A prospective, randomized study comparing neurophysiologic monitoring with total intravenous anesthesia versus inhalational anesthesia during posterior spine fusion in adolescents with idiopathic scoliosis

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Introduction

Presently, most recommendations support the administration of total intravenous anesthesia (TIVA) for scoliosis patients undergoing corrective spinal surgery. The use of these agents facilitates neurophysiologic monitoring of spinal cord function. However, significant disadvantages with propofol relate to its context sensitive half-life and the potential for prolonged wake-up times. Despite our institution’s experience demonstrating successful neurophysiologic monitoring with titrated use of the volatile agent desflurane, there are limited data supporting this practice. The purpose of this study is to compare efficacy of neurophysiologic monitoring during general anesthesia with either TIVA or a volatile agent.

Demographics

- 25 adolescents, ranging in age from 12 to 18 years
  - idiopathic scoliosis
- One patient was excluded for intraoperative loss of neurophysiologic monitoring and the need to perform a wake-up test.
- No differences in intraoperative fluid therapy, surgical duration, or intraoperative course

Findings

- Use of a volatile agent necessitated the administration of 30-35% greater stimuli (mV) to achieve the MEP baseline value of 441 ± 70 versus 325 ± 75 mV, p<0.01
- The amplitude of SSEP was decreased with the volatile agent. No clinically significant effect on latency was noted in the SSEPs.
- One patient in the volatile anesthetic group required reduction in agent concentration to improve neurophysiologic monitoring.
- Mean wake-up times were 3 minutes in the volatile group versus 10 minutes in the intravenous anesthetic group.

Discussion

Although neurophysiologic monitoring was facilitated by the use of TIVA, a volatile-based anesthetic can be utilized effectively by experienced teams performing neurophysiologic monitoring.

The primary advantage of the volatile-based technique includes a more rapid awakening and a greater degree of titratability throughout the anesthetic. This may be particularly relevant should a wake-up test become necessary.

Methods

- IRB approval and informed consent obtained
- Prospective, randomized study design including patients with idiopathic scoliosis
  - total intravenous anesthesia
  - volatile anesthesia
- Anesthetic technique
  - Propofol or desflurane titrated to bispectral index of 40-60
  - Remifentanil titrated between 0.1 to 1 μg/kg/min to maintain mean arterial pressure at 55-65 mmHg
- Neurophysiological monitoring per standard practice
- Infusions discontinued when monitoring completed
- Hydromorphone for postoperative analgesia
- Data collection
  - Fluid therapy, surgical duration, intraoperative course, and wake-up times
  - Maximum stimulus required to obtain MEP
  - SSEP amplitude and latency recorded

References