



MRI-guided stereotactic laser ablation of presumed cavernous malformations in drug-resistant epilepsy:
clinical and imaging outcomes

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Introduction

Open surgical resection is indicated for cavernous malformations (CM) associated with medically refractory epilepsy. Minimally invasive alternatives may maintain therapeutic efficacy while minimizing complications and disfigurement. MRI-guided stereotactic laser ablation (SLA) is a novel approach to treating focal epilepsy and tumors by delivering laser thermal energy via a commercial, FDA-cleared device. We present a series of five cases of SLA of presumed CM associated with refractory epilepsy. We include data regarding safety, ablation volumes, seizure outcomes, and follow up imaging.

Methods

Five patients with medically refractory epilepsy undergoing standard presurgical evaluation (3-Tesla MRI, fluoro-deoxyglucose PET, neuropsychological evaluation, and inpatient video-EEG studies) were found to have corresponding lesions consistent with CM. Each underwent stereotactic placement of a laser fiber assembly (optical fiber in a saline-cooled 1.6-mm diameter catheter, Visualase, Inc.) via twist drill hole under general anesthesia. Real-time MR anatomic and thermal imaging verified placement and extent of ablation of CM and surrounding cortical rim during ablation with a 15W diode laser.

Results

Procedural MR imaging revealed no evidence of hemorrhage following fiber placement within presumed CM. Immediate post-procedure contrasted imaging confirmed ablation in all cases. We detected no adverse events or neurological deficits. No ICU admissions were indicated and patients were discharged within 24-36 hours. Three of four patients with at least 6 months of follow up (range 6-20 months) are seizure free (75%). Follow up is < 6 months in the fifth patient. Failure to achieve seizure freedom in one subject could not be explained by pre-procedure lesion size, or post-procedure ablation characteristics, but might indicate a wider seizure network in a subject with prolonged epilepsy duration (>45 years). Available follow up MR imaging at 6 months indicates non-enhancing cystic necrosis limited to the ablation zone.

Conclusions

Minimally invasive MRI-guided SLA of presumed epileptogenic CM is a potentially safe and effective alternative to open resection. We have performed this procedure without complication in five patients with excellent seizure outcomes. With additional experience this technique may be a first line alternative for patients with epileptogenic CM and perhaps symptomatic hemorrhagic CM as well.

Learning Objectives

By the end of the presentation, participants should be able to: 1) Describe the natural history and classical treatment of cavernoma related drug-resistant epilepsy 2) Describe the technique for minimally invasive stereotactic laser ablation of cavernous malformations 3) Understand the potential benefits, risks, and complications associated with the new procedure.

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