

Stereotactic laser ablation of symptomatic cavernous malformations: imaging and clinical outcomes

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INTRODUCTION: MRI-guided laser interstitial thermal therapy (stereotactic laser ablation, SLA) is a novel, minimally invasive treatment of symptomatic cerebral cavernous malformations (CCMs). We describe clinical/imaging outcomes of the largest series of SLA for CCMs to date.

METHODS: Twenty consecutive patients with presumed CCM and medically refractory epilepsy, intractable headaches, or aggressive natural history (bleeding, neurological deficit) underwent anatomic MRI. Epilepsy patients also underwent functional MRI, EEG, PET, and neuropsychometric testing. Patients underwent stereotactic twist-drill craniostomy and insertion of a saline-cooled laser fiber delivering 980-nm diode laser energy (Visualase, Medtronic); one large thalamic CCM underwent 3 distinct stereotactic trajectories. MRI provided accuracy confirmation and near-real-time thermography. Patients underwent clinical and imaging follow-up.

RESULTS: CCM locations were temporal (11), frontal (4), parietal (2), thalamic (2), and pallidal (1). Complications occurred only in subcortical cases, and included transient scalp numbness (thalamus, n=1), transient hemiparesis associated with hemorrhage (pallidum, n=1), and worsening hemiparesis persistent at early follow-up (thalamus, n=1). Eleven of 12 epileptic patients with >1-year follow-up were seizure-free (92% Engel class 1 outcome) from ablation alone. All 6 remaining epilepsy patients with <1-year follow-up were seizure-free at last follow-up. Both headache patients with >1-year follow-up were improved. All ten CCMs with postoperative imaging >6 mo revealed clear involution.

CONCLUSION: Minimally invasive MR-guided ablation of symptomatic CCMs is an effective alternative to open resection. Neurological complications were location-dependent. Operative hemorrhage rate was 1/20 (5%), and 0/17 cortical cases. Additional experience and longer follow-up are needed.

KEYWORDS: Cavernous malformation; epilepsy; headaches; magnetic resonance imaging; stereotactic laser ablation; laser interstitial thermal therapy

LEARNING POINTS:

- Cerebral cavernous malformations (CCMs) are ideal candidates for stereotactic laser ablation due to their minimal blood flow, lobular shape, and susceptibility to thermocoagulation.

- Twenty consecutive patients with medication-refractory epilepsy or intractable seizures confirmed to be concordant with CCM location underwent laser ablation.
- Out of 12 epileptic patients with one year follow-up, 11 are seizure free (92% Engel class 1). One went on to resection and afterward was seizure free.
- No significant lasting perioperative complications occurred.