Editorial

Monitoring in young patients

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In our current age of medical care focus on quality and safety, Fulkerson and colleagues4 provide another reminder that it is the job of pediatric neurosurgeons to try to utilize appropriate techniques and technologies in all of our patients, even the very youngest. This clear and well-written paper describes the use of motor evoked potentials (MEPs) in a series of 10 consecutive children younger than 3 years of age who were undergoing spine surgery. Because the specific techniques, thresholds, and approaches may differ in the youngest patients, there has been a belief among some providers that intraoperative neurophysiological monitoring may be of limited applicability in congenital spine surgery in this age group. The authors provide a detailed descriptive series outlining how such monitoring may be done, specifically for a pediatric neurosurgical audience. While it goes without saying that the current small, descriptive series does not prove that intraoperative monitoring can prevent deficits from being worse or from occurring altogether, the authors provide a starting point for those practitioners who utilize monitoring in their older children and wish to consider expanding into the youngest patients.

The paper concisely and pragmatically describes the rationale and background, technical and age-dependent considerations, anesthetic considerations, maturational physiological issues, and potential advantages and pitfalls in this type of monitoring. The authors include a rational operational definition of minimal acceptable response amplitude, which helps to define the parameters of decision making. In this small series, 2 patients had persistent (although ultimately at least partially improving) deficits that correlated with persistent decrements in corresponding monitoring parameters of greater than 50%.

Intraoperative monitoring using MEPs in very young children is not new. Interestingly, our orthopedic colleagues have used intraoperative monitoring, particularly for spinal deformity surgery, for many years, and some large series have been published in their literature, as well as in textbooks.1-3 Some of these series include neurological patients in the age group described in the current report and include descriptions of alternate techniques that might be of help in overcoming some of the lower extremity or sacral monitoring obstacles encountered in this series. For instance, alternate myotomes may be used, and sphincter muscles can also be included in the monitoring paradigm for infants (not described in this series), which is of particular interest to neurosurgical applications in distal congenital spine anomalies. Other authors have described using “double-trains,” peripheral nerve facilitation techniques, and combining D-wave and myotomal transcranial electric MEP monitoring as described over several decades by Deletis,1 who, along with his colleagues, was among the first to apply D-wave monitoring in pediatric neurosurgery for resection of intramedullary spinal cord tumors.

Although small in number and heterogeneous in disorder, this series provides some guidance for pediatric neurosurgeons who wish to include monitoring in their surgical armamentarium in young children. Going forward, as with many other areas in pediatric neurosurgery, only by combining our series among centers, discussing our varying techniques in public forums, and designing studies to answer questions will we ultimately learn what works best to improve quality and safety in surgery for all of the patients we serve, including those at the lowest end of the age spectrum.

References

Response

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I thank Drs. Duhaime and Schwartz for their interest in our paper. I agree with their excellent comments regarding the limitations of our study and the technique of intraoperative monitoring in very young children, and I hope other readers will glean the same points.

We have only shown that one may gather reliable intraoperative neurophysiological data in a small series of children younger than 3 years old through a standard anesthetic regimen and stimulation technique; however, data interpretation is still undefined in terms of meeting the primary goal of intraoperative neuromonitoring, which is the elimination or minimization of neurological embarrassment at the earliest possible point to prevent resulting neurological injury and dysfunction. We must still determine if we can extrapolate analysis of MEP responses from experiences with older children and adults, or if younger children require their own analytical criteria.

Other MEP monitoring techniques described by Drs. Duhaime and Schwartz, such as D-wave monitoring, although considered by some to be more invasive and more time- and effort-consuming to apply, may be more appropriate for monitoring in the youngest of children. Nonetheless, one should compare these various techniques to determine the optimal MEP monitoring technique in this challenging pediatric age group. Perhaps future cooperative, multiinstitutional pediatric spine forums, such as the Pediatric Craniocervical Society or Scoliosis Research Society, will accomplish this per Drs. Duhaime and Schwartz’s suggestion, and move toward ensuring and improving the quality and safety in neurosurgery for our youngest patients. (DOI: 10.3171/2010.11.PEDS10459)