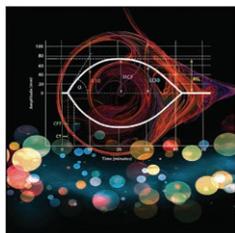


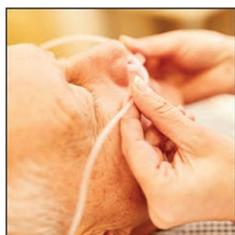
THIS MONTH IN ANESTHESIOLOGY



148 Temporal Transitions in Fibrinolysis after Trauma: Adverse Outcome Is Principally Related to Late Hypofibrinolysis

Hypofibrinolysis after traumatic injury as detected by viscoelastic hemostatic assays such as rotational thromboelastometry (ROTEM) has been temporally described both in an early form, present on admission, and as a late form, developing hours after traumatic injury. The hypothesis tested was that temporal transitions in fibrinolysis states after traumatic injury would facilitate stratification of adverse late clinical outcomes and improve understanding of how tranexamic acid administered empirically to inhibit hyperfibrinolysis, a commonly observed trauma-induced coagulopathy, modulates the fibrinolytic response and affects mortality. This was a secondary analysis of data collected from 731 patients, 432 (59%) of whom were untreated and 299 (41%)

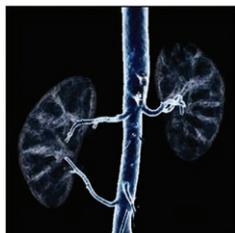
whom were treated with tranexamic acid between 2008 and 2018. Both delayed-onset (at 24 h) and persistent (on admission and at 24 h) ROTEM-hypofibrinolysis were associated with organ dysfunction and late mortality after injury in untreated patients. Empiric administration of tranexamic acid was associated with reduced early mortality and appeared to alter the fibrinolytic patterns but did not increase late mortality regardless of the ROTEM-fibrinolysis pattern in the first 24 h after injury. *See the accompanying Editorial on page 7. (Summary: M. J. Avram. Image: A. Johnson, Vivo Visuals Studio.)*



82 Carbon Dioxide Changes during High-flow Nasal Oxygenation in Apneic Patients: A Single-center Randomized Controlled Noninferiority Trial

Administering humidified, heated oxygen to apneic patients at high flow rates (up to 70 l/min) *via* nasal cannulas is reported to improve carbon dioxide clearance. The null hypothesis that there is a detectable difference in the linear rates of mean arterial partial pressure of carbon dioxide increase between different flow rates of 100% oxygen during a 15-min apneic period after induction of general anesthesia and neuromuscular blockade in adults computed by a linear regression was tested in a randomized controlled noninferiority trial of 125 patients. Patients were randomly assigned to four experimental groups (oxygen flow rates 0.25, 2, 10, and 70 l/min; those in the lowest flow experimental group were intubated and the airway openings of the others

were maintained with continuous jaw thrust) and a control group (70 l/min oxygen with continuous laryngoscopy). The upper limit of a two-sided 95% CI for the mean difference in the linear rate of arterial partial pressure of carbon dioxide increase was below the predefined noninferiority margin of 0.3 mmHg/min in all experimental groups. *See the accompanying Editorial on page 1. (Summary: M. J. Avram. Image: Adobe Stock.)*



93 Intraoperative Hypotension and Acute Kidney Injury after Noncardiac Surgery in Infants and Children: A Retrospective Cohort Analysis

Hypotension during noncardiac surgery is linked to end-organ damage in adults, with distinct absolute and relative mean arterial pressure (MAP) thresholds under which the risk of acute kidney injury increases. The hypothesis that children with intraoperative hypotension are likely to develop postoperative acute kidney injury was tested in a retrospective study by assessing the relationship between absolute and relative characterizations of hypotension and acute kidney injury in children having noncardiac surgery. Absolute and relative hypotension were defined as lowest intraoperative MAP and the maximum percentage reduction in MAP from preoperative baseline, respectively, sustained for 5 cumulative minutes. Postoperative acute kidney injury was identified if

the postoperative serum creatinine concentration was either more than 1.5 times baseline or increased more than 0.3 mg/dl in any 48-h period. Among 64,412 children who had noncardiac surgery, 4,506 had serum creatinine concentrations assessed preoperatively and postoperatively. The incidence of postoperative acute kidney injury in the study population was 11% (499 of 4,506). No association was found between intraoperative hypotension and postoperative acute kidney injury. *See the accompanying Editorial on page 4. (Summary: M. J. Avram. Image: J. P. Rathmell.)*



115 Pain and Opioid Consumption and Mobilization after Surgery: *Post Hoc* Analysis of Two Randomized Trials

Inadequate postoperative analgesia impairs functional recovery and promotes postoperative complications. The hypothesis that postoperative pain in adults recovering from abdominal surgery is inversely associated with postoperative mobilization was tested in a retrospective analysis of data from 673 patients who had their position and activity monitored continuously during two randomized trials. Postoperative mobilization was defined as the number of hours per postoperative day spent sitting or standing during the initial 48 postoperative hours. Postoperative pain was recorded using the numerical rating scale, which is an 11-point Likert scale. The median (interquartile range) mobilization time of patients with time-weighted average pain scores of 3 or less

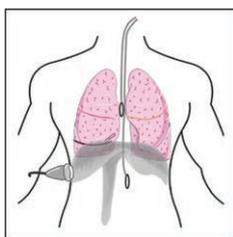
was 1.9 (1.0 to 3.6) hours per day, that of patients with time-weighted average pain scores between 3 and 6 was 1.7 (0.7 to 3.1) hours per day, and that of patients with time-weighted average pain scores of 6 or more was 1.2 (0.5 to 2.6) hours per day. Mobilization time was not associated with postoperative opioid consumption. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*



104 Mediastinal Masses, Anesthetic Interventions, and Airway Compression in Adults: A Prospective Observational Study

Recommendations to prevent airway collapse during general anesthesia in patients with large mediastinal masses have been dictated by the belief that maintenance of spontaneous ventilation and avoidance of neuromuscular blockade are superior to positive pressure ventilation and paralysis. The hypothesis that anesthetic interventions including positive pressure ventilation and neuromuscular blockade could be instituted without clinically significant compromise of central airways was tested in prospective observational study of 17 adult patients with moderate to severe mediastinal mass-mediated tracheobronchial compression. The stepwise effects of general anesthesia, positive pressure ventilation, and neuromuscular blockade on airway patency were

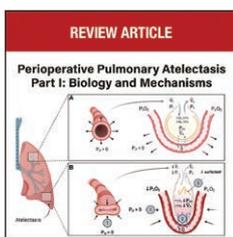
evaluated in intubated patients using real-time videobronchoscopic recordings during staged inductions. Scoring of the airway caliber was based on gross assessments of anterior-posterior diameter changes relative to baseline in the region of maximal compression. No anterior-posterior diameter changes of more than 50% compared to the awake, spontaneously breathing state, which were clinically significant, were observed with the introduction of general anesthesia, positive pressure ventilation, or neuromuscular blockade. (Summary: M. J. Avram. Image: J. P. Rathmell/P. Hartigan.)



162 Poor Correlation between Diaphragm Thickening Fraction and Transdiaphragmatic Pressure in Mechanically Ventilated Patients and Healthy Subjects

Transdiaphragmatic pressure, defined as the difference between esophageal and gastric pressures, is the reference method for evaluating diaphragm function. Determining it relies on use of gastroesophageal catheters. Diaphragm function can be explored noninvasively by ultrasound and diaphragm thickening fraction calculated based on the change in diaphragm thickness during inspiration. The hypothesis that diaphragm thickening fraction would be correlated with the change in transdiaphragmatic pressure was tested by examining the within-individual relationships in 14 healthy subjects and 25 mechanically ventilated patients

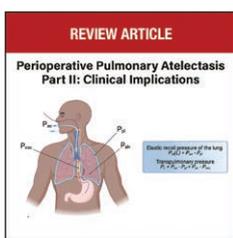
from two previously published studies. At the group level, diaphragm thickening fraction was moderately correlated with the change in transdiaphragmatic pressure in healthy subjects (R [95% CI], 0.40 [0.34 to 0.47]) and weakly correlated with the change in transdiaphragmatic pressure in mechanically ventilated patients (0.11 [0.03 to 0.19]), hampering the possibility of inferring pressure output from ultrasound recordings. Individual correlations between diaphragm thickening fraction and the change in transdiaphragmatic pressure were significant in 8 of 14 (57%) healthy subjects and in 2 of 25 (8%) mechanically ventilated patients. (Summary: M. J. Avram. Image: From original article.)



181 Perioperative Pulmonary Atelectasis: Part I. Biology and Mechanisms (Review Article)

Pulmonary atelectasis, the incomplete expansion of alveoli and terminal bronchioles, occurs when collapsing forces from positive pleural pressure and surface tension overcome expanding forces from alveolar pressure and parenchymal tethering. Classical presentations of atelectasis are hypoxemia and lowered respiratory system compliance. Factors that impair hypoxic pulmonary vasoconstriction accentuate hypoxemia produced by atelectasis. Hallmarks of atelectasis-related inflammatory response include the presence of cytokines and immune cells, and their functional alteration. The lack of cyclic stretch associated with atelectasis could contribute to structural damage as could inflammation and ischemia. During atelectasis, lung mechanical forces that may

contribute to lung injury include cyclic opening and closing, stress concentration due to the distribution of mechanical forces in the three-dimensional lung structure around a region the initially surrounding area of which is reduced by atelectasis, and overdistension of the nonatelectatic lung that could promote higher lung inflammation than atelectasis at comparable low tidal volume and lower driving pressure. (Summary: M. J. Avram. Image: From original article.)



206 Perioperative Pulmonary Atelectasis: Part II. Clinical Implications (Review Article)

Active clinical management of pulmonary atelectasis based on identification of risk factors and implementation of specific diagnostic and therapeutic approaches can optimize lung function and minimize lung injury. Risk factors for atelectasis can be categorized as patient-, anesthesia-, and surgery-related and are well known. Computed tomography is the gold standard for diagnosis and quantification of alveolar collapse and is useful to determine its cause. Other useful imaging techniques include magnetic resonance imaging, pulmonary ultrasound, and chest radiography. Therapeutic management includes a broad range of interventions aimed at promoting lung recruitment, which improve intraoperative oxygenation and respiratory compliance during general

anesthesia. Because intraoperative lung recruitment may not translate into higher postoperative lung aeration, strategies designed to maintain lung recruitment postoperatively may independently improve postoperative outcomes. Noninvasive positive pressure ventilation after extubation may prevent pulmonary atelectasis and compensate for the postoperative reduction of functional residual capacity in patients at high risk for pulmonary atelectasis or those with clinical presentations consistent with lung collapse. (Summary: M. J. Avram. Image: From original article.)