**Anesthesiology**

**440** Defining an Intraoperative Hypotension Threshold in Association with Stroke in Cardiac Surgery

The hypothesis that hypotension during and after cardiopulmonary bypass is associated with the risk of postoperative stroke was tested in a retrospective cohort study of 7,457 consecutive adult patients who underwent cardiac surgery requiring cardiopulmonary bypass between 2009 and 2015. 111 (1.4%) of whom had a confirmed postoperative diagnosis of stroke. Stroke was associated with longer durations of hypotension during cardiopulmonary bypass. In the analysis using total hypotension duration, every additional 10min of mean arterial pressure less than 55 mmHg during cardiopulmonary bypass was associated with a 16% increased odds of stroke and every additional 10 min of mean arterial pressure between 55 and 64 mmHg was associated with a 13% increased odds of stroke. Other independent predictors of stroke risk after adjustment for intraoperative hypotension included older age, preexisting hypertension, combined valvular and coronary artery bypass graft surgery, emergent operative status, prolonged cardiopulmonary bypass duration, and new onset postoperative atrial fibrillation. (Summary: M. J. Avram. Photo Illustration: S. Jarret, C.M.I./J. P. Rathmell.)

**517** Effectiveness of Lumbar Facet Joint Blocks and Predictive Value before Radiofrequency Denervation: The Facet Treatment Study (FACTS), a Randomized, Controlled Clinical Trial

Lumbar facet joint blocks, including intraarticular and medial branch blocks, are often used before radiofrequency ablation. The hypotheses that intraarticular injections of local anesthetic and steroid may have therapeutic effect in a small segment of the population compared to placebo and medial branch blocks and that medial branch blocks would have better predictive value before denervation than intraarticular and placebo injections were tested in a multicenter randomized controlled trial of 208 patients. The mean reduction in average numeric rating scale pain scores at 1 month was 0.7 ± 1.6 in the intraarticular facet block group, 0.7 ± 1.8 in the medial branch block group, and 0.7 ± 1.5 in the placebo group. The average numeric rating scale pain scores 3 months after radiofrequency ablation were 3.0 ± 2.0 in the intraarticular facet block group. 3.2 ± 2.5 in the medial branch block group, and 3.5 ± 1.9 in the control group. See the accompanying Editorial View on page 396. (Summary: M. J. Avram. Image: J. P. Rathmell.)

**406** Cognitive Decline after Delirium in Patients Undergoing Cardiac Surgery

The hypothesis that delirium would be associated with decline in cognition at 1 month after cardiac surgery was tested in a prospective observational study of 142 patients. Delirium was defined as any Confusion Assessment Method, Confusion Assessment Method for the Intensive Care Unit, or chart-review positive assessment during hospitalization. Neuropsychologic testing, which assessed a number of cognitive domains known to be affected by cardiac surgery, was generally performed within 2 weeks of surgery and then 4 to 6 weeks and 1 yr after surgery. Delirium was diagnosed in 76 (53.5%) patients. The decline in composite cognitive Z score from baseline to 1 month after surgery was greater among patients with delirium compared to patients without delirium (greater decline by −0.29; 95%CI, −0.54 to −0.05) in a model adjusted for age, sex, race, education, and logistic EuroSCORE. On the other hand, at 1 yr there was no difference in adjusted decline from baseline in composite cognitive Z score by delirium status. See the accompanying Editorial View on page 389. (Summary: M. J. Avram. Image: ©ThinkStock.)

**428** Do Hospitals Performing Frequent Neuraxial Anesthesia for Hip and Knee Replacements Have Better Outcomes?

Population-based studies and meta-analyses have advanced the concept that use of neuraxial anesthesia in joint replacement operations may be associated with improved perioperative outcomes on a patient level. The hypothesis that differences in medical and economic outcomes would be found between hospitals that use neuraxial anesthesia for joint replacement surgery and those that do not and that a volume-outcome relationship exists was tested using data from a nationwide database on 808,237 total knee replacements and 371,607 hip replacements performed at 550 hospitals between 2006 and 2014. Neuraxial anesthesia was not used for these cases by 151 of the hospitals. After multiplicity adjustment, no consistent effect of hospital-level neuraxial anesthesia for joint replacement surgery on clinical outcomes was observed. However, reductions of up to −14.1% (95% CI, −20.9 to −6.6%) and −15.6% (95% CI, −22.8 to −7.7%) were seen for hospitalization cost in knee and hip replacements, respectively, both in the third quartile of neuraxial volume. (Summary: M. J. Avram. Image: J. P. Rathmell.)
Preoperative Fascia Iliaca Block Does Not Improve Analgesia after Arthroscopic Hip Surgery, but Causes Quadriceps Muscles Weakness: A Randomized, Double-blind Trial

The hypothesis that a fascia iliaca compartment block with dilute local anesthetic, in addition to intraarticular local anesthetic injection, will improve postoperative pain control in patients undergoing ambulatory hip arthroscopy, while minimizing effects on quadriceps strength, was tested in a randomized, double-blinded, placebo-controlled trial of 78 patients. The primary outcome, the highest numeric rating scale pain score in the recovery room, was similar in the block group (mean ± SD, 6 ± 2) and the placebo group (7 ± 2; difference, –0.2; 95% CI, −1.1 to 0.7). Perioperative opioid requirements and postanesthesia care unit lengths of stay did not differ between the two groups, nor did pain scores and opioid use after discharge. The measured force of maximal voluntary isometric contractions of the quadriceps muscle on the surgical side in the block group at discharge (18 patients, 18 ± 37 N) was substantially less than that in the placebo group (22 patients, 101 ± 85 N).

Dexmedetomidine Prevents Excessive γ-Aminobutyric Acid Type A Receptor Function after Anesthesia

Brief exposure to a general anesthetic can trigger a sustained increase in cell-surface expression and function of extrasynaptic α5 subunit-containing γ-aminobutyric acid type A receptors that persist long after the anesthetic has been eliminated. The α2 adrenergic receptor agonist dexmedetomidine reduces the incidence and duration of postoperative delirium. The hypothesis that dexmedetomidine reduces the excessive function of α5 γ-aminobutyric acid type A receptors in neurons that persists after general anesthesia and thereby attenuates postanesthetic cognitive deficits was tested using a reverse translational approach to identify the cellular and molecular mechanisms that contribute to its cognition-sparing properties as well as in murine behavioral studies. Dexmedetomidine activated α2 adrenergic receptors in astrocytes and stimulated the release of brain-derived neurotrophic factor, which acts as a paracrine factor to prevent excessive cell-surface expression and function of α5 γ-aminobutyric acid type A receptors in neurons. Behavioral studies confirmed that cotreatment with dexmedetomidine attenuated postanesthetic deficits in memory and problem solving.

Early Hemodynamic Management of Critically Ill Burn Patients (Clinical Focus Review)

Burn injury is associated with early profound hypovolemia, followed by a systemic inflammatory response, with a subsequent hyperdynamic state. The main challenge in the initial fluid administration strategy in patients with burn injury is to avoid significant hypovolemia, which may induce hypoperfusion, without over-resuscitating the patient. This review begins with an overview of the cardiovascular consequences of burn injury and a review of the risks of under- and over-fluid resuscitation. The Parkland formula for predicting required fluid volumes and hemodynamic targets in early resuscitation of critically ill burn patients are then discussed as is goal-directed fluid resuscitation therapy based on more advanced hemodynamic monitoring to reach alternative targets to better tailor fluid resuscitation. The roles of crystalloid solutions and colloid solutions in fluid resuscitation are then considered. Knowledge gaps related to hemodynamic targets as well as the role of colloids, adjuvant therapies, and vasopressors, and their effect on outcome and the immune system are identified.

Persistent Postsurgical Pain: Pathophysiology and Preventative Pharmacologic Considerations (Review Article)

Pain sensitization is a form of synaptic plasticity in dorsal root ganglia and the spinal cord that amplifies pain signaling and results from perioperative noxious and surgical stimuli, inflammatory mediators, and glial activation. After surgery, pain sensitization can translate into clinical hyperalgesia that is associated with a higher risk of developing persistent postoperative pain. The transition from acute to persistent postoperative pain is a complex and poorly understood progressive process involving biologic, psychologic, and socioenvironmental factors. This review begins with a description of both the basic science mechanisms of acute pain and the critical factors that may be responsible for transition from acute pain to persistent postoperative pain. An updated pragmatic review of the pharmacologic strategies that can be used to prevent development of persistent postoperative pain is then provided. See the accompanying Editorial View on page 399.