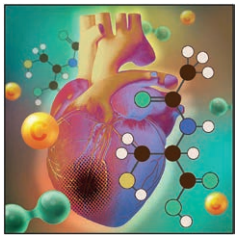
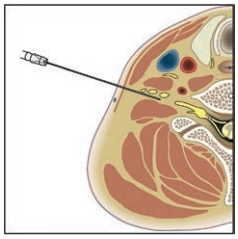
THIS MONTH IN ANESTHESIOLOGY



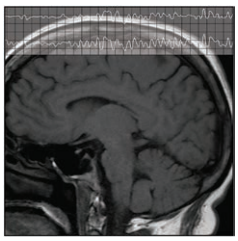
408 Hyperoxia and Antioxidants for Myocardial Injury in Noncardiac Surgery: A 2 × 2 Factorial, Blinded, Randomized Clinical Trial

Hyperoxia and oxidative stress may be associated with increased risk of perioperative myocardial injury. Antioxidant supplements may relieve oxidative stress by scavenging free radicals. The hypothesis that hyperoxia (fraction of inspired oxygen 0.80) increases the degree of myocardial injury compared to normoxia (fraction of inspired oxygen 0.30) and, separately, that antioxidants reduce the degree of myocardial injury compared to placebo, was tested in a 2 × 2 factorial randomized trial of 576 patients with significant cardiovascular risk factors undergoing major noncardiac surgery under general anesthesia. The antioxidant intervention consisted of intravenous 3 g vitamin C and 100 mg/kg N-acetylcysteine. The primary outcome was the degree of myocardial injury as assessed by the area under the curve for high-sensitivity troponin plasma concentrations measured during the first 3 postoperative days. The median difference (95% CI) in the primary outcome between the 80% and 30% oxygen groups was 1.5 ng · day/l (–2.5 to 5.3 ng · day/l), whereas that between the antioxidant and placebo groups was –0.5 ng · day/l (–4.5 to 3.0 ng · day/l). *See the accompanying Editorial on* ***page 403***. *(Summary: M. J. Avram. Image: A. Johnson, Vivo Visuals Studio.)*



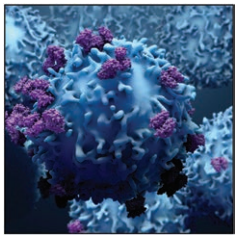
434 Interscalene Brachial Plexus Block with Liposomal Bupivacaine *versus* Standard Bupivacaine with Perineural Dexamethasone: A Noninferiority Trial

The postoperative analgesic benefit of a single-shot interscalene brachial plexus block for shoulder surgery lasts no longer than 24 h, even when using a longer-acting local anesthetic such as bupivacaine. Perineural dexamethasone is used as an additive to prolong the duration of analgesia. Liposomal bupivacaine is an extended-release bupivacaine formulation that was designed to provide prolonged analgesia. The hypothesis that the average numeric rating scale pain scores over 72 h in patients given perineural liposomal bupivacaine would be noninferior to those in patients given bupivacaine with perineural dexamethasone was tested in a randomized noninferiority trial of 111 patients undergoing elective outpatient arthroscopic shoulder surgery. A mean difference for numeric rating scale pain score at rest of less than 1.3 was to be considered noninferior. The mean ± SD numeric rating scale pain score over 3 postoperative days for the liposomal bupivacaine group, 2.4 ± 1.9, was noninferior to that of the bupivacaine with dexamethasone group, 3.4 ± 1.9; the mean difference (interquartile range) was –1.1 (–1.8 to –0.4). *(Summary: M. J. Avram. Image: G. Nelson/J. P. Rathmell.)*



420 Propofol-induced Unresponsiveness Is Associated with a Brain Network Phase Transition

The hypothesis that propofol anesthesia is associated with abrupt and divergent changes in brain network connectivity for different frequencies and time scales was tested by reanalyzing electroencephalography (EEG) data from 16 volunteers undergoing slow induction and emergence from propofol anesthesia. Phase and power information were extracted from 15-s windows and three types of connectivity metrics were calculated: coherence and weighted phase lag index, which are phase-based metrics that assess synchrony between EEG channels at specific frequencies, and mutual information, which is a measure of nonlinear correlation. As summary statistics for each functional connectivity metric, global efficiency was estimated as a measure of network integration, as were clustering coefficient as a measure of network segregation and statistical complexity. Propofol caused a loss of complexity in cortical network dynamics at concentrations sufficient for unresponsiveness by inducing a phase transition to a frontocentral 10-Hz hypersynchronous "giant component" while causing a profound decrease in the global efficiency of the network in slower time scales. This resulted in the brain becoming simultaneously too simple and too uncoupled for sufficient information flow to maintain wakefulness. *See the accompanying Editorial on* ***page 405***. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*



448 Expression Profiles of Immune Cells after Propofol or Sevoflurane Anesthesia for Colorectal Cancer Surgery: A Prospective Double-blind Randomized Trial

Cancer recurrence after surgical resection is influenced primarily by tumor grade and may also be affected by perioperative factors such as the anesthetic. Propofol has been reported to have a greater antitumor effect during cancer surgery than volatile anesthetics. Natural killer cells and T lymphocytes have prominent antitumor effects after cancer surgery. The hypothesis that propofol-based anesthesia would have less harmful effects on circulating immune cells than sevoflurane-based anesthesia during colorectal cancer surgery was tested in a trial of 153 patients diagnosed with adenocarcinoma randomly assigned to receive propofol- or sevoflurane-based anesthesia by comparing the fractions of circulating natural killer cells, T lymphocytes, and related immune cells between groups. The fractions of circulating natural killer cells, helper T cells, and cytotoxic T cells in patients receiving propofol-based anesthesia did not differ from those in patients receiving sevoflurane-based anesthesia up to 24 h postoperatively. There were also no differences between groups in the fractions of regulatory T cells with tumor-promoting effects due to surface expression of the enzymes CD39 and CD73. *(Summary: M. J. Avram. Image: Adobe Stock.)*

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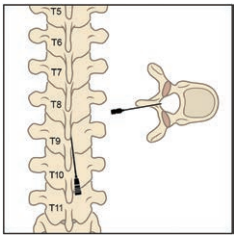
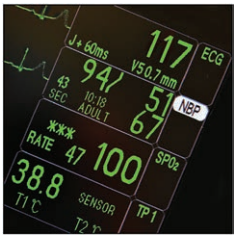


459 Epidural Analgesia and Recurrence after Colorectal Cancer Surgery: A Danish Retrospective Registry-based Cohort Study

Although surgery is the primary curative treatment for colorectal cancer, recurrence is frequent. The effect of curative surgery on the immune and neurohumoral system may generate a favorable microenvironment for cancer progression, and opioids and inhalational anesthesia may promote metastases. Epidural analgesia can attenuate the neurohumoral response to surgery and reduce both intraoperative opioid requirements and postoperative pain. The hypothesis that epidural analgesia decreases the risk of cancer recurrence after colorectal cancer surgery was tested in a retrospective registry-based cohort study of patients who underwent complete micro- and macro-radical resections. The treatment group received general anesthesia supplemented with insertion of an epidural catheter for analgesia and the control group received general anesthesia without neuraxial analgesia. Propensity score matching, which was used to adjust for potential confounders, yielded 2,980 patient pairs. Median follow-up was 58 months. There were 567 (19.0%) patients with cancer recurrence in the epidural analgesia group and 610 (20.5%) in the control group; the hazard ratio for recurrence was 0.91 (95% CI, 0.82 to 1.02). *(Summary: M. J. Avram. Image: G. Nelson/J. P. Rathmell.)*

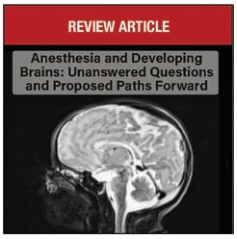


472 End-tidal Carbon Dioxide for Diagnosing Anaphylaxis in Patients with Severe Postinduction Hypotension

Severe hypotension within minutes of the induction of anesthesia is a common sign of perioperative hypersensitivity reactions, but it is not specific because the most common cause of hypotension is an excessive dose of anesthetic. The hypothesis that that low end-tidal CO_2 ($ETCO_2$) is a marker of anaphylaxis in mechanically ventilated hypotensive patients was tested in a retrospective study comparing $ETCO_2$ in 49 adult patients with a diagnosis of anaphylaxis (either allergic or nonallergic) with that in 555 patients with severe hypotension from any other cause after induction of anesthesia. The minimum values (median [interquartile range]) of both $ETCO_2$ (17 [12 to 23] mmHg) and mean arterial pressure (34 [26 to 42] mmHg) in the anaphylaxis group were lower than in the hypotension group ($ETCO_2$ 32 [29 to 34] mmHg, mean arterial pressure 42 [38 to 45] mmHg). The area under the receiver operating characteristic curve (95% CI) representing the ability of $ETCO_2$ to discriminate between anaphylaxis and postinduction hypotension, 0.95 (0.91 to 0.99), was higher than that obtained for mean arterial pressure, 0.71 (0.61 to 0.81). *(Summary: M. J. Avram. Image: J. P. Rathmell.)*

482 Postoperative Management of Lung Transplant Recipients in the Intensive Care Unit (Review Article)

The perioperative outcome of lung transplantation is affected by the unique pathophysiologic conditions and risk factors attributable to the characteristics of the donor and the recipient as well as the interaction between them. The most relevant postoperative acute critical complication occurring in lung transplantation recipients in the intensive care unit is primary graft dysfunction, a particular form of acute respiratory distress syndrome that is mainly due to ischemia-reperfusion injury, which occurs in 20 to 30% of recipients. High-grade evidence-based guidelines for the management of lung transplantation recipients in the intensive care unit are not yet available. This review highlights the current practice and areas with opportunities for future investigation in: management of mechanical ventilation, management of fluids and hemodynamics, prevention and management of neurologic complications, immunosuppressive therapies, antimicrobial strategies, and management of nutritional support and of abdominal complications. Such perioperative management is best delivered by integrated care provided by a multidisciplinary dedicated team with specific expertise in lung transplantation. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*



500 Anesthesia and Developing Brains: Unanswered Questions and Proposed Paths Forward (Review Article)

Exposure to anesthetic agents during brain maturation has been reported to disrupt neurodevelopment in animal models, raising concerns that anesthetic agents may cause a clinically relevant long-term neurodevelopmental effect in children. However, designing clinical studies based on outcomes assessed in animals has proven to be difficult for a variety of reasons, including the absence of a clearly identifiable human phenotype and the multitude of potentially confounding factors that need to be accounted for in observational studies. Several clinical studies have found no association with broad measures of intelligence but have reported deficits in specific outcomes including behavioral function. Although these results may help identify a phenotype of injury after anesthesia exposure, uncommon events in large populations are difficult to study using traditional methods such as randomized controlled trials and prospective cohort studies. Therefore, new approaches to this research will be needed to determine if a recognized phenotype is caused by anesthetic medications or other factors related to surgery or the perioperative experience. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*