1065  Inhalational versus Intravenous Induction of Anesthesia in Children with a High Risk of Perioperative Respiratory Adverse Events: A Randomized Controlled Trial

There are currently no evidence-based guidelines or recommendations that would enable pediatric anesthesiologists to make informed choices on the type of anesthetic induction technique required to reduce or prevent perioperative respiratory adverse events. The hypothesis that the occurrence of perioperative respiratory adverse events would be significantly higher with inhalation induction of anesthesia with sevoflurane compared with intravenous induction with propofol was tested in an open-label randomized controlled trial of 298 children between 0.7 and 8 yr of age with at least two risk factors for perioperative respiratory adverse events. Perioperative adverse events were observed in 39 (26%) of the patients in the intravenous induction group and in 64 (43%) of the patients in the inhalation induction group, for an unadjusted relative risk of 1.64. After adjustment for age, sex, weight, and American Society of Anesthesiologists physical status, the relative risk was 1.68. See the accompanying Editorial View on page 1051. (Summary: M. J. Avram. Illustration: A. Johnson, Vivo Visuals.)

1099  Amisulpride Prevents Postoperative Nausea and Vomiting in Patients at High Risk: A Randomized, Double-blind, Placebo-controlled Trial

The incidence of nausea or vomiting within 24 h of operation under volatile anesthesia is 60 to 80% in patients with at least three of four risk factors for postoperative nausea and vomiting. Consensus guidelines recommend patients at high risk of postoperative nausea and vomiting be provided prophylaxis with a combination of antiemetics with different mechanisms of action. In a double-blind, randomized, placebo-controlled trial, the hypothesis that amisulpride, a potent dopamine D2 and D3 receptor antagonist, is superior to placebo in the prevention of postoperative nausea and vomiting when used with another antiemetic (primarily ondansetron or dexamethasone) was tested in 1,147 patients with three or four risk factors for postoperative nausea and vomiting. Complete response, defined as no emesis or rescue medication use in the 24-h postoperative period, occurred in 58% of the amisulpride group and 47% of the control group. (Summary: M. J. Avram. Image: ©ThinkStock.)

1117  Positive End-expiratory Pressure Alone Minimizes Atelectasis Formation in Nonabdominal Surgery: A Randomized Controlled Trial

The importance of the individual components of “protective ventilation” (low tidal volumes, positive end-expiratory pressure [PEEP], and recruitment maneuvers) for patients undergoing general anesthesia is unclear. The hypothesis that PEEP (7 or 9 cm H2O, depending on body mass index) alone would limit atelectasis formation and maintain blood oxygenation in healthy lungs during nonabdominal surgery was tested in a randomized, controlled, evaluator-blinded trial of 24 patients. The median atelectasis area after completed surgery and before recovery, measured by computed tomography and calculated as the percentage of the total lung area, was 1.8% in the PEEP group and 4.6% in the zero PEEP group. The ratio of arterial oxygen partial pressure to inspired oxygen fraction decreased at the end of surgery in the zero PEEP group, which also had higher levels of arterial carbon dioxide partial pressure mid-surgery and at the end of surgery. (Summary: M. J. Avram. Image: J. P. Rathmell.)

1075  Can Mathematical Modeling Explain the Measured Magnitude of the Second Gas Effect?

The second gas effect occurs when a soluble first gas such as nitrous oxide is delivered in high inspired concentrations and the alveolar-capillary uptake of the first gas increases the alveolar concentrations of other gases present, accelerating their uptake. The magnitude of the second gas effect may be greater when the effect on arterial blood partial pressures is measured due to the effect of inhomogeneity of ventilation and blood flow ratios on the distribution of perfusion-driven nitrous oxide uptake throughout the lung. Modeling of ventilation-perfusion inhomogeneity confirmed that the second gas effect is greater in blood than it is in expired gas and its magnitude increases in blood but decreases in expired gas as the degree of ventilation-perfusion mismatch increases. Minimum alveolar concentration calculations based on end-tidal anesthetic concentration measurements may well underestimate the depth of anesthesia when nitrous oxide is supplemented with a volatile agent. See the accompanying Editorial View on page 1053. (Summary: M. J. Avram. Image: J. P. Rathmell.)
1092 Does Equi–Minimum Alveolar Concentration Value Ensure Equivalent Analgesic or Hypnotic Potency? A Comparison between Desflurane and Sevoflurane

Minimum alveolar concentration, which reflects the spinal mechanism of immobility rather than the cerebral mechanism of analgesia and hypnosis, has been used as the standard measure of volatile anesthetic potency. The hypothesis that desflurane and sevoflurane at equal minimum alveolar concentrations would not have equivalent analgesic and hypnotic potencies was tested in a prospective, randomized trial of 89 patients scheduled for arthroscopic knee surgery. The surgical pleth index and the bispectral index were used to assess levels of analgesia and of hypnosis in response to standardized tetanic stimulation during single-agent volatile anesthesia, respectively. At a steady-state of age-corrected 1.0 minimum alveolar concentration, the mean poststimulation surgical pleth index value for the desflurane group was 49 while that for the sevoflurane group was 64 and the poststimulation bispectral index value was 36 for the desflurane group and 41 for the sevoflurane group. (Summary: M. J. Avram. Image: J. P. Rathmell.)

1140 Association of Polypharmacy with Survival, Complications, and Healthcare Resource Use after Elective Noncardiac Surgery: A Population-based Cohort Study

The hypothesis that polypharmacy would be adversely associated with postoperative outcomes was tested in a population-based cohort study of 266,499 patients aged 66 yr and older having elective, intermediate- to high-risk operations between 2002 and 2014. Polypharmacy (five or more filled prescriptions for unique drugs) was present in 146,029 (54.8%) of the patients in the 90 days before surgery. Within 90 days of surgery, 4,356 patients in the polypharmacy group died (30 per 1,000 patients), whereas 1,919 patients in the group without polypharmacy died (16 per 1,000), for an unadjusted hazard ratio of 1.88. After multilevel multivariable adjustment, the hazard ratio was 1.21. Individuals with a frailty-defining diagnosis did not have a significant decrease in survival when exposed to polypharmacy (adjusted hazards ratio 0.92), while the influence of polypharmacy was exaggerated in people without frailty-defining diagnoses (adjusted hazards ratio 1.30). (Summary: M. J. Avram. Image: J. P. Rathmell.)

1193 Biologic Impact of Mechanical Power at High and Low Tidal Volumes in Experimental Mild Acute Respiratory Distress Syndrome

Mechanical power transferred from a mechanical ventilator to the lungs can be influenced by tidal volume, driving pressure, and respiratory rate. High mechanical power may induce ventilator-induced lung injury. The hypothesis that low tidal volume would minimize ventilator-induced lung injury regardless of the degree of mechanical power was tested in 40 rats with acute respiratory distress syndrome induced by intratracheal instillation of Escherichia coli lipopolysaccharide. At low mechanical power, low tidal volume reduced diffuse alveolar damage score, without changing expression of biomarkers associated with inflammation (interleukin 6), alveolar pulmonary stretch (amphiregulin), or epithelial cell damage (club cell protein 16). At high mechanical power, high tidal volume increased diffuse alveolar damage, promoted ultrastructural impairment in alveolar epithelial and endothelial cells and alveolar–capillary membrane, as well as loss of cell–cell adhesion. Even at low tidal volumes, high mechanical power promoted ventilator-induced lung injury. See the accompanying Editorial View on page 1062. (Summary: M. J. Avram. Image: J. P. Rathmell.)

1241 Neuroimaging of Pain: Human Evidence and Clinical Relevance of Central Nervous System Processes and Modulation (Review Article)

Numerous studies combining sensory and behavioral testing with functional magnetic resonance imaging studies have increased our understanding of how pain is processed within the human central nervous system (CNS). Neuroimaging has advanced the current understanding of the role of the CNS in chronic pain by demonstrating that there are multiple circuits involved in modulation of the pain experience and these circuits may also be altered in patients with chronic pain. Neuroimaging research has also provided evidence for how pharmacologic, psychologic, and physiologic changes within the CNS and body modulate the pain experience via exogenous and endogenous processes. These findings have benefited clinical practice by providing clinicians with an educational framework to discuss the biopsychosocial nature of pain with patients. Advances in neuroimaging-based therapeutics trials may provide additional benefits for clinical practice by providing objective biomarkers of chronic pain and guiding treatment for personalized pain management. (Summary: M. J. Avram. Image: Adapted from original article.)