CORRESPONDENCE

Imaging epilepsy with SISCOM

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We read with interest the Review by Duncan (Imaging in the surgical treatment of epilepsy. *Nat. Rev. Neurol.* **6**, 537–550; 2010) on the role of imaging in epilepsy surgery.[1] The combination of functional MRI with EEG or magnetoencephalography is a useful method for studying the irritative zone during the interictal period. These technologies are, however, of limited use for studying ictal activity, a fundamental step in the presurgical evaluation of refractory epilepsy. Although mentioned by Duncan in his article, we feel a slightly expanded discussion is warranted concerning the use of computer-aided subtraction ictal single-photon emission CT coregistered to MRI (SISCOM) and its variants to identify an epileptogenic zone.[2,3] In our view, this methodology has been poorly explored in the context of refractory epilepsy, and provides valuable information for the identification of ictal activity and seizure propagation that has not been matched by other methods to date.

SISCOM can be used to visualize ictal activity in the brain, and allows abnormal neural perfusion to be mapped onto surrounding neural structures. This technique may prove useful during several scenarios in the presurgical evaluation of refractory epilepsy. In patients with normal or near-normal MRI, SISCOM can be employed to improve localization of the epileptogenic zone for electrode placement, surgical resections and determination of surgical prognosis (Figure 1).[4,5] In addition, SISCOM is useful in the planning of invasive investigations and the tailoring of surgery in patients with large lesional zones. In such patients, resection of part of the epileptogenic zone can sometimes be sufficient to control seizures.[6,7] SISCOM might also have a role in evaluating and surgical planning in patients who have undergone unsuccessful resections.[8]

Presurgical SISCOM can provide valuable prognostic information. In some studies, resection of the entire epileptogenic zone, as identified by SISCOM, has been associated with good surgical outcome.[4–7] SISCOM might also be used to contraindicate surgical resections.[3] Finally, SISCOM might permit the study of the epileptogenic zone, seizure propagation and the relationship between seizures and the underlying morphological neural substrates, allowing insights into the mechanisms of seizure propagation.[9,10]

The use of SISCOM might improve the presurgical evaluation of patients with temporal lobe epilepsy[11–13] and might be particularly useful for preoperative assessment of patients with extratemporal disease.[3,6,14,15] When SISCOM localization findings are concordant with other presurgical findings (for example, EEG or PET findings) patients are more likely to have a good surgical outcome than those with nonconcordant or nonlocalizing findings.[2,3,9,15] Thus, SISCOM improves the sensitivity and specificity of presurgical evaluation by improving localization for epilepsy surgery, and may allow surgery in previously ineligible patients. In spite of these advances, further studies are necessary to determine the accuracy of SISCOM in MRI-negative patients, the impact of SISCOM in surgical decision-making, and the predictive power of SISCOM for surgical outcomes.

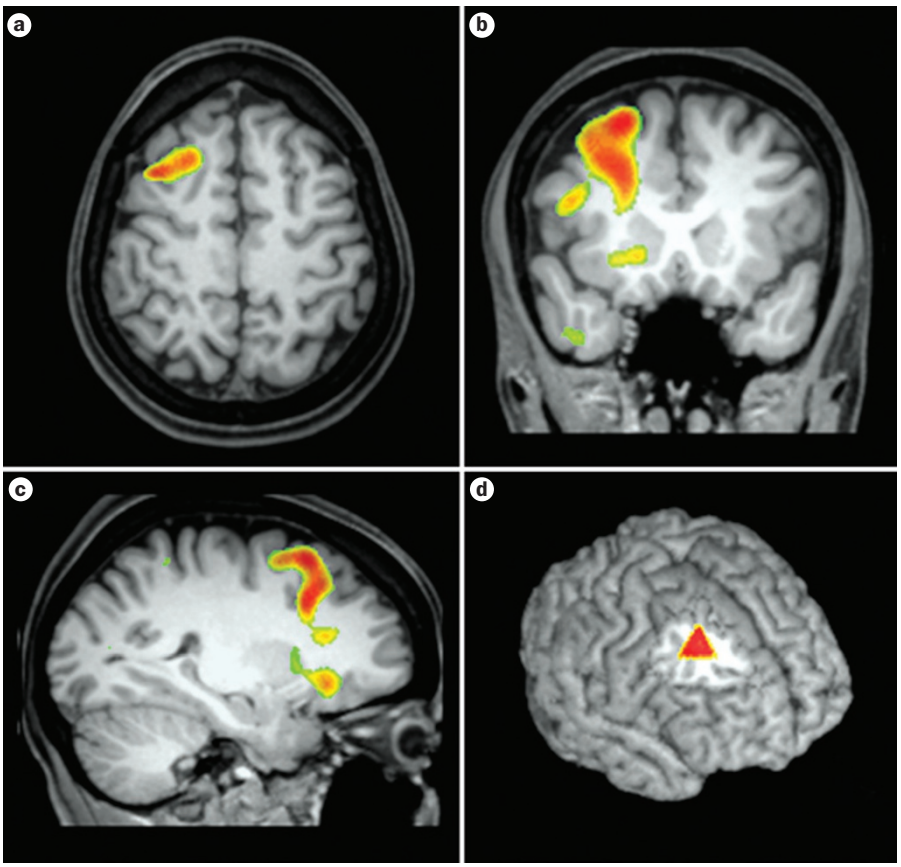

Figure 1 | SISCOM can reveal the epileptogenic zone. **a** | Axial, **b** | coronal and **c** | sagittal brain SISCOM images reveal ictal hyperperfusion (red areas) in the right frontal lobe. **d** | Three-dimensional view showing the area of ictal hyperperfusion (triangle). Abbreviation: SISCOM, computer-aided subtraction ictal single-photon emission CT coregistered to MRI.

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Competing interests
The authors declare no competing interests.

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