

Correspondence

- 797 Early death amongst anaesthetists
Q. J. W. Milner FRCA and E. S. M. Ziegler MB, ChB
- 798 Epidural service implications of a feeding policy in labour
T. S. H. Armstrong FRCA and I. G. Johnston FFARCSI
- 799 Double cannulation of the internal jugular vein – another wheel re-invented
E. O. Thomas FRCA and C. R. Monk FRCA
- 799 Monitoring dangers and apparatus safety
S. L. Snowdon FRCA
- 800 Remifentanyl in the critically ill
T. N. Evans and G. R. Park
- 801 Ambient light requirements for successful intubation with the Trachlight™ in adults
H. Iwama MD, S. Ohmori MD, T. Kaneko MD and K. Watanabe MD
- 801 Use of the Trachlight for intubation in the Pierre–Robin syndrome
K. Iseki MD, K. Watanabe MD and H. Iwama MD
- 802 Comparison of the Macintosh and McCoy laryngoscope blades
P. Groom and M. Hawkins
- 803 Miniature screen for fiberoptic intubation using a camera
M. T. Popat FRCA and H. Howells FRCA
- 803 Jaw thrust as a sign of anaesthetic depth
D. Bukht
- 803 Potential morphine sparing effect of midazolam
R. K. Mirakhur
- 804 Dangerous faulty loss of resistance syringe
A. Dark FRCA
- 804 An unusual enclosure
Z. Kotyra, A. Lee and W. J. Fawcett
- 804 An unusual enclosure
T. Evans
- 805 Monitors of cerebral oxygenation
C. Inray and C. Knickenberg
- 805 A dual technique for identification of the epidural space
R. J. H. Bayliss and J. E. Cropp
- 806 Residual throat pack – a further method of prevention?
R. J. Burden MRCP, FRCA and A. Bliss FRCA
- 806 Burn in the mouth during laser surgery
T. Asai MD
- 807 Adult face mask for neonatal anaesthesia and resuscitation
Yew Weng Chan MB, BS, M Med (Anaes)
- 807 Anaesthesia for laparoscopic cholecystectomy in myasthenia gravis: a non-muscle relaxant technique
J. A. Tortosa MD, PhD and J. Hernández-Palazón MD, PhD
- 808 The use of sumatriptin in the treatment of postdural puncture headache
C. Hodgson and A. Roitberg-Henry
- 808 Spontaneous movement, propofol and dopamine receptors
A. Borgeat MD and Y. A. Ruetsch
- 809 Propofol, fluoxetine and spontaneous movement
T. S. H. Armstrong and P. D. Martin
- 810 Sevoflurane induction and acute epiglottitis
K. Milligan FRCA
- 810 Coagulation assessment at the bedside
T. Engelhardt MB BS and D. R. Ball FRCA
- 811 The reproducibility of the iliac crest as a marker for lumbar spinal level
M. Thavasoathy MRCP
- 811 Halothane or halitosis?
P. V. Scott FRCA

Early death amongst anaesthetists

Very real concern has recently been expressed at the stress under which anaesthetists work and the effects that this appears to have on their health. In a review of the obituaries published in the *British Medical Journal*, Wright and Roberts have shown the average age at death of the anaesthetists represented to be 66 years [1]. This is the lowest of all doctors born in the UK. Whilst it is

likely that reporting differences have influenced this sample, it gives sobering thought to the profession. An editorial by Dickson [2] and an article by Seeley [3] published recently in this journal have both addressed the problems of excessive stress amongst anaesthetists. Dickson highlighted a lack of control over working patterns to be a major stressor reported by the Linkmen at their 1995 meeting. Seeley describes a 'constant complaint from those who practice anaesthesia for surgery is the

inability to organise their professional lives'.

Whitehall II has just been published [4] and is an attempt to analyse the cause of the excessive morbidity found amongst male middle grade civil servants in a previous study on mortality within the civil service [5]. A direct association between low job control and the risk of heart disease was found, unexplained by classic ischaemic heart disease risk factors. The demands of the job itself were not identified as increasing the risk and

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furthermore both papers suggest that the complexity and difficulty of a job is not regarded as being a detrimental stressor.

An alteration in anaesthetists' working patterns to give them more control over the organisation of their work load is urgently required to counter this problem, for the benefit of anaesthetists, the specialty and patients.

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Epidural service implications of a feeding policy in labour

Ever since Mendelson's paper in 1946, which illustrated the risks of asphyxia and aspiration pneumonitis in the pregnant population during anaesthesia [1], fasting during labour has been standard policy in most maternity units. Recently, however, there has been considerable interest in liberalising these policies. It has been suggested that fasting may result in maternal harm by increased psychological stress [2] and

ketosis [3], which cannot safely be avoided by simply administering glucose intravenously [4]. As a result, various protocols, such as that adopted by Nottingham [5], have been suggested to allow liberalisation of oral intake during labour. The issue of safety, however, should general anaesthesia be required has still not been resolved. In particular, the effect of opioid medication on the labouring stomach is a concern. Both systemic and epidural opioids have been shown to cause significant delays in gastric emptying during labour [6, 7]. Conversely, a recent study demonstrated that 0.0002% fentanyl in 0.125% bupivacaine does not prolong gastric emptying, compared to plain bupivacaine [8]. Even so, if we are to consider relaxing the ban on eating during labour, we need to have an alternative to systemic opioid analgesia. A possible solution would be opioid-free epidural infusions and we therefore set out to discover the potential impact on our epidural service, if we were to allow food during labour.

Over a 5-week period, on the first or second postnatal day, we asked all the mothers who had laboured ($n = 149$) whether, had it been available, they would have wanted something to eat during labour. Of those who answered in the affirmative and had received diamorphine, we then asked whether or not they would have considered alternative forms of pain relief, including epidural analgesia, in order to be allowed to eat.

The results showed that more than half of these women (12 of 21) would have been more likely to choose an epidural during labour if it meant that they could eat. Moreover, in terms of the overall sample size, it represents a potential increase of 8% in the epidural rate. We feel that this figure is probably an underestimate, as some of the women who felt that they would not have wanted food in early labour may well have changed their minds if food had been physically offered to them. They might, therefore, be more likely to request an epidural in later labour, particularly as diamorphine would not then be available.

In any case, an increase of 8% would

in itself represent an additional 200 epidurals in our unit each year, increasing the epidural rate from 28% to 36%. This is unlikely to have anaesthetic staffing consequences, but may well result in additional pressure on our midwives. It is already difficult for them to provide adequate staff to run more than two epidurals simultaneously. Further resource implications include the possibility of an increase in the instrumental delivery rate [9]. This may be particularly apparent, as opioid-free epidural solutions would be used [10].

Therefore, we would advise any units, particularly district general hospitals like our own, which are considering a relaxation in their policies regarding eating during labour to examine the impact which such a change might have on labour ward staffing and resources.

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Double cannulation of the internal jugular vein – another wheel re-invented

There has been some correspondence in recent months regarding the hazards of double cannulation of the internal jugular vein [1] and there is general agreement that a double wiring technique should be utilised to minimise hazards [2]. When using a double wiring technique another problem occasionally encountered is that once the initial wire has been placed, the internal jugular vein cannot be relocated. Failure to relocate was a more frequent problem in the past with multiple single catheters and various techniques were described to overcome this [3], which also drew some criticism [4]. We encountered the problem of relocation recently in a patient requiring both a quadruple lumen and pulmonary artery (PA) catheter; despite numerous attempts to enter the internal jugular vein for the second wire, we ultimately placed a multilumen catheter down the external jugular vein.

For monitoring and drug delivery during anaesthesia for cardiac surgery we place an 8.5F quadruple lumen (Quad) Vygon central line (product No. 158.016). The design of this quadruple lumen catheter is fortuitous in that, unlike its triple lumen counterparts, it not only allows the initial locating guidewire to pass through the central lumen (yellow hub) but it also allows the simultaneous passage of a second guidewire through the medial lumen (green hub), as illustrated in Fig. 1 above.

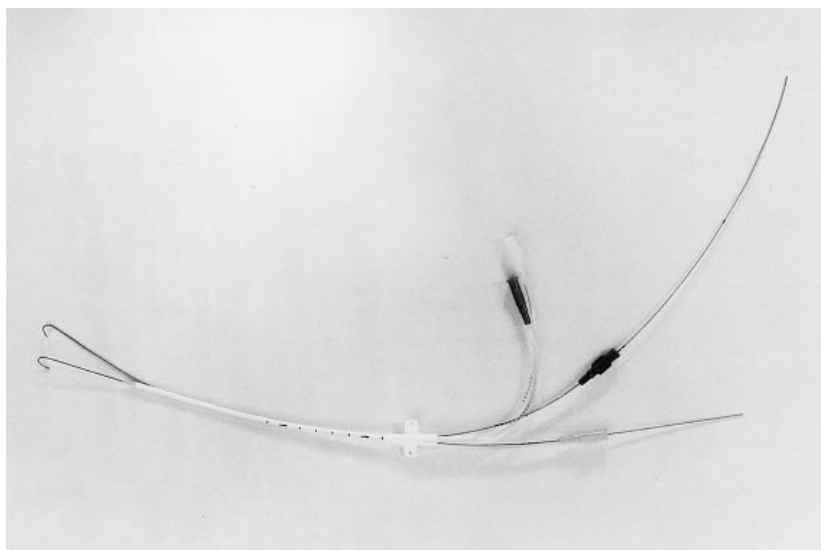


Figure 1

Therefore, if double cannulation is required and two wires cannot be placed we recommend the following: introduce the quadruple lumen catheter over the initial guidewire into the internal jugular vein in the usual manner; with the wire still *in situ* thread a second wire down the green (medial) lumen; remove the catheter leaving two wires successfully placed in the internal jugular vein, then introduce the two required catheters appropriately, remove both wires and the cannulae are ready for clinical use.

Whilst we do not advocate this as a routine technique, as it has potentially increased haemorrhagic consequences [5], it is a reasonable alternative to multiple unsuccessful attempts in locating the internal jugular vein [6].

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Monitoring dangers and apparatus safety

Dr Saunders, in an editorial (*Anaesthesia* 1997; **52**: 399–400), drew attention to problems associated with monitoring. The Association of Anaesthetists has also just distributed its updated version of the Checklist for Anaesthetic Apparatus. Both monitoring and the checklist are concerned with improving safety and yet the multiplicity of modern monitoring and the detail of the checklist mean it is difficult to see the wood for the trees. Which aspects of each process really are important in improving safety? There is also an overlap between what is being checked to ensure apparatus is safe and what is being monitored in case something either is, or becomes, unsafe. Dr Saunders is right to stress the need for a critical evaluation of monitoring to

establish what is effective and essential. This evaluation should be done alongside a review of the checklist. If a piece of monitoring is to be relied on it must be accurate within defined limits, therefore checked and the significance of its limitations understood.

The reason for the checklist and use of some of our monitoring is the result of serious anaesthetic accidents in the past and the hope to prevent similar occurrence in the future; thus it may not be possible to easily test the effectiveness of all monitoring in quite the way Dr Saunders would hope. Nevertheless it is possible to prioritise what we display on a monitor so that a few essential parameters are relied upon while others are used merely to give background information and, even then, only if they are calibrated and their function properly understood. Perhaps only those monitored parameters deemed to be essential should have alarms, setting limits appropriate to the technique of anaesthesia.

Ideally we should be able to rely on having equipment provided for our use in a fully functional condition while depending on just a few key monitors to alert our attention to malfunction of patient or machine. It must be remembered that we are only able to check equipment for a limited number of superficial faults. Much of modern apparatus is not accessible for critical scrutiny in everyday use. There is, therefore, a responsibility which can only be taken

by the relevant engineer or technician who has been appointed to carry out a service or calibration. The anaesthetist should aim to use only those forms of monitoring which can be shown to be effective in improving outcome or safety while reviewing apparatus checks so that time is spent effectively detecting common or serious faults at the patient-machine interface and eliminating duplication of function where possible. A long list of equipment checks or a multiplicity of monitoring is likely to be observed in a cursory manner. Far better to have a few, demonstrably essential, functions of both patient and machine monitored and checked conscientiously.

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Remifentanyl in the critically ill

Remifentanyl is a new opioid analgesic with a unique metabolism. Its effect is terminated by ester hydrolysis in the blood and tissues [1]. This ensures that it has a short duration of action and rapid recovery even when given as a continuous infusion [2]. The metabolism of remifentanyl is independent of liver and kidney function and accumulation does not occur in these patients.

We wished to examine its use in the critically ill. Six adults needing sedation and analgesia whilst receiving mechanical ventilation were given remifentanyl

(Table). All patients were started on a dose of $0.25 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ of remifentanyl and the rate titrated to the individual's needs, up to a maximum of $2 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. For stimulating procedures such as tracheal suction, bolus doses of $1 \mu\text{g}\cdot\text{kg}^{-1}$ were also given. The infusion rates, duration of infusion and time to recovery are also shown in the table. All the patients were adequately sedated. The duration of remifentanyl infusion ranged from 3 to 33 days, with a mean of 10.5 days. The modal infusion rate ranged from 0.082 to $0.43 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. In some patients the respiratory depression was useful, allowing patients to tolerate unusual forms of ventilatory support without the neuromuscular paralysis used before. All patients showed signs of recovery from remifentanyl within 10 min of stopping the infusion. Two of the patients studied experienced transient episodes of diarrhoea at this time.

We have shown that remifentanyl is a useful tool for sedation and analgesia in the critically ill. It has a short duration of action that is unaffected either by the duration of infusion or the total dose given. The predictable rapid awakening is useful for rapid neurological assessment of critically ill patients and for weaning from mechanical ventilation. Since its metabolism is independent of renal or hepatic metabolism it may be used more predictably in these patients. Remifentanyl is similar in price to propofol. The reduction in the use of other

| Patient number/age/sex | Diagnosis | Length of infusion (days) | Remifentanyl modal infusion rate ($\mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) | Remifentanyl infusion rate ($\mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) | Sedation in the 24 h before remifentanyl | Sedation in the 24 h after remifentanyl |
|------------------------|--------------------------|---------------------------|---|---|--|---|
| 1 43 yr F | pneumonia | 8 | 0.27 | 0.2–0.37 | propofol 3960 mg alfentanil 250 μg midazolam 12.5 mg | alfentanil 1.06 mg midazolam 3 mg |
| 2 62 yr M | liver transplant | 8 | 0.43 | 0.1–0.53 | propofol 5915 mg morphine 2.5 mg | propofol 1650 mg |
| 3 36 yr M | pneumonia | 3 | 0.29 | 0.22–0.38 | midazolam $7 \text{ mg}\cdot\text{h}^{-1}$ morphine $4 \text{ mg}\cdot\text{h}^{-1}$ | midazolam $8.6 \text{ mg}\cdot\text{h}^{-1}$ morphine $6.9 \text{ mg}\cdot\text{h}^{-1}$ |
| 4 60 yr F | upper GI bleed | 6 | 0.11 | 0.04–0.17 | propofol 160 mg | none |
| 5 63 yr M | perforated gastric ulcer | 33 | 0.11 | 0.013–0.25 | midazolam $8 \text{ mg}\cdot\text{h}^{-1}$ alfentanil $1500 \mu\text{g}\cdot\text{h}^{-1}$ | none |
| 6 41 yr F | small bowel transplant | 5 | 0.067 | 0.042–0.082 | midazolam $2.4 \text{ mg}\cdot\text{h}^{-1}$ morphine $0.7 \text{ mg}\cdot\text{h}^{-1}$ propofol 650 mg | midazolam $1.8 \text{ mg}\cdot\text{h}^{-1}$ morphine $1.5 \text{ mg}\cdot\text{h}^{-1}$ |

agents led to savings in drug costs in one patient. In the others it was either cost neutral or more expensive. These initial observations show that remifentanyl will have an important place for sedation in the critically ill. Further studies with remifentanyl are needed to define this place exactly.

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Ambient light requirements for successful intubation with the Trachlight™ in adults

Hung *et al.* [1] showed that nearly 88% of tracheal intubations can be effectively performed under ambient light with or without shading of the neck using the Trachlight™ (Laerdal Medical Corp., Armonk, NY). However, in order to

facilitate direction and insertion of the tracheal tube through the cords, it is necessary to be able to see movement and the position of the transillumination through the pharynx. When the transillumination of the pharynx is seen through the neck, the tip of the tracheal tube can be easily directed towards the vocal cord. This is a report on the evaluation of the intensity of ambient light needed for transillumination through the pharynx.

Ten adults requiring general anaesthesia for elective surgery were studied. General anaesthesia was induced with propofol, isoflurane and 33% O₂/nitrous oxide and vecuronium used for relaxation. Before orotracheal intubation with the Trachlight™, the ambient light around the neck was decreased to 350 Lux as measured with an illuminometer. In this environment, the first attempt to insert the tracheal tube into the pharynx was tried and the ease of transillumination through the pharynx was evaluated. When it was not seen, the ambient light was decreased by 50 Lux and the manoeuvre repeated. Demographic data of the patients and the intensity of ambient light for visualisation through the pharynx are shown in Table 1. After recognition of the transillumination of the pharynx, the tip of the tube was directed forward through the vocal cord; this was easily achieved in all patients.

Our data have shown that the intensity of ambient light for adequate transillumination through the pharynx is between 150 and 300 Lux in adults.

Optimum transillumination is achieved with an intensity of 150 Lux or less.

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Use of the Trachlight for intubation in the Pierre–Robin syndrome

An alternative intubation technique using a new lightwand device (Trachlight™, Laerdal Medical Corp., Armonk, NY) has been reported to facilitate tracheal intubation in patients with difficult airways [1]. This is a case report of a patient with the Pierre–Robin syndrome successfully intubated with this device.

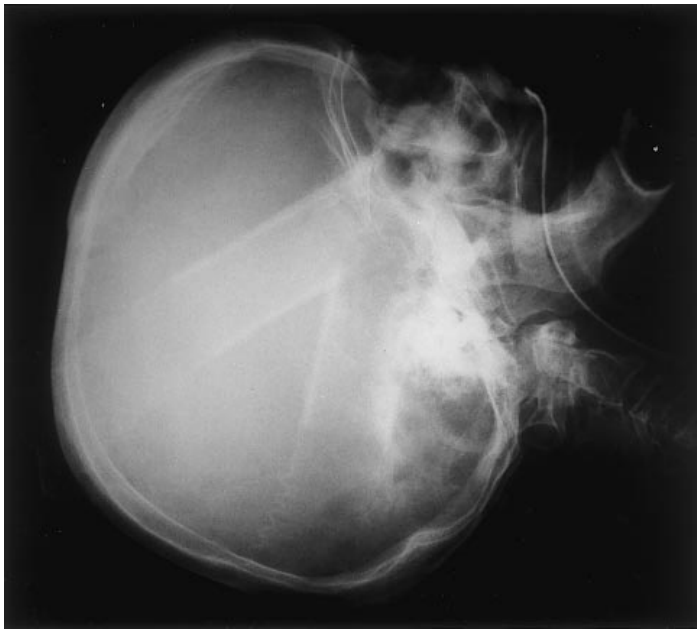
A 76-year-old female with Pierre–Robin syndrome suddenly collapsed and was transported to our emergency ward. She was deeply unconscious and severe respiratory obstruction with snoring was present. Two anaesthetists failed to intubate her trachea by direct laryngoscopy (orally and nasally), the laryngoscopic view being Grade IV [2]. Orotracheal intubation with the Trachlight™ was tried and was successful within one minute at the first attempt. The figure at the top of the page overleaf shows the classical features of the face and lateral head X-ray of the small lower jaw that are characteristic of the Pierre–Robin syndrome.

The Trachlight™ was developed by Hung *et al.* [3] and has been shown to be an effective, rapid and safe method of tracheal intubation in elective surgical patients [3], as well as in patients with difficult airways. This suggests that the device might be useful as a first-line option in patients following a failed laryngoscopic intubation [1]. The present case was exactly what these studies

Table 1 Demographic data and ambient light visualised through the pharynx.

| Patient no. | Age (years) | Sex | Weight (kg) | Height (cm) | Intensity of ambient light (Lux) | | | | |
|-------------|-------------|-----|-------------|-------------|----------------------------------|-----|-----|-----|-----|
| | | | | | 350 | 300 | 250 | 200 | 150 |
| 1 | 34 | F | 54 | 164 | × | × | × | ○ | |
| 2 | 26 | F | 46 | 150 | × | × | × | ○ | |
| 3 | 42 | F | 58 | 160 | × | × | × | × | ○ |
| 4 | 48 | M | 64 | 169 | × | × | × | × | ○ |
| 5 | 54 | M | 66 | 166 | × | × | × | × | ○ |
| 6 | 67 | M | 60 | 155 | × | × | × | ○ | |
| 7 | 55 | F | 50 | 153 | × | ○ | | | |
| 8 | 58 | M | 55 | 156 | × | × | × | × | ○ |
| 9 | 59 | M | 52 | 163 | × | ○ | | | |
| 10 | 76 | F | 57 | 148 | × | ○ | | | |

x: failure to visualise the transillumination; ○: success visualising the transillumination.



recommended. Since Hung *et al.* [1] there have also been reports of four patients with the Treacher–Collins or Pierre–Robin syndromes successfully intubated with the Trachlight™.

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Comparison of the Macintosh and McCoy laryngoscope blades

In a reply to our correspondence concerning their blade comparison study

[1], Cook and Tuckey asked whether photographing the laryngeal view would itself interfere with laryngoscopy. In answer to this question, a method has been developed which is unobtrusive and quick to perform [2]. In conjunction with a standardised intubating position, it constitutes the only objective assessment currently available. The authors also question the direct clinical

relevance of such standardisation. This is indicative of the poor design of many previous clinical studies of laryngoscopy. They do not appear to understand that standardisation is fundamental to any comparative study. Of course, clinical practice is not rigidly standardised, but clinical research must adhere to protocols if valid conclusions are to be made. Standardisation is the norm in all other areas of medical research and needs to be applied to airway management studies if they are to be taken seriously.

We hope our correspondence will provoke interest in this field and generate new work undertaken in a more scientific manner.

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Figure 1

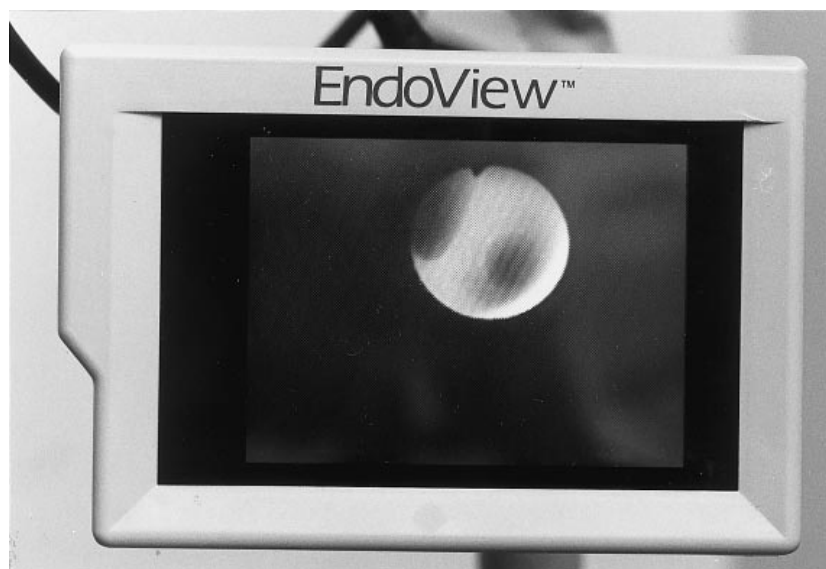


Figure 2

Miniature screen for fibreoptic intubation using a camera

Performance of fibreoptic endoscopy and tracheal intubation is greatly facilitated by the use of a camera and television monitor. This system is also useful for training, allowing the trainer to demonstrate good endoscopic techniques on models and patients and giving guidance to the trainee on the screen [1, 2]. The drawbacks of the existing systems include the cost and the bulky nature of the equipment requiring stacking trolleys.

We wish to describe a camera system with a miniature screen (Endoview, Urohealth, USA) which endoscopists may find useful. This system consists of a fully integrated and self-contained camera requiring no external camera control unit. The screen is a 4" liquid crystal display (LCD) unit which can be attached to the camera or to an infusion stand (Fig. 1 left). The system costs less than half of existing systems and is extremely portable and lightweight. We have now assessed this system in 20 fibreoptic intubations. After an initial learning curve, we have found it easy to focus the camera and adjust the light on the screen to obtain a satisfactory image. This compares well with existing closed-circuit television screen but is obviously smaller in size (Fig. 2).

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Jaw thrust as a sign of anaesthetic depth

I read with interest the study by Drage *et al.* (*Anaesthesia* 1996; **51**: 1167–70) concerning the use of jaw thrust as a sign of anaesthetic depth. As an anaesthetic senior registrar at St Bartholomew's 15 years ago, my colleagues and I prevailed upon Dr Robert Ballantine (then chief of the Anaesthetic Department) to write a letter describing his use of the jaw thrust as a sign of anaesthetic depth [1]. While he never claimed the technique as original it was affectionately known at St

Bartholomew's as 'Ballantine's sign'. Since the advent of laryngeal mask airways I for one have taught another generation of trainee anaesthetists the value and provenance of this sign. As has been noted in these pages many times before there is remarkably little new under the sun and it encourages us to recognise the skills and expertise of our forbears in medicine.

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Potential morphine sparing effect of midazolam

Dr Verheecke (*Anaesthesia* 1997; **52**: 389) points out that the main reason for the reduction in the analgesic requirement of morphine in patients receiving low-dose midazolam in our study [1] is the amnesic effect of the latter drug, in other words the patients 'forgot' to complain of pain or to press the button of the PCA system. Our patients did not forget about their pain or to press the button on the PCA system as shown by the need of a loading dose of morphine and self-administration from the PCA system in the post-operative period. This has been overlooked (or perhaps forgotten) by Dr Verheecke. This was not a retrospective study of whether patients remembered having pain but a study where the patients were assessing their pain in real time and using morphine as required from their PCA system. The same is true for emetic symptoms as well.

It is also worth pointing out to Dr Verheecke that the peak average plasma midazolam concentrations in the study were just over 50 ng.ml⁻¹. These are far below the peak concentrations of well over 100 ng.ml⁻¹ obtained after administration of midazolam 5 mg intravenously [2]. The amnesic effect of even this dose of midazolam is nearly over in 20 min [3]. It is therefore unlikely that the findings of our study were due to an amnesic effect of midazolam. Perhaps

the suggested explanations offered in our paper are more plausible. Dr Verheecke appears to be taking a very superficial view of the amnesic actions of benzodiazepines such as midazolam without considering the dosage and the plasma concentrations which produce such an effect.

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Dangerous faulty loss of resistance syringe

I would like to report a case in which a faulty loss of resistance syringe was encountered during a routine obstetric epidural for analgesia in labour, a fault which could easily have resulted in an inadvertent dural tap. Dr C. McBeth [1] reported a case in which a fault in a Portex loss of resistance device was discovered *as it was being used* to identify the epidural space in an obstetric patient. In their case the fault was a crack in the barrel of the syringe which allowed the leakage of air from the syringe when the plunger was depressed, thus not allowing pressure to build up inside the syringe. She claimed that this fault made identification of the epidural space impossible and could potentially have led to a dural tap. While I agree that such a syringe would be useless in helping to identify the epidural space, I fail to see how such a syringe would increase the likelihood of a dural tap. The absence of any resistance in such a syringe would alert the anaesthetist to a problem and I doubt whether any anaesthetist would continue to advance the

needle in such a case – the whole technique is based on detecting a loss of resistance on entering the epidural space – such resistance must be present before its loss can be detected.

The fault I report, however, is far more dangerous and much more likely to lead to a dural tap and potentially even more serious neurological damage, than a leaking syringe. In this case a Portex 16 g Single Use Epidural Minipak (Lot number 95K 08) was opened in preparation for a routine obstetric epidural for analgesia in labour. On checking the full range of travel of the syringe it was noted to stick quite firmly at around the 5–6 ml mark. The sticking point was not sudden, but increased over several millimetres to a point where significant pressure was required to overcome it. This fault was recognised as dangerous and the syringe was not used. Inspection of the syringe revealed no visual abnormality whatsoever. Had it not been checked then the resistance felt during use may have reassured the anaesthetist that the needle was in the midline and encouraged advancement of the needle in anticipation of the expected loss of resistance, which would probably not have occurred with this syringe. Dural tap, and possibly direct damage to the spinal cord (such syringes are used for higher lumbar and thoracic epidurals), would have been more than likely.

This experience reinforces the advice given by Stableforth [2] to Dr McBeth that the checking of equipment is of paramount importance. The correct functioning of any piece of equipment cannot be taken for granted. Novel faults can give misleading feedback which potentially may expose the patient to danger.

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References

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A reply

Thank you for the opportunity to

respond to Dr Dark's letter. We have examined the returned Loss of Resistance Device and can confirm Dr Dark's observation.

Our investigation indicates that this incident arose due to a rare combination of the barrel and plunger components at the extremes of their respective specifications. Since becoming aware of the potential for this type of incident we have modified the tooling used to manufacture these components in order to prevent a recurrence. As a further measure, we have reviewed and improved our functional testing routines at the point of assembly of these devices.

We thank Dr Dark for bringing this matter to our attention and agree that this incident highlights the importance of the need to check all medical devices prior to use.

T. Evans
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An unusual enclosure

Over the past three months we have encountered three cases of a small plastic ball located within our glass loss of resistance syringes, which are part of a prepacked epidural set (Fig. 1 overleaf). The syringes themselves are manufactured by Sanitex, but the epidural packs are supplied by Portex. Whilst on no occasion was the plastic ball small enough to pass out of the syringe, there is a risk that it may obstruct the syringe preventing the usual loss of resistance on entering the epidural space. We thus suggest that a thorough visual inspection of syringes is undertaken prior to use.

Z. Kotyra
A. Lee
W. J. Fawcett
Royal Surrey County Hospital,
Guildford GU2 5XXA reply

Thank you for the opportunity to respond to Dr Fawcett's letter. We have examined the returned glass Loss of Resistance Device and can confirm Dr Fawcett's observation. Our investigation indicates that this isolated incident arose



Figure 1

due to a failure on our part to completely remove packaging material used to prevent damage to the barrel prior to assembly. Since becoming aware of the potential for this type of incident we have reviewed and improved our packaging methods for this device to remove the potential for a recurrence of this type of incident.

We thank Dr Fawcett for bringing this matter to our attention.

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Monitors of cerebral oxygenation

'The unacceptably high failure rate of the recently introduced Critikon 2020 will limit or prevent its clinical use' (*Anaesthesia* 1997; 52: 136–40). Our experience of the Critikon 2020 does not reflect the authors. Satisfactory data collection has been achieved during 15 carotid endarterectomies. We have encountered problems with diathermy interference and the partial loss of a trace due to movement of the sensor (caused by the surgeon). The Critikon 2020 was also used to perform 130 field studies up

to an altitude of 4670 m and in temperatures ranging from -11°C to 85°C . Power was obtained from a 2-kW Honda generator. Data collection was satisfactory (only one trace was unacceptable). On the same expedition we experienced equipment failures with the pulse oximeters, capnographs and the blood gas analyser.

Like McKeating *et al.* we experienced more data loss in young males, who appeared to have a combination of low hairlines and 'thickset' skulls. Signal loss was greatest during the hyperventilation studies and was related to movement of the subject's head. We found the Critikon 2020 disposable adhesive fixation pads unsatisfactory and used a blue-line tubifast bandage (Seton Healthcare Group plc, Tubiton House, Oldham OL1 3HS) to keep the sensor in place. All subjects were monitored in the lying position after a 5-min resting phase. Data from the monitor were logged continuously to a Toshiba Satellite 200CDS Computer. Data sampling was at intervals of 1 s, and the Interlock hold time was set at 120 s. We feel these settings may be important in improving data collection.

Our experience of the Critikon 2020 would suggest that it is at least as reliable as other standard clinical monitoring

systems and we do not accept the authors conclusion regarding reliability.

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A dual technique for identification of the epidural space

Jacob and Tierney describe a novel and innovative method for teaching the skills required for the identification of the epidural space (*Anaesthesia* 1997; 52: 141–3). Although we acknowledge the advantages of a method of involving both student and tutor in this difficult technique, we question the wisdom of encouraging the use of air to define the loss of resistance. The disadvantages of a 'loss of resistance to air' are well documented and include air embolism, cauda equina compression and an increased incidence of inadvertent dural puncture and incomplete block [1–5]. Although many anaesthetists regard these disadvantages as contentious it would seem sensible to teach inexperienced anaesthetists a technique which is as safe as possible. It could be argued that this new dual technique allows an inexperienced operator to develop a feel for entering the dural space which can then be applied to a saline-based method but this then negates the benefit of such close supervision when this changeover is made. If the advantages of saline are not stressed, an increasing number of anaesthetists will be encouraged to perpetuate an inferior technique.

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Residual throat pack – a further method of prevention?

An 11-year-old girl presented for dental extractions. She had a permanent metal tracheostomy tube *in situ* since birth for a congenital airway problem, but was otherwise fit and well.

Anaesthesia proceeded uneventfully using a spontaneously breathing technique. Following removal of her permanent metal airway, a short cuffed tracheal tube was placed easily through the tracheal stoma and a throat pack was inserted. After uneventful surgery, the metal airway was replaced and humidified oxygen provided to the child in recovery through a tracheostomy mask. Thirty minutes later, she complained of nausea and, shortly after, vomited. The throat pack was easily identifiable; her postoperative recovery, thereafter, was unremarkable. Despite vigilance and the best of intentions, failure to remove a throat pack prior to extubation is a potential hazard with serious sequelae. It is common practice to place a throat pack sign on the forehead, but this may not be observed when the airway has been maintained via an unusual route. Our patient had a clear artificial airway at the conclusion of surgery and our attention was directed towards the tracheostomy site rather than the oropharynx with the result that the need to remove the throat pack was overlooked.

Several systems have been suggested to prevent this complication, such as placing a label in a prominent site [1], suturing the pack to the tracheal tube [2] or attaching a heavy gauze suture to the end of the throat pack which then extends several centimetres outside the

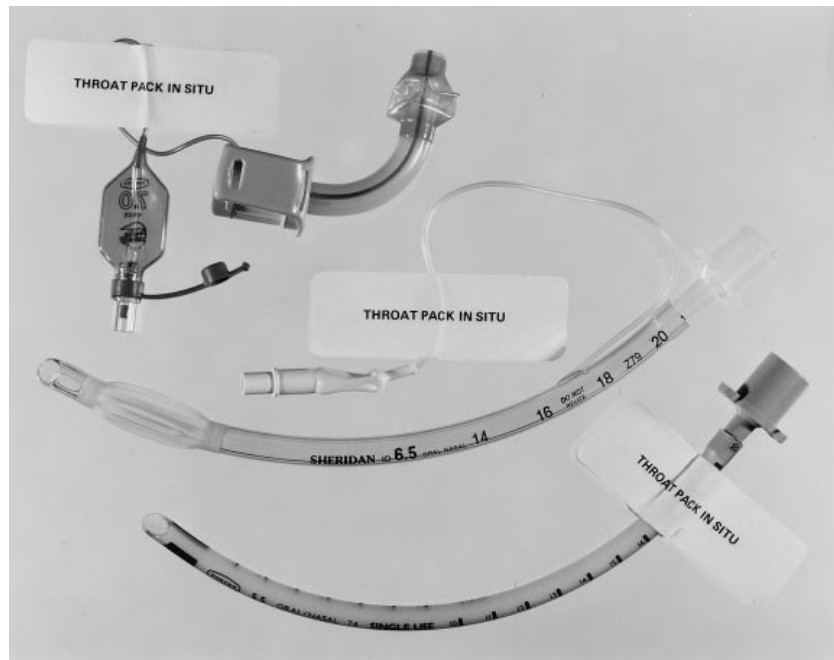


Figure 1

mouth [3]. In rare circumstances where the anatomical airway is bypassed and a throat pack is required, we suggest that the artificial airway could be labelled (Fig. 1) in addition to one of the above methods to reinforce the need to attend to the oropharynx at the end of anaesthesia.

Whatever measures are taken, the responsibility for the removal of a throat pack rests firmly with the anaesthetist who puts it in; such an obligation can never be overemphasised.

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Burn in the mouth during oral laser surgery

A 50-year-old man was scheduled for resection of hypertrophy of the lingual tonsil using a carbon dioxide laser. After induction of anaesthesia and muscle relaxation, a cuffed nonmetal tracheal tube (Defensor tube: Fuji System Corporation, Japan) resistant to laser beams was inserted nasally into the trachea. A Boyle–Davis gag was inserted and the surgeons were instructed to use the beam for as short a duration as possible and not to target it around the tracheal tube.

Despite my concern, the surgeon used the laser beam almost continuously for more than 15 min. No damage to the tracheal tube occurred; however, at the end of surgery, the surgeon noticed that the gag was extremely hot. This was removed immediately and it was noticed that there was discoloration of the lips and hard palate where the gas was attached. Iced water was poured over the lesion. Fibreoptic bronchoscopy showed no apparent damage to the trachea. After about 20 min of cooling, anaesthesia was discontinued and the trachea was extubated. The patient had

sore lips for a few days, but recovered fully without any scarring.

One possible cause for this burn was that the metal gag was heated by the laser beam which inadvertently had been targeted directly at the gag. Another possibility is that the beam hit a metal instrument (such as forceps), scattered and generated heat in the gag [1]. I draw readers' attention that if laser surgery of the oropharynx lasts longer than expected, burns may occur not only by ignition of a tracheal tube, but also by overheating of metal instruments (including a laser-resistant metal tracheal tube) in the oropharynx.

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Reference

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Adult face mask for neonatal anaesthesia and resuscitation

A 2-day-old newborn with Tessier orofacial clefts and exposed left orbit (Fig. 1) was scheduled for CT scan under general anaesthesia followed by reconstructive plastic surgery to cover the exposed orbital floor.

The patient arrived in the anaesthetic room with a nasogastric tube in place. After gastric decompression, anaesthesia

was induced with sevoflurane via an Ayres-T piece system. It was apparent that the use of a Rendell–Baker Soucek mask would not provide a good airtight seal over the facial defects and would cause untoward compression on the exposed left orbit. Smooth induction was made possible with the use of an upside-down size two Everseal (MIE) mask over the entire face of the patient (Fig. 1). The seal provided was found to be excellent and assisted ventilation was possible before the patient was paralysed and the trachea intubated.

Since then I have used this arrangement in the occasional resuscitation of apnoeic newborn in the obstetric suite with success. I consider this technique a useful addition to our neonatal anaesthetic practice.

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Anaesthesia for laparoscopic cholecystectomy in myasthenia gravis: a non-muscle relaxant technique

A 65-year-old, 85-kg woman was scheduled for laparoscopic cholecystectomy. Myasthenia gravis, Osserman and Genkins stage 2b had been diagnosed 10 years previously. She had a forced vital capacity of 1.4 l. She was taking pyridostigmine 300 mg.day⁻¹ and prednisone 20 mg.day⁻¹ by mouth. The anticholinesterase therapy was discontinued on the morning of the surgery

and she was given ranitidine (150 mg) orally the evening before surgery, a further 150 mg 1 h before surgery together with metoclopramide 10 mg at the same time. No sedation was given. Under appropriate monitoring and after insertion of an epidural catheter (L1–L2) general anaesthesia was induced by inhalation of 2% isoflurane in O₂ and nitrous oxide (N₂O) (1:1) for 5 min. Assisted ventilation was continued for a further 5 min with 4% isoflurane and O₂:N₂O (1:1). A tracheal tube was inserted without difficulty, with no coughing, straining or bucking and her haemodynamic parameters remained unchanged. Following intubation, 10 ml of 2% lignocaine was injected into the epidural catheter over a 15-min period. General anaesthesia was maintained with isoflurane (end-tidal concentration 1.5%) and nitrous oxide 60% in oxygen. Analgesia and muscle relaxation were obtained with the epidural block. The operation proceeded uneventfully using standard operative techniques and lasted approximately 45 min; the operating conditions were satisfactory. Fifteen minutes later, the patient had recovered from the general anaesthesia and mechanical ventilation was gradually withdrawn using the intermittent mandatory ventilation mode. Following demonstration of a maximal inspiratory pressure of –20 mmHg, the patient's trachea was uneventfully extubated in the operating theatre. In the recovery room a continuous epidural infusion of bupivacaine 0.125% was started at 10 ml.h⁻¹, with excellent results. The patient was transferred to the open ward 24 h later where



Figure 1

she continued to do well. Anticholinesterase therapy was reintroduced at half the pre-operative dosage on the first postoperative day.

The published anaesthetic experience in this disease is quite large, especially the anaesthetic management of patients undergoing thymectomy [1–3]. However, we are not aware of any previous reports on epidural anaesthesia in combination with light general anaesthesia for laparoscopic cholecystectomy in myasthenia gravis. The currently described anaesthetic technique avoids muscle relaxants and provides excellent intubating and operating conditions with effective analgesia well into the postoperative period, preserves the function of diaphragm and allows earlier extubation [4, 5].

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The use of sumatriptan in the treatment of postdural puncture headache

Reflex cerebral vasodilatation has been suggested as a key contributory factor in the aetiology of postdural puncture headache (PDPH) [1]. This arises from a combination of traction on the pain-sensitive intracranial vasculature and low cerebrospinal fluid (CSF) pressure secondary to leakage of CSF through the dural puncture hole [2]. We wish to report a case of PDPH successfully treated with the serotonin receptor agonist sumatriptan, a cerebral vasoconstrictor that is well established in the treatment of migraine headache.

A 19-year-old primigravida developed a PDPH 24 h after spinal anaesthesia performed for manual removal of a retained placenta. The headache initially settled with bed rest and analgesia. She was discharged 3 days postpartum but was readmitted 2 days later complaining of a severe recurrence of the headache. An epidural blood patch was performed in the left lateral position at the site of the original dural puncture by a consultant anaesthetist. Injection of blood was stopped after 15 ml had been given as the patient complained of sudden back pain. Unfortunately, the headache remained unchanged over the next few hours.

Carp *et al.* [3] have reported treatment of PDPH with sumatriptan and accordingly 6 mg of sumatriptan was administered subcutaneously to the patient 5 h after the unsuccessful epidural blood patch. The headache improved considerably within an hour of sumatriptan administration, although the improvement was maintained at this stage for just 12 h. The patient was anxious and distressed and very reluctant to consider a further epidural blood patch. A second dose of sumatriptan was given 14 h after the first dose and produced a final resolution of the headache.

The success rate of an epidural blood patch in the treatment of PDPH is approximately 90% [4]. We recommend sumatriptan in the management of PDPH when conventional therapy has failed. The need for a second dose within 24 h reflects the experience of

Carp *et al.* It is interesting to speculate that sumatriptan may be suitable as first-line therapy in patients with anticipated difficult lumbar spine anatomy. Successful drug treatment of a PDPH in such patients may avoid the need to perform an epidural blood patch with the attendant risk of accidental dural puncture.

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Spontaneous movement, propofol and dopamine receptors

We would like to comment further on the letter to Dr E. A. Akpek (*Anaesthesia* 1997; **52**: 390–1) dealing with the spontaneous movements after administration of propofol. In his letter, he argues that the reduction in the incidence of postoperative nausea and vomiting following induction of anaesthesia with propofol is through dopaminergic receptors. To support this assessment the author mentions the letter of DiFlorio [1] and the article of Appadu *et al.* [2]. In the former it was only speculated that propofol may act on the dopaminergic receptor and in the latter it was shown that propofol does not interact strongly with D₂ dopamine receptors. Although the antiemetic effect of propofol is still not

fully understood, recent studies [3, 4] demonstrated that propofol could neither prevent apomorphine-induced vomiting – which is mediated by dopaminergic receptors – nor could a continuous infusion of subhypnotic doses of propofol increase the plasma levels of prolactin, a very sensitive marker of dopaminergic receptor blockade [5]. Therefore, we disagree with the hypothesis of Dr Akpek linking the spontaneous movements associated with propofol administration by an interaction with the dopaminergic system.

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Propofol, fluoxetine and spontaneous movement

We are prompted by the paper by Chan *et al.* (*Anaesthesia* 1996; **51**: 663–6) and subsequent correspondence [1] to report two cases of pronounced involuntary muscle movements following induction of anaesthesia with propofol. These occurred in patients who had been prescribed regular fluoxetine and we wish to suggest a possible interaction.

Both patients were female, ASA Grade 1 and aged in their mid-twenties. They had both previously undergone anaesthesia and surgery uneventfully. Since then, however, both had been prescribed fluoxetine (20 mg once daily) by their respective general practitioners. One had received the drug for 4 months, the other for 6 months. Neither had any history of epilepsy or movement disorder. Both presented for incision and drainage of subcutaneous abscesses on the same Accident and Emergency Department day case operating list. No premedication was prescribed and anaesthesia was induced in each case with 180 mg propofol (2.0–2.5 mg.kg⁻¹). This was immediately followed in both women by pronounced involuntary upper limb movements lasting 20–30 s, which ceased spontaneously. Following this, anaesthesia and surgery continued uneventfully. Recovery was unremarkable and both returned home that afternoon. As a matter of note, two other patients received similar doses of propofol from the same batch without incident.

Fluoxetine is a commonly prescribed selective serotonin re-uptake inhibitor (SSRI). It is indicated in the management of depressive illness, particularly where sedation is not required [2]. Although the drug has been implicated in causing convulsions [3] and prolonging ECT seizures [2], it is thought to be safer in this regard than the older tricyclic agents which it has superseded [4]. Propofol is known to cause epileptiform activity and involuntary movements [5, 6]. However, it is also known to shorten ECT seizures [7] and is not recommended by the American Psychiatric Association for that reason. Moreover, it has also been claimed that it possesses anticonvulsant properties, probably mediated by activating GABA receptors [8]. Although the mechanism of involuntary movements following its use as an induction agent is unclear, one suggestion is that propofol may block dopaminergic D₂ receptors and thereby unmask D₁ activity. This manifests as these involuntary movements [1]. There is anecdotal opinion that such movements are seen with low induction doses in unpremedicated patients

who are possibly in a 'light' plane of anaesthesia.

While our patients' movements and their associated prescription of fluoxetine could simply be ascribed to coincidence, it is known that destruction of serotonin-rich brain tissue in an animal model increases anaesthetic requirement [9]. A possible explanation, therefore, is that as brain serotonin re-uptake is blocked in our patients, they may have had an increased anaesthetic requirement, and hence received what was for them a low dose of propofol. Despite its increasing prescription, there is a paucity of literature on the anaesthetic implications for patients prescribed fluoxetine, particularly regarding whether or not such patients have an increased requirement for anaesthetic agents.

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serotonin or norepinephrine brainstem areas on halothane and cyclopropane MACs in rats. *Anesthesiology* 1978; **49**: 252.

Sevoflurane induction and acute epiglottitis

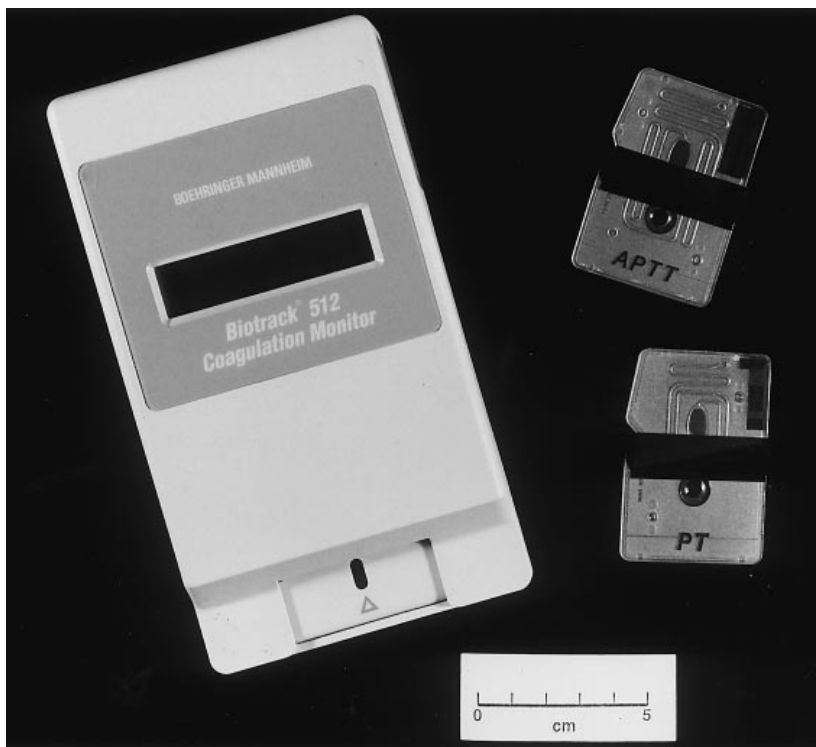
Fenlon and Pearce (*Anaesthesia* 1997; **52**: 285–6) comment that sevoflurane should probably not be used for induction of anaesthesia in a child with acute epiglottitis and continue that there were no anecdotal reports in the literature of sevoflurane being used in this condition. I have recently used sevoflurane for securing an airway in an 8-year-old child with acute epiglottitis. This was a child with a classic history of short-duration, acute respiratory distress and presented sitting up and drooling. Oxygen saturation whilst breathing air was about 89% and he therefore required intubation on a fairly urgent basis. He was taken to the operating theatre and anaesthesia was induced with sevoflurane in oxygen and I can report that the induction was completely without incident and, if anything, better than my previous experiences using halothane. I would recommend its use in this condition because the speed of induction was significantly greater than that achievable with halothane and there was no evidence of any respiratory depression as a result of using sevoflurane.

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Coagulation assessment at the bedside

Greaves reports that attempted subarachnoid block in a patient receiving subcutaneous low-dose unfractionated heparin resulted in accidental spinal cord injury with haemorrhage [1]. This adds to the literature that the majority of spinal haematoma complicating central neural blockade occur in patients with an abnormality of haemostasis [2]. Dr Greaves mentions that patient response to 'low dose' heparin is highly variable,



with some becoming clinically anticoagulated following a single dose [3] and that the activated partial thromboplastin time (APPT) be measured prior to institution of block in these patients. Others support this advice [4, 5], but some maintain that routine anticoagulation tests cannot assess the effects of low-dose heparin [2]. There are several practical difficulties in obtaining laboratory-based measurements of coagulation status in the immediate pre-operative period. Blood must be drawn, collected, labelled, transported, analysed and results reported. We write to emphasise that practical alternatives to laboratory-based analyses are now available [6]. The Biotrack 512 Coagulation Monitor (Biotrack Inc., Fremont, CA, USA) is an example of a new generation of robust and reliable devices that allow rapid measurement of a range of patient values at the bedside, the so-called 'point of care'. The Biotrack 512 device (Figure) is a lightweight, portable, battery-powered unit that provides quantitative analysis of whole blood APPT or prothrombin time (PT). Measurement is started by inserting a disposable test cartridge

(Figure) into the monitor. The monitor reads calibration data encoded on the cartridge, warms it to control reaction temperature and then provides visual and audible prompts for the test. A drop of freshly drawn blood is applied to the well of the cartridge, initiating measurement. Blood is drawn by capillary action into the reagent well, where coagulation is activated. Blood continues to flow until a clot forms. A laser-based optical system detects this flow and its endpoint. APPT or PT are displayed on the monitor, permitting immediate verification of these values without resort to the laboratory.

Whilst analyses using thromboelastography may provide a more complete picture of coagulation status [7] these devices currently lack the attributes of economy and portability that these hand-held machines offer; they signal a quiet revolution in the field of chemical pathology.

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The reproducibility of the iliac crest as a marker of lumbar spinal level

I read with interest the study of Dr Render (*Anaesthesia* 1996; **51**: 1070–1) dealing with the reproducibility of the iliac crest as a marker of lumbar spinal level. I feel, however, that caution should be exercised when extrapolating the results of this study to clinical practice. The study was performed on supine patients whose hips were poorly flexed and in whom the axis of the pelvic brim was perpendicular to the spine. In practice, however, regional anaesthesia is usually performed in the lateral or sitting

position. In the lateral position especially, because of the vagaries of positioning and the often slightly uneven surface on which the patient may lie, the axis of the pelvic brim is seldom perpendicular to the spine, thus giving rise to a degree of variability with regard to the point of intersection of Tuffier's line with the spine.

I would also question her comment that the lack of hip flexion 'leads to minimal distortion as there is little distraction of the lower vertebrae from the sacrum with flexion'. In practice, with maximal hip and lower spine flexion, the distance between the spinous processes of L4 and L5 may easily exceed 1 cm when compared to the maximally flexed state. This increased distance between the spinous processes would theoretically bring them more cephalad relative to Tuffier's line, increasing the likelihood of this line crossing at L4–5 rather than L3–4.

I agree that a further clinical test to define the L3–4 interspace would be of value. However, the method recommended in Dr Render's paper, of counting down from C7, may prove inaccurate because of the difficulty in reliably counting and palpating all the interspaces between C7 and L4. An alternative technique, mentioned in some older texts as *Eriksson's Illustrated Handbook in Local Anaesthesia*, suggests palpating the 12th rib to the intersection with the erector spinae muscle and drawing a transverse line. This should cross the midline at the level of the spinous process of T12. Since this method identifies an anatomical landmark which is closer to the desired L3–4 level, and is unaffected by lateral pelvic rotation, I feel that, in conjunction with Tuffier's line, it may be a more accurate and easier to perform method.

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Halothane or halitosis?

Anaesthetists who use the circle system with carbon dioxide absorption at low fresh gas flows ($\leq 800 \text{ ml} \cdot \text{min}^{-1}$) need to monitor vapour concentrations. In employing the Datex AS/3 Monitor (Vickers Medical) they may have come across an anomaly. With enflurane, isoflurane, desflurane or sevoflurane (all of them ethers) the monitor's screen, after about an hour's anaesthesia, may display 'halothane detected' (or 'mixed agent') when it is hard to see how halothane, a hydrocarbon, could possibly have been detected.

It seems the current AS/3 analysers (ASX 100, ASX 200) can detect hydrocarbons other than halothane, in particular, methane. When the sampled concentration of methane, derived from the patient's bowel, exceeds 0.025% it is analysed and then reported as halothane (data from Vickers Medical). At which stage and especially in 'auto' mode the displayed MAC value can change, usually by an increase, putting the anaesthetist in somewhat of a quandary. One answer is to increase the fresh gas flow briefly ($6 \text{ l} \cdot \text{min}^{-1}$ for 2–3 min). That will dilute, or flush out, by scavenging, an accumulation of methane; and incidentally, may do the same for noxious contaminants such as Compound A – another ether – if sevoflurane were the volatile agent. The monitor's display will return to normal.

Another answer is to buy the new analyser. Owners of the current AS/3 cannot update their monitors simply by changing the software.

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