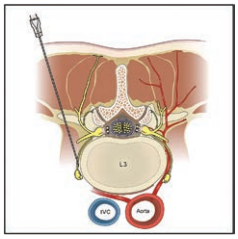
THIS MONTH IN ANESTHESIOLOGY

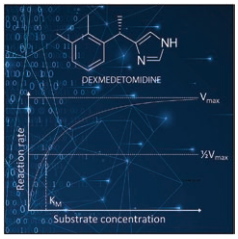
268 Preoperative Point-of-Care Ultrasound to Identify Frailty and Predict Postoperative Outcomes: A Diagnostic Accuracy Study

Frailty is the decline in physical and cognitive reserves leading to increased vulnerability to stressors such as surgery. Sarcopenia, or skeletal muscle loss, is a biologic and functional marker of frailty that can be quantified objectively. The hypothesis that point-of-care ultrasound could discriminate between frail and nonfrail patients before surgery was tested in 32 patients scheduled for major surgery who had a computed tomography scan within 90 days of their preoperative visit. Frailty was identified in 18 of the 32 patients using the Fried frailty phenotype assessment, the reference standard. The areas under the receiver operating characteristic curves (95% CI) for psoas muscle cross-sectional area measured by computed tomography and for quadriceps depth, rectus femoris cross-sectional area, and rectus femoris circumference measured by ultrasound were 0.88 (0.76 to 1.00), 0.80 (0.64 to 0.97), 0.70 (0.49 to 0.91), and 0.67 (0.46 to 0.88), respectively. Thus, preoperative ultrasound measurement of quadriceps depth discriminated between frail and nonfrail patients nearly as well as computed tomography measurement of psoas muscle cross-sectional area. *See the accompanying Editorial on* ***page 255****. (Summary: M. J. Avram. Image: A. Johnson, Vivo Visuals Studio.)*



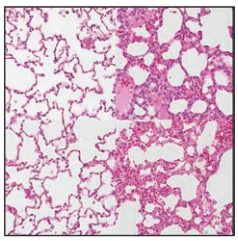
314 Botulinum Toxin Type A for Lumbar Sympathetic Ganglion Block in Complex Regional Pain Syndrome: A Randomized Trial

Complex regional pain syndrome is a chronic pain disorder characterized by sensory, vasomotor, sudomotor/edema, and/or motor/trophic symptoms. The hypothesis that botulinum toxin type A injected onto the lumbar sympathetic ganglia would have a prolonged sympathetic blocking effect compared to local anesthetic (control) was tested in a randomized, controlled study of 44 patients diagnosed with unilateral lower extremity complex regional pain syndrome by evaluating their effects on temperature increase and pain reduction. All patients had mean baseline pain scores of more than 7 on the 11-point numerical rating scale and a temperature increase in the ipsilateral foot during a screening lumbar sympathetic ganglion block. The mean (95% CI) increase from baseline temperature in the affected sole at 1 month in the botulinum toxin group was 1.0°C (0.4 to 1.5°C), whereas that in the control group was 0.1° (–0.3 to 0.4°C). The temperature remained increased in the botulinum toxin group at 3 months. The botulinum toxin group had larger changes in pain scores than the local anesthetic group at both 1 and 3 months. *See the accompanying Editorial on* ***page 261****. (Summary: M. J. Avram. Image: G. Nelson/J. P. Rathmell.)*



279 Dexmedetomidine Clearance Decreases with Increasing Drug Exposure: Implications for Current Dosing Regimens and Target-controlled Infusion Models Assuming Linear Pharmacokinetics

Dexmedetomidine pharmacokinetic models underpredict the measured plasma target-controlled infusion concentrations that are higher than those used in the model validation studies. The elimination clearance of high hepatic extraction ratio drugs like dexmedetomidine is determined by liver blood flow and not enzyme activity. The data of 48 subjects from two published pharmacokinetic studies were pooled to build a three-compartment pharmacokinetic model with nonlinear elimination clearance that successfully predicted plasma dexmedetomidine concentrations over a wide concentration range. Cardiac output did not explain between-subject or within-subject variability in dexmedetomidine elimination clearance. Dexmedetomidine elimination clearance may decrease with increasing plasma concentrations because dexmedetomidine alters the liver blood flow to cardiac output ratio in a concentration-dependent manner. When dexmedetomidine administration by target-controlled infusions were simulated, plasma concentrations up to 2 ng/ml predicted by the previously published linear pharmacokinetic model were similar to those predicted by the nonlinear model developed in the present study. Discrepancies between the concentrations predicted by the linear model and those predicted by the nonlinear model were observed beyond this concentration. *See the accompanying Editorial on* ***page 258****. (Summary: M. J. Avram. Image: J. P. Rathmell.)*



293 Adverse Mechanical Ventilation and Pneumococcal Pneumonia Induce Immune and Mitochondrial Dysfunctions Mitigated by Mesenchymal Stem Cells in Rabbits

Severe pneumonia often requires mechanical ventilation and is often fatal despite early antibiotic treatment. The hypothesis that mechanical ventilation induces immune and mitochondrial dysfunctions that can be mitigated by human umbilical cord tissue–derived mesenchymal stem cells alone or in combination with antibiotics was tested in rabbits with pneumococcal pneumonia undergoing high-pressure adverse mechanical ventilation. The survival of rabbits with pneumonia undergoing high-pressure adverse mechanical ventilation (0 of 7) was less than that of those undergoing protective mechanical ventilation (6 of 7) or breathing spontaneously (7 of 7). The survival of infected animals undergoing high-pressure adverse mechanical ventilation randomly assigned to treatment with mesenchymal stem cells (4 of 7), ceftaroline (4 of 7), or both (6 of 7) was improved compared to those treated with saline (0 of 7). In this model of 24-h mechanical ventilation, lung stretch worsened pneumonia, leading to uncontrolled infection and severe lung damage subsequent to ventilator-induced lung injury. Mesenchymal stem cells improved pneumonia outcomes by modulating host response as well as metabolic and mitochondrial homeostasis, acting synergistically with antibiotics. *(Summary: M. J. Avram. Image: From original article.)*

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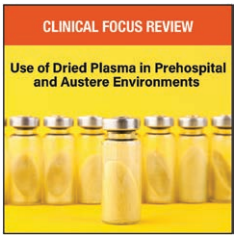
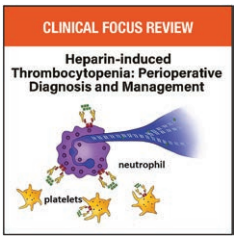


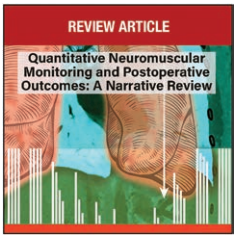
327 Use of Dried Plasma in Prehospital and Austere Environments (Clinical Focus Review)

Patients with traumatic hemorrhage have been reported to realize a survival benefit when transfusion of plasma and platelets in addition to erythrocytes is initiated before arrival at a trauma center. However, practical constraints can limit the ability to administer plasma in an out-of-hospital setting, including the fact that fresh frozen plasma requires frozen storage, takes approximately 30 min to thaw, and must be ABO-type matched. Lyophilized plasma, which is produced by freezing and sublimation of plasma, offers advantages that could enable broader use of plasma for prehospital transfusion. It has coagulation factor and related protein concentrations that are similar to those of standard plasma products and, for pooled lyophilized plasmas, less variable. Its indications for use are generally the same as for other forms of plasma and it is reported to have similar effectiveness and safety. Although lyophilized plasma may be more expensive than fresh frozen plasma, its advantages, including room temperature storage, easier inventory management, reduced waste, and rapid availability, can make it a cost-effective option. *(Summary: M. J. Avram. Image: Adobe Stock.)*



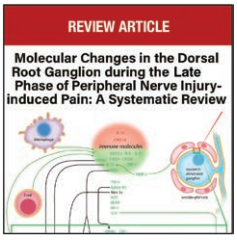
336 Heparin-induced Thrombocytopenia: Perioperative Diagnosis and Management (Clinical Focus Review)

Heparin-induced thrombocytopenia is an immune-mediated disease that induces a severe prothrombotic state. Heparin-induced thrombocytopenia antibodies usually develop 4 to 14 days after starting heparin therapy and the subsequent decline in the platelet count occurs 2 to 4 days after seroconversion. Timely diagnosis and treatment of heparin-induced thrombocytopenia are essential. Diagnosis is based on clinical assessment and laboratory assays. Clinical scoring systems that calculate a pretest probability for heparin-induced thrombocytopenia based on the timing and decrease of platelet count are followed by immunoassays to rule out heparin-induced thrombocytopenia or confirm the presence of antibodies. The direct thrombin inhibitors argatroban and bivalirudin are used to treat suspected or diagnosed heparin-induced thrombocytopenia; patients are often transitioned to warfarin for several months after platelet count increases. Polyvalent immunoglobulins are used to treat acute heparin-induced thrombocytopenia refractory to direct thrombin inhibitor anticoagulant therapy and plasmapheresis is used to reduce antibody burden, especially in severe heparin-induced thrombocytopenia refractory to standard anticoagulant therapy. *(Summary: M. J. Avram. Image: From original article.)*



345 Quantitative Neuromuscular Monitoring and Postoperative Outcomes: A Narrative Review (Review Article)

This narrative review considers the evidence supporting the use of intraoperative quantitative neuromuscular monitoring to identify the presence of residual neuromuscular block in the perioperative setting. Quantitative monitoring technologies include mechanomyography, acceleromyography, and electromyography. There is clinically relevant difference between qualitative (subjective) evaluation of responses to neurostimulation using peripheral nerve stimulator devices and quantitative (objective) monitoring of neuromuscular function by real-time measurement of the train-of-four ratio. The accepted threshold for defining postoperative residual neuromuscular block is a train-of-four ratio of less than 0.9. Quantitative monitoring can decrease the risk of adverse postoperative events associated with incomplete neuromuscular recovery, including hypoxemic events, episodes of airway obstruction, unplanned reintubation, and other pulmonary complications. Most studies comparing quantitative monitoring to either no monitoring or qualitative monitoring used neostigmine to reverse neuromuscular block. The risk of incomplete neuromuscular recovery after surgery was less when sugammadex was used to reverse neuromuscular block. *(Summary: M. J. Avram. Image: A. Johnson, Vivo Visuals Studio.)*



362 Molecular Changes in the Dorsal Root Ganglion during the Late Phase of Peripheral Nerve Injury–induced Pain in Rodents: A Systematic Review (Review Article)

The dorsal root ganglion contains cell bodies of primary sensory neurons and transmits sensory information from the periphery toward the central nervous system. Molecular and cellular changes in the dorsal root ganglion in chronic pain conditions induce upstream and downstream effects on the spinal dorsal horn and injury site *via* its central and peripheral projections. This systematic review sought to identify quantitative molecular changes that occur in the dorsal root ganglion of rodents starting 3 weeks after peripheral nerve injury–induced pain. The main classes of molecules found to be quantitatively changed include neuropeptides, sodium channels, potassium channels, transient receptor potential channels, and immune-related molecules. The neuropeptides galanin and neuropeptide Y were consistently upregulated at both the gene and the protein level, which might have relevance for treatment of chronic pain conditions at the level of the dorsal root ganglion. However, evidence supporting causal links of the identified molecules with chronic pain was not always clear, making it difficult to select specific molecules as a focus for treatment. *(Summary: M. J. Avram. Image: From original article.)*