Complication of the transtracheal catheter
Editor,—We report an unusual complication of a transtracheal catheter used to ventilate the lungs of a patient undergoing fibreoptic intubation.

A 53-yr-old male presented for resection of a carcinoma of the floor of the mouth and reconstruction using a free myocutaneous radial forearm flap. Airway examination revealed limited mouth opening of 1–2 cm but good extension of the neck at the atlantoaxial joint. Nasal fibreoptic intubation was planned with the aid of cricothyrotomy and tracheal jet ventilation to oxygenate the patient’s lungs. Following sedation with propofol, 1% lidocaine (lignocaine) was injected first into the skin and then another 2 ml into the trachea through a cricothyroid membrane puncture using a 23-gauge needle.

A 14-gauge transtracheal catheter (VBM-Germany) was inserted in one manoeuvre through the cricothyroid membrane and the introducer withdrawn. Placement in the trachea was confirmed by aspiration of air into a saline-filled syringe, capnography and a small jet of oxygen delivered from a high pressure Sanders injector, which caused the patient to cough. Anaesthesia was induced with propofol and fentanyl, and neuromuscular block was achieved with vecuronium. Commencement of assisted ventilation using the injector caused immediate swelling with crepitus around the catheter site, extending down the anterior aspect of the patient’s neck. The catheter was removed immediately, ventilation via a face mask was confirmed and fibreoptic intubation performed with oxygen insufflation and apnoea. No complications appeared as a result of surgical emphysema, and the operative procedure, including a modified radical supraomohyoid neck dissection, was uneventful.

Subsequent inspection of the catheter demonstrated laceration at the junction of the catheter sheath and hub (fig. 1). This had allowed oxygen to be forced into the paratracheal tissues despite correct placement of the catheter tip into the tracheal lumen. The mechanism by which this hole was made is unknown. It may have occurred at manufacture, although neither the manufacturer nor the suppliers of this transtracheal catheter have received a similar report. The introducer needle has a preformed curve and a 30° bevel tip. Although at no time was the needle reintroduced into the catheter, it is more likely that this perforation occurred at placement. It is possible that when withdrawing the needle any rotation within the plastic catheter could result in a similar cut, although we have found this difficult to reproduce in vivo.

We have found that elective use of a transtracheal catheter to aid fibreoptic intubation is highly acceptable. It is of value in patients who will not tolerate topical or awake nasotracheal intubation, particularly young children, the mentally handicapped and patients for whom communication is difficult.

Increasingly, at this hospital it is the preferred technique for all patients with a difficult airway requiring intubation, provided that they have reasonable neck extension and a palpable cricothyroid membrane. By leaving the catheter in position after operation, there is an immediately available means of ventilation should airway difficulty occur after extubation. It has a low morbidity that appears primarily related to tissue emphysema through displacement of the catheter. However, barotrauma with resultant pneumothorax has been reported, as has oesophageal puncture, bleeding and haemoptysis. Whatever the mechanism of action that caused the perforation, this complication could have had serious consequences. This case highlights the need for constant vigilance when using an oxygen injector via a transtracheal catheter for intermittent positive pressure ventilation of the lungs.

W. Ames
P. Venn

Blood transfusion for Caesarean section
Editor,—We read with interest the article by Rainaldi and colleagues1 describing the use of blood salvage during Caesarean section. We were surprised that 23.5% of women in the control group required blood transfusion after operation. As a result, we conducted a survey into the use of blood products in maternity patients in our hospital. During 1997, 642 Caesarean sections were performed, of which 32 (4.98%) received blood transfusions required blood transfusion after operation. As a result, we conducted a survey into the use of blood products in maternity patients in our hospital. During 1997, 642 Caesarean sections were performed, of which 32 (4.98%) received blood transfusions in the period between the day of operation and day of discharge. Table 1 shows the indication and timing of transfusion in our patients.

This major difference in transfusion rate between our patients and those in the study is surprising. Unfortunately, no details are provided on the indications for administration of blood, estimated...
operative blood loss or the use of oxytocic agents. Further, there appears to be a greater proportion of patients with conditions normally associated with increased intraoperative blood loss in the group that underwent blood salvage (table 2).

Although these patients would be at a greater risk of postoperative anaemia, it could equally be argued that excessive intraoperative bleeding would contribute to the volume of blood successfully salvaged. However, even with the increased risk of intraoperative haemorrhage, the average volume of red blood cells salvaged was equivalent to only 1.5 U. of packed cells. We have to assume that all of the salvaged blood was reinfused.

We feel that the high transfusion rate in the control group can be explained in two ways. Either patients experienced a greater operative blood loss or the authors transfused patients who were only mildly anaemic. Although the technique of blood salvage during Caesarean section may be safe, we would conclude that it would be of most benefit to patients with placental abruption or placenta accreta, when large volumes of blood could be salvaged. As these events tend to be rare and unpredictable, the beneficial use of blood salvage during Caesarean section will be limited.

Table 1  Factors which may be associated with excess bleeding during Caesarean section in the two groups

<table>
<thead>
<tr>
<th>Factor</th>
<th>Blood salvage</th>
<th>No blood salvage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeat Caesarean section</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>Multiple pregnancy</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Placenta praevia</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>(Fibroids)</td>
<td>5</td>
<td>(0)</td>
</tr>
<tr>
<td>(Coagulopathy)</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2  Timing, indication and incidence of blood transfusion associated with Caesarean section

<table>
<thead>
<tr>
<th>Time of transfusion</th>
<th>Indication</th>
<th>No. of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraoperative</td>
<td>Preoperative anaemia</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Blood loss</td>
<td>4</td>
</tr>
<tr>
<td>Postoperative</td>
<td>Anaemia and/or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>intraoperative blood loss</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Post-partum haemorrhage</td>
<td>10</td>
</tr>
</tbody>
</table>

Editor,—I was surprised to read from Motamed and colleagues that continuous epidural analgesia resulted in more episodes of desaturation during the postoperative period than patient-controlled analgesia until I appreciated that morphine was being used in the epidural mixture together with bupivacaine. Morphine is a very water-soluble opioid and has been recognized for several years to be unpredictable in its respiratory depressant effect. I would caution readers to extrapolate from this article the idea that all epidural opioid–local anaesthetic mixtures are dangerous. The use of weak bupivacaine solutions (0.1–0.15%) with fentanyl 2–4 µg ml⁻¹ produces a safe, synergistic effect with minimal motor block and respiratory depression.

I would be grateful for clarification as to whether the amount of morphine delivered in the study was 0.25 mg h⁻¹ (as written in the summary) or 0.25 ml ml⁻¹ (as written in the methodology).

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Editor,—We are grateful to Dr Stuart-Taylor for her careful reading of our article. We agree that continuous epidural analgesia with a combination of local anaesthetic and opioid carries a risk of late respiratory depression as a result of systemic or CSF absorption of the opioid. However, opioids provide sustained pain relief and although the incidence of late respiratory depression is low (0.09–0.2/1000), it may occur with hydrophilic or lipophilic opioids. Several studies have evaluated the occurrence of desaturation after different types of analgesia, finding that hypoxaemia occurred in all analgesia groups, although epidural analgesia tended to cause longer periods of desaturation.

Many surveys have reported that epidural analgesia using either opioids alone or a combination of local anaesthetics and opioids is safe in the ward provided that adequate nursing monitoring is available. This regimen can be used without sophisticated monitoring techniques. The risk of respiratory depression or hypoxaemia, or both, after epidural opioid analgesia can be minimized by oxygen treatment. Standing orders for patients receiving epidural opioids include avoidance of parenteral opioids. Although epidural analgesia is associated with longer episodes of hypoxaemia, it produces better pain relief which may result in more rapid patient mobilization with potentially fewer postoperative complications.

We apologize for the mistake in the methodology section; the correct dose of morphine is 0.25 mg h⁻¹, the dilution of the mixture infused in the epidural space is 0.125% bupivacaine associated with morphine 0.025 mg ml⁻¹, and the rate of infusion is 10 ml h⁻¹.

C. Motamed
C. Jayr
Villejuif, France


3. Scott DA, Beilby DS, McClymont C. Postoperative analgesia

**Accidental i.v. injection of local anaesthetic**

Editor,—We agree with Checketts and Wildsmith that negative aspiration, test dosing and slow administration of divided doses are important steps in preventing complications relating to epidural catheter misplacement. However, the report by Abouleish, Elias and Nelson demonstrated that, despite these measures, systemic toxicity after inadvertent i.v. injection may still occur. We would like to describe one additional precautionary test that may have prevented systemic toxicity in this case.

After negative aspiration, it is our practice to ask patients to describe what is felt during the subsequent epidural injection. A sensation of cold is invariably felt in the patient’s back after administering 2–3 ml of local anaesthetic. It can be diffuse or localized. The commonest site is the mid thoracic region but it may be felt at any point along the vertebral column. It is experienced not only during the initial test dose, but also with each subsequent injection. This sensation is most likely a result of spread of fluid within the epidural space and therefore may not be felt if accidental i.v. or intrathecal injection occurs. We feel that seeking this sensation during the initial test dose, but also with each subsequent injection, will prevent accidents of this type which have already occurred in some centres.

The data presented in the report illustrate how carrying out a test dose can provide early evidence of accidental i.v. injection. Tachycardia and hypotension can occur minutes later, but there are also reports of patients only developing symptoms hours later. Having a protocol to follow can prevent accidence.

**Editor,—**We read the case report regarding this unpleasant and potentially dangerous complication of extradural anaesthesia and the accompanying editorial with interest. While fractionating of the main dose remains the optimum method of avoiding a serious reaction if the dose was systemic, perhaps there are other lessons to be learnt from this report. Although the authors have stated that there were no signs of subarachnoid block after administration of ropivacaine 45 mg, they state later in the same paragraph that no sensory or motor effects were seen after a total dose of 120 mg. The complete absence of any block after the first three fractions could have been an indication that the catheter was misplaced which prevented the fourth and fifth fractions from being given. The effect of ropivacaine 75 mg (the first three doses) (1.27 mg kg⁻¹) should have produced early signs of sensory block such as warmth or tingling, despite the slow onset of plain ropivacaine. We recommend that we should elicit the lack of epidural anaesthesia with as much vigour as looking for signs and symptoms of systemic toxicity.

I. BOWLER
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A. MARCHANT
University Hospital of Wales


**Editor,—**The editorial by Checketts and Wildsmith discussed the usefulness of test dosing to detect i.v. epidural catheter placement. The fact that neither a test dose nor aspirating the epidural space and therefore may not be felt if accidental i.v. or intrathecal injection occurs. We feel that seeking this sensation during the initial test dose, but also with each subsequent injection, will prevent accidents of this type which have already occurred in some centres.

The data presented in the report illustrate how carrying out a test dose can provide early evidence of accidental i.v. injection. Tachycardia and hypotension can occur minutes later, but there are also reports of patients only developing symptoms hours later. Having a protocol to follow can prevent accidents of this type which have already occurred in some centres.

**Editor,—**We thank your correspondents for their interest in our editorial, and you for the opportunity to comment further. Before responding specifically to their individual points we feel it is important to repeat the major message:

(1) There is currently no practical method of physically demonstrating with absolute certainty that an epidural catheter does or does not lie within a vein.

(2) Any putative test dose must have a high probability of producing systemic effects without causing harm.

(3) Any significant dose of local anaesthetic must be injected incrementally.
Discussion of detailed points of technique must not be allowed to obscure these vital aspects. We all have our favoured “tricks of the trade”, but none provide immunity from a major reaction, the (fortuitously) low incidence of which means that it may take a long time for a false premise to be revealed clinically.

Bowler and Marchant suggest that the complete absence of signs of block after 75 mg of ropivacaine had been injected via the epidural catheter of the patient reported by Abouleish, Elias and Nelson’ should have caused concern. However, the mean time to pinprick block of L1 after 75 mg (15 ml of 0.5%) of epidural ropivacaine in the study quoted was 8 min, and less than 50% of the patients achieved a Bromage grade 1 motor block at any time.2

Some patience is therefore required. In addition, we are aware of a patient developing ventricular fibrillation after accidental i.v. injection of as little as 50 mg (10 ml of 0.5%) of bupivacaine, albeit very rapidly. Thus unless administered as a very slow injection, the i.v. toxic dose is almost certainly less than the effective dose. Finally, sensations of warmth and paresthesiae are not always reported by patients and therefore are not reliable markers of correct placement of an epidural catheter. Indeed they may be described after i.v. injection!

McAtamney, Connolly and Carabine stated that a cold sensation is felt in the patient’s back during epidural injection. We have never had a patient remark on this sensation and it is incautious of them to describe it as “a useful additional safety measure” when they also suggest it “merits further investigation”.

Woodward’s suggestion of using Shah’s3 technique to confirm correct epidural catheter placement is not new and has its advocates, including us. However, this method has not been shown to be any better at detecting epidural vein cannulation than a gentle aspiration test with a 2-ml syringe (which itself is not infallible as we have seen) although we use both aspiration and syphon tests in the hope of identifying i.v. placement sooner rather than later.

M. R. CHECKETTS
J. A. W. WILDSMITH
University of Dundee
Dundee


Editor,—We read with interest Dr Woodward’s letter. One of the points he raises is that negative aspiration of blood can result from occlusion of the tip of the catheter by the wall of the blood vessel, as a result of creation of negative pressure on aspiration. We not only agree with his statement, but also practice and teach it. Dr Abouleish, in his book entitled “Pain control in obstetrics” published 21 yr ago,1 stated “A catheter can be in a blood vessel and yet no blood is aspirated because the tip can be against the vessel wall. In such a case, aspiration following injection of 2 ml of solution is more liable to obtain a sanguinous aspiration than prior to injection, because the injectate distends the vein and separates the catheter tip from the vessel wall. However, as mentioned before, aspiration can be negative even if the catheter tip lies in a blood vessel. Therefore, aspiration is only important when positive and the only reliable sign that the catheter is inside a blood vessel is the reaction of the patient to the test dose.” In our case report, aspiration was negative before and after injection of the local anaesthetic. We also agree with Dr Woodward that a transparent tape is advisable, and we mentioned that in the discussion of the article. Moreover, when aspiration is performed with the patient on her side, the point of insertion is easily seen and blood in the catheter is detected early.

To stay within the allotted space for the article, we did not discuss many aspects of test doses and intravascular malposition of an epidural catheter. We think the editorial by Drs Checketts and Wildsmith is excellent. It expanded the discussion and shed light on these controversies.2

In summary, the purposes of our article were to alert anaesthetists that all local anaesthetics are potentially toxic, to demonstrate the relative safety of ropivacaine and to emphasize that vigilance, a high index of suspicion, and fractionation of the therapeutic dose are the main factors to prevent cardiac toxicity from local anaesthetics.

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ERRATUM

A guide for tube exchange using a fibrescope and the plastic sheath of a guidewire in small children (BJA 1998; 81: 103)
The name of Dr. J. -H. Bahk was spelt incorrectly in his letter to the editor.
We apologize to the author for this error, which arose during the editorial process.