◇ This Month in

ANESTHESIOLOGY

■ Can Transesophageal Echocardiography Accurately Diagnose Traumatic Aortic Injury? Goarin *et al.* (page 1373)

Survival of patients who sustain traumatic aortic injury as a result of blunt trauma (from motor vehicle or falling accidents) depends on early and accurate diagnosis. Goarin *et al.* evaluated the effectiveness of transesophageal echocardiography (TEE) to diagnose traumatic aortic injury in a large population of blunt trauma patients.

During the 9-yr study period, 209 of the 1,890 patients admitted to the center met the study inclusion criteria of enlargement of the mediastinum, sudden deceleration, or both. For 142 patients, the cause of trauma was a motor vehicle accident; for 69, a fall caused the trauma. One patient of the 209 underwent emergency aortic surgery and died. The team performed TEE and angiography in the remaining 208 patients and diagnosed traumatic aortic injury in 42 (20%).

Angiography (aortography or contrast-enhanced computed tomography) was less accurate than TEE in diagnosing aortic injury because it could not be used to diagnose most of the minor injuries, such as intramural hematoma or limited intimal flap. However, when considering only patients with major aortic injury who might need surgery, TEE and angiography were equivalent. Although the investigators were not blinded to the diagnostic method, and some variations in technique occurred during the study, TEE distinguished major from minor aortic injury, thus aiding in decision making regarding indications for emergency or delayed surgery.

■ Extent of Ischemia in Skeletal Muscle Compared during Circulatory Occlusion and Exsanguination Korth *et al.* (page 1407)

In 18 patients scheduled to undergo elective surgery of the lower limb, Korth *et al.* obtained permission to insert microdialysis probes into both quadriceps femoris muscles to quantify the extent of ischemia produced by use of a tourniquet. The probes on the side of surgery were placed midline 2 cm below the tourniquet, and the probes on the opposite leg served as controls. The probes were perfused at a rate of 2 μl/min with sterile Ringer's solution. Samples were collected on ice at 15-min intervals and stored for later analysis. Blood samples were obtained from the femoral vein before ischemia and at 2, 60, and 120 min after deflation of the tourniquet.

The patients were assigned to one of two groups. One group underwent surgery under circulatory occlusion, with the leg elevated for a few minutes followed by tourniquet inflation to a pressure of 380 mmHg to surpass arterial blood pressure. In the second group, the leg was elevated and exsanguination was accomplished with use of an elastic Esmarch bandage wrapped around the ankle and rolled toward the body, followed by tourniquet inflation to 380 mmHg and removal of the bandage.

At a flow rate of 2 μl/min, average baseline concentrations in the dialysate were 2.5 mM for glucose, 1.7 mM for lactate, 5.2 μM for choline, and 14.3 μM for hypoxanthine. Within 30 min of circulatory occlusion by tourniquet, extracellular glucose concentrations decreased 40%. At the same time, interstitial levels of lactate and hypoxanthine increased in linear fashion to 206% and 241% of baseline levels, respectively. These indicators of tissue ischemia change were even more increased after exsanguination—to 268% of baseline for lactate and to 286% of baseline for hypoxanthine. The authors conclude that circulatory occlusion is less demanding on muscle tissue than is exsanguination.

■ Intrapulmonary Instillation of Perfluorocarbon in Experimental Acute Lung Injury Max *et al.* (page 1437)

Max *et al.* used an experimental model to induce acute lung injury in 20 pigs to study the effects of partial liquid ventilation (PLV) with perfluorocarbon on the distribution of pulmonary blood flow. Gas exchange and hemodynamic and pulmonary blood flow were assessed in all animals before and after induction of acute lung injury with use of a saline lavage. Then, the animals were assigned randomly to one of two groups: a group of 10 who were submitted to PLV by administering 15 ml/kg of perfluorocarbon through the endotracheal tube at 1 and 2 h after injury, and a group of 10 in whom controlled mechanical ventilation was continued with no changes in respirator settings. Measurements were performed 1 and 2 h after injury in the latter group, as well. At specific points in the study protocol, researchers also injected radioactive-labeled macroaggregates of human serum albumin to enable measurement of pulmonary blood flow using single photon emission computed tomography. With use of specialized software, they generated 12 lung segments (four transaxial slices consisting of ventral, middle and dorsal segments) for each animal to be examined for distribution of blood flow. Arterial

carbon dioxide tension increased from 32 ± 4 to 57 ± 13 mmHg after acute lung injury was induced, but, after the initial changes, arterial carbon dioxide tension and pH remained constant in groups 1 and 2. When all 20 pigs, either in gaseous ventilation or in PLV groups, were analyzed together, acute lung injury was shown to cause an increase of pulmonary blood flow to the ventral segment of slice 2 and to the middle segments of slices 1 and 2. Blood flow increased in the combined middle segments but decreased in the dorsal ones. Neither PLV nor gaseous ventilation resulted in a redistribution of blood flow to any of the 12 segments when values at 1 and 2 h after injury were compared with those measured immediately after acute lung injury. In a third group of five pigs, the attenuation control group, a similar number of lung lavages (11 ± 2) were needed to induce acute lung injury with an arterial oxygen tension of 52 ± 14 mmHg. Arterial oxygenation improved significantly after PLV with perfluororcarbon, which may be caused by an improvement in ventilation/perfusion ratios.

■ Addressing Clinical Productivity in Academic Anesthesiology Departments Abouleish *et al.* (page 1509)

For private-practice and academic anesthesiologists alike, the ability to measure productivity has become increasingly important in individual compensation and in justification of budgets and staffing levels. However, the practice and billing of anesthesia services complicate the ability to quantify individual productivity, especially at teaching hospitals, where anesthesia is often administered in a team model (concurrency) and where clinicians may be obligated to staff all clinical settings, despite daily or weekly variations in workload.

Accordingly, Abouleish *et al.* compared various measures of individual productivity to define the methods best suited to academic anesthesiology. The team collected and analyzed all billing and scheduling data for clinical activities of faculty members of the anesthesiology department at their university medical center for the 1998 fiscal year. Unless they spent less than 20% of their time providing clinical care, all clinical sites and all clinical faculty anesthesiologists were included in the analysis. Thirty-five faculty anesthesiologists were identified, but nine were excluded from all of the measurements because their clinical full-time equivalent was less than 0.2. Except for one member, all of the excluded faculty were new faculty who had joined the department in July during the fiscal year.

The team examined several methods of measuring individual productivity, including normalized clinical days per year, time units per operating room (OR) day worked, normalized time units per year, total American Society of Anesthesiologists (ASA) units per OR day, and normalized total ASA units per year. Means and medians were reported for each measurement, and different groups of outliers were identified. Each of the measurements valued certain types of productivity more than others. For example, normalized clinical days per year identified faculty who worked more than their clinical full-time equivalent predicted. Time units per OR day and total ASA units per OR day identified apparently low-productivity faculty as those who worked a large portion of their time in obstetric anesthesia or in the ambulatory surgicenter. Total ASA units per OR day identified specialized anesthesiologists (cardiac anesthesia) as apparently high-productivity faculty. The authors determined that, in their department, normalized clinical days per year is the most useful measure of individual productivity because it measures individual anesthesiologists' contributions to daily staffing, includes all clinical sites, is independent of nonanesthesia factors, and is easy to collect and determine.

Gretchen Henke