Title : DIAZEPAM ALTERS CORTICAL EVOKED POTENTIALS

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Introduction. Somatosensory cortical evoked potentials (SCEPs), the brain's electrical responses to stimulation of peripheral nerves, are valuable for monitoring spinal cord function during operations on the spine.[1] Impairment of spinal cord function can be detected by alterations in SCEPs[2] and prompt corrective action markedly decreases the likelihood of permanent neurologic damage.[3] We know that anesthetics affect SCEPs,[4] but specific drug effects have not been well defined. Description of these drug effects will allow selection of agents that disturb SCEPs least and will facilitate intraoperative decision-making by aiding distinction between SCEP changes due to drug effects and those due to surgical manipulation. We have examined SCEP changes produced by diazepam 0.1 mg/kg.

Method. Six men and 7 women, 19 to 54 years of age, ASA I, free of CNS-active drugs and scheduled for elective operations, gave informed consent to SCEP monitoring during intravenous premedication. Subjects came to the operating room fasted and unpremedicated. D_5W 200 ml was given IV prior to baseline SCEP recording. ECG was monitored continuously, and blood pressure (Roche Arteriosonde), heart rate and respiratory rate were recorded every 2 minutes. Averaged SCEPs to stimulation of the median nerve at the wrist and posterior tibial nerve at the ankle were recorded over corresponding primary somatosensory areas using platinum subdermal electrodes on the scalp and a gold cup ear clip. For each averaged SCEP 64 monopolar, constant current, square wave pulses of 300 μsec duration and up to 20 ma were employed to provide visible motor responses. Stimuli were delivered at pseudorandom intervals of 1.0-1.4 sec via subdermal electrodes (cathode proximal). After baseline SCEP recording, incremental doses of diazepam (.01, .02 and .07 mg/kg) were administered at 5 minute intervals by bolus IV injection. Sixty seconds after each injection, two averaged SCEP responses to median nerve stimulation were recorded. Additional SCEPs were recorded after the drug injection sequence in 12 patients.

Results. Diazepam produced dose-related decreases in amplitudes of primary specific SCEP complexes (latency 20 to 120 msec) and abolished late waves (latencies 200-400 msec) in all cases. Initial increases in primary specific complex amplitudes preceded amplitude depression in 3 patients. Amplitudes returned part way toward baseline values within 20 minutes after medication in all cases. Diazepam accentuated negative waves at both ≃ 35 msec (N35) and ≃ 65 msec (N65) in 9 patients, and at least one of these waves was accentuated in every case. N35 appeared de novo after drug administration in 3 patients, N65 in 6. Diazepam increased P30 to P90 interpeak latency in 10 cases and decreased height of P90 relative to P30 in 9. Seven of the 13 patients fell asleep after medication, but all responded when addressed. Vital signs remained within normal limits.

Conclusions.

1) Diazepam 0.1 mg/kg characteristically alters but does not abolish intermediate latency SCEPs;

2) Diazepam 0.1 mg/kg abolishes long latency SCEPs to nonpainful stimuli;

3) Premedication with diazepam 0.1 mg/kg is acceptable for patients requiring SCEP monitoring, but even small incremental doses of diazepam should be avoided immediately prior to and during surgical manipulations that might affect spinal cord function.

References

1. Nash CL, Lorig RA, Schatzinger LA, et al: Spinal cord monitoring during operative treatment of the spine. Clin Orthop Rel Res 126: 100-105, 1977.

2. Croft RJ, Brodkey JS, Nulsen FE: Reversible spinal cord trauma. A model for electrical monitoring of spinal cord function. J. Neurosurg 36: 402-406, 1972.

3. MacEwen GD, Bunnell WP, Sviram K: Acute neurologic complications in the treatment of scoliosis: A report of the Scoliosis Research Society. J Bone Joint Surg 57-A: 404-408, 1975.