Interstitial laser ablation for epilepsy: beauty lies in the eye of the beholder

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MRI-guided laser interstitial thermal therapy (MRgLITT) is among the most promising approaches for the surgical treatment of medically refractory epilepsy. It differs from other current interventions in its combination of being minimally invasive with an immediate effect, having a good safety profile and allowing precise three-dimensional targeting. To date, however, it is not clear if we can localise an epileptogenic zone well enough to take full advantage of the targeting of MRgLITT. In their JNPN paper, Youngerman et al provide an update on outcomes from a cohort of patients who underwent MRgLITT for mesial temporal lobe epilepsy.1 2 The cohort now consists of 277 patients from 11 epilepsy centres in the USA. This might be the last large outcome data before the release of results from the pivotal prospective SLATE trial (NCT02844465) asking whether MRgLITT is appropriate for the treatment of epilepsy associated with mesial temporal sclerosis (MTS).3 The results are promising for the use of MRgLITT in mesial temporal lobe epilepsy, and informative for patient selection—though like all studies evaluating a new technique it underestimates the effect size as the early phase of a learning curve is captured and not the era of mature use.

Youngerman et al found that 52.5% of patients remained seizure free (Engel Class I) 2 years after mesial temporal MRgLITT.4 This is much better than the expected seizure freedom rate of 0%-8% with continued medical management alone but falls short of the 58%-73% seizure freedom rate with an anterior temporal lobectomy.4 5 When including patients who only had rare disabling seizures after surgery (Engel Class II), the ‘good outcome rate’ was 75% at 2 years.1 These are meaningful improvements in seizure burden without the need for craniotomy or damage to temporal neocortex and the concomitant higher morbidity.

The side effect profile associated with mesial temporal MRgLITT is also becoming clear. Youngerman et al found that a homonymous superior quadrantanopia contralateral to the operated side was the most common complication (4.3% of cases),1 consistent with damage to Meyer’s loop of optic radiations in the temporal lobe. There are previous reports of complete hemianopsia due to damage to the lateral geniculate nucleus,6–8 which sits near to the posterior aspect of the hippocampus, but in the current series the majority of deficits were quadrantopathies. Other complications in the series were rare, with only one symptomatic haemorrhage and seven cases of extraocular movement problems, three of which were persistent and likely due to the application of too much energy at the tentorial notch.

The patient population included in this report is different from what will eventually be reported in the SLATE trial. While the SLATE trial has strict criteria for inclusion, requiring concordant lateralisation of seizure onset and MTS, the majority of patients in the cohort reported by Youngerman were not participants in SLATE and, therefore, had a wider variety of presentations. The variation in presentation likely led to less consistent outcomes, but it also meant that predictors of favourable and poor outcomes could be identified in the less strictly selected group of patients.

In their multivariate analysis, Youngerman and coworkers found that a semiology that included focal to bilateral tonic-clonic seizures was the best predictor of low seizure-freedom rates after MRgLITT, with an OR of 0.49 for Engel I or II at 2 years.1 This adds to a growing list of predictors reported by other groups in similarly selected patients. MTS appears to be a positive predictor for seizure freedom,9 10 although it was not a significant predictor in the multivariable analyses reported by Youngerman et al1 and Michalak et al.11 This might be due to the fact that the majority of the Youngerman cohort actually had MTS (72.8%). Continuous delta slowing on scalp electrodes over the temporal region, likely implying temporal neocortex dysfunction, was found to be a predictor of poor seizure-freedom rates after mesial temporal MRgLITT.12 Recently, Michalik et al reported that specific seizure onset patterns, identified on depth electrodes implanted in mesial temporal structures, predicted favourable or poor outcomes.13

Surgical details like fibre placement, number of fibres used and volume of entorhinal cortex and amygdala ablated, which are outcome predictors,13 were not controlled in this retrospective analysis. Importantly, again, it has to be realised that these data reflect the early phase of a neurosurgical learning curve.

One other important aspect of outcomes missing from Youngerman et al’s report is the distribution of neuropsychological outcomes after surgery. An expectation of MRgLITT is that it will cause less injury to temporal neocortex than open resection, whether anterior temporal lobectomy or selective amygdalohippocampectomy. Comparative reports have so far supported this expectation, with less decrement in verbal memory, naming performance and face recognition with MRgLITT than with open anterior temporal lobectomy.14 15 Ultimately, we expect that the SLATE trial will provide the clearest picture of how MRgLITT affects neuropsychological performance and what its true efficacy is.

Very likely with robust data and a standardised use of MRgLITT its beauty versus that of ATL will lie in the eye of the individual patient. Some will prefer the lower morbidity and cognitive preservation of MRgLITT while accepting the slightly lower rate of seizure freedom, whereas others will be willing to take a higher risk for the beauty of a better likelihood of long-term seizure freedom. What a noble destination for an epilepsy surgeon: to offer the patient valid alternatives based on real benefit/risk ratios.

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