Functional Hemispherotomy using Magnetic Resonance-Guided Laser Induced Thermal Therapy
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Introduction
Open hemispherectomy has traditionally been performed in pediatric patients with refractory seizures due to unilateral lesions. Magnetic resonance-guided laser-induced thermal therapy (MRLITT) is increasingly used for precise targeted ablation of epileptogenic brain foci. Here, we describe its novel application in functional hemispherotomy.

Case Presentation
- 5-year old with refractory hemiclonic seizures following a hemispheric infarct with residual left hemiparesis and speech delay.
- Multidisciplinary epilepsy surgery review recommended palliative hemispherectomy; however, open craniotomy was deemed exceedingly high risk due to multiple medical comorbidities including congenital cardiac disease and end stage renal failure.
- MRLITT was considered an alternative with lower risk for hemodynamic perturbations.

Methods
- Using preoperative MR imaging and stereotactic planning software, five fiber trajectories were planned to achieve the main hemispherotomy objectives in the context of post-infarct encephalomalacia.
- 5 trajectories: Temporal stem, mesial temporal region, adjacent to the body of the corpus callosum, adjacent to the rostrum and genu of the corpus callosum extending to the basal frontal lobe, and adjacent to the splenium of the corpus callosum extending to the basal occipitotemporal region.
- Fiber implantation employed frame-based stereotaxy and robotic assistance, and included temporary external ventricular drain (EVD) placement.
- Ablations occurred at 4-6 sites along each fiber trajectory following steroid administration.

Preoperative Planning

Post Ablation Imaging

Clinical Outcome
- Anticipated immediate post-operative worsening of baseline hemiparesis (remained ambulatory).
- At one and six month follow-up she demonstrated improved strength on her left side, as well as improvements in speech beyond preoperative baseline.
- Seizure frequency decreased > 90 % on continued antiepileptic medication therapy.
- 3 total seizures (all short, self-resolving) at 3.5 months and 5 months post-operatively.
- Has remained seizure-free since for 8 months.

Conclusions
To our knowledge, this is the first reported application of MRLITT to achieve a functional hemispherotomy, highlighting a novel application for this minimally invasive technique in patients who are poor candidates for open surgery.