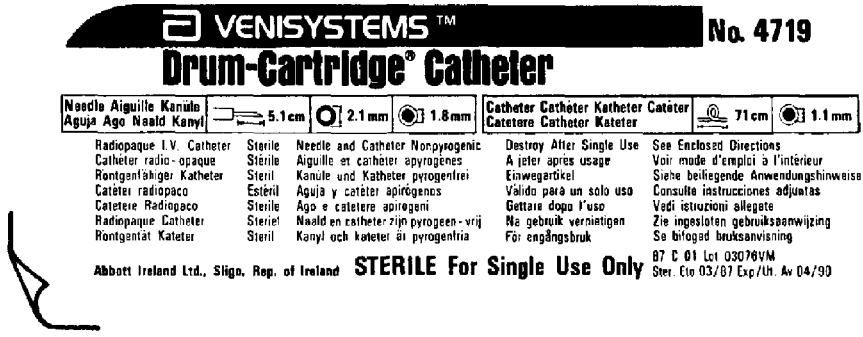

FIGURE Remarquer la dimension du cathéter sur l'emballage, soit 71 cm. / Package with catheter length indicated as 71 cm.

au bout distal de ce cathéter un marqueur pour nous confirmer l'intégrité de celui-ci lors de son retrait.

To the Editor:

We would like to draw your attention to the use of the central venous Drum-Cartridge® Catheter (Abbott Ireland Ltd.). The package of the Drum-Cartridge® Catheter (Figure) includes the following dimension: length 71 cm. We examined ten catheters and found their length to vary from 71 cm to 73 cm. While withdrawing this catheter from the patient, how could one be sure that it is not missing 2 cm, which could become a pulmonary embolus? We propose the addition of a mark at the tip of the catheter to allow confirmation of its integrity after withdrawal.

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Epinephrine test dose is not warranted for confirmation of intravascular migration of epidural catheter in a parturient

To the Editor:

We strongly object to the recommendation by Eldor *et al.*[1] that epinephrine alone be used when testing for the accidental intravenous placement of an epidural catheter. The authors presented the case of a parturient who, two hours following institution of an uneventful epidural block, complained of ringing in the ears when a top-up dose of 5 ml of 0.5 per cent bupivacaine was injected. Administration of another dose of only 2 ml of the anaesthetic elicited the same reaction. However, aspiration of the catheter failed to yield blood and, therefore, three doses of 10 μg of epinephrine were injected to "prove the point." The injection of epinephrine under these circumstances is unwarranted and unsafe, for the following reasons.

First, ringing in the ears subsequent to an injection of local anaesthetic is virtually always diagnostic of entry into the bloodstream. Second, blood is often not obtainable by either aspiration or free flow, as the catheter lumen is small while blood is viscous. Third and most importantly, intravascular administration of even small doses of epinephrine into pregnant sheep and guinea pigs has been shown to reduce uterine blood flow for periods longer than the maternal cardiovascular effects.[2,3] Furthermore, when 3 ml of saline or 15 μg of epinephrine in 3 ml of saline were injected intravenously in a random fashion in 20 unanaesthetized healthy parturients in active labour, "fetal distress" developed in two of the patients who received epinephrine but in none receiving saline; decreased uterine blood flow was suspected as the cause of the temporally related fetal heart rate abnormalities.[4]

Intravenous placement of an epidural catheter can be proven with complete safety for the fetus by comparing the reaction to an injection of saline with that of a local anaesthetic with low cardiotoxic properties.

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REFERENCES

1 *Eldor J, Frankel D, Olshawang D.* Epinephrine test dose for confirmation of intravascular migration of epidural catheter in a parturient. Can J Anaesth 1987; 34: 430.

2 *Hood D, Dewan D, James F.* Maternal and fetal effects of epinephrine in gravid ewes. Anesthesiology 1986; 64: 610–3.

3 *Chestnut D, Weiner C, Martin J et al.* Effect of intravenous epinephrine on uterine artery blood flow velocity in the pregnant guinea pig. Anesthesiology 1986; 65: 633–6.

4 *Leighton B, Norris M, Sosis M et al.* Limitations of epinephrine as a marker of intravascular injection in laboring women. Anesthesiology 1987; 66: 688–91.

REPLY

We would like to thank Drs. Seidman and Marx for their comments.

We agree that "ringing in the ears subsequent to an injection of local anaesthetic is virtually always diagnostic for entry into the bloodstream," even though we would not recommend the intentional use of bupivacaine to prove the intravascular migration of a catheter, as the authors suggest at the end of their letter.

Drucker[1] mentions bupivacaine as a drug that can cause tinnitus. Intravenous lidocaine, in contrast, can temporarily reduce or abolish tinnitus in many patients but can aggravate tinnitus in some and may have no effects on others.[2]

Bowdle et al.[3] gave 30–50 mg of bupivacaine IV to six normal human volunteers, over 10–15 minutes. All subjects experienced mild CNS toxicity consisting of tinnitus, facial tingling, or subtle visual disturbances, associated with peak venous plasma concentrations of 0.81–2.7 $\mu g \cdot ml^{-1}$.

However, in a recent review[4] of obstetric epidural test doses there is no mention of the clinical impression of tingling in the ears as the first sign of inadvertent intravenous injection of bupivacaine through the epidural catheter. Hasselstrom and Mogensen[5] described a patient who developed generalized seizures after infusion of bupivacaine at a rate of 2 $mg \cdot min^{-1}$. The plasma concentration of bupivacaine at the time of the convulsive episode was low (1.1 $\mu g \cdot ml^{-1}$).

With few exceptions (six), as those described above, toxic reactions to bupivacaine do not occur at plasma levels below 4 $\mu g \cdot ml^{-1}$. We agree with Drs. Seidman and Marx that "blood is often not obtainable by either aspiration or free flow as the catheter lumen is small while blood is viscous." Moreover, approximately 70 per cent of the intravascular malpositions of the epidural catheter could not be detected with the aspiration test, using a 2 ml disposable syringe.[7]

We agree that "intravascular administration of even small doses of epinephrine into pregnant sheep and guinea pigs has been proven to reduce uterine blood flow for periods longer than the maternal cardiovascular effects."[8,9]

However, it has been shown that top-up injections into epidural catheters which had initially been properly positioned, can result in intravascular injection.[10–12] Vessel puncture at the time of catheter insertion has been reported in as many as nine per cent of obstetric epidurals.[13]

During the last few years there have been reports of circulatory collapse following overdoses of bupivacaine.[14–16]

Albright also described cases where 2, 3, 4 and 5 ml test doses of 0.75 per cent bupivacaine failed to indicate intravascular injection, sometimes with fatal consequences.[17] He also suggested that epinephrine should be used with the therapeutic dose of bupivacaine in obstetrics.

The epidural test dose is designed to avoid two potentially lethal complications of epidural blockade, namely total spinal block and accidental intravenous injection of local anaesthetic. By using the clinical test of tinnitus after a test dose of bupivacaine 0.5 per cent or the injection of a small dose of epinephrine through the epidural catheter to elicit a transient maternal pulse rise, the injection of a large bolus of the local anaesthetic can be avoided.

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REFERENCES

1 Drucker T. Drugs that can cause tinnitus. Am Tinnitus Assoc Newsletter, 1979; 4: 3–5.

2 *Goodey RJ.* Drugs in the treatment of tinnitus. 1981; Tinnitus, Pitman Books, London (Ciba Foundation Symposium 85), pp. 263–78.

3 *Bowdle TA, Freund PR, Slattery JT.* Propranolol reduces bupivacaine clearance. Anesthesiology 1987; 66: 36–8.

4 *Prince G, McGregor D.* Obstetric epidural test doses. Anaesthesia 1986; 41: 1240–50.

5 *Hasselstrom LJ, Mogensen T.* Toxic reaction of bupivacaine at low plasma concentration. Anesthesiology 1984; 61: 99–100.

6 *Moore DC, Thompson GE, Crawford RD.* Long acting local anesthetic drugs and convulsions with hypoxia and acidosis. Anesthesiology 1982; 56: 230–2.

7 *Beck H, Brassow F, Doehn M et al.* Epidural catheters of the multi-orifice type: dangers and complications. Acta Anaesthesiol Scand, 1986; 30: 549–55.

8 *Hood D, Dewan D, James F.* Maternal and fetal effects of epinephrine in gravid ewes. Anesthesiology 1986; 64: 610–3.

9 *Chestnut D, Weiner C, Martin J et al.* Effect of intravenous epinephrine on uterine artery blood flow velocity in the pregnant guinea pig. Anesthesiology 1986; 65: 533–6.

10 *Ryan DW.* Accidental intravenous injection of bupivacaine: a complication of obstetrical epidural anaesthesia. Br J Anaesth, 1973; 45: 907–8.

11 *Ravindran R, Albrecht W, McKay M.* Apparent intravascular migration of epidural catheter. Anesth Analg 1979; 58: 252–3.

12 *Zebrowski ME, Gutsche BB.* More on intravascular migration of an epidural catheter. Anesth Analg, 1979; 58: 531.

13 *Verniquet AJW.* Vessel puncture with epidural catheters. Experience in obstetric patients. Anaesthesia, 1980; 35: 660–2.

14 *Liu P, Feldman HS, Covino BM, Giasi R, Covino BG.* Acute cardiovascular toxicity of intravenous amide local anesthetics in anesthetized ventilated dogs. Anesth Analg, 1982; 61: 317–22.

15 *Albright GA.* Cardiac arrest following regional anesthesia with etidocaine or bupivacaine. Anesthesiology 1979; 51: 285–7.

16 *Kotelko DM, Shnider SM, Dailey PA et al.* Bupivacaine induced cardiac arrhythmias in sheep. Anesthesiology, 1984; 60: 10–8.
17 *Albright GA.* Epinephrine should be used with the therapeutic dose of bupivacaine in obstetrics. Anesthesiology 1984; 61: 217–8.

Factors influencing the presence of a leak around an endotracheal tube in patients with croup

To the Editor:

The consequences of inappropriate extubation are very serious. We wish, therefore to comment on the survey by Drs. Adderley and Mullins,[1] in which the reliability of the "leak test" as a criterion for elective extubation of children with croup was assessed.

The factors influencing the occurrence of a "leak" around a tracheal tube, previously stated by Finholt *et al.*,[2] are repeated by the authors. They include the amount of positive pressure applied to the tube, the presence of airway narrowing below the tube, the presence of neuromuscular blockade, and head position. However, Finholt *et al.* studied patients requiring tracheal intubation for elective surgical procedures and used the "leak" test to assess tracheal tube fit. They state quite clearly that the test is invalidated if complete muscle paralysis was not present.

We suggest that the factor of overriding importance in determining the presence of an audible leak around a tracheal tube in a patient *with croup* is the size of the tube in relation to the normal tracheal diameter. If, for example, a 24-month-old child, who would normally be intubated with a tracheal tube of internal diameter of 4.5–5.0 mm is intubated with a 3.0 mm tube during an episode of croup, any leak which subsequently occurs will occur at an earlier stage in the recovery process than if the same child had been intubated with a 3.5 mm tube.

The size of the tracheal tube in relation to the normal tracheal diameter must be a factor of major importance in determining when a leak occurs during the recovery phase of a child with croup. Account must be taken of this when the "leak test" is used to assess the timing of elective extubation. On its own, the test cannot be an adequate predictor of the patient's ability to manage without a tracheal tube. The consequences of premature extubation are so serious that we recommend that extubation be performed under inhalational anaesthesia, with facilities for immediate reintubation.

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REFERENCES
1 *Adderley RJ, Mullins GC.* When to extubate the croup patient: the "leak" test. Can J Anaesth 1987; 34: 304–6.
2 *Finholt DA, Henry DB, Raphaely RC.* The "leak test" – a standard method for assessing tracheal tube fit in pediatric patients. Anesthesiology 1984; 61: A450.

REPLY

We have defined our "leak" which we believe is useful for predicting when to extubate a patient with croup, and this is not to be confused with Finholt's "leak" which is defined differently and serves a different purpose, i.e., elective surgical procedures in patients without inflammatory disease of the upper airway. We did refer to Finholt's paper in the discussion but emphasized that their set of criteria, including full paralysis with neuromuscular agents, was really not applicable in the decision to extubate the child with croup.

We have no argument that the tube size used in intubating a child with croup is very important, particularly the dangers encountered with using a tube which might be too large; however, we feel that the tube sizes indicated in Table I of the article in general are appropriate for children with croup.

We cannot agree with the recommendation to extubate under inhalational anaesthesia as a routine. Certainly extubation under anaesthesia is appropriate if extubation is being attempted in the absence of a "leak" and certainly there should be facilities available for immediate re-intubation wherever extubation takes place. These children should be watched carefully in an intensive care setting for at least 24 hours following extubation. However, if extubation is going to fail, the obstruction generally gradually and progressively gets worse over hours. In one of the eight patients in the series who failed extubation, re-intubation was required at greater than 24 hours.

Therefore successful extubation under anaesthesia in the Operating Room is not an adequate predictor of a patient's ability to manage without a tracheal tube.

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