the tumor boundary. Conjunction analysis performed between rhyming and word copying tasks was found to substantially increase the specificity of the activation maps while maintaining the same sensitivity when compared with direct cortical simulation. CONCLUSIONS: Our preliminary studies demonstrate that functional data for speech mapping generated by use of the tablet during fMRI is replicable at surgery, with an increased sensitivity without loss of specificity for speech cortex mapping. We have begun to identify advanced language testing paradigms for its further development.