THIS MONTH IN

ANESTHESIOLOGY

16 Withholding *versus* Continuing Angiotensin-converting Enzyme Inhibitors or Angiotensin II Receptor Blockers before Noncardiac Surgery: An Analysis of the Vascular events In noncardiac Surgery patIents cOhort evaluatioN Prospective Cohort

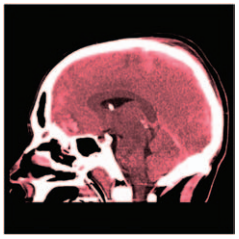
Angiotensin-converting enzyme inhibitors (ACEi) and angiotensin II receptor blockers (ARBs) block the physiological renin-angiotensin response to hypotension. The hypothesis that withholding ACEi/ARBs is associated with a lower risk of the 30-day composite outcome of all-cause death, myocardial injury after inpatient noncardiac surgery (MINS), and stroke was tested in 14,687 of the 16,079 patients from 12 centers in eight countries recruited from August 2007 to January 2011 for the Vascular events In noncardiac Surgery patIents cOhort evaluatioN (VISION) study. ACEi/ARBs were withheld in 1,245 (26%) of the 4,802 patients who took them at baseline. Withholding ACEi/ARBs on the day of surgery was associated with an 18% reduction in the relative risk of the composite outcome of death, stroke, or MINS (150/1,245 [12%] *vs.* 459/3,557 [13%]; adjusted relative risk, 0.82; 95% CI, 0.70 to 0.96). *See the accompanying Editorial View on* **page 1**. *(Summary: M. J. Avram. Photo: © ThinkStock. Illustration: A. Johnson, Vivo Visuals.)*

28 Mask Ventilation during Induction of General Anesthesia: Influences of Obstructive Sleep Apnea

The prevalence of sleep-disordered breathing (SDB) is as high as 69% of the general surgical population. Pharyngeal airways of patients with SDB are narrower and more collapsible under general anesthesia and paralysis, and mandibular advancement is less effective, particularly in obese subjects. The hypothesis that the presence of SDB, defined as an apnea hypopnea index more than 5/h, reduces the efficiency of mask ventilation (MV) assessed by tidal volume (TV) achieved with a constant ventilator setting was tested in 80 patients undergoing general anesthesia. TV during one-hand MV progressively increased by more than 70% in one minute, but one-hand MV was more difficult in patients with severe SDB. Higher body mass index and occurrence of expiratory flow limitation independently decreased the efficiency of one-hand MV. Two-hands MV maximized the efficiency of MV. *See the accompanying Editorial View on* **page 4**. *(Summary: M. J. Avram. Photo: J. P. Rathmell.)*

47 Relationship between Intraoperative Hypotension, Defined by Either Reduction from Baseline or Absolute Thresholds, and Acute Kidney and Myocardial Injury after Noncardiac Surgery: A Retrospective Cohort Analysis

Various degrees of hypotension are common during anesthesia and surgery and may cause organ ischemia. The relationships between absolute and relative characterizations of hypotension and myocardial injury and acute kidney injury (AKI) were assessed in a retrospective cohort study of 57,315 adults having inpatient noncardiac surgery between 2005 and 2015, in whom the overall incidence of myocardial injury was 3.1% and that of AKI was 5.6%. Mean arterial pressure below absolute thresholds of 65 mmHg and lower or relative thresholds of 20% or more below baseline were progressively related to both myocardial and kidney injury. Prolonged exposure was associated with increased odds of organ injury at any given threshold. Both absolute and relative thresholds were predictive, but there was no advantage to using relative over absolute thresholds for myocardial injury or AKI. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*



104 Extubation Failure in Brain-injured Patients: Risk Factors and Development of a Prediction Score in a Preliminary Prospective Cohort Study

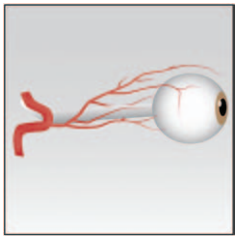
There is a high rate of extubation failure in mechanically ventilated brain-injured patients. Risk factors for extubation failure were determined in a prospective observational study of 140 brain-injured patients with Glasgow Coma Scale scores less than or equal to 12 before intubation, who were intubated for a neurologic reason and ventilated for more than 48 h. Extubation failure occurred in 43 (31%) patients, with failure occurring in 31 (24%) before 48 h. Three components of upper airway function (cough, gag reflex, and deglutition) and one component of neurological status (a dichotomized visual function subscore of the Coma Recovery Scale-Revised) were identified as independent risk factors for extubation failure. From these, a four-item pragmatic clinical score predictive of extubation failure in brain-injured patients was developed and subsequently internally validated. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*

85 Vasopressin *versus* Norepinephrine in Patients with Vasoplegic Shock after Cardiac Surgery: The VANCS Randomized Controlled Trial

Vasoplegic syndrome is characterized by low arterial pressure with normal or elevated cardiac output and reduced systemic vascular resistance. Patients who develop vasoplegic shock after cardiac surgery are at higher risk of organ failure and have increased mortality and longer hospital length of stay. The hypothesis that administration of vasopressin to patients with vasoplegic shock after cardiac surgery would be associated with fewer postoperative complications compared to norepinephrine administration was tested in a randomized, double-blind trial of 300 patients. The primary outcome, a composite endpoint of death or severe postoperative complications within 30 days after surgery, occurred in 74 patients in the norepinephrine group (49%) and in 48 patients in the vasopressin group (32%) (unadjusted hazard ratio 0.55, 95% CI, 0.38 to 0.80; absolute risk reduction 16.8%, 95% CI, 5.7 to 27.3). *See the accompanying Editorial View on* **page 9**. *(Summary: M. J. Avram. Photo: S. Shernan, Brigham and Women's Hospital.)*

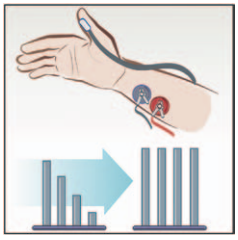
74 Isoflurane Anesthesia Has Long-term Consequences on Motor and Behavioral Development in Infant Rhesus Macaques

Anesthetic exposure has been associated with impaired behavioral and cognitive development in young animals, and retrospective studies of childhood exposure to anesthesia suggest behavioral and neurocognitive effects may be more profound after repeated exposure. The hypothesis that exposure to isoflurane would increase the display of anxious/inhibited behavior in response to some provoked tests and alter behavior in the home environment was tested in 24 rhesus macaques, a highly translational nonhuman primate model. Animals were exposed to a 5-h isoflurane anesthetic once, three times, or not at all over the first 2 weeks of life. Animals with one exposure had no significant behavioral alterations. However, animals with three exposures had motor reflex deficits at 30 days of age and were more likely to display anxiety behavior at 1 yr of age, after they were weaned from their natal group. *See the accompanying Editorial View on* **page 6**. *(Summary: M. J. Avram. Illustration: J. Ursino, ImagePower Productions.)*



165 Anesthesia for Ophthalmic Artery Chemosurgery (Clinical Concepts and Commentary)

Retinoblastoma is a rare tumor of the eye affecting primarily children for which there are a variety of therapeutic options, each of which has drawbacks. Direct intraarterial chemotherapy for retinoblastoma (also known as ophthalmic artery chemosurgery) is rapidly gaining acceptance as an effective treatment modality with limited long-term morbidity. However, potentially dramatic acute respiratory and hemodynamic changes often occur during the procedure. This Clinical Concepts and Commentary discusses the relevant anatomy of the carotid and ophthalmic arteries and describes the ophthalmic artery chemosurgery technique at the authors' institution. It then discusses respiratory complications, including the sudden profound decrease in lung compliance and precipitous drop in tidal volume, and cardiovascular complications (both bradycardia and hypotension), as well as what is known about the mechanisms of these complications and the questions that remain to be addressed regarding them. *(Summary: M. J. Avram. Illustration: J. P. Rathmell.)*



173 Current Status of Neuromuscular Reversal and Monitoring: Challenges and Opportunities (Review Article)

While modern surgery would not be possible without neuromuscular blocking agents, incomplete recovery from neuromuscular blockade represents a significant patient safety concern. The present review discusses the gaps in perioperative management of neuromuscular block in current clinical practice. These gaps include the limitations of anticholinesterases as antagonists of residual nondepolarizing block and the inadequacy of subjective (visual and tactile) means of assessment of residual neuromuscular block to ensure adequate recovery of neuromuscular function even after pharmacologic antagonism of moderate block with anticholinesterases. The potential for sugammadex to decrease the frequency of undetected residual block in the postoperative period is also reviewed as is evidence of the importance of objective perioperative measurement of neuromuscular function whenever neuromuscular blocking agents are used. *See the accompanying Editorial View on* **page 12**. *(Summary: M. J. Avram. Illustration: J. Ursino, ImagePower Productions.)*