◇ This Month in

ANESTHESIOLOGY

■ Video-Assisted Instruction of Tracheal Intubation. Shulman *et al.* (page 615)

Shulman *et al.* recruited anesthesia providers (certified registered nurse anesthetists and anesthesiologists) to test a video system designed for training with the Bullard laryngoscope (BL). Thirty-six providers who had performed fewer than three Bullard laryngoscopies in the past 5 years were enrolled.

Before beginning the study, participants watched a video of the Bullard laryngoscopy procedure, and witnessed a minimum of three BL intubations. They were then randomized into two groups: those who would receive BL training with a video system, and those who would receive the traditional instruction method of directly looking through the laryngoscope eyepiece. The video system allowed a supervising anesthesiologist to monitor and guide the participant's progress. Each participant performed 15 intubations during the "training" period and an additional 15 post-training intubations. Study authors recorded the time from initiation of intubation to successful laryngoscopic view and successful intubation for each event. Failure at intubation was defined as four tube advancements without passing the tube successfully into the trachea.

There were a total of 459 intubations in the video-trained group (207 male patients and 252 female patients) and 579 in the non–video-trained group (238 male and 341 female patients). Several trainees left their departments prior to completing all 30 study intubations, accounting for fewer than the initial 600 intubations planned for each study group. The success rate of intubations was 92% for the video-instructed group and 85% for the non-video group. Individual mean intubation times varied considerably for study participants, ranging from 45 s to 128 s. The study authors found that time to laryngoscopy view and intubation times were longer in the non-video group during the training period, but that this difference disappeared when all intubations were considered in the aggregate.

While the video system allows instructors to give direct feedback to trainees and decreases time for laryngoscopic view during the initial learning period, this advantage diminishes as providers acquire more experience with the BL. No difference between the different instruction groups was discernible during the latter half of the study period.

■ Do Upper Respiratory Infections Warrant Cancellation of Pediatric Cardiac Surgery? Malviya *et al.* (page 628)

In a study population of 713 children scheduled for elective cardiac surgery, Malviya *et al.* tracked peri- and postoperative complications of children presenting with and without upper respiratory infections (URIs) before surgery. A diagnosis of URI required the presence of at least two symptoms, such as rhinorrhea, sore or scratchy throat, sneezing, nasal congestion, malaise, or cough or fever, in tandem with a parent's confirmation of the infection. Children's ages ranged from 1 month to 16 years, and the procedures were nonemergent open heart surgeries conducted over a 4-year period.

Study authors documented the duration of anesthesia and surgery, as well as aortic cross-clamp, circulatory arrest, and cardiopulmonary bypass times. Anesthesia management varied according to patient status and the attending faculty anesthesiologist. Any respiratory complications during the perioperative period, such as laryngospasm, bronchospasm, breath holding for more than 15 s, and persistent cough, were identified by the anesthesiologist. Patients were also followed during time spent in the intensive care unit (ICU) and in the hospital until time of discharge. All postoperative complications were recorded on a daily basis.

Children with URIs before surgery had a higher incidence of respiratory and multiple postoperative complications, including bacterial infections, compared to those without URIs. Those with URIs also stayed in the ICU for a longer time. However, these complications and longer ICU stays had no long-term sequelae, and overall length of hospital stay was not significantly different between groups. The authors concluded that, given the seriousness of underlying heart disease, children with URIs scheduled for cardiac surgery should be evaluated on a case-by-case basis when deciding whether to proceed with surgery.

■ Effects of Isoflurane and Mechanical Ventilation on Fluid Dynamics Compared in Sheep. Connolly *et al.* (page 670)

Building on a prior study, Connolly *et al.* designed a multi-step protocol to investigate the separate effects of isoflurane anesthesia and mechanical ventilation on the distribution of intravenous fluid boluses in sheep. Seven

female merino sheep received splenectomies, at which time indwelling arterial and venous catheters were also inserted. A 5–7 day recovery period was allowed.

Then, each sheep was given a 25 ml/kg 20-min bolus of 0.9% saline under four different protocols separated by at least 24 h. The boluses were given while the animals were conscious and spontaneously breathing (CSV); while conscious and mechanically ventilated (CMV); while isoflurane-anesthetized and spontaneously ventilated (ISOSV); and while isoflurane-anesthetized and mechanically ventilated (ISOMV). Hemodynamic variables, temperature, and urinary output were measured during a 2-h prestudy period and then at regular intervals before and after administration of the saline bolus. Protocols were conducted in random order except for CMV, which the investigators scheduled as the last procedure for every animal, because it required a tracheotomy.

The team determined that the initial plasma volume expansion was similar between protocols, based on indicator dilution and mass balance calculations. At 180 min post-bolus, mean urinary output was comparable in the CSV and CMV protocols (15.6 +/− 2.1 and 15.9 +/− 2.9 ml/kg, respectively), but much lower in the ISOSV and ISOMV protocols (2.7 +/− 0.6 and 3.1 +/− 1.1 ml/kg, respectively). Conversely, the increase in estimated extracellular volume, most likely interstitial fluid volume, was much greater in the two isoflurane groups (an increase of ~22 ml/kg in both the ISOSV and ISOMV groups, *vs.* approximately 8.5 ml/kg in the two conscious groups). The physiologic mechanism by which isoflurane decreases urinary excretion and simultaneously increases extracellular fluid volume is not fully understood. In addition, relevance of these findings for humans remains to be confirmed.

■ Xenon's Role as a Neuroprotective Agent In Cardiopulmonary Bypass Explored in Rats. Ma *et al.* (page 690)

To explore the possible clinical use of xenon as a neuroprotectant during cardiopulmonary bypass (CPB), Ma *et al.* compared xenon at subanesthetic concentrations with another *N*-methyl-D-aspartate (NMDA) antagonist during CPB in a rat model. The animals were randomized to one of four groups, with approximately 12 to 13 rats/group. In the SHAM group, rats were cannulated but did not undergo CPB. In the CPB group, rats were subjected to 60 min of nonpulsatile CPB, with the oxygenator receiving a gas mixture of 30% O_2, 65% N_2, and 5% CO_2. In the third group, rats received MK801 (0.15 mg/kg, intravenously) 15 min before a 60-min–duration CPB procedure. Finally, rats in the fourth group received a gas mixture during CPB of 60% xenon, with the balance being comprised of 30% O_2, 5% N_2, and 5% CO_2.

Rats underwent functional neurologic testing (comprised of prehensile traction, strength, and balance beam performance assays) on the first, third, and twelfth postoperative days. Neurocognitive outcome was evaluated daily beginning on the third day after surgery. This consisted of placing the rat in the Morris water maze, a 1.5-m–diameter deep pool of water with a platform submerged 1 cm below the surface in one quadrant. Time to locate the submerged platform was measured as a test for impairment in visual-spatial learning and memory components of neurocognition. After the final day of testing, all animals were killed and their brains removed for histologic examination.

On postoperative days 1 and 3, rats in the SHAM and CPB + xenon groups had significantly better neurologic outcomes compared with rats in the CPB and CPB + MK801 groups. On postoperative days 3 and 4, the SHAM, MK801, and xenon group rats showed better neurocognitive outcomes than those in the CPB-alone group. By the twelfth day, neurocognitive outcomes remained significantly better in the CPB + xenon group compared with the CPB-alone group. The authors did not find any histologic evidence of differences in the degree of neuronal injury (*e.g.*, number of dead neurons in various regions of the hippocampus), which might correspond to neurocognitive and neurologic difference. This limits the conclusions that can be drawn from their results. In addition, sternotomy was not used during the CPB procedure, and the SHAM operated group did not receive donor rat blood, two elements that may contribute to neurologic injury during cardiac surgery. Nevertheless, xenon did act as a neuroprotectant in the rats receiving it, and they exhibited no neurotoxic effects as a result. Clinical trials will proceed to investigate whether neurocognitive deficits after cardiac surgery can be prevented by administering xenon during the peri-CPB period.

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