Direct cortical motor evoked potentials

Transcranial motor evoked potentials and direct cortical motor evoked potentials (DCMEP) paradigms have historically been used contemporaneously or independently during supratentorial craniotomy. The use of DCMEPs for monitoring the corticospinal tracts during craniotomy has been well described [1) 2) 3) 4) 5)].

DCMEP has many advantages over TCMEP monitoring. For example, there is limited-to-no patient movement; therefore, the stimulation can be conducted continuously throughout a procedure allowing for real-time feedback of motor system integrity. DCMEP also allows for a more focal superficial stimulation. Using a single contact from a strip or grid electrode placed directly on the exposed cortex allows for the use of comparatively lower stimulation intensity, therefore, reducing current density, current spread, and deep penetration of stimuli [6)]

Case reports

A 12-year-old girl required general anesthesia under intraoperative direct cortical motor evoked potentials monitoring due to supratentorial glioma. Remimazolam-based anesthesia was selected, instead of propofol, due to the patient's egg hypersensitivity. Stable myogenic MEPs were recorded throughout the surgery with remimazolam at 0.9 mg/kg/h and remifentanil at 0.35 μg/kg/min, following adjustments of stimulation intensity and titration of remimazolam infusion. Neither intraoperative memory nor motor deficits were present after surgery.

Kamata et al. presented a pediatric case whose dc-MEP was recorded under remimazolam anesthesia. The cardiovascular stability and avoidance of propofol infusion syndrome with remimazolam were superior to propofol [7)].

A 65-year-old female underwent a supratentorial craniotomy for the clipping of a right-sided unruptured middle cerebral artery (MCA) aneurysm. DCMEP recordings of the upper extremity degraded after the parent vessel was temporarily occluded with a clip. The recordings returned once the clip was released. The DCMEP lower extremity recordings did not deviate from their established baseline. TCMEP recordings (upper and lower extremities) also did not differ from their established baselines. The permanent clip was placed without incident, and the patient awoke neurologically intact. This case study demonstrates the specificity and sensitivity of DCMEP vs. TCMEP. DCMEP activates the corticospinal tract more superficially; therefore, it was evident by the loss of the upper extremity DCMEPs without the loss of lower extremity DCMEPs that the temporary vessel occlusion caused an ischemic event focal to the cortical area perfused by the MCA. TCMEP did not detect this ischemic event [8)].

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