Intraoperative Stimulation Mapping Metaanalysis

A systematic search retrieved 90 reports published between 1990 and 2010 with 8,091 adult patients who had resective surgery for supratentorial infiltrative glioma, with or without ISM. Quality criteria consisted of postoperative neurologic examination details and follow-up timing. New postoperative neurologic deficits were categorized on the basis of timing and severity. Meta-analysis with a Bayesian random effects model determined summary event rates of deficits as well as gross total resection rate and eloquent locations. Meta-regression analysis explored heterogeneity among studies.

Late severe neurologic deficits were observed in 3.4% (95% CI, 2.3% to 4.8%) of patients after resections with ISM, and in 8.2% (95% CI, 5.7% to 11.4%) of patients after resections without ISM (adjusted odds ratio, 0.39; 95% CI, 0.23 to 0.64). The percentages of radiologically confirmed gross total resections were 75% (95% CI, 66% to 82%) with ISM and 58% (95% CI, 48% to 69%) without ISM. Eloquent locations were involved in 99.9% (95% CI, 99.9% to 100%) of resections with ISM and in 95.8% (95% CI, 73.1% to 99.8%) of resections without ISM. Relevant sources of heterogeneity among studies were ISM, continent, and academic setting.

Glioma resections using ISM are associated with fewer late severe neurologic deficits and more extensive resection, and they involve eloquent locations more frequently. This indicates that ISM should be universally implemented as standard of care for glioma surgery [1)]

The stimulation paradigm can be subject to false positive findings due to electrical current spread at distance from the stimulator [2)].

1)
De Witt Hamer PC, Robles SG, Zwinderman AH, et al. Impact of intraoperative stimulation brain mapping on glioma surgery outcome: a meta-analysis. J Clin Oncol 2012;30(20):2559-2565.
2)
Mandonnet E, Winkler PA, Duffau H (2010) Direct electrical stimulation as an input gate into brain functional networks: principles, advantages and limitations. Acta Neurochir (Wien) 152: 185–193