Continuous subcortical motor evoked potential stimulation using the tip of an ultrasonic aspirator for the resection of motor eloquent lesions.

Abstract:
Resection of a motor eloquent lesion has become safer because of intraoperative neurophysiological monitoring (IOM). Stimulation of subcortical motor evoked potentials (scMEPs) is increasingly used to optimize patient safety. So far, scMEP stimulation has been performed intermittently during resection of eloquently located lesions. Authors of the present study assessed the possibility of using a resection instrument for continuous stimulation of scMEPs. An ultrasonic surgical aspirator was attached to an IOM stimulator and was used as a monopolar subcortical stimulation probe. The effect of the aspirator's use at different ultrasound power levels (0%, 25%, 50%, 75%, and 100%) on stimulation intensity was examined in a saline bath. Afterward monopolar stimulation with the surgical aspirator was used during the resection of subcortical lesions in the vicinity of the corticospinal tract in 14 patients in comparison with scMEP stimulation via a standard stimulation electrode. During resection, the stimulation current at which an MEP response was still measurable with subcortical stimulation using the surgical aspirator was compared with the corresponding stimulation current needed using a standard monopolar subcortical stimulation probe at the same location. The use of ultrasound at different energy levels did result in a
slight but irrelevant increase in stimulation energy via the tip of the surgical aspirator in the saline bath. Stimulation of scMEPs using the surgical aspirator or monopolar probe was successful and almost identical in all patients. One patient developed a new permanent neurological deficit. Transient new postoperative paresis was observed in 28% (4 of 14) of cases. Gross-total resection was achieved in 64% (9 of 14) cases and subtotal resection (> 80% of tumor mass) in 35% (5 of 14). Continuous motor mapping using subcortical stimulation via a surgical aspirator, in comparison with the sequential use of a standard monopolar stimulation probe, is a feasible and safe method without any disadvantages. Compared with the standard probe, the aspirator offers continuous information on the distance to the corticospinal tract.