A faulty epidural catheter

Prior to inserting an epidural catheter, some practitioners have in the past recommended that the catheter should be passed through the Tuohy needle to ensure it passes freely. Today, in our experience, this test appears rarely to be used. This is probably due to the high standard of modern epidural catheters, and the fact that most epidural packs contain both catheter and a corresponding gauge disposable Tuohy needed. At the National Hospital for Neurology and Neurosurgery 16 G Portex 'Minipack' epidural catheters are placed routinely intrathecally as lumbar drains in patients undergoing neurosurgery.

Recently we had problems in passing a catheter through a Tuohy needle. The system involved was a Portex Minipack System 1 with integral 16 G Tuohy needle (nominal ID 1.15 mm) and corresponding catheter (nominal OD 1.1 mm). The epidural space had been identified in the anaesthetised patient at the L_3–L_4 level using the saline loss of resistance technique. The Tuohy needle was then advanced with one smooth movement through the dura; CSF flowed freely out of the hub of the needle. The catheter was passed 4 cm into the intrathecal space. On withdrawing the Tuohy needle, we found that it would not pass freely over one part of the catheter. On careful examination it was noted that the catheter was not of even diameter and that a relatively thickened section was preventing withdrawal of the needle (normal diameter 'a' compared to the thickened diameter 'b' in the Figure). It was decided that as we did not wish to puncture the dura repeatedly we would attempt to pull the needle forcibly over the catheter. This was successfully achieved with the catheter securely held near the skin entry site. The manoeuvre resulted in extrusion and narrowing of the catheter further along its length ('c' in the photograph), but the catheter did not snap and remained patent. There were no subsequent adverse sequelae.

This case illustrates that despite the modern technology involved in manufacture and testing of epidural catheters, faults do still occur, albeit rarely. We recommend that catheters be completely passed through Tuohy needles before use.

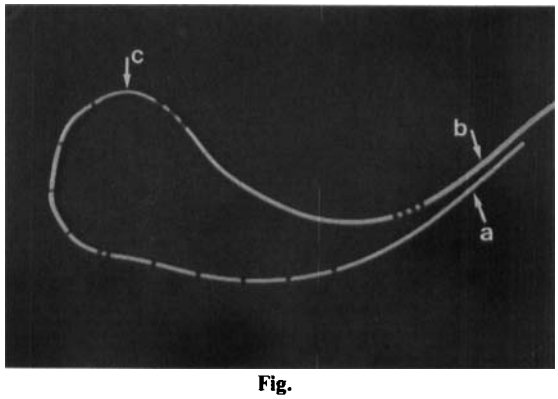

Fig.

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A.P. BARANOWSKI
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A reply

Firstly I would like to thank *Anaesthesia* for giving us the opportunity to comment on this incident.

The difficulties encountered by Drs Baranowski and Nandi are an extremely rare occurrence with Portex epidural catheters. Some 4 years ago, and as part of a manufacturing process review, advances in extrusion technology allowed a tightening in catheter specifications. Batch information supplied by the two doctors confirms that the catheter concerned pre-dates these advances. Whilst we at Portex continue to ensure that our products meet the highest possible standards, we would like to agree with the recommendations by Drs Baronowski and Nandi that *all* medical equipment is checked prior to use.

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Breathing system filters can affect the performance of anaesthetic monitors

The introduction of new anaesthetic machines (Ohmeda CD Modulus) to our hospital was accompanied with the routine use of airway filters (Pall BB22-15) in an effort to reduce bacterial contamination of the circle breathing systems.

Recently we have been using filters which incorporate a gas sampling port on the anaesthetic machine side of the filter and are designed to be fitted between the catheter mount and the anaesthetic breathing system. It has been noted, however, that a variety of errors have been caused in the accuracy of end-tidal gas monitoring and ventilation monitoring. Following the induction of anaesthesia and insertion of a laryngeal mask in one patient, the signals from both the capnograph and the tidal volume monitor were lost. Initially this was thought to be caused by malposition of the laryngeal mask although both the expiratory valve and the reservoir bag were clearly moving normally, indicating respiration, albeit with a low tidal volume. Removal of the filter from the breathing system resulted in a return of the capnographic trace and the measurement of a tidal volume of 90 ml.

It would seem the loss of capnography signal was due to the proportionately greater effect of gas mixing at low tidal volumes when the breathing system deadspace had been increased by the addition of a filter occupying a significant volume. End-tidal gas monitoring was observed to be affected less during hypoventilation when using filters with a lower internal volume such as the Dar 350/5845 (28 ml internal volume) than with the Pall BB22-15 (96 ml internal volume) during other anaesthetics.

The effect on tidal volume monitoring was reproduced in the laboratory using a test lung. The introduction of a filter into the breathing system resulted in a reduction in the volume recorded by the Ohmeda volume monitor which was much greater than that indicated on the test lung or measured with a Wright's respirometer.

When the experiment was repeated using a selection of filters with different resistances to gas flow, the discrepency in monitored tidal volume was proportional to the resistance introduced. The pressure drop across the Pall filter is quoted by the manufacture as 0.8 cmH_2O at a flow of 50 $l.min^{-1}$ when new. In practice, the resistance to gas flow increased significantly during anaesthesia because of condensation on the filter. We found that the pressure drop across the Pall filter had increased to 2.2 cmH_2O at 50 $l.min^{-1}$ (air) after 3 h use and that of the Dar had

increased to 1.4 cmH_2O under similar conditions after 5 h use. It is probable that the discrepancy in monitored tidal volume was due to a change in the expiratory flow waveform resulting from an increase in breathing system resistance

Thus the effect on the accuracy and performance of anaesthetic monitoring apparatus needs to be considered when selecting a bacteriological filter for use in breathing systems.

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Conversion of orotracheal to nasotracheal intubation with the aid of the fibreoptic laryngoscope

We describe a method of converting orotracheal into nasotracheal intubation, in patients who present difficulties in tracheal intubation, using the fibreoptic laryngoscope.

A 47-year-old-female, ASA 1, weighing 72 kg was scheduled for the removal of a lower impacted wisdom tooth and a biopsy of a radiotranslucent area surrounding it. She was premedicated with temazepam 20 mg. Anaesthesia was induced with glycopyrronium, fentanyl, propofol and atracurium. After 2 min face mask ventilation with nitrous oxide and isoflurane in oxygen, direct laryngoscopy revealed only the tip of the epiglottis and several attempts at nasotracheal intubation failed. The 'anterior larynx' was associated with reduced atlanto-occipital mobility and a minor degree of micrognathia. The trainee anaesthetist involved inserted a laryngeal mask airway (LMA) which enabled the patient's lungs to be ventilated without difficulty while senior help was summoned.

As the initial attempts at intubation had caused epistaxis, it was decided to complete nasotracheal intubation in two stages, to reduce the risk of aspiration of blood into the trachea. During the first stage, a gum elastic bougie was passed through the lumen of the LMA into the trachea. The LMA was removed over the bougie and a 6 mm cuffed tracheal tube was advanced over the bougie to secure orotracheal intubation, as has been described previously [1]. During the second stage, an anaesthetic assistant displaced the mandible anteriorly by applying pressure behind the ascending rami. An Olympus LF1 fibreoptic laryngoscope, (onto which had been mounted a 6.5 mm nasal tube), was passed, under direct vision, through the nose and into the pharynx. After identifying the oral tube as it entered the larynx, the fibrescope tip was manipulated anteriorly between the tube and the aryepiglottic fold towards the vocal cords. It was then possible to direct the tip of the instrument between the vocal cords anterior to the tube and to advance it down the trachea to the tube cuff. The cuff was deflated, the fibrescope advanced to the carina, the oral tube removed and the nasal tube advanced over the fibrescope, which guided it into the trachea.

A nasal tube greatly improves access in oral surgery and for some operations it is mandatory. In the great majority of cases, conversion of oral to nasal intubation is a relatively simple task. The nasal tube is advanced through the nostril until its tip is in the pharynx. Direct laryngoscopy then allows the oral tube to be removed and the nasal tube to be placed into the trachea under direct vision. This method could not be applied in the case we have described, because it was impossible to visualise the larynx with the aid of the Macintosh laryngoscope. The fibreoptic laryngoscope provided a satisfactory solution to the problem. One way to achieve nasotracheal intubation with this instrument would be simple to remove the oral tube or LMA and to use the standard technique of fibreoptic nasotracheal intubation. However, this procedure, even in uncomplicated airways and when performed by experienced personnel, takes a significant amount of time [2]. During this period, the patient is apnoeic and there is a risk of arterial oxygen desaturation, should intubation be delayed unduly. Additionally, the airway is not protected, so there is a risk that the trachea could be soiled by blood or other material. These problems could be minimised, to some extent, by advancing the fibrescope into the pharynx and then removing the oral tube. The apnoeic and unprotected period should be correspondingly less. In this technique, however, the fibreoptic guide has not yet secured access to the lumen of the trachea and it is possible that there could still be considerable delay while the fibrescope negotiates the pharynx and larynx.

The method we have described relied on the fact that the diameter of the Olympus LF-1 intubation fibrescope is only 4 mm. It is therefore possible to insert the instrument into a trachea that is already occupied by a small tracheal tube. Access is via the triangular area bounded by the anterior commissure, anterior vocal cords and anterior aspect of the tracheal tube. The technique ensures maximum possible control of the airway, since the orotracheal tube is not removed until the trachea has been cannulated by the fibrescope. The apnoeic period is minimal since automatic ventilation continues normally for most of the procedure. Similarly, the risk of soiling the lower airway is minimal since the trachea is protected by a cuffed tube for most of the procedure.

The technique may be considered when it is necessary to convert orotracheal into nasotracheal intubation, but it may be particularly useful when the patient presents a difficult intubation. Anaesthetists relatively inexperienced in fibreoptic techniques may particularly appreciate the safer and more controlled conditions this method provides in comparison with the standard method of fibreoptic nasotracheal intubation.

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Pressure effects of syringes

With respect to the recent correspondence (*Anaesthesia* 1993; **48:** 545) on the negative pressure which may be generated with different sizes of syringes while aspirating a spinal needle, I would like to add that in this situation the limiting factor to the magnitude of the pressure developed is the degree of expansion of the small volume of dead