Episodes of Severe Hypertension in a Patient with Neurofibromatosis as a Result of Neuromonitoring During a Posterior Spinal Fusion

AR Young, MD, L Lenke, MD, ED Thuet, BS, R Groener, MD
Washington University School of Medicine
Department of Anesthesiology & Department of Orthopedic Surgery
St. Louis, Missouri

Case
A 14-year-old female with a history of NF type 1 presented for posterior spinal fusion with severe thoracic myelopathy due to an angular kyphoscoliotic spinal deformity. She had marked spasticity and lower extremity weakness leading to an inability to ambulate despite halo-gravity traction and a course of steroids. The patient had no history of hypertension or intracranial manifestations of her NF1 and underwent an uneventful anesthetic for halo placement.

Standard ASA monitors were used during induction and fiberoptic intubation, which were uneventful. An arterial line and a BIS monitor were placed. Anesthesia was maintained with a fentanyl and propofol TIVA in order to facilitate optimal neuromonitoring consisting of somatosensory evoked potentials (SSEPs), transcranial motor evoked potentials (tcMEPs), and descending neurogenic evoked potentials (DNEPs) via epidural electrodes. Additionally, the surgeon requested that a high-normal blood pressure be maintained to optimize spinal cord perfusion, given the patient’s pre-existing neurologic deficits.

The patient remained hemodynamically stable throughout the beginning of the case, including during SSEP and tcMEP monitoring. However, adequate monitoring could not achieved and so DNEP was instigated.

When epidural stimulation began, the patient became abruptly hypertensive with systolic pressures in the 180’s to 190’s. The surgeon was notified, and the patient received boluses of fentanyl and propofol. Nonetheless, the blood pressure did not return to normal until the epidural electrode stimulation was discontinued. The infusion rates of propofol and fentanyl were increased, we confirmed that the patient was not relaxed and had no recall them after the surgery. As the patient was more than adequate spinal cord perfusion, we elected not to treat the episodes with any additional antihypertensives. We repeated the attempt at epidural neuromonitoring a total of four times with the same results and so decided to abort the use of the epidural electrodes and to use serial wake-up tests instead. Three wake-up tests were performed during the duration of the case, each time with the patient following commands adequately and still with some lower extremity weakness. She had no further episodes of hypertension either intra-operatively or post-operatively.

Discussion
Intraoperative neurophysiologic monitoring (IONM) has become widely used in pediatric spine surgery as a means to monitor spinal cord function while the patient remains under general anesthesia and helps to identify impending injuries to nervous system structures. IONM includes somatosensory evoked potentials (SSEPs), transcranial motor evoked potentials (tcMEPs), and descending neurogenic evoked potentials (DNEPs), among others. The inability to utilize intraoperative neurophysiologic monitoring poses a challenge to anesthetic management.

DNEPs are used to monitor the antidiromic activity of the dorsal column. While they are not MEPs as once was thought, they have been shown to be very sensitive in detecting changes in spinal cord function during surgery, and were thus used as an adjunct to the SSEPs when the tcMEPs were not adequate.

We did not find any reports of episodic hypertension associated with epidural stimulation during spinal cord monitoring in the literature. The hypertension was severe enough to preclude the use of this monitoring technique, obliging the use of the first method historically used to assess the functional integrity of the motor tracts during spine surgery, the “wake-up” test. The patient was able to follow commands during each wake-up test and had no recall them after the surgery. As the patient was more than sufficiently anesthetized and the DNEP stimulation was within a normal range, it is likely that the cause of the hypertension was patient related, especially considering her pre-existing medical conditions. However, the mechanism is unknown.

References