Insular Laser Ablation for Focal Onset Seizures in Children, Early Experience

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Introduction

Growing awareness of insular onset semiology and appreciation that failed frontal and/or temporal resections for epilepsy, especially in nonlesional patients, may be related to nonrecognition of an insular focus is increasing referrals for insular SEEG implantation and, ultimately, insular resection. However, epilepsy surgeons recognize that insular resection entails significant risk of injury to eloquent cortex (especially in the dominant hemisphere), critical vasculature, operculum, internal capsule, and basal ganglia. As few pediatric series reporting outcomes after insular resection for epilepsy exist, we are reporting our early experience employing "minimally invasive" stereotactic insular laser ablation in 7 children diagnosed with insular-onset seizures, some of whom had previously undergone cortical resection.

Insular Ablation Patients

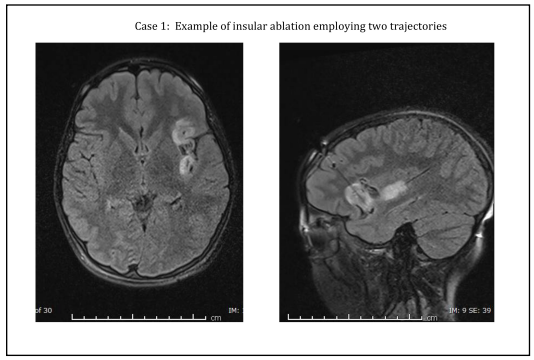
Case #	Age at ablation (yrs)	Path	Engel	f/u duration	prior surgeries
7	4	TS	2	5 mos	cortical resection
6	18	Nonlesional	1	6 mos	none
5	18	FCD	3	11 mos	cortical resection
4	10	Nonlesional	1	11 mos	none
3	16	FCD	1 off meds	13 mos	VNS removal, topectomy
2	10	Nonlesional	1 off meds	17 mos	none
1	13	FCD	2	18 mos	insular resection

Methods

Over the past 24 months, the senior author performed 150 epilepsy surgical procedures, including invasive monitoring, cortical resection, tumor resection, and laser ablation, to address refractory focal onset seizures in 115 children (VNS procedures not included). Of the 34 treated with laser ablation, 7 (2 boys, 5 girls) required insular ablation (Visualase) directed either by the Leksell stereotactic frame or the ROSA system. Age at seizure onset of these 7 patients ranged from 2.5 to 9 years (average 3.9). Age at time of ablation ranged from 4 to 18 years (average 12). 3T MRI was normal ("nonlesional") in 3 children prior to ablation, while preoperative imaging of the other patients disclosed lesions consistent with FCD. Four children had undergone prior resective craniotomy. Patients were observed in the neuro ICU overnight after ablation, then usually discharged the following day (average length of stay 1.3 days).

Results

Four children have maintained Engel Class 1 outcome at follow-up 5, 11, 13, and 17 months, respectively (one off all anticonvulsants); 2 patients remain Engel Class 2 at follow-up at 5 and 18 months, respectively. One patient has improved to Engel Class 3 at 11 months followup. No child sustained a neurologic deficit related to laser ablation. Two of the children underwent insular ablation in the dominant hemisphere.



Above: Post-ablation FLAIR imaging of a boy with multifocal cortical dysplasia and insular-onset seizures. Attempted insular resection had left him Engel Class IV, with a transient right hemiparesis which resolved by the time he was referred for laser ablation. Eighteen months post ablation, he has achieved Engel Class II and remains free of neurologic deficit.

Conclusions

For appropriately selected children, stereotactically guided laser ablation may supplant open resection to address insular onset seizures, even in patients previously deemed surgical failures.

Learning Objectives

Become aware of "minimally invasive" approaches to eliminating seizure foci within the insula.

References

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