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Titel des Beitrags:
Intraoperative subcortical motor evoked potential stimulation: how close is the corticospinal tract?

Abstract:
Subcortical stimulation is a method used to evaluate the distance from the stimulation site to the corticospinal tract (CST) and to decide whether the resection of an adjacent lesion should be terminated to prevent damage to the CST. However, the correlation between stimulation intensity and distance to the CST has not yet been clearly assessed. The objective of this study was to investigate the appropriate correlation between the subcortical stimulation pattern and the distance to the CST. Monopolar subcortical motor evoked potential (MEP) mapping was performed in addition to continuous MEP monitoring in 37 consecutive patients with lesions located in motor-eloquent locations. The proximity of the resection cavity to the CST was identified by subcortical MEP mapping. At the end of resection, the point at which an MEP response was still measurable with minimal subcortical MEP intensity was marked with a titanium clip. At this location, different stimulation paradigms were executed with cathodal or anodal stimulation at 0.3-, 0.5-, and 0.7-msec pulse durations. Postoperatively, the distance between the CST as defined by postoperative diffusion tensor imaging fiber tracking and the titanium clip was measured. The correlation between this distance and the subcortical MEP electrical charge was calculated. Subcortical MEP mapping
was successful in all patients. There were no new permanent motor deficits. Transient new postoperative motor deficits were observed in 14% (5/36) of cases. Gross-total resection was achieved in 75% (27/36) and subtotal resection (> 80% of tumor mass) in 25% (9/36) of cases. Stimulation intensity with various pulse durations as well as current intensity was plotted against the measured distance between the CST and the titanium clip on postoperative MRI using diffusion-weighted imaging fibertracing tractography. Correlational and regression analyses showed a nonlinear correlation between stimulation intensity and the distance to the CST. Cathodal stimulation appeared better suited for subcortical stimulation. Subcortical MEP mapping is an excellent intraoperative method to determine the distance to the CST during resection of motor-eloquent lesions and is highly capable of further reducing the risk of a new neurological deficit.