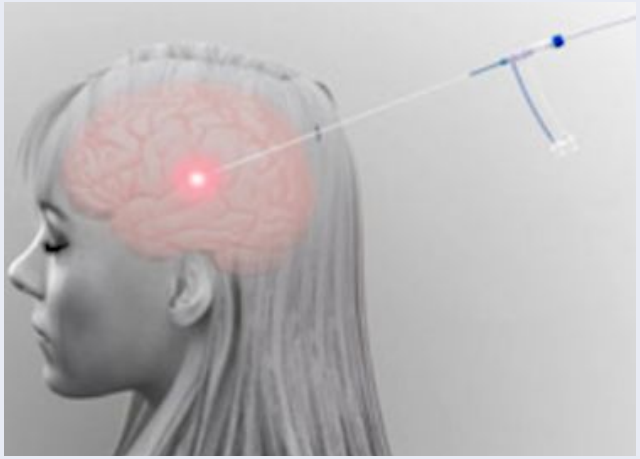
Stereotactic laser ablation of symptomatic cavernous malformations

imaging and clinical outcomes



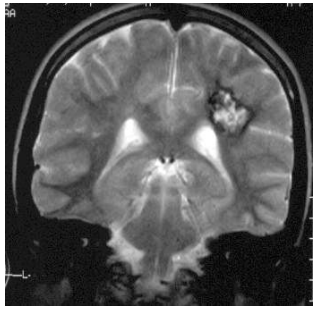
James Malcolm
Matthew Stern, Daniel Drane
Jon Willie, Robert Gross

#1839

Disclosures

None

Introduction



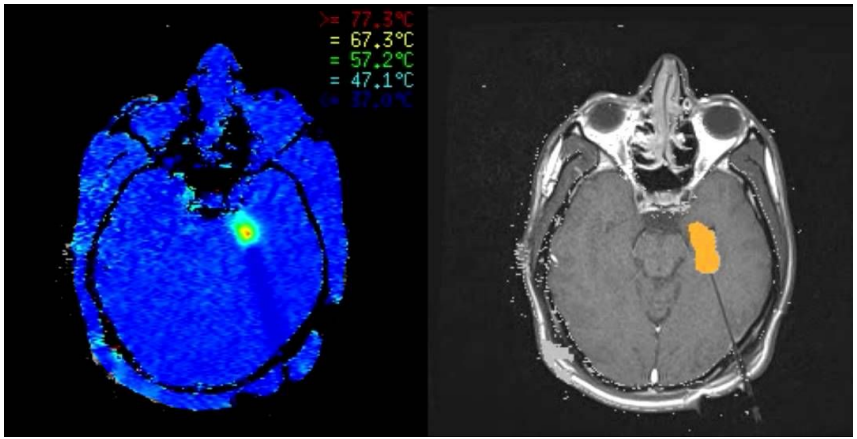
- Cerebral cavernous malformations (CCMs) are abnormal vascular malformations that tend to bleed
  - Risk of hemorrhage is 2.4% over 5 years*
- Present as seizures, headache, neurologic deficit, or incidental finding
- Asymptomatic management: observe, serial MRI over 2-3 years
- Symptomatic: resection
  - Risk of death/stroke after resection is 6% over 2-3 years*

* Poorthius 2014

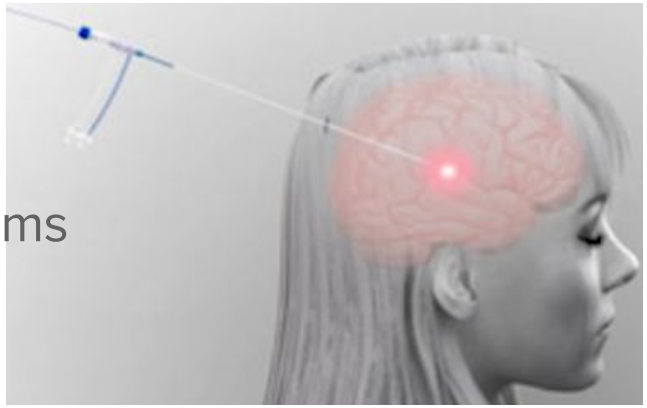
Why use a laser?

- Low flow implies low risk of hemorrhage from probe insertion
- Thermal coagulation removes risk of hemorrhage
- Good success using it to treat mesial temporal lobe epilepsy
- Minimal damage to surrounding healthy structures during approach
- Minimal length of stay

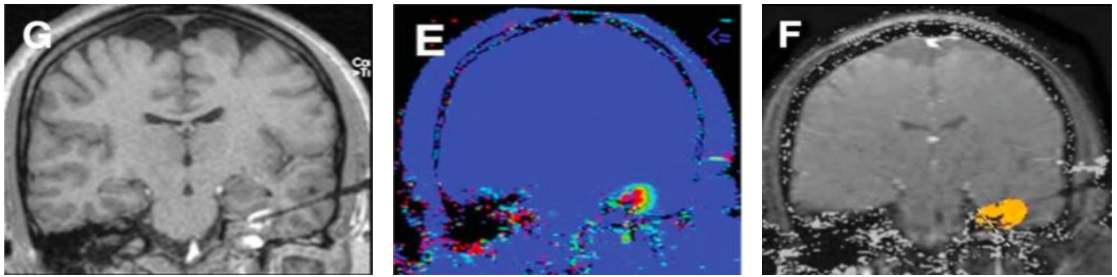
Safe? Effective?



Methods



- Symptomatic CCMs: seizures, headaches w/ associated neuro deficit, progressive symptoms
- Workup: **MRI**, psychometric, PET, video-EEG
  - Concordant with lesion?
- Attendings: Jon Willie, Robert Gross
- Frame: ClearPoint MRI-compatible or traditional Cosman-Roberts-Wells
  - ClearPoint avoids transfers between scanner and OR
- Visualase workstation: real-time estimation of ablation zone

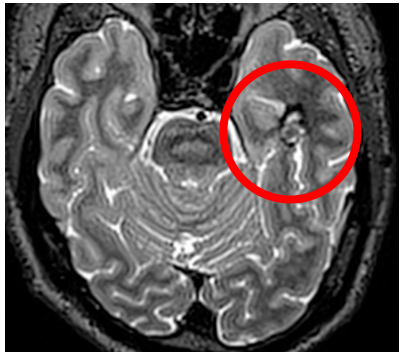


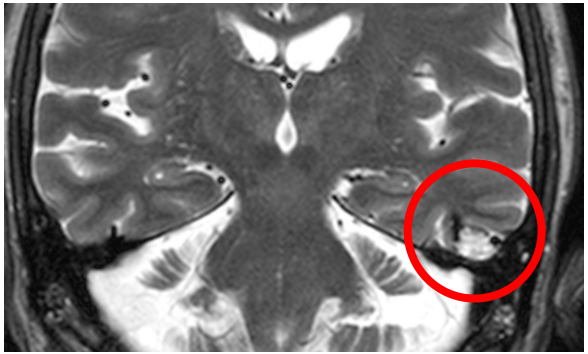
JY #1

Patient Characteristics

- n=20, 9 male, 11 female
- Mean age: 37 ± 17
- Mean preop symptom duration: 12.7 years
- 17 patients with seizures, 3 with headaches/deficit
- Most often located within temporal lobe
  - 1 basal ganglia, 2 thalamus

PC #4





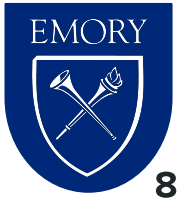
AH #5

Complications

- No complications during laser fiber insertion (ie. no bleeding)
- Two aborted procedures, but repeat procedures were successful
  - One patient developed cardiac instability
  - One patient underwent awake procedure for thalamic CCM, complained of pain at pin sites, deflection. Repeat procedure with full anesthesia.
- One patient bled during ablation (4.2 cm^3 basal ganglia) and procedure terminated after incomplete ablation, symptom improvement at f/u
- Two patients with neurologic deficit post-procedure
  - #11 SS (basal ganglia bleed), hemiparesis, only subtle spasticity at last f/u
  - #7 SR left C1-C2 numbness, recovered at last f/u
- **No lasting perioperative complications**

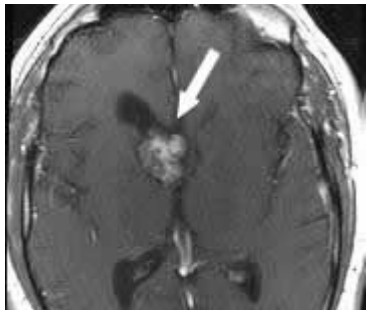
Clinical Outcomes

- 14 patients with > 1 year follow up
  - Mean follow up: 18 mo ± 7.5
  - 2 lost to followup
  - 4 ablated within past year, included for perioperative complications
- **11 of 12 epileptic patients with one year f/u were seizure free (92%)**
  - One patient went on to resection (#3 JC)
    - Unclear initial diagnosis
    - ICM/resection at 9 months ⇒ seizure free
- **2 of 2 headache patients with one year f/u had decreased symptoms**



Comparison to other techniques

- Current series: 92% seizure free at 12 months (n=11/12)
- **Microsurgical Resection is the Gold Standard**
  - Resect both lesion and surrounding epileptogenic tissue
    - Ring of gliosis and macrophages filled with hemosiderin
  - Leave developmental venous anomaly (infarction)
  - Seizure control is 75%*
- Stereotactic radiosurgery
  - May take 1-3 years
  - Continued risk of hemorrhage
  - Associated radiation morbidity
  - Seizure control is 53%#



* Rosenow 2013, Ruan 2015 #Bartolomei 1999

Conclusions

- Small preliminary case series
- Increased efficacy compared to open resection
  - Seizure freedom: 92% laser vs 75% open
- Minimally invasive
  - LOS 1-2 in most patients (BG bleed LOS 3)
- Minimal risk profile
  - No long-term complications
- Can always undergo later resection