Articles of Interest

Section Editor: Rick G. Smith, BS, CCP

CARDIAC ANESTHESIA

Regulation of perfusion pressure during cardiopulmonary bypass using sevoflurane.

Compared to other vasodilators, sevoflurane safely regulated systemic vascular resistance during hypothermic cardiopulmonary bypass (CPB).

Anesthetic concentrations of propofol protect against oxidative stress in primary astrocyte cultures—Comparison with hypothermia.

Propofol as a continuous infusion during cardiopulmonary bypass does not affect changes in serum free fatty acids.

BIOCOMPATIBILITY

Neurological and general outcome in low-risk coronary artery bypass patients using heparin coated circuits.

Comparison of two heparin-coated extracorporeal circuits with reduced systemic anticoagulation in routine coronary artery bypass operations.

Safety and efficacy of heparin-bonded surfaces in cardiopulmonary bypass.

Cardiopulmonary bypass with heparin-coated perfusion circuits and reduced anticoagulation is a safe and effective method to improve clinical results in cardiac surgery. Svenmarker and colleagues randomized three hundred coronary artery bypass patients into three groups: Carmeda Bioactive Surface, Baxter Duraflo II and a control group. Outcomes were evaluated using clinical indicators while brain injury was studied using S100 release and memory tests. Blood loss (Duraflo only), transfusion requirements and postoperative creatinine elevation were lower in the heparin-coated groups. No difference in clinical outcomes was noted between the three groups. Heparin-coated groups showed no advantage in S100 release or neurological impairment. In a similar paper, Ovrum et al randomized over 1300 patients in either Carmeda or Duraflo groups. Similar findings were noted as both groups showed no appreciable difference in clinical outcomes between the different coatings. Finally, Dr. von Segesser provides a good historical overview of surface coatings and efforts to prevent thromboembolism of the perfusion circuit.

Heparin antibodies and thromboembolism in heparin-coated and noncoated ventricular assist devices.

CARDIOPULMONARY SUPPORT

Cardiopulmonary bypass support for emergency cesarean delivery in a patient with severe pulmonary hypertension.

Long-term mild hypothermia with extracorporeal lung and heart assist improves survival from prolonged cardiac arrest in dogs.

CEREBRAL PROTECTION

Jugular bulb oximetry during cardiac surgery [Review].

Cerebral injury may develop during cardiopulmonary bypass (CPB) due to a mismatch of cerebral oxygen demand and supply. Jugular bulb oximetry during cardiopulmonary bypass highlights the potential dangers of hypotension (MAP<60 mm Hg) and hypocapnia during the warming phase of CPB. While hypothermia seemed to protect the brain, rapid rewarming with blood temperatures exceeding 37 degrees centigrade impaired cerebral oxygenation. Monitoring of SvO2 is a poor indicator of SjO2.

135
Effects of reduced pulse pressure on the cerebral metabolism during prolonged, nonpulsatile left heart bypass.

Coronary artery bypass performed without the use of cardiopulmonary bypass is associated with reduced cerebral microemboli and improved clinical results.

Is off-pump cardiac surgery better for the brain?

In an invited editorial to the paper from Bowles and associates, Drs. Wan and Yim champion the notion of not excluding CPB and the long-standing history of excellent results, but of reducing or eliminating the deleterious effects of CPB.

Intracranial cerebral artery disease as a risk factor for central nervous system complications of coronary artery bypass graft surgery.

Longitudinal assessment of neurocognitive function after coronary-artery bypass surgery.

This article, recently quoted in the public media, demonstrates the impairment in neurocognitive function in patients undergoing cardiac surgery with cardiopulmonary bypass. In their study, the authors showed marked deterioration immediately after surgery followed by gradual recovery. However, at five years follow-up, the authors point to a significant regression in neurocognitive scores. In the accompanying editorial, Drs. Selnes and McKhann from Johns Hopkins University note that in this study a control group was not used and that many elderly patients may experience further cognitive decline due to aging. Cognitive declines among the elderly after non-cardiac surgery are similar to the results seen by Newman et al.

Does off-pump coronary artery bypass surgery reduce the risk of brain injury?

Hypoperfusion, the systemic inflammatory response and embolism are incriminating factors in neuropsychological deficits following cardiopulmonary bypass procedures. Microemboli resulting from reinfused cardiomyocyte blood during CPB are implicated as a risk factor. However, literature reviews show no clear advantage in preventing brain injury when CPB is avoided. Dr. Stump suggests that other factors (patient selection, number of coronary anastomoses, aortic manipulation, etc.) may explain the differences in clinical outcomes.

Platelet Pl(A2) polymorphism enhances risk of neurocognitive decline after cardiopulmonary bypass.

Is there a relationship between cognitive dysfunction and systemic inflammatory response after cardiopulmonary bypass?

Clinical implication of orbital ultrasound monitoring during selective cerebral perfusion.

Perioperative neuropsychologic testing.

The use of neurocognitive tests in evaluating the outcome of cardiac surgery: Some methodologic considerations.


Developmental and neurologic effects of alpha-stat versus pH-stat strategies for deep hypothermic cardiopulmonary bypass in infants.

Comparison of neurologic outcome after deep hypothermic circulatory arrest with alpha-stat and pH-stat cardiopulmonary bypass in newborn pigs.

The assessment of postoperative cognitive function [Review].

HEMATOLOGY

On-site coagulation monitoring does not affect hemostatic outcome after cardiac surgery.

An algorithm with on-site hemostasis monitoring, (aPPT, PT, bleeding time, ACT; no measurement of platelet function) showed no difference in total chest tube drainage and transfusion requirements compared...
to clinical judgement in the treatment of postoperative bleeding. Adherence to unrealistic transfusion triggers and acceptance of misleading laboratory data increases the possibility of inappropriate clinical interventions. Newer technology may prove more beneficial and cost-effective.*


Heparin-induced thrombocytopenia: Pathogenesis, management, and prevention.

Heparin-induced thrombocytopenia (HIT) is an increasingly common and dangerous consequence of heparin administration. An overview of the clinical picture and treatment of HIT is presented along with discussion of the thrombin inhibitors lepirudin and argatroban. Danaparoid sodium, while not licensed for the treatment of HIT, has been used successfully as well.

Cardiac surgery with cardiopulmonary bypass in patients with type II heparin-induced thrombocytopenia.

Anticoagulation during cardiopulmonary bypass in patients with heparin-induced thrombocytopenia type II and renal impairment using heparin and the platelet glycoprotein IIb-IIIa antagonist tirofiban.

The use of lepirudin for anticoagulation in patients with heparin-induced thrombocytopenia during major vascular surgery.

Another point of view on the mechanism of thrombin generation during cardiopulmonary bypass: Role of tissue factor pathway inhibitor.

Platelet glass bead retention predicts bleeding after cardiac surgery.

The influence of intravascular volume therapy with a new hydroxyethyl starch preparation [6% HES 130/0.4] on coagulation in patients undergoing major abdominal surgery.


PATHOPHYSIOLOGY

Capillary leak syndrome in children who undergo cardiopulmonary bypass: clinical outcome in comparison with complement activation and C1 inhibitor.

To pump or not to pump – Introduction.

The systemic inflammatory response syndrome and off-pump cardiac surgery.

Aprotinin and the systemic inflammatory response after cardiopulmonary bypass [Review].

High-dose aprotinin reduces the clinical consequences of the systemic inflammatory response and blood loss and transfusion requirements as a result of cardiopulmonary bypass.

Effect of aprotinin (Trasylol) on the inflammatory and thrombotic complications of conventional cardiopulmonary bypass surgery.

Ultra-low dose aprotinin decreases transfusion requirements and is cost effective in coronary operations.

Ventilation, cardiopulmonary bypass, and acute respiratory distress syndrome: Are the lungs the problem?

Hypothermic cardiopulmonary bypass alters oxygen/glucose uptake in the pediatric brain.
Quantitative assessment of a circulating depolarizing factor in shock.

Hierarchy of regional oxygen delivery during cardiopulmonary bypass.

PERFUSION TECHNIQUE
Pressure-adjusted antegrade brain perfusion for surgery of the aortic aneurysm.

Effects of combined conventional and modified ultrafiltration in adult patients.

Combined ultrafiltration (UF) and modified ultrafiltration (MUF) is beneficial in high-risk adult patients by improving hemodynamics, hemostatic and pulmonary functions.

Transesophageal echocardiographic imaging of a new aortic cannula for differential perfusion during cardiopulmonary bypass.

Left hemispheric strokes in coronary surgery: Implications for end-hole aortic cannulas.

These two papers by Rehfeldt and Weinstein demonstrate the dangers of high velocity blood flow in the proximal aorta and its role in perioperative stroke. Rehfeldt describes a triple-lumen, balloon-tipped endovascular aortic cannula (Cardeon Neural Pulmonary Bypass System ™) Cardeon Inc. Cupertino, CA. The proximal lumen perfuses the arch vessels while the distal lumen delivers blood to the distal aorta. He also illustrates the benefits and advantages of TEE for the proper cannula placement, occlusion volume of the balloon and detection of atheromatous matter in aorta. Weinstein reports his clinical experience and warns of the relationship between end-hole aortic cannulas and post-bypass stroke.

Safety and efficacy of a heparin removal device: A prospective randomized preclinical outcomes study.

Thoracoabdominal aortic repair in a 190-kg patient: Optimized perfusion with two oxygenators.

Simplified retrograde systemic perfusion for removal of air from the aorta in an infant.

Investigation on the ability of an ultrasound bubble detector to deliver size measurements of gaseous bubbles in fluid lines by using a glass bead model.

Thoracic and thoracoabdominal aneurysm repair under deep hypothermia using subclavian arterial perfusion.

Comparison of three commercially available hollow fiber oxygenators: Gas transfer performance and biocompatibility.

Pro: Aprotinin should be used in patients undergoing hypothermic circulatory arrest.

TRANSPLANTATION
Endoluminal laser-Doppler measurements of jejunal perfusion in patients undergoing liver transplantation.

ABO-incompatible heart transplantation in infants.

Reduced need for vasopressors in patients receiving aprotinin during orthotopic liver transplantation.