How eloquent is eloquent?

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Received: 14 June 2011 / Accepted: 15 June 2011 / Published online: 6 July 2011
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Kim et al. [2] report on awake craniotomy for resective epilepsy surgery in eloquent areas of the brain. The study includes 55 (out of 71) patients in whom complete follow-up was available. All patients suffered from non-lesional, or cryptogenic, pharmaco-resistant epilepsy. They had complete epileptological work-up, including invasive diagnostics with extra-operative brain mapping via subdurally implanted electrodes, for the generation of the final resection plan. Preoperative and postoperative MRI was obtained and co-registered in order to create a “resection frequency map” summarizing and displaying all resection areas on a single view. Color coding was used on a normalized brain surface in order to indicate how often particular regions of the brain had been removed (i.e. red color indicating frequent resections). Twenty-seven resections were performed in the frontal lobes, the rest in parietal and temporal lobes, or multilobar. Resections close to the speech area were stopped at 1 cm distance. Neurological deficits occurred in 18%—transient in 13%, and permanent in 5%, respectively. Epileptological outcome was Engel class I or II in 49% and 16%, respectively, and moderate/poor in a total of 35%. They state that the resection frequency map allows for objectivation of resections in/around eloquent brain areas. Thereby, they had found that resection of Broca’s area was followed by neurological deficits in 50%. They concluded that “awake resective surgery with intraoperative brain mapping is an effective and safe treatment option for non-lesional epilepsy involving eloquent areas”.

There is a law in surgery in and around eloquent areas of the brain: everything has its price, or, maximizing the extent

of resection works at the expense of neurological function only. I do not see why that rule should not apply to the authors’ series. They report their results with non-lesional epilepsy surgery in eloquent brain areas. How could they perform resections in such areas with a rate of 18% transient and 5% permanent neurological deficits without having applied a new definition of what is eloquent and what is not? Having performed eight resections of the SMA would account for >10% of (transient) deficits alone. Even the literature on multiple subpial resection (MST) alone indicates higher rates of transient neurological worsening [3, 4].

And neither does awake craniotomy per se, which is mostly employed in the surgery of intrinsic brain tumours, have “a low risk of new neurological impairment”, as stated by the authors, with a high rate of new deficits reported even by the most eminent groups. Furthermore, new concepts of glioma resection under awake craniotomy do not aim at total resection (a goal which is pursued by the present authors, who supposedly want to resect the whole epileptogenic zone in order to obtain good epileptological results), but rather on partial resection, which should allow for functional re-organization of the involved brain region—prior to potential resection of recurrent tumour [1].

To be very conservative in my judgement, I would describe their aim—to successfully treat non-lesional epilepsy—as ambitious, if not overly so, as these patients are the most delicate and complex ones to treat in modern epilepsy surgery. But the authors go even further by stating that such patients may be treated successfully and with very little risk of neurological deterioration, even if the epileptogenic zones are located in eloquent cortical areas.

It is well known that lesional epilepsy may respond very well to (extended) resection, even if one might have to remove an eloquently located cavernoma or a focal cortical

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dysplasia. But the treatment of otherwise cryptogenic epilepsy with non-resective techniques alone (such as MST) has proved to be associated with a fairly high rate of neurological worsening. The authors did not provide essential answers as to how, and why they think they can resect eloquent cortex in a fairly radical fashion (also opposed to the above-mentioned concept of staged tumour resection under awake craniotomy) and thereby do less harm than others who rather transect than resect in similar areas? And, in view of their weak results concerning epileptological outcome, what is the benefit of their technique?

There is an intuitive answer for this, as the same patho-anatomical rules apply for all patients around the world, and as what is not possible is not possible. When looking at the localization maps provided by the authors, most resections were performed outside, or at best adjacent to, eloquent cortex. In view of their own notion that “we resected the epileptogenic zone as close as 1 cm from the speech arrest area or primary motor area...”, the assumption that they have neither touched nor resected eloquent cortex in the majority of their cases seems justified. This does explain their weak results concerning excellent epileptological outcome as well, with less than 50% of patients presenting in Engel class I on follow-up, as the epileptogenic zones may have extended into these regions, if not originated from them.

All in all, the conclusion of their paper—“awake resective surgery with intraoperative brain mapping is an effective and safe treatment option for non-lesional epilepsy involving eloquent areas”—promises something which is by no means supported by the results of their study.

This work is an excellent example for the fact that certain things should not be intermingled—i.e. resection planning and functional recovery in infiltrative brain tumours and resective epilepsy surgery. Furthermore, and in view of the ever-increasing attempt to individualize and to tailor respective approaches in neurosurgery, I doubt the value of normalized brain maps, such as shown in their figures, which represent a mere summation of data obtained in different individuals.

Of course, they have shown that epilepsy surgery may be performed under the conditions of awake craniotomy, and they are to be commended for that. And that’s it.

Conflicts of interest None.

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