ELECTROENCEPHALOGRAPHY DURING TRANSCRANIAL ELECTRICAL STIMULATION FOR MOTOR EVOKED POTENTIALS

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INTRODUCTION

Transcranial electrical motor evoked potential (MEP) intraoperative monitoring can help reduce morbidity from spine surgery. However, it poses some risks, including intraoperative seizures. Transcranial electrical and magnetic stimulation at sufficiently high intensities have both been shown to produce epileptiform afterdischarges, as well as seizures. The purpose of this study is to determine the effects of transcranial electrical stimulation on the electroencephalogram (EEG), and the possible utility of the EEG during MEP monitoring for spine surgery.

METHODS

PATIENTS - 27 patients with spine tumors undergoing surgical resection with instrumentation

Inclusion Criteria
- Spine lesion and/or surgery which posed a risk to motor pathways (e.g., anterior-lateral location)

Exclusion Criteria
- History of seizures or anticonvulsant treatment
- Known intracranial lesions (e.g., tumor, stroke)

STIMULI - MEP stimulation settings varied between individual patients: 250-600V, 4-6 pulse trains at 1.5 to 2 ms intervals.

PROCEDURE –
- Patients underwent intraoperative MEP monitoring during spine tumor resection and instrumentation surgery.
- An electrode montage surrounding the MEP scalp stimulation site was used for EEG monitoring (Cz-Fpz, C3-Fpz, C4-Fpz, Fz-Fpz, F3-Fpz, F4-Fpz; see diagram below).
- C1 and C2 stimulation electrodes were located slightly medial and anterior to C3 and C4, respectively.
- Baseline, post-stimulus and inter-stimulus EEGs were recorded with stimulation amplifiers temporarily disconnected to decrease electrical noise.
- If afterdischarges occurred, MEP monitoring was discontinued.

RESULTS

- Baseline EEGs revealed no epileptiform activity or electrographic seizures in all patients.
- In 4 of 27 patients, there were single or brief bursts of afterdischarges lasting up to several seconds, following transcranial MEP stimulation.
- In all cases, there was spontaneous return of the EEG to normal baseline activity.
- No patients demonstrated clinical or electrographic seizures prior to or after transcranial MEP stimulation during the intraoperative monitoring period.

SUMMARY & CONCLUSIONS

- Concurrent electroencephalography during motor evoked potential stimulation is practical and occasionally reveals afterdischarges.
- This suggests that concurrent EEG monitoring may improve the safety of MEP monitoring.

REFERENCES