◇ This Month in

ANESTHESIOLOGY

■ Prophylactic Therapy for Cesarean Patients at Risk for Hypotension. Hanss *et al.* (page 635)

Hypotension is a common adverse effect of subarachnoid block, the preferred anesthesia regime for cesarean section. In a recent study, Hanss *et al.* used analysis of heart rate variability (HRV) to explore whether spinal hypotension could be predicted, and prophylactic therapy initiated, in pregnant patients. Women with uneventful pregnancies (no hypertension, preeclampsia, etc.) scheduled for elective cesarean sections were randomized to either a control group or a treatment group. Heart rate variability analyses were performed the day before surgery, the day of surgery before prehydration (in one of the treatment groups), and after prehydration. During measurements, patients were asked to lie quietly in the supine position with left uterine displacement. The HRV analysis was performed immediately after measurement by an investigator blinded to patients' randomized group assignments.

Patients assigned to the control group were classified into subgroups depending upon their baseline low-to-high frequency ratio (LF/HF) of HRV: LF/HF less than 2.5 or LF/HF greater than 2.5. Patients assigned to the treatment group who had baseline values of LF/HF greater than 2.5 were treated with vasopressor infusion immediately after subarachnoid block (n = 20), or with colloid prehydration until LF/HF decreased below 2.5. Results demonstrated that 3 of 17 patients in the control group with low baseline LF/HF experienced hypotension, whereas 20 of 23 with high baseline LF/HF had hypotension after subarachnoid block. Vasopressor therapy (given to those with LF/HF greater than 2.5) prevented hypotension in 19 of 20 patients. In the second subset of patients assigned to the treatment group, prophylactic colloid infusion reduced elevated baseline LF/HF from 5.4 to 1.3, and hypotension was prevented in 17 of 20 patients. In this study, the authors found that it was possible to use LF/HF of HRV to guide prophylactic therapy for subarachnoid block-induced hypotension. However, clinical application of the results is not currently possible since no commercial device is available for routinely analyzing HRV.

■ Genetic Predictors of Maternal Hypotension during Spinal Anesthesia Sought. Smiley *et al.* (page 644)

Smiley *et al.* recruited 170 healthy women undergoing elective cesarean section to determine whether genetic variants of the $\beta_2$adrenoceptor (β_2AR) alter either the incidence of hypotension or amount of vasopressor treatment required during spinal anesthesia. The rationale for this study was based on other studies, including one by the current authors, linking pressor response to laryngoscopy and tracheal intubation with β_2AR polymorphism. Women with hypertension, preeclampsia, or cardiovascular disease were excluded from the study. Spinal anesthesia was performed with 12 mg hyperbaric bupivacaine, 25 μg fentanyl, and 200 μg morphine. During the study period, the Trendelenburg position, reverse Trendelenburg, and changes in lateral tilt were avoided. If hypotension developed, women with heart rates less than 120 were treated with 5–15 mg ephedrine; those with heart rates greater than 120 were treated with 40–80 μg intravenous phenylephrine. A research coordinator recorded blood pressure, heart rate, and any medications given each minute until delivery.

Blood samples for obtaining DNA analysis were obtained perioperatively from each study participant. The β_2AR genotype at codons 16 and 27 was determined for each woman, and analysis of variance was used to compare variables between genotypes. The researchers used ephedrine or phenylephrine in more than 90% of the patients. No difference of incidence of hypotension was linked to β_2AR genotypes. However, they did find a significant effect of genotype on the amount of vasopressor treatment required. For example, women who were Gly homozygotes received significantly less ephedrine than those who were Arg16 homozygotes or Arg16/Gly heterozygotes. The authors found that glycine at position 16 and/or glutamate at position 27 of the β_2AR lead to lower vasopressor use for treatment of maternal hypotension during spinal anesthesia. They urge further studies in larger samples across all ethnic groups (this study included white, Hispanic, and African-American participants) with more accurately titrated doses of vasopressors.

■ Best Head Positions for Rheumatoid Arthritis Patients during Surgery. Tokunaga *et al.* (page 675)

In patients with rheumatoid arthritis, cervical spine disorders are common, and improper perioperative head positioning can result in serious postoperative complications. Anesthesiologists should always be particularly careful to position rheumatoid arthritis patients with atlantoaxial subluxation in a way that prevents spinal

cord compression. Tokunaga *et al.* tested methods for keeping the rheumatoid arthritis patient's head and neck protruded, so as to reduce risk of excessive flexion of the cervical spine during orotracheal intubation. The team enrolled 10 patients scheduled for general anesthesia for orthopedic procedures.

Conventional lateral cervical x-rays were obtained the day before surgery with the patient's head in three positions—flexion, neutral, and extension—while the patient was sitting or standing. During induction of anesthesia, a lateral radiographic view of the upper cervical spine was obtained in two positions—during airway control with a face mask and during orotracheal intubation at the actual point of maximum laryngeal exposure with a conventional laryngoscope. Intubations were performed with the patient's head positioned on a flat pillow or on a flat pillow combined with a donut-shaped pillow. The position that showed less atlantoaxial subluxation was chosen for the head position during surgery. Copies of the fluoroscopic images were used to determine anterior atlantodental intervals, posterior atlantodental interval, and angle of atlas and axis (C1–C2 angle; angle between a line parallel to the distal line of C1 and C2).

Based on the authors' calculations, the anterior atlantodental interval average was 5.1 mm in the flat pillow position, and 2.3 mm in the protrusion position (which employed both flat and donut pillows). While it reduced the anterior atlantodental interval, the protrusion position increased the posterior atlantodental interval in all 10 rheumatoid arthritis patients with atlantoaxial subluxation. The results suggest that the protrusion position, which involves support of the upper cervical spine and extension at the craniocervical junction, might be advantageous for these patients.

■ Authors Assess Risks of Xenon Used as a Neuroprotective Agent during Cardiopulmonary Bypass. Jungwirth *et al.* (page 770)

Although xenon's neuroprotective properties may improve cerebral outcome after cardiac surgery using cardiopulmonary bypass (CPB), the tendency to expand gaseous bubbles may abolish this effect or even worsen cerebral outcome. Jungwirth *et al.* studied the impact of xenon on neurologic, cognitive, and histologic outcome after CPB with cerebral air emboli (CAE) in rats. Groups of 10 rats each were assigned to one of four groups. In two groups receiving both CPB and CAE, rats were subjected to 90-min normothermic CPB with 10 repetitively administered CAE. Rats in two sham groups were not exposed to CPB and CAE. Each group was further subdivided into those receiving xenon (56%; 20 min before, during, and 30 min after CPB) and nitrogen groups. The rats' performance on neurologic and cognitive function tests was assessed until 14 days after surgery. After killing the rats, investigators determined the extent of cerebral infarcts due to the CAE.

Animals in the CPB–CAE groups showed transient deficits in gross neurologic functions. Fine motor and cognitive impairments persisted until postoperative day 14 in rats from the CPB–CAE–xenon group. Infarct volumes were consistently larger in this group compared to the CPB–CAE–nitrogen group. It appears that xenon exposure aggravated the neurologic dysfunction produced by CAE during CPB. The potential neuroprotective effects of xenon may have been masked by the effects of xenon on CAE.

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