

## CORRESPONDENCE

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## Venous Gas Embolism from an Argon Coagulator

**To the Editor:**—We report a near-fatal perioperative incident recently experienced in our institution. The patient was a 21-month, 10-kg girl who had received a living-related liver transplant 2 months earlier. She was scheduled for laparotomy to biopsy two hepatic nodules suspected to be of lymphoproliferative origin. Nasotracheal intubation was performed after mask induction with sevoflurane; a double-lumen central venous catheter was inserted using the right subclavian approach and its tip was positioned under fluoroscopic control at the junction of the right atrium and the superior vena cava. Anesthesia was maintained with isoflurane, nitrous oxide, sufentanil, and atracurium.

The first hepatic nodule was resected easily, but the second was difficult to excise, so only biopsies were performed with a Hepafix needle (Braun, Germany).

To control the local bleeding that followed, the surgeon used an Argon beam coagulator (Bircher; gas flow 60 SL PM). This was followed by a sudden disappearance of the capnogram, followed by bradycardia, hemoglobin desaturation, and, finally, cardiac arrest. The administration of isoflurane and nitrous oxide were discontinued, ventilation was controlled with 100% oxygen, the patient was placed in Durant's position, and external cardiac massage was started. Aspiration through the central venous catheter yielded  $\pm 10$  ml gas, which confirmed the suspected diagnosis of venous gas embolism. Epinephrine ( $3 \times 50 \mu\text{g}$ ), 50 ml colloid, and 0.5 mg atropine were administered before a cardiac rhythm reappeared. Total duration of resuscitation was approximately 5 min. An arterial catheter was placed, and blood gas analysis showed mixed acidosis, with hypercapnia and lactic acidosis (maximal level observed: 5.6 mM).

The rest of the operation proceeded uneventfully. The patient was transferred to the pediatric intensive care unit for postoperative

treatment, where there was evidence of posthypoxic cerebral sequelae. We hypothesize that argon was injected under pressure in hepatic vein(s) opened by the liver biopsies.

This case report shows the possible risk of a gas embolism associated with the use of argon enhanced coagulation. Argon enhanced coagulation (AEC) is a method of operative coagulation of tissues that uses a jet of argon gas encompassing an electrofulguration arc. To our knowledge, this is the first time this problem is reported outside the setting of laparoscopic surgery.<sup>1-3</sup> As shown previously in animal experimental studies, the following are recommended<sup>4</sup>:

1. anesthesiologists should be aware of the potential for venous gas embolism when AEC is in use;
2. surgeons who use AEC should select an argon flow rate as low as feasible to clear a bleeding tissue surface of blood and debris;
3. as in any situation at risk for venous gas embolism, it is probably safer to avoid using  $\text{N}_2\text{O}$  when extensive use of AEC is planned.

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## A Useful Maneuver when Intravenous Access is Difficult

*To the Editor:*—It is not uncommon for intravenous access to be difficult because a patient has severe vasoconstriction or a poor superficial venous system. Sometimes, application of a warm compress over the patient's hand will dilate the veins sufficiently. The following is another technique that may assist in cannulating peripheral veins, without resorting to a central venous route. If a patient arrives in the operating room with a 25G needle in place, use it. If not, try inserting a 22G or a 25G needle anywhere you can find a vein. After ensuring the intravenous line is functioning, apply a venous tourniquet to the

upper arm and infuse 50-100 ml of intravenous solution with a 10 ml syringe. One will be pleasantly surprised to find the patient's veins unexpectedly accessible.

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## Infectious Complications after Epidural Anesthesia

*To the Editor:*—A recent case report by Pinczower and Gyorke<sup>1</sup> addressed a clinically important but rarely reported subject—an infectious complication of epidural anesthesia and analgesia. Because of clustering and pure chance, prospective studies on epidural anesthesia were not large enough to detect rare events such as epidural abscess or vertebral osteomyelitis.<sup>2</sup> A recent, large, retrospective study that analyzed 288,000 epidural catheterizations suffers from potential misclassification bias and other restrictions linked to retrospective analysis by a questionnaire.<sup>3</sup> In addition, symptoms of infectious complications related to an epidural catheter may present so late that they are not traced back to the previous epidural catheter. Recognizing catheter-related infections such as epidural abscess<sup>4</sup> or vertebral osteomyelitis<sup>1</sup> is important, because they can result in permanent neurologic damage. The need for an increased level of awareness of catheter-related osteomyelitis is stressed by two previous case reports of this complication and by a time delay of 8 and 15 weeks between onset of symptoms and definite diagnosis in these patients.<sup>5,6</sup> The question of whether the epidural catheter only serves as a nidus for hematogenous spread or as a primary entrance port of

infection can rarely be answered in the individual case and has no influence on course and treatment of this complication. However, it is interesting that the patient reported by Pinczower and Gyorke and one of the previously reported patients<sup>6</sup> were both diagnosed with vertebral osteomyelitis secondary to *Pseudomonas aeruginosa*, whereas the most common organism in epidural catheter-related infections is *Staphylococcus aureus*.<sup>7</sup> An important aspect is that all three patients with catheter-related osteomyelitis were immunocompromised. Pinczower and Gyorke's patient received systemic methylprednisolone therapy and, of the previously reported patients, one received triamcinolone and betamethasone epidurally, in addition to suffering from diabetes mellitus,<sup>5</sup> and the other patient was immunocompromised by a history of pancreatitis and high alcohol intake.<sup>6</sup>

It is necessary to increase the index of awareness among physicians for infectious complications of epidural anesthesia and analgesia, and special care should be exercised with epidural catheters in immunocompromised patients.