

ANESTHESIOLOGY

■ Does the Air Test Reliably Detect Intravenous Placement of Multiorifice Epidural Catheters? Leighton *et al.* (page 1617)

Because most studies of epidural test dose effectiveness have evaluated single-orifice catheters, Leighton *et al.* set out to determine the sensitivity and specificity of the air test to reliably detect intravascular placement with the currently used three-hole catheters. In 300 laboring women who requested epidural analgesia, blunt-tip, three-hole 20-gauge epidural catheters were placed at the L2-L3 or L3-L4 interspace. If neither blood nor cerebrospinal fluid (CSF) could be aspirated through the needle, 3 ml lidocaine, 2%, or 0.25% bupivacaine was injected. After a 3-min interval, patients were questioned about changes in lower extremity sensation or motor strength. If these signs of spinal anesthesia were absent, the team performed the air test by injecting 1 ml air through the epidural catheter and listening for maternal heart sound changes 15 s after injecting the air. Tests were repeated if the women experienced contractions during the observation period. If no blood was aspirated and no heart tone changes were heard, the team injected 10 ml bupivacaine, 0.125%, with 50 μ g fentanyl. Epidural analgesia was continued if a sensory band was present 20 min after epidural injection.

Catheters through which blood was initially aspirated were air-tested and then replaced. Patients who had air-test-positive but blood-aspiration-negative catheters received 100 mg lidocaine through the catheter and then were questioned about toxicity symptoms (perioral numbness, tinnitus, and diplopia).

The air test detected 82% of intravascular catheters, whereas aspiration detected 91%; neither test detected all cases of intravascular placement. Eight of 11 intravascular catheters were positive for both the air test and the blood aspiration. In one air-test-positive catheter, blood could not be aspirated, and the patient developed perioral numbness after lidocaine injection. In the remaining 288 catheters, bupivacaine-fentanyl injection produced epidural analgesia in 279 patients, but no effect in another 9. The difficulty of testing multiport catheters underscores the need for careful local anesthetic dose fractionation to reduce the risk of large doses in patients

with unrecognized epidurovascular or epidurointra-the-cal catheters.

■ Effects of Low-dose Ketamine and Epidural Morphine on Postsurgical Pain after Gastrectomy. Aida *et al.* (page 1624)

Aida *et al.* randomly assigned patients scheduled for gastrectomy to receive epidural morphine, intravenous low-dose ketamine, or combinations thereof to evaluate patient postsurgical pain. All 121 patients were administered standard general anesthesia. The 30 patients assigned to the epidural morphine group received the opioid as a bolus dose of 0.06 mg/kg 40 min before skin closure, maintained at 0.02 mg \cdot kg⁻¹ \cdot h⁻¹ until closing of the incision. Intravenous ketamine was administered in another group of 29 patients as a bolus dose of 1.0 mg/kg 10 min before closure, maintained at a dose of 0.5 mg \cdot kg⁻¹ \cdot h⁻¹ until close of the incision. A group of 31 patients received a combination of the two drugs and the control group (n = 31) received intravenous and epidural saline. The anesthesiologist was blinded as to which drug solution was administered. Another physician blinded to study drug assessed patients for their postsurgical pain at rest using the visual analog scale (VAS) scores at 6, 12, 24, and 48 after surgery. Twelve hours postsurgery, pain with movement (trying to change position) was also assessed.

Epidural morphine alone administered before incision closure reduced VAS values at 24 and 48 h after surgery, and decreased patient consumption of morphine *via* patient-controlled analgesia pumps at 6 and 12 h postoperatively. Low-dose intravenous ketamine also lowered VAS values at rest and decreased morphine consumption compared with those in the control group. However, patients in the combination group who received epidural morphine and intravenous ketamine showed the lowest VAS values both at rest and with movement, compared with all other groups. The results may suggest that epidural morphine affects the spinal cord segmentally, and intravenous ketamine may block brain stem sensitization *via* the vagus or phrenic nerve during upper abdominal surgery. To effectively provide postsurgical pain relief after upper abdominal surgery, drugs that affect the brain, spinal cord, and peripheral nervous system may be necessary.