Correspondence

Use of methoxamine in the resuscitation of epinephrine resistant electromechanical dissociation

Dr McBrien *et al.* describe three interesting cases of electromechanical dissociation (EMD) resistant to epinephrine treatment (McBrien *et al. Anaesthesia* 2001; **56**: 1085–9). In these cases, an α adrenergic agonist (methoxamine) proved to be lifesaving. However, to 'consider an α agonist for any case of cardiac arrest secondary to electromechanical dissociation which is unresponsive to epinephrine' may not be appropriate. These cases involved a specific situation where the likely cause of hypotension was a fall in the systemic vascular resistance (SVR). This occurred as a result of proven type 1 hypersensitivity in two cases and direct action of methylmethacrylate cement in the other. Clearly in this case, an α agonist is a logical choice. The Advanced Life Support guidelines are designed to cover a wide range of differing conditions for use by practitioners of differing experience who may or may not be aware of the originating event. Indeed, hypotension causing EMD may be as a result of cardiac tamponade, tension pneumothorax or hypovolaemia. It is unlikely that the use of α agonists would be helpful in these situations. It would seem prudent to continue to use epinephrine as the first line treatment for an EMD cardiac arrest and to advise using an α agonist in cases of hypotension where reduced SVR is suspected as the cause when epinephrine may not be effective in restoring the blood pressure. However, as methoxamine has now been withdrawn from clinical use, other α agonists such as metaraminol or phenylephrine may be more readily available.

F. M. J. Harban
Queen Elizabeth Hospital,
Birmingham B15 2TH, UK

Reference

1 European Resuscitation Council Guidelines 2000 for Advanced Life Support. A statement from the Advanced Life Support Group and approved by the Executive Committee of the European Resuscitation Council. Resuscitation 2001; **48**: 211–21.

Outreach critical care services

We read with interest the editorial: 'The acute pain service: a model for outreach critical care' (Counsell. *Anaesthesia* 2001; **56**: 925–6). We would like to make a few observations regarding this. Just as the publication of '*Pain After Surgery*' led to the development of the acute pain service, the Department of Health has commissioned *Comprehensive Critical Care – a review of adult critical care services as a response to the Audit Commission's report* '*Critical to Success*'. Indeed, it is the first time that there has been a review of critical care services in the UK. With the NHS being a monopoly, at least as far as critical care services in this country goes, we definitely need the government's backing and blessing to make any meaningful progress in this field. In this regard the 'heavy bias' of NHS executives is welcome, especially if it means that there would be more money for the service and a commitment to the improvement of the services to the patients.

There is no pleasure without pain – so we suppose that we cannot ignore that comprehensive critical care is a package that comes with a number of recommendations and 'Outreach Critical Care' is one small aspect of it. The service is to be developed with the following three essential objectives: to avert admissions, to enable discharges and to *share critical care skills*; we feel that the latter is the most important aspect of the package. We are not sure how the acute pain team evolved, but it was probably similar to how the intensive care services evolved in this country, i.e. based on historic legacy and ad hoc development, led by a few anaesthetists who were interested.

As advanced level trainees, we have been to local and regional meetings for the introduction of the outreach services as a part of our management training. We are convinced that the experiences of the acute pain services have been considered in the planning of the 'Outreach Services'. The main pitfalls previously or still being experienced with the acute pain services are being avoided. In this aspect there is a push to educate the ward staff and junior doctors about management of ill

All correspondence should be addressed to Professor M. Harmer, Editor of Anaesthesia, Department of Anaesthetics, University of Wales College of Medicine, Health Park, Cardiff CF14 4XN UK.
Letters (two copies) must be typewritten on one side of the paper only and double spaced with wide margins. In addition, please include your letter as a Word for Windows or .rtf document on disk or alternatively submit as an e-mail attachment addressed to HarmerM@cf.ac.uk Copy should be prepared in the usual style and format of the Correspondence section. Authors must follow the advice about references and other matters contained in the Notice to Contributors to *Anaesthesia* printed at the back of each issue. The degree and diploma of each author must be given in a covering letter personally signed by all the authors.
Correspondence presented in any other style or format may be the subject of considerable delay and may be returned to the author for revision. *If the letter comments on a published article in Anaesthesia, please send three copies; otherwise two copies of your letter will suffice.*

patients and patients with a potential to deteriorate rather than 'open a veritable Pandora's Box'. The introduction of early warning scores (e.g. MEWS) and the ALERT course [1], which is now evolved and running in many hospitals, should be able to take the pressure off the critical care services, at least in the long run. Time will tell whether Critical Care Outreach teams will do an equal, lesser or better job in this role than the Acute Pain teams. Comprehensive critical care outreach service is a 24-h, 7-days a week service, unlike the acute pain service, which is a 9–5, Monday to Friday service in almost all hospitals we have worked in. At the most unsocial time the 'acute pain (ful) baby' is left to be attended by a surrogate. An important point in this debate has been overlooked. Acute pain teams are involved almost exclusively with surgical patients. Their usefulness in helping manage sick medical patients are very limited, a large proportion of admissions to ICU being 'medical'. We see no problem in the possibility that there may be two teams potentially reviewing the patients. If nothing else, this gives sick patients 'two bites of the cherry' in terms of chances that problems will be detected soon enough to benefit them. Ideally, the Acute Pain Service in a hospital would work alongside the Critical Care team in wards contributing in their areas of undoubted expertise.

We suppose we are in a world of fantasy, as we foresee that the acute pain teams will have to be amalgamated within the outreach service. There would be no point and it would be extremely expensive to run two teams. The expert group which reviewed adult critical care services was determined that their proposals should describe a service which would meet the needs of patients and be delivered by professions and specialities working in partnership and says 'successful implementation depends on breaking down the barriers between specialities and professions to focus on the needs of the patient' [2].

C. V. Prasad
D. Acharya
Blackpool Victoria Hospital,
Blackpool FY3 8NR, UK

References

1 ALERT – Acute Life-threatening Events – Recognition and Treatment. *A multiprofessional course in the care of the acutely ill patients* -School of Postgraduate Medicine. University of Portsmouth.
2 Department of Health. A review of adult critical care services. *Comprehensive Critical Care*. May 2000.

A reply

Clearly, the need for a review of critical care services has been long overdue. There is a need for the involvement of NHS executives in order to empower the financial backing to allow improvements to take place, but the question of balance remains a key issue. Would a broader representation of clinicians have led to a more balanced perspective? Certainly on the issue of the objectives of 'Outreach Critical Care' I think it would have.

From what I can ascertain, the only direct input from an 'Acute Pain' practitioner in the North-west has been the involvement of a nurse practitioner at the zonal meetings in the Preston (which includes Blackpool) area. I am unaware of any involvement beyond this. How then can the experiences of acute pain have been fully considered as claimed?

The comments of Drs Prasad and Acharya show a naive lack of insight into what Acute Pain Services (APS) have to offer and what they have achieved: a naiveté, I suspect, that is sadly reflected more generally amongst intensive care physicians. As a case in point, let us look briefly at the achievements of one of the Acute Pain Services in the North-west.

Beginning largely as a postoperative service, they have spread over the past 10 years to include support for patients in pain in many areas across the hospital including paediatrics, accident and emergency and medicine. They have supported the use of acute pain techniques when required in medical and palliative care settings including home epidurals and have provided multidisciplinary teaching programmes in all settings to support these initiatives. They have introduced improvements in the management of incident pain in departments such as X-ray and have supervised the hospital-wide implementation of Entonox and supported the dissemination of its use into community practice. Recognizing the poor standards in key areas of practice, they have facilitated the introduction of standardised regimens for postoperative antiemesis, postoperative oxygen and more recently undertaken initiatives to improve peri-operative fluid management. These include the introduction of new pre-operative fluid/starvation guidelines and the standardisation of pre- and postoperative fluid regimens. Over the years, the service has established the principle of direct referral of sick patients to Intensive Care by acute pain nurses. This was achieved long before the publication of 'Comprehensive Critical Care', despite initial opposition from a number of the intensive care consultants. Clearly, a service such as this has much experience of value when planning a hospital wide service such as 'Outreach' and whilst I accept that not all APS have developed to quite this degree, all have a great deal to offer for the reasons outlined in my original article.

To my mind the 'outreach' recommendation is the most important aspect of the document, not as you suggest a 'small part'. It is this initiative, if as a profession we can get it right, that could ultimately benefit the most patients. Is it enough to rely on MEWS and ALERT simply to avert the tide of new referrals to ICU, which I doubt they will do, or should we be trying to do more? Surely, it is better to prevent physiological deterioration from occurring in the first place. Comprehensive Critical Care fails to address this issue. In my experience, intensive care physicians are quick to criticise the poor fluid management, lack of oxygen or analgesia that has led to a patient's deterioration, yet they have little concept of how and why these problems occurred or as to how they can be avoided. Above all else, it is this insight that Acute Pain Services has to offer.

So what of MEWS and ALERT in which Drs Prasad and Acharya put so much faith? To date, early warning systems have only been validated on surgical wards and more recently on a medical admissions unit [1]. I am only

aware of one hospital that has so far implemented a system onto general medical wards, and that only recently. On a national basis the lid has, as yet, only been partially removed from 'Pandora's Box', so perhaps one should temper one's optimism. The value of education alone in changing practice has been questioned [2] and therefore the potential impact of the ALERT initiative warrants consideration. Although ALERT has all the appearances of 'a good idea', there is no evidence, in these days of evidence-based practice, that the course has any impact on the standard of care on the wards or that it will help to reduce the need for ICU. Given the expense both in time and money of running these courses for small groups of students, such evidence is badly needed. I have taught on ALERT for the past 6 months and it is clear that the package has its problems. Some of the lectures are poor and a number of the slides are unintelligible. Timing of the lectures, particularly to junior medics, is crucial due to the rapid turnover of staff.

The provision of 9–5, Monday to Friday, Acute Pain Services has nothing to do with convenience as implied and everything to do with funding. Most services (the one outlined earlier being a good example) strive to improve cover to include early evenings and a part service at weekends within existing budgets where possible. The use of other trained staff, e.g. from theatre recovery or using a link nurse network is also organised to reduce unnecessary calls to medical staff. The need for 24-h cover for both Acute Pain and Outreach is the single most cogent financial argument for why service co-operation is essential. There should be no need for an 'outreach nurse' to refer basic acute pain problems, such as topping up an epidural, to a pain nurse. Multi-skilling and co-operation are essential to provide the sort of comprehensive service that is required, and the model that I suggested is, I believe, one way to achieve this.

So where in the North-west is the exemplary Acute Pain Service outlined above? Actually it's at the Blackpool Victoria Hospital, Drs Prasad and Acharya's own hospital. I suspect that, as yet, they have had no dealings with the APS other than to attend sick patients flagged up and referred by the pain nurses. This seems a sad omission when the service has so much to offer. Acute Pain Services have to date been at the forefront of critical care at ward level and I do not believe therefore that Intensive Care have a monopoly view on the issues. If they want that monopoly, then it is incumbent upon the speciality to include training in outreach development for SpR's. With outreach services as yet non-existent or in their embryological state, training and insight can only be gained by spending time with the more established Acute Pain Services.

Like Intensive Care, Acute Pain Services have grown in an unco-ordinated fashion and mistakes have been made. If the outreach initiative is to have its maximum effect quickly there is a need to widen the debate about its remit and to establish effective, well thought out services, otherwise the mistakes of the past will be repeated. Many people like myself in the acute pain field have been striving for years to improve general standards of care on the wards with little support from policy or finance. We admit to some frustration that now monies are available our efforts, advice and potential contributions are being largely ignored. Our patients deserve the best quality service possible and the NHS deserves the best service for its investment. This is achievable if we work together.

D. J. Counsell
Maelor Hospital,
Wrexham, UK

References

1 Subbe CP, Kruger M, Rutherford P, Gemmel L. Validation of a modified Early Warning Score in medical admissions. *Quarterly Journal of Medicine* 2001; **94**: 521–6.

2 Bero LA, Grilli R, Grimshaw JM, Harvey E, Oxman AD, Thompson MA. Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. The Cochrane Effective Practice and Organisation of Care Review Group. *British Medical Journal* 1998; **317**: 465–8.

Disposable laryngoscope blades

Further to recent correspondence [1–4] on the hazards of prion-related diseases and the hazards encountered when using new disposable surgical equipment [1], we would like to report our experience with the use of new disposable anaesthetic equipment. Recent concerns regarding the possibility of transmission of prion-related diseases following the use of re-usable laryngoscopes [2, 3] have stimulated the trial of various single use laryngoscope blades or blade covers.

Recently, we were asked to use two such blades from one supplier (LiteBladeTM II blades 1 and 2, Truphatek International Ltd) during the course of our anaesthetic list. We found that the curved infant blade (blade 2) offered little or no view of the larynx and very little room for manoeuvre in the mouth. When a re-usable Macintosh infant blade was used, laryngoscopy was performed without difficulty. The blade was compared with our standard equipment (also made by Truphatek); it could be seen that cross sections of the blades were very different in shape (Fig. 1), the disposable blade having no oblique profile where it would have been in contact with the tongue. In addition, the portion of the blade which would have been in the mouth during laryngoscopy was much larger (Fig. 2). The result was that the blade did not curve around the tongue. This significantly reduced the unoccupied area of the mouth and pharynx when the blade was inserted compared with the similar re-usable blade. In the small infant's mouth this reduction in area prevented a good view of the larynx. We were therefore not satisfied with the performance of the disposable curved infant blade.

Later, on a different patient, we tried to use a disposable straight infant blade from the same supplier (blade 1). During laryngoscopy a small piece of green material, looking very similar to the material of which the laryngoscope blade was manufactured, was seen in the vallecula. This was removed using a yankauer sucker (Fig. 3), prior to intubation. We can only assume that a

Figure 1

Figure 2

Figure 3

fragment of the larngoscope blade had fallen off. On re-examination of the blade, a piece was missing where the blade joined the laryngoscope handle (Fig. 4), although the material removed from the airway did not appear to be the appropriate size or shape. It may have been that the moulding process had left a small tag attached to the blade near the light bulb (Fig. 5). If so, this was not noticed during routine inspection. Had the fragment been inhaled we do not know whether it would have produced a significant inflammatory response or whether it would have been clinically or radiologically detectable. We do believe that if detection and removal of the fragment bronchoscopically had been necessary it would have been very difficult.

Our experience re-emphasises the importance of quality control, the checking of equipment, and the potential dangers of converting to new equipment in the light of concerns over repeated use equipment. Like those incidents already reported [1, 5], there have also been several problems with the disposable ENT surgical equipment in our trust. We agree with some of the comments made in *Anaesthesia News* [4, 5] cautioning against the hasty change to disposable equipment. We recognise that this change has been made in an attempt to reduce a risk, which may be significant but is not yet fully quantified. The change has already led to critical incidents which, if repeated could lead to morbidity or mortality.

Figure 4

Figure 5

S. Babb
S. Mann
The John Radcliffe,
Oxford OX3 9 DU, UK

References

1 Martin F, Wilde A. Tonsillectomy – anaesthetic technique and the new disposable surgical equipment. *Anaesthesia* 2001; **56**: 912.
2 Lowe PR, Engelhardt T. Prion-related diseases and anaesthesia. *Anaesthesia* 2001; **56**: 485.
3 Arnstein F. New variant Creuzfeldt-Jakob disease – is our practice safe? *Anaesthesia* 2001; **56**: 585.
4 Frerk C. Life is not risk free. *Anaesthesia News* no. 167 June, 2001.
5 Allan B. Disposable danger. *Anaesthesia News* no. 169 August, 2001.

A reply

As a leading manufacturer of all types of re-usable and single use laryngoscopes, we are always interested in discussing with clinicians and taking into account their particular likes and dislikes concerning our equipment. Obviously, we prefer to do this face to face rather than in the public domain and our UK Agents (Proact Medical Ltd, Kettering) are always available to help in these discussions. However, it should be noted that our Lite Blade range of seven blade sizes is very widely used in the UK, USA and most European countries and was first made available in the UK in 1994, many years before the current move towards use of single use products. Overall, we are very pleased by the

wide appreciation of the single use version including the strong light emission, the rigidity of the blade and the variety of size options. On the other hand, we also accept the comments from other clinicians who have been trained and have been very happy using our metal blade ranges for many years.

With respect to these particular clinicians' views, we fail to see the relevance of linking their comments on the shape of one of our blades to their reservations about the need to convert from re-usable to single use products, an issue worthy of discussion in itself.

D. Grey
Trumphatek International Ltd,
Netanya, Israel 42101

Overfilling of vaporisers

After reading recent correspondence regarding a failure of an Ohmeda Tec 5 generation vaporiser (Fernando & Peck. *Anaesthesia* 2001; **56**:1009–10), I was left with the impression that they described a relatively freak event which was unlikely to be repeated. However, a recent event in our hospital revealed it was relatively easy to overfill this generation of vaporisers without any tilting at all. In fact, several of our vaporisers were overfilled on the same evening. This overfilling may be achieved simply by loosening the filler from the bottle and filling with the vaporiser turned on, manoeuvres that have been used to speed the filling process. Despite our staff being familiar with the current recommendations of the AAGBI [1] regarding checking anaesthetic equipment, the overfilling was only noticed when an oversupply of vapour (6.5% when dialled to 1.5%) triggered an alarm on the anaesthetic agent monitor. Fortunately, this incident had no adverse effect on our patient. However, if the faulty vaporiser had been in one of our anaesthetic induction rooms without volatile agent monitoring, and the patient had been less fit, this may not have been the case. This event highlighted the fact that no-one in our department was aware that these later generation vaporisers could be overfilled, with some convinced by their previous experience that it was impossible. We believe it likely that a similar belief is common around the country. This lack of awareness had contributed to a less diligent checking of the vaporisers and reduced emphasis on training those who filled them. A similar problem with overfilling has been described with older models and led to a Safety Action Bulletin from the Department of Health in 1992 [2]. There were also interesting discussions in the Canadian press around the same time [3, 4]. Our incident has taught us an old lesson.

D. Daniels
St George's Hospital,
London, SW10 0QT, UK
E-mail: ddaniels@doctors.org.uk

References

1 Checklist for Anaesthetic Apparatus 2. *London: Association of Anaesthetists of Great Britain and Ireland*, 1997.
2 Department of Health. Anaesthetic agent vaporisers fitted with agent specific fillers: reports of overfilling. *Safety Action Bulletin* no. 82, 29 April 1992.
3 Sinclair A, Van Bergen J. Vaporiser overfilling. *Canadian Journal of Anaesthesia* 1993; **40**: 77–86.
4 Hardy JF. Editorial. *Canadian Journal of Anaesthesia* 1993; **40**: 1–3.

The Pro-Seal laryngeal mask airway

We were interested in recent correspondence relating to reflux of gastric contents into the drain tube of the Pro-Seal laryngeal mask airway (Dalgleish & Dolgner. *Anaesthesia* 2001; **56**: 1010). As part of a trial comparing performance of the Pro-Seal with the classic laryngeal mask airway we inserted a gastric tube into the drain tube of 30 Pro-Seal laryngeal mask airways in elective surgery patients. All patients were starved for 6 h for solids and 3 h for fluids. In all cases, fibre-optic examination of the drain tube and the oesophagus below was undertaken before passage of the gastric tube. On no occasion was gastric content seen in the drain tube or in the upper oesophagus. Gastric fluid was aspirated in 29 of 30 cases with a median volume of 22 ml and a range of 0–85 ml. In none of the cases was there any suggestion of clinical regurgitation or aspiration.

In a recent case in our intensive care unit, a Pro-Seal was being used to allow endoscopic guidance during a percutaneous tracheostomy. The patient had been nasogastrically fed and the stomach was aspirated before the procedure. During dilation of the trachea, some nasogastric feed was vented a considerable distance out of the drain tube. Since the endoscope was at the glottic opening during this episode of regurgitation, it was possible to confirm, under direct vision, that there was no laryngeal or tracheal soiling.

Large studies and meta-analysis has suggested that the incidence of aspiration of gastric contents when using a classic laryngeal mask airway is approximately 0.05–0.009% [1, 2]. A recent editorial on mechanical ventilation via the laryngeal mask airway rather speculatively suggested that aspiration of gastric contents might occur in up to 360 patients per year in the UK [3] and implied that such practice could not be considered entirely safe. The choice of whether to use a laryngeal mask airway when artificially ventilating a patient varies considerably in UK practice [4].If elective cases may have significant volumes of gastric fluid, and there is some doubt as to whether ventilation via the classic laryngeal mask airway is safe, then the Pro-Seal is likely to be a valuable addition to the airway armamentarium. Laryngeal seal pressure is increased by approximately 50% [5] and the drain tube allows easy and reliable access to the stomach [5]. In addition, the drain tube might be expected to vent gas leaking into the oesophagus reducing gastric dilation, although this is untested. Should regurgitation occur, the drain tube may allow venting of regurgitated material and its appearance in the drain tube may act as an early warning.

However, these potential advantages have not been rigorously examined and it is therefore too early to be sure of the role of the Pro-Seal in anaesthetic practice. What evidence is there that the Pro-Seal allows a greater margin of safety in the event of regurgitation? At

present there is little; we are aware of three cases in which regurgitated matter has appeared in the drain tube without laryngeal or tracheal soiling (A. Brain, Personal communication). Drs Dalgleish and Dolgner's report brings the total to four, but is the first to be published. In addition, a study in cadavers [6] supports the contention. A study, at present only presented at a meeting, of the use of the Pro-Seal for laparoscopic cholecystectomy showed no more gastric distension than with a tracheal tube (Maltby JR, Beriault MT, Watson NC, Liepert DJ, Fick GH. Laparoscopic cholecystectomy: LMA-Proseal vs. tracheal intubation. Poster presentation. Canadian Anaesthesiologist's Congress 2001, Halifax, Canada).

If we wait for a controlled study between the two devices to give us the answer, it will be a long wait. If the incidence of aspiration during anaesthesia while ventilating through the classic laryngeal mask is 1 in 11 000 cases, as has recently been suggested [3] and this number can be halved by using the Pro-Seal, this would reduce the number of such cases in the UK by 180 per year. Conducting a trial to detect such a reduction, however, would require approximately 1.3 million patients in each group.

T. M. Cook
J. P. Nolan
Royal United Hospital,
Bath BA1 3NG, UK

References

1 Brimacombe S, Berry A. The incidence of aspiration associated with the laryngeal mask airway: a meta-analysis of published literature. *Journal of Clinical Anaesthesia* 1995; **7**: 297–305.
2 Verghese C, Brimacombe J. Survey of laryngeal mask airway usage in 11 910 patients: safety and efficacy for conventional and non-conventional usage. *Anesthesia and Analgesia* 1996; **82**: 129–33.
3 Sidaras G, Hunter JM. Is it safe to artificially ventilate a paralysed patient through the laryngeal mask? The jury is still out. *British Journal of Anaesthesia* 2001; **86**: 749–53.
4 Simpson RB, Russell D. Anaesthesia for daycase gynaecological laparoscopy: a survey of clinical practice in the United Kingdom. *Anaesthesia* 1999; **54**: 72–6.
5 Brain AIJ, Verghese C, Strube PJ. The LMA 'Pro-Seal' – a laryngeal mask with an oesophageal vent. *British Journal of Anaesthesia* 2000; **84**: 650–4.
6 Keller C, Brimacombe J, Kleinsasser A, Loekinger A. Does the Pro-Seal laryngeal mask airway prevent aspiration of regurgitated fluid? *Anesthesia and Analgesia* 2000; **91**: 1017–20.

Gum elastic bougies

There are two types of adult gum elastic bougies, one with a kink, one straight (Kumar & Jones. *Anaesthesia* 2001; **56:** 1121). I prefer the kinked one for two reasons.

First, if the larynx is very anterior the kink helps upward insertion. Second, when pushed right in, the kinked bougie stops at first or second generation bronchi, leaving 25 cm or so sticking out of the mouth. The oesophagus takes all 60 cm. The kink stops you going too far down the bronchial tree; lung laceration and pneumothorax in a ventilated intensive care patient has been reported, caused by a bougie [1].

W. F. S. Sellers
Kettering General Hospital,
Northamptonshire, NN16 8UZ, UK

Reference

1 de Lima LG, Bishop MJ. Lung laceration after tracheal extubation over a plastic tube changer. *Anaesthesia and Analgesia* 1991; **73**: 350–51.

Call for an alternative coupling system for regional equipment

We have read with interest recent editorial comment and correspondence in both the anaesthetic [1–3] and general medical [4, 5] press regarding the need for system wide change separating epidural and spinal equipment from the luer system. Recent deaths in the UK [6, 7] and Australia [8], together with serious critical incidents occurring in our own hospital, due to the administration of an epidural infusion via the intravenous (IV) route and the administration of epidural medications intended for intravenous use, has led us to consider various strategies that might be taken to implement an alternative coupling system for regional equipment. As part of this process the development of a coalition for change will be essential. This should include the various medical colleges and associations, hospital and health authorities, manufacturers and therapeutic goods administration bodies as well as anaesthetists and other practitioners involved in administering centroneuraxis medications (oncologists, chronic pain personnel, haematologists, intensive care physicians, radiologists). Early involvement of national and international regulators would be important as they typically work to fairly rigid agendas and long timeframes. Networking will be equally important particularly with and between interested political and professional bodies or individuals with a high political influence [5].

When considering alternative designs for regional equipment, we should ideally retain the positive basic properties of the current system but with the additional feature of incompatibility with the standard luer fittings. It is possible to describe a set of properties for the ideal regional coupling as set out in Table 1. It is envisaged that the new coupling shall constitute the interface between all components associated with regional drug administration, including epidural and spinal needle hubs, filters, drawing-up cannulae, minimum volume extension tubing as well as syringes. In line with this development, drugs for regional use should be packaged in such a way that only regional coupling systems could access them. There have now been several suggestions of an alternative coupling system to the current luer standard [1–3, 5, 9]. However, their relative merits have yet to be established. It will be essential to choose the most effective of any proposed solution, especially when one takes into account the considerable effort that will be required to implement the modifications to regional equipment on the scale required [5].

We believe that all clinicians strive to provide the safest level of care for their patients as a matter of basic principle and for that reason alone this type of

Table 1 Properties of the ideal regional equipment coupling.

Clinical features
Male and female fittings shall be conical to facilitate a partial twisting action for connection and disconnection
Separation and coupling forces shall be similar to those for the conical taper of the luer system
All the components required for regional drug administration shall employ this coupling
Components with this connection shall be easily distinguished from i.v. components, e.g. colour coded
All regional components should be physically incompatible with intravenous equipment and vice versa
Technical characteristics*
Male and female conical fittings shall have tolerances for maximum and minimum dimensions within 1%
Rocking of the conical coupling elements should not be evident
Liquid and air leakage should not occur
No evidence of stress cracking under conditions or likely to be encountered in clinical use
Production shall be with materials that are suitable for medical use, cheap and environmentally responsible

* As described in the International Standards (ISO 594, ISO 594/1).

change should be embraced. However, it is conceivable that when future patient incidents occur, failure to implement change in the knowledge of the problem and the availability of potential solutions could constitute a serious medico-legal challenge.

A. Cyna
S. Simmons
Women's and Children's Hospital,
Adelaide, SA 5005, Australia
E-mail: cyanaa@wch.sa.gov.au

References

1 Birks RJS. Safety matters. *Anaesthesia* 2001; **56**: 823.
2 Lanigan C. Luer-lock epidural connections. *Anaesthesia* 2001; **56**: 586.
3 Laws D. The time has come for non-interchangeability of spinal and epidural equipment with intravascular access ports. *British Journal of Anaesthesia* 2001; **86**: 903.
4 Berwick DM. Not again! Preventing errors lies in redesign – not exhortation. *British Medical Journal* 2001; **322**: 247–8.
5 Bickford Smith PJ. Designing safer medical devices requires financial and political support. *British Medical Journal* 2001; **322**: 548.
6 Laville S, Hall C, McIlroy AJ. Cancer boy dies after doctors' drugs blunder. *Electronic Telegraph*, February 2001; **Issue 2083**: http://www.telegraph.co.uk
7 Sapsted D. Patient died after being injected with wrong fluid. *Electronic Telegraph*, 2 May 2001; **Issue 2168**: http://www.telegraph.co.uk
8 Harcourt V. Coronial warning after fatal epidural infusion. *Australian and New Zealand College of Anaesthetists Bulletin* 2001; **10**: 5–6.
9 Cyna AM, Simmons SW, Osborn K, Andrew M. Fatal epidural infusion – call for a system wide change. *Anaesthesia and Intensive Care* (in press).

Obesity and day-case surgery in an isolated unit

We read with interest, the article 'Obesity and day-case surgery' (Davies *et al*. *Anaesthesia* 2001; **56**: 1112–15). The authors have mentioned that morbid obesity should not be used solely as an exclusion criterion for day-case surgery and patients should be considered for day-case surgery based on their medical, physical and social conditions and the type of surgery. Although these criteria are important, we feel that one should also seriously consider the location of the day-case surgery unit. Most day-case surgery units in district general hospitals are in the main hospital compound with facilities for overnight stay, access to high dependency unit services and medical assistance immediately available for the surgeon and anaesthetist when required. However, there may be a number of day-case surgery units that are isolated with no access to these facilities. Although patient selection criteria for day-case surgery are becoming less rigid, selection of patients for day-case surgery in such an isolated unit should be more stringent [1]. Obese patients, although they are fit and well pre-operatively, may give rise to various surgical and anaesthetic problems because of the physiological, anatomical and pharmacological changes associated with obesity. Problems may occur during induction, intra-operatively and postoperatively in the recovery room. Both general and regional anaesthesia may not be straightforward. Thus one has to be prepared for the unforeseen adverse incidents.

The guidelines for day-case surgery from the Royal College of Surgeons of England are that patients who are grossly obese with a body mass index greater than 30 $kg.m^{-2}$ should be excluded for day-case surgery [2]. We also wish to mention another weight related selection criterion to be considered, which is the maximum weight carried by the operating theatre table. Most normal operating theatre tables can only withstand body weight up to a maximum of 23 stone (although some may withstand more than this) and there have been incidences where we have to postpone cases and a special operating theatre table has to be ordered.

In the article, although the authors have mentioned that there is no significant difference between the unplanned admission rate and unplanned contact with health care professionals for patients with a body mass index greater than 35 $kg.m^{-2}$ and body mass index less than 35 $kg.m^{-2}$, the reasons for them are not mentioned. It would be interesting to know the reasons and whether they are related to obesity.

Thus we wish to stress that not only the patient and type of surgery criteria are important, the location of the day-case

surgery unit is also an important criterion to be considered when selecting patients for day-case surgery. Although there is no evidence that a body mass index greater than 35 $kg.m^{-2}$ should solely be an exclusion criterion for day-case surgery, one should seriously consider that criterion when considering patients for day-case surgery in an isolated unit. On the other hand, one could argue that day-case surgery, in the first place, should not be done in such an isolated unit. We believe that there may be a number of such isolated units in this country.

K. M. Ni
J. C. Watts
Burnley General Hospital,
Burnley, Lancashire BB10 2PQ, UK

References

1 Ni KM, Watts JC. Day case surgery in an isolated unit may require more stringent selection of cases. *Anaesthesia* 2001; **56**: 485–6.
2 The Royal College of Surgeons of England. Guidelines for Day Case Surgery. March 1992. London: The Royal College of Surgeons of England.

A reply

Thank you for the opportunity to reply to Drs Ni and Watts' letter. We do not believe that our reasons for admission to the hospital after surgery, or unplanned contact with health care workers, were directly related to the patient's obesity. Eight patients with a body mass index of greater than 35 $kg.m^{-2}$ were admitted; of these three were for pain, one following an umbilical hernia repair and two postendometrial thermal ablation. One patient had voiding problems after a hysteroscopy, one patient felt 'unwell' after the insertion of a pubovaginal sling, one elderly gentleman was admitted for hypotension after the removal of a skin lesion and there was no reason recorded for the last patient. Four patients with a body mass index of greater than 35 $kg.m^{-2}$ had unplanned contact with health care professionals. One returned to Casualty for a pressure dressing to be applied to the wound of an umbilical hernia repair, one called the day surgery unit (DSU) for advice on analgesia following endometrial thermal ablation and one called the DSU for advice on her experience of frequency following a cystoscopy. The final patient contacted her General Practitioner with some swelling of her neck, but with no difficulty breathing or swallowing, following a hysteroscopy; he prescribed an antihistamine and the symptoms resolved.

We agree that staff may need to be more cautious when selecting patients for surgery in an isolated DSU. However, we could find no evidence that obesity alone is a predictor of problems following day surgery. We agree that there may be other weight related criteria that may limit patient selection In our unit, as mentioned in our paper, the maximum weight carried by our trolleys is l25 kg and we do not accept patients above this weight for day surgery.

K. Davies
Royal Devon & Exeter Hospital,
Exeter EX4 6DW, UK

K. Houghton
J. Montgomery
Torbay Hospital,
Torquay TQ2 7AA, UK
E-mail: jane.montgomery@sdevonhc-tr.swest.nhs.uk

The Airway Management Device (AMD) is not 'reliable and safe'

The recent comments (O'Neil. *Anaesthesia* 2001; **56:** 1010–11) should not be allowed to pass without further comment. Dr O'Neil states that a new airway device must be safe and reliable. No-one would disagree with this statement: but his claim that the AMD, which he invented, is such a device is not substantiated by the available evidence. We audited 105 cases [1] and were unable to establish an airway in 10 cases. In a further five, complete obstruction occurred during anaesthetic maintenance or recovery. Eight patients showed intermittent or partial obstruction. In addition, the AMD required more manipulation to establish an airway, and more manipulation during anaesthesia than observed in other comparable papers studying the laryngeal mask airway. Cuff pressure exceeded 100 cmH_2O in two thirds of patients in whom it was measured. Minor complications occurred in 13% of cases.

In Mandal's recent report of 50 cases, the AMD could not be placed in one case, was removed because of airway obstruction in five cases and required repositioning because of obstruction in a further case. Complications included, but were not limited to, regurgitation in two patients [2].

After our opinions were communicated to the distributors of the AMD (but not necessarily because of them) the device was removed from the market and design modifications have been made. A modified AMD is soon to be available. To our knowledge there are no reports of evaluation of the performance of the modified AMD. To suggest that the AMD (in its previous or current form) is either reliable or safe is therefore untenable.

T. Cook
J. P. Nolan
K. J. Gupta
D. A. Gabbott
Royal United Hospital,
Bath BA1 3NG, UK

References

1 Cook TM, Gupta K, Gabbott DA, Nolan JP. An evaluation of the Airway Management Device. *Anaesthesia* 2002 (in press).
2 Mandal NG, Hebblethwaite R. Experience with the airway management device. An audit of 50 consecutive cases. *Today's Anaesthetist* 2001; **16**: 67–8.

Nasal endoscopy prior to nasotracheal intubation

I read with interest the recent article (Coe *et al. Anaesthesia* 2001; **56**: 447–50) that investigated whether there was a difference in the incidence of complications following nasal intubation, depending upon which nostril was chosen. The total incidence of difficulty or failure to intubate either nostril was 24% (31 patients). The incidence of bleeding following nasal intubation was 26% overall (33 patients) of which 9% (11 patients) had severe bleeding.

Although there was no significant difference in the incidence of complications between the left and right nostril groups, the overall complication rate was clinically significant.

In the study, the authors made a clinical assessment of nostril patency followed by blind insertion through either the left or right nostril. However, clinical assessment of nostril patency is highly unreliable and misleading [1]. Blind nasal insertion results in a high incidence of complications, especially epistaxis. This is not surprising as a high proportion of patients presenting for nasal intubation have significant intranasal deformities, even though they give no history of nasal obstruction and when both nostrils appear patent on clinical examination [2]. In my experience, performing a preliminary fibreoptic nasal endoscopy enables the diagnosis or exclusion of intranasal abnormalities and allows the selection of the most patent nostril for intubation. This results in fewer complications and I would therefore recommend this approach to nasotracheal intubation.

S. Singh
Queen Elizabeth Hospital,
Birmingham Bi5 2TH, UK
E-mail: sukhbinder.singh@virgin.net

References

1 Smith JE, Reid AP. Identifying the more patent nostril before nasotracheal intubation. *Anaesthesia* 2001; **56**: 258–62.
2 Smith JE, Reid AP. Asymptomatic intranasal abnormalities influencing the choice of nostril for nasotracheal intubation. *British Journal of Anaesthesia* 1999; **83**: 882–6.

A more 'failsafe' approach to difficult intubation with the gum elastic bougie

The gum elastic bougie is frequently used to facilitate difficult intubation, but sometimes fails due to oesophageal placement. When this occurs, the bougie is either reinserted, or an alternative airway management technique used. We suggest another option: leaving the bougie in the oesophagus and using it as a guide to insertion of the Pro-Seal laryngeal mask airway™ (PLMA™) [1]. This technique is quick and simple using the following steps: The distal end of the PLMA™ drainage tube is lubricated by squeezing a water-based gel into it; the drainage tube is threaded over the bougie until it protrudes from the proximal end; the PLMA™ is railroaded along the bougie, either following the palatopharyngeal curve using the index finger, or more directly using a laryngoscope; the cuff is then inflated and ventilation commenced.

Our combined successful experience of the bougie-PLMA™ technique in 25 consecutive elective cases suggests that the bougie not only helps guide the PLMA™ into its correct location, but also reduces impaction at the back of the mouth. The technique can be practiced on routine cases provided there is no known oesophageal pathology. It may also be useful backup technique if the PLMA™ becomes folded over during insertion [2].

J. Brimacombe
A. Howath
Cairns Base Hospital,
Cairns 4870, Australia

C. Keller
Leopold-Franzens University,
6020, Innsbruck, Austria

References

1 Brimacombe J, Keller C. The ProSeal laryngeal mask airway. A randomised, crossover study with the standard laryngeal mask airway in paralysed, anaesthetised patients. *Anesthesiology* 2000; **93**: 104–9.
2 Brimacombe J, Keller C, Berry A. Gastric insufflation with the ProSeal laryngeal mask. *Anesthesia and Analgesia* 2001; **92**: 1614–15.

Capnography for feeding tube placement

A recent letter (White. *Anaesthesia* 2001; **56**: 1123) reported that capnography is extremely useful for detecting inadvertent insertion of a feeding tube into the airway. I would point out that this idea has been suggested already [1, 2] and recently two independent researchers studied this method formally and confirmed its reliability [3, 4]. The use of a capnograph not only reliably detects inadvertent insertion of a tube into the airway but also shortens the time needed for correct insertion compared with the two-step radiological method [3].

Radiography is the most reliable method, but is not foolproof [5]. One major theoretical advantage of the use of a capnograph over radiography is that capnography can minimise pneumothorax caused by inadvertent insertion of a feeding tube into the intrapleural space [1, 2]. A capnograph is attached to a feeding tube at the point when the feeding tube is inserted at a depth of about 25 cm (when the tube does not reach the bronchi or lungs). If carbon dioxide is detected, the feeding tube is removed and penetration of the pleura can be avoided [1] Alternatively, a small-bore tracheal tube is inserted into the oesophagus, and after the absence of carbon dioxide waveform is confirmed, a feeding tube is advanced through the tracheal tube into the gastrointestinal tract [2]. I fully support Dr White's suggestion and I believe that multiple methods, including capnography and radiography, should be used to detect migration of a feeding tube into the airway and to minimise pneumothorax.

T. Asai
Kansai Medical University,
Moriguchi City, Osaka 570–8507,
Japan

References

1 Asai T, Stacey M. Confirmation of a feeding tube position; how about capnography? *Anaesthesia* 1994; **49**: 451.
2 Asai T. Use of a tracheal tube and capnograph for insertion of a feeding tube. *Anaesthesia* 1998; **53**: 93.
3 Kindopp AS, Drover JW, Heyland DK. Capnography confirms correct feeding tube placement in intensive care unit patients. *Canadian Journal of Anaesthesia* 2001; **48**: 705–10.
4 Burns SM, Carpenter R, Truwit JD. Report on the development of a procedure to prevent placement of feeding tubes into the lungs using end-tidal

CO_2 measurements. *Critical Care Medicine* 2001; **29**: 936–9.
5 Kiwak MG, McLoud TC, Dedrick CG, Shepard JAO. Entriflex feeding tube: Need for care in using it. *American Journal of Roentgenology* 1984; **143**: 1341–2.

A new cause of airway obstruction

I wish to inform colleagues of a potential cause of apparent airway obstruction caused by a design fault in a reservoir bag. This is caused by the twisting of the neck of the rubber reservoir bag provided with the PAL Bain breathing system. The resulting obstruction of the outlet to the bag results in the appearance of complete or partial airway obstruction when trying to hand ventilate the patient.

Other reservoir bags, such as those made by Intersurgical, have little or no neck to the bag and have a plastic 'cage' (Fig. 6), which prevents outlet obstruction even with extreme twisting of the bag However, the PAL reservoir bag has a longer neck and has no such plastic 'cage' (Fig. 7), and thus with as little as half of a complete turn, the outlet of the bag can become completely obstructed. This has led to a number of incidents within our trust including the unnecessary replacement of a tracheal tube and, on a separate occasion, a laryngeal mask.

S. Boumphrey
Derriford Hospital,
Plymouth PL6 8DH, UK

A reply

The 2 L neoprene (non-latex) reservoir bag referred to in the above letter is used widely in our range of adult breathing systems and incorporates a plastic bag mount, to maintain patency, in its neck. The vigilance and postmarketing surveillance systems that we operate, as a requirement of the Medical Devices Directive (93/42/EEC), suggests that the vast majority of users of this bag do not experience the same difficulties reported by Derriford Hospital.

Nevertheless, we appreciate the users' concerns and thank them for bringing these to our attention. We can advise that, as a result of this feedback, we have now sourced and validated a different non-latex bag for use in our range of adult breathing systems. This new bag will incorporate a longer plastic bag mount in its neck. We are in the process of introducing this new bag across our adult breathing system range.

J. A. Roe
European Quality Assurance &
Regulatory Affairs Manager,
Pall Life Sciences,
Portsmouth PO1 3PD, UK

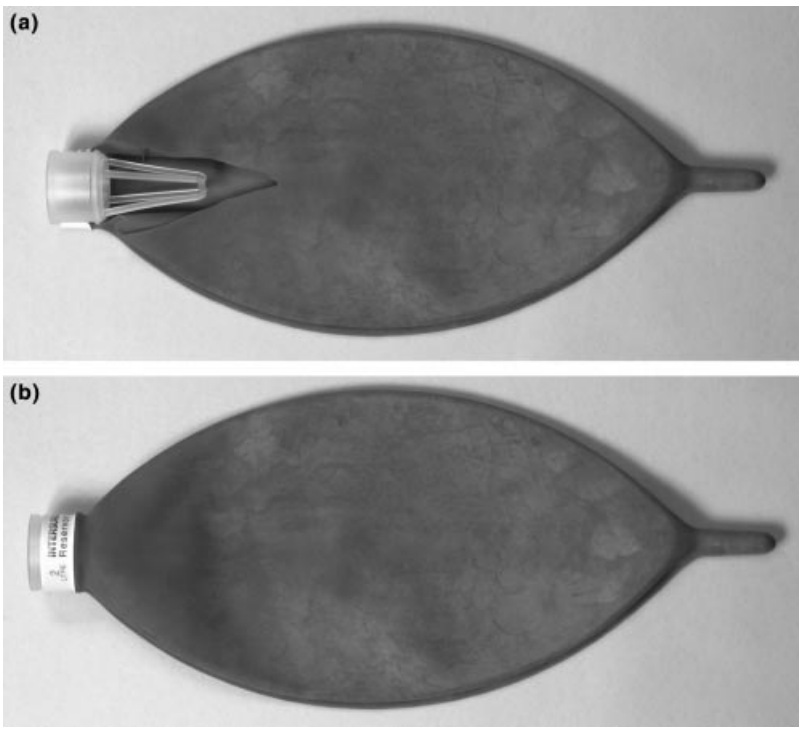

Figure 6

A new clinical sign during one-lung anaesthesia: fact or fiction?

Over recent years, there has developed amongst anaesthetists a reluctance to be open-minded about any clinical practice that is not 'evidence-based' or not widely accepted. In the area of one-lung anaesthesia, for instance, one practice that is yet to be widely embraced is the use of an ambient pressure oxygen reservoir attached to the non-ventilated lung [1, 2], even though the resulting exclusion of atmospheric nitrogen will almost certainly hasten lung collapse and so facilitate thoracoscopic surgery. It will very likely also reduce the risk of arterial desaturation [3].

Another of the several suggested benefits [1, 4–6], is the ability to identify gas leaking past the endobronchial cuff of the double-lumen tube. If the leak is large, the reservoir bag will be seen to progressively fill with each inspiratory phase of single-lung ventilation, but smaller leaks may not be so immediately obvious. They can, however, be identified by the anaesthetist pressing an ear to the surface of the reservoir bag and listening for the characteristic high-pitched sound of gas escaping past a tight restriction [1].

Listening over the reservoir bag provides different information from that obtained by listening over the respiratory tubing connecting the mechanical ventilator to the ventilated lung, a clinical practice that was employed by at least some thoracic anaesthetists of an

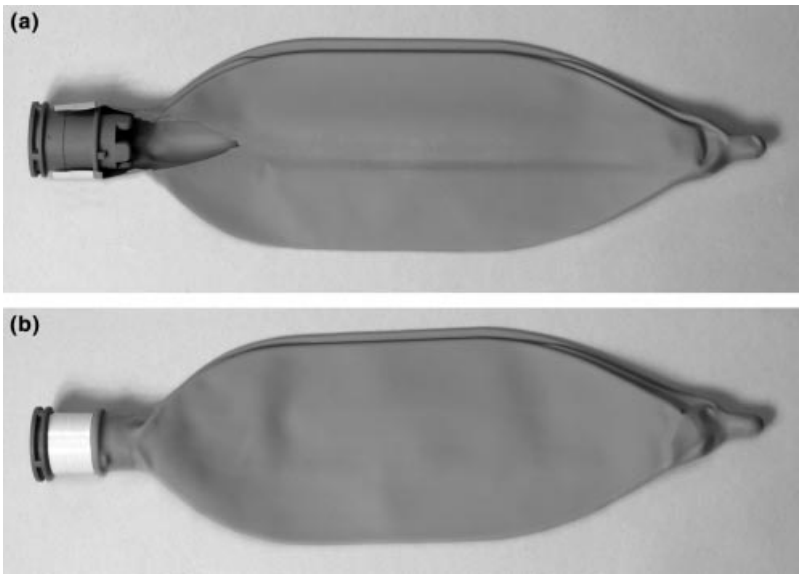

Figure 7

era past. Here, the transmitted sound of air moving freely in and, more importantly, freely out of the endobronchial apparatus and large airways is reassuring, as is the absence of wheezy or rattly noises.

In spite of the fact that listening over the ventilator tubing during one-lung anaesthesia provides useful clinical information to an older anaesthetist such as myself, very few younger anaesthetists seem prepared to consider that simple auditory signs might provide information additional to that provided by today's sophisticated monitoring equipment. To me, a particular change in monitored pressure-volume loops might suggest either a recent shift in position of the double-lumen tube or a recent accumulation of bronchial secretions, whereas listening over the ventilator tubing will usually indicate which of the two is causing the change. Perhaps the bending over to listen is a worry!

With regard to these two different ear-pressing exercises, it must be said that listening over the oxygen reservoir bag is not as generally useful during thoracic surgery as listening over the ventilator tubing at a time when the chest cannot be readily auscultated. Even so, anaesthetists might be more tempted to try the former in the first instance – if only to ascertain whether or not a small gas leak occurring past a bronchial cuff really does sound like a 'tight fart'.

J. Pfitzner
The Queen Elizabeth Hospital,
Adelaide, South Australia 5011

References

1 Pfitzner J, Peacock MJ, Daniels BW. Ambient pressure oxygen reservoir apparatus for use during one-lung anaesthesia. *Anaesthesia* 1999; **54**: 454–8.
2 Pfitzner J, Carne HD, Taylor EC. One-lung anaesthesia: response to questions on the ambient pressure oxygen reservoir. *Anaesthesia* 1999; **54**: 1023–4.
3 Baraka A, Lteif A, Nawfal M, *et al.* Ambient pressure oxygenation via the non-ventilated lung during video-assisted thoracoscopy. *Anaesthesia* 2000; **55**: 602–3.
4 Pfitzner J, Peacock MJ, Tsirgiotis E, Walkley IH. Lobectomy for cavitating lung abscess with haemoptysis: strategy for protecting the contralateral lung and also the non-involved lobe of the ipsilateral lung. *British Journal of Anaesthesia* 2000; **85**: 791–4.
5 Pfitzner J, Peacock MJ, Daniels BW. Administering ambient pressure oxygenation to the non-ventilated lung during thoracoscopic surgery. *Anaesthesia* 2001; **56**: 281–2.
6 Pfitzner J, Peacock MJ, Pfitzner L. Speed of collapse of the non-ventilated lung during one-lung anaesthesia: the effects of the use of nitrous oxide in sheep. *Anaesthesia* 2001; **56**: 933–9.

Airway management of a child with temporomandibular joint ankylosis following otitis media

Although the incidence of difficulty is comparatively low, failure to properly manage the airway may be life threatening during anaesthesia. Limitation of full mouth opening is one of the major causes of difficult tracheal intubation. The temporomandibular joints (TMJ) play a crucial role in mouth opening, and disorders of them can cause problems to anaesthetists. We report the anaesthetic management of a patient with severe TMJ ankylosis following otitis media.

A 3-year-old, 12.8 kg girl presented for surgical release of ankylosis of the right TMJ. She had a past medical history of incision and drainage of cellulitis of the face caused by otitis media at 8 months of age. At that operation, no limitation of mouth opening or TMJ abnormality had been seen, but immediately following the operation the patient developed a limited ability to open her mouth. The reduced oral opening and difficulty in chewing resulted in growth retardation. On admission to our hospital, physical examination showed a maximal mouth opening of 2 mm. Pre-operative 3-D computed tomography revealed significant deformity and hyperplasia of the right mandibular condyle, which was fixed to the glenoid fossa.

On the day of surgery, the patient was premedicated with hydroxyzine 12.5 mg and atropine 0.1 mg intravenously. Anaesthesia was induced with sevoflurane in oxygen 100% with the patient breathing spontaneously. After confirming the ease of mask ventilation, the concentration of sevoflurane was increased to 5%. On attempting intubation, the mouth could not be opened more than 2 mm. We therefore decided to try transnasal intubation using a broncho fibrescope. After

increasing the sevoflurane concentration, lidocaine 4% was sprayed into the right nostril. As the patient's mouth only opened 2 mm, we could not apply topical lidocaine 4% to the patient's larynx. A well-lubricated uncuffed 4-mm-OD tracheal tube was introduced through the right nostril and positioned in the nasopharynx. A 60-cm Olympus LF-p broncho fiberscope (Olympus Optical Co. Ltd, Tokyo, Japan) with an external diameter of 2.2 mm was threaded inside the tube. The fibrescope was advanced, the vocal cords identified, and their surrounding structures identified as intact. When we attempted to pass the tracheal tube through the vocal cords, severe laryngospasm developed and we failed to place the tracheal tube in the trachea. Mask ventilation became difficult, and the oxygen saturation, measured by pulse oximetry (Spo_2), decreased transiently to 70%. After performing a bilateral superior laryngeal nerve block with mepivacaine 1%, ventilation by facemask became easy and the SPo_2 returned to 100%. The second attempt at transnasal fibreoptic bronchoscopy-assisted intubation was successful. During surgery, anaesthesia was maintained with oxygen in nitrous oxide and sevoflurane (end-tidal concentration of 2–3%). Muscle relaxation was maintained with intermittent boluses of vecuronium. The surgical course was uneventful and the maximal mouth opening was 28 mm immediately after surgery. After being trained to open her mouth, the patient was discharged on the 30th postoperative day. Examination showed a maximal mouth opening of 30 mm.

In this case, otitis media caused arthritis of the TMJ, and as the infection developed, bony adhesions occurred on the TMJ causing true ankylosis. There are three mechanisms by which otitis media can cause ankylosis: primary otitis media causing secondary joint involvement; suppurative arthritis of the TMJ involving the middle ear secondarily; and suppurative arthritis of the joint, which drains into the cartilaginous canal.

Conventional tracheal intubation cannot be performed if the maximal mouth opening is less than 25 mm. Aiello and Metcalf demonstrated that when the mouth opening is less than 25 mm, it is unlikely that any part of the larynx will be visualised by direct laryngoscopy [1]. If the mouth opens less than 25 mm, transoral fibreoptic bronchoscopy-assisted intubation, transnasal fibreoptic bronchoscopy-assisted intubation, tracheostomy, or blind nasal intubation should be performed under sedation or using general inhalation anaesthesia with the patient breathing spontaneously. In our case, as the patient's maximal mouth opening was only 2 mm and the patient was 3 years old, we chose transnasal fibreoptic bronchoscopy-assisted intubation under sevoflurane anaesthesia, with the patient breathing spontaneously. We were also prepared to perform an emergency tracheostomy.

The incidence of laryngospasm during anaesthesia is reported to be 8.6/1000 in adults and 27.6/1000 in children [2]. Topical lidocaine, succinylcholine, and positive pressure ventilation are the standard management of laryngospasm. However, since our patient's mouth opening was limited and we needed to maintain spontaneous breathing, we could not use lidocaine and succinylcholine. Mevorach demonstrated that bilateral superior laryngeal nerve block was useful for treating severe repeated postoperative laryngospasm [3]. We believe that laryngospasm could have been avoided if a superior laryngeal nerve block had been performed before attempting intubation in our patient with limited mouth opening.

T. Kawasaki
T. Sata
C. Kawasaki
M. Ogata
A. Shigematsu
University of Occupational and Environmental Health,
Kitakyushu 807–8555, Japan

References

1 Aiello G, Metcalf I. Anaesthetic implications of temporomandibular joint disease. *Canadian Journal of Anaesthesia* 1992; **39**: 610–16.
2 Olsson GL, Hallen B. Laryngospasm during anaesthesia: a computer-aided incidence study in 136 929 patients. *Acta Anaesthesiologica Scandinavica* 1984; **28**: 567–75.
3 Mevorach DL. The management and treatment of recurrent postoperative laryngospasm. *Anesthesia and Analgesia* 1996; **83**: 1110–1.

Evaluation of the Pneupac Ventipac portable ventilator in critically ill patients 1

We were very interested to read the recent study (McCluskey *et al. Anaesthesia* 2001; **56**: 1073–81) and believe that the authors have provided valuable detailed information regarding potential changes in cardiorespiratory parameters with portable ventilators. A few questions, however, occurred to us. We particularly wondered whether it would not have been preferable to assess the ventilator in the conditions in which it is most commonly used, i.e. during transfer of critically ill patients. The study evaluates the performance of this ventilator when it is still. The authors rightly acknowledge that there are many other factors that may cause deterioration in the clinical condition during transfer. They do not, however, mention the possibility that the ventilator performance itself may be affected by physical movement during transfer. Perhaps the manufacturers can demonstrate that the ventilator performance is not affected by motion. We appreciate that considerable technical difficulty would accompany the attempt to assess this equipment during transfer, particularly using the very careful and thorough method adopted by McCluskey and colleagues. However, it might be possible to achieve during intrahospital transport such as from ICU to CT scan. In addition, it would probably require the use of continuous cardiac output monitoring, rather than thermodilution.

The second question that occurred to us concerned patient selection. They described use of the ventilator in cases with an appropriately wide variety of clinical conditions, including very sick patients (13 of 20 cases having a

PaO_2/FiO_2 ratio of less than 200 mmHg). However, they imposed the condition that patients must have been stable for a period of 3 h. We felt that there are occasions when unstable patients have to be transported, particularly where tertiary centre treatment is required (e.g. neurosurgery, paediatric intensive care) and that these will make up a significant proportion of all use. In these situations, the clinical condition may be far from ideal but lifesaving treatment may only be available at the receiving hospital. We have experience of the Pneupac Ventipac ventilator in such circumstances, in both adult and paediatric cases, and have found it to be a highly reliable piece of equipment.

Finally, we wondered whether the choice of ventilator mode was representative of normal case mix. All patients were ventilated in volume control mode, yet in many circumstances pressure-controlled ventilation is preferable. Patients requiring transport are therefore sometimes converted from pressure control ventilation to volume control at the time of transport because of limitations of the portable ventilator. We wondered whether the same cardiovascular stability would have been demonstrated if the study periods on the standard ITU ventilator for some of these patients had been in pressure control mode.

J. K. McNicholas
Portsmouth Hospital,
Portsmouth PO6 3LY, UK

F. M. J. Harban
University Hospital Birmingham,
Birmingham B15 2TH, UK

Evaluation of the Pneupac Ventipac portable ventilator in critically ill patients 2

We read with great interest the Pneupac Ventipac assessment (McCluskey *et al. Anaesthesia* 2001; **56**: 1073–81). We would like to address some methodological and conceptual problems.

Firstly, we could not identify which ventilator was used. The Ventipac V200D advertised on the Pneupac website looks different from the model illustrated in the paper. Second, as the authors themselves state, the ventilator was tested on an immobile patient and therefore does not reflect the conditions when used as a transport ventilator. More importantly, the Ventipac does not meet the minimal requirements for a transport ventilator set out in the guidelines for the transport of critically ill patients published by the American College of Critical Care Medicine and the Society of Critical Care Medicine [1]. These guidelines suggest that a transport ventilator should be capable of delivering ventilatory modalities equivalent to those used in the intensive care unit. This would disqualify the gas powered Ventipac as it will deliver neither pressure support nor pressure control ventilation. Recently, the Association of Anaesthetists of Great Britain and Ireland published recommendations for the transfer of critically ill patients [2]. One major addition to the American recommendations is the requirement for a delivered minute ventilation monitor, a feature the Ventipac lacks. In a clinical review article, Wallace and Ridley suggested that equipment used for medical transport should be battery powered and capable of delivering variable oxygen concentrations, also properties the Ventipac does not have [3]. In our experience, a ventilator like the Ventipac is not optimal for the transport of patients with multisystem organ failure, especially those with abnormal lung compliance and airway resistance, which require flexibility in ventilation techniques and close monitoring of ventilatory parameters during the transport.

Lastly, we feel very uncomfortable with gas-powered transport ventilators. Unanticipated delays during transport, be it within a hospital (e.g. getting stuck in an elevator) or between countries do happen. With a gas-driven ventilator, once the oxygen tank is empty, you will find yourself without oxygen and without ventilator. A battery-powered ventilator may be a more flexible alternative.

In summary, although the tested ventilator performed well, the testing conditions did not adequately simulate patient transfer and we would not base the decision of which ventilator to choose on this investigation.

M. Shamir
M. Peruansky
Hadassah Medical Center,
Jerusalem 91120, Israel
E-mail: shamir61@bezeqint.net

References

1 Guidelines committee of the American College of Critical Care Medicine, Society of Critical Care Medicine and American Association of Critical Care Nurses Transfer guidelines task force. Guidelines for transfer of critically ill patients. *Critical Care Medicine* 1993; **21**: 931–7.
2 The Neuroanaesthesia Society of Great Britain and Ireland, and The Association of Anaesthetists of Great Britain and Ireland. Recommendations for the Transfer of Patients with Acute Head Injuries to Neurosurgical Units. December 1996.
3 Wallace MW, Ridley SA. Transport of critically ill patients. *British Medical Journal* 1999; **319**: 368–71.

A reply

We would like to thank Drs Shamir, Peruansky, McNicholas and Harban, for their interest in our article and are grateful for the opportunity to respond to the points raised. The Pneupac Ventipac portable ventilator used in our study is a predecessor to the current model V200D, which incorporates an additional integrated battery-powered alarm system. The rationale for using the earlier model was that having comprehensively evaluated its performance characteristics in a previous study using an artificial lung model and a group of anaesthetised patients [1], we were reasonably confident that the ventilator would perform safely in critically ill patients.

Drs Shamir and Peruansky state that the Pneupac Ventipac does not meet published recommendations for the transfer of critically ill patients [2, 3]. Ideally, a transport ventilator should possess all of the features of a standard intensive care ventilator and one could argue that the only totally satisfactory solution is to use a standard intensive

care ventilator attached to a 'mobile' electricity source, which as we stated has been advocated [4]. The more additional features that are incorporated into a portable ventilator, the greater becomes its weight, size, cost and complexity (and the possibility of lower reliability). The ideal portable ventilator does not exist and a pragmatic choice has to be made based on a series of compromises.

Nearly all of our patients are paralysed and ventilated during transport and are therefore managed safely and effectively using volume control mode. We find that patients in whom pressure control ventilation is mandatory are usually not sufficiently stable for transport. Thus, we consider pressure controlled and pressure support modes to be desirable rather than essential features of a transport ventilator. Similarly, we do think that continuously variable inspired oxygen fraction is an essential requirement of a transport ventilator. There is little clinical advantage in setting a ventilator to deliver a precise oxygen fraction and using 100% oxygen in patients requiring more than 50% provides a useful 'safety' factor during transport.

The Pneupac Ventipac is also criticised by Drs Shamir and Peruansky for being gas-powered rather than battery-powered. The article cited to support this viewpoint features a Dräger Oxylog [5]. Whilst this ventilator does have an integral battery, it serves only to power monitoring and display functions and to control internal valves. Such a ventilator is dependent on *both* electricity and compressed gas, and will not operate if either source fails. A transport ventilator driven entirely by battery power independently of a gas supply would be limited to patients not adversely affected by ventilation with 21% oxygen. Clearly, our study group falls well outside this requirement.

While we agree with Drs McNicholas and Harban that it would have been useful to assess the ventilator during patient transport, we decided to limit our study to immobile patients for two reasons. Firstly, there is so little data on the effects of portable ventilators on haemodynamic and ventilatory variables of critically ill patients, we were primarily interested in observing changes in these variables due solely to the transition from the standard intensive care ventilator to the portable ventilator *per se*. Changes observed during transport could have been due to a variety of other factors, particularly disturbance of the patient by motion. Second, as Drs McNicholas and Harban state, such a study would have been technically much more difficult and it seemed prudent to limit the scope of this initial study for that reason.

Drs McNicholas and Harban also make a valid point concerning our patient selection. We acknowledge in our article that an important limitation of our study was that unstable patients were excluded. Whilst recognizing that transport of unstable patients is occasionally necessary, the majority of transfers take place only after appropriate resuscitation and stabilisation of the patient. We also doubt very much that our local ethics committee would have permitted our study to proceed if we had proposed to use the portable ventilator in unstable patients.

Finally, none of the points raised above detract from the primary aim of our study, namely to investigate the effects of a portable ventilator on invasively-monitored haemodynamic and ventilatory variables in critically ill patients. Within the acknowledged limitations of our study, we feel it represents a useful first step in this area of interest.

A. McCluskey
C. L. Gwinnutt
E-mail: amccluskey@mcmail.com

References

1 McCluskey A, Gwinnutt CL. Evaluation of the Pneupac Ventipac portable ventilator: comparison of performance in a mechanical lung and anaesthetised patients. *British Journal of Anaesthesia* 1995; **75**: 645–50.
2 Guidelines for transfer of critically ill patients. Guidelines committee of the American College of Critical Care Medicine, Society of Critical Care Medicine and American Association of Critical Care Nurses transfer guidelines task force. *Critical Care Medicine* 1993; **21**: 931–7.
3 Recommendations for the Transfer of Patients with Acute Head Injuries to Neurosurgical Units. The Neuroanaesthesia Society of Great Britain and Ireland, and The Association of Anaesthetists of Great Britain and Ireland. London, 1996.
4 Waydhas C, Schneck G, Duswald KH. Deterioration of respiratory function after intrahospital transport of critically ill surgical patients. *Intensive Care Medicine* 1995; **21**: 784–9.
5 Wallace PGM, Ridley SA. Transport of critically ill patients. *British Medical Journal* 1999; **319**: 368–71.

Aberrant brachio-cephalic artery precluding placement of tracheostomy

A 56-year-old Afro-Caribbean woman underwent an emergency evacuation of a posterior fossa haematoma following an acute cerebral haemorrhage. Postoperatively she spent 48 h in the Intensive Care Unit and after an uneventful extubation went to the Neurological High Dependency Unit. Here she demonstrated fluctuating levels of consciousness with a Glasgow coma scale (GCS) of 3–11. A subsequent CT scan showed evidence of hydrocephalus. Possible mechanisms of acute hydrocephalus in posterior fossa injury are as follows: haematoma that extends to the supratentorial area compresses the aqueduct posteriorly and causes hydrocephalus or haematoma and contusional lesions may directly occlude the fourth ventricle and cause acute hydrocephalus [1]. This made the decisions regarding 'step down' difficult. Whilst in the step down unit, she suffered two episodes of aspiration and was re-intubated and ventilated in order to protect her airway. She made a good recovery from these episodes. Her short-term airway management however, posed a problem.

In view of the patient's fluctuating level of consciousness and in order to protect her airway from further aspiration it was decided to perform a tracheostomy. In preparation for a percutaneous tracheostomy a visual examination of her neck was performed. Although she appeared to have an

anatomically easy neck, on palpation it became apparent that she had a pulsatile mass lying directly across her trachea. The percutaneous route was abandoned.

In order to investigate more fully, a CT scan of the neck was performed. This demonstrated a 1.5-cm diameter aberrant brachio-cephalic artery overlying the trachea. This vessel represented the only arterial supply to her right arm and the right side of her head. A literature search has only revealed one paper that describes a similar vessel [2]. Aberrant arterial neck vessels have only been described in children perhaps indicating that such vessels are normally discovered before adulthood [2–4]. Perhaps the reason her aberrant vessel was not discovered earlier is that her skin colour made it less visible to the casual observer.

As the percutaneous route had been abandoned a request was made for a formal theatre tracheostomy by the Maxillo-facial team. At a subsequent multidisciplinary meeting, the Maxillo-facial surgeons concluded that the potential late risk of erosion into the vessel by a rigid plastic tube in a mobile area was too great. The decision was made not to proceed with any form of tracheostomy.

The patient continued to make a slow recovery with a fluctuating GCS between 3 and 12, having been successfully extubated once again. However, despite slow progress she died several days later due to a massive pulmonary embolus.

Percutaneous tracheostomy has gained acceptance as an alternative to conventional surgical tracheostomy. A recent postal survey of intensive care unit practice in the UK showed that percutaneous tracheostomy was in use in 78.4% of units [5]. Two methods are currently widely used, the percutaneous dilatation technique described by Ciaglia and the guidewire dilatational forceps technique. The Toye method and the Rapitrac method have fallen into disuse because of high mortality rates [6]. Variations in the anatomy of the neck can make percutaneous tracheostomy both difficult and hazardous. Perhaps the most important lesson to be learnt from this case is the importance of careful visual and physical examination of the neck when considering performing a percutaneous tracheostomy. As Muhammad *et al.* [7] conclude, the risk of bleeding, although low, can be minimised if the operator maintains a high index of suspicion for aberrant vascular anatomy and investigates possible abnormalities with diagnostic ultrasound.

G. A. Mukadam
E. Hoskins
London, UK

References

1 Karasawa H, Furuya H, Sugiyama K, *et al.* Acute hydrocephalus in posterior fossa injury. *Journal of Neurosurgery* 1997; **86**: 629–32.
2 Fournial JF, Stanley P, Fouron JC, *et al.* Abnormalities of the aortic arch. Apropos of 30 surgical cases in children. *Archives Mal Coeur Vaiss* 1975; **68**: 485–95.
3 Bertolini A, Pelizza A, Panizzon G, *et al.* Vascular rings and slings. Diagnosis and surgical treatment of 49 patients. *Journal of Cardiovascular Surgery (Torino)* 1987; **28**: 301–12.
4 Chun K, Colombani PM, Dudgeon DL, Haller JA, Jr. Diagnosis and management of congenital vascular rings: a 22-years experience. *Annals of Thoracic Surgery* 1992: **53**: 597–602.
5 Cooper RM. Use and safety of percutaneous dilatational tracheostomy in intensive care. *Anaesthesia* 1998; **53**: 1209–27.
6 Hutchinson RC, Mitchell RD. Life threatening complications from percutaneous tracheostomy. *Critical Care Medicine* 1991; **19**: 118–20.
7 Muhammad JK, Major E, Wood A, Patton DW. Percutaneous dilatational tracheostomy: haemorrhagic complications and the vascular anatomy of the anterior neck. A review based on 497 cases. *International Journal of Oral Maxillofacial Surgery* 2000; **29**: 217–22.

Anaesthesia for Stiff–Person Syndrome

Stiff–Person Syndrome (formally Stiff Man Syndrome) is a rare neurological condition characterised by muscle rigidity and spasm. It is thought to be immunological in origin [1] and is associated with the production of antibodies against glutamic acid decarboxylase, the rate-limiting enzyme for the synthesis of gamma-aminobutyric acid (GABA). Loss of inhibition from higher centres causes over-activity of the gamma motor neurone system and subsequent progressive muscle rigidity. We describe anaesthesia in a man with Stiff–Person Syndrome who presented with respiratory failure secondary to left lung collapse.

A 60-year-old man presented to the Accident and Emergency department with respiratory deterioration following treatment for a chest infection. He had a 4-year history of stiffness and spasms and a diagnosis of Stiff–Person Syndrome had previously been made. His efforts at ventilation were severely impaired by rigidity of his thoracic and abdominal muscles.

In the Accident and Emergency department, his oxygen saturation on room air was recorded as 86%. His arterial blood gases on high flow oxygen with a reservoir bag indicated a respiratory acidosis (pH 7.29, P_{O_2} 7.2, P_{CO_2} 8.1, HCO_3 28.7, BE 1.0). A chest X-ray showed a 'white out' of his left hemithorax and mediastinal shift. A diagnosis of respiratory failure secondary to left lung collapse as a consequence of aspiration or secretion retention was made and he was admitted to the Intensive Care Unit.

Initial attempts at management with non-invasive ventilation (CPAP of 6 cmH_2O) were unsuccessful and his arterial blood gases worsened (P_{O_2} 7.0, P_{CO_2} 10.2). A decision was made to start invasive ventilation. At this point, no information was available regarding which drugs were safe in this condition.

Anaesthesia was induced with midazolam 1 mg and propofol 30 mg. Atracurium 50 mg produced good intubating conditions (Cormack and Lehane grade 2 laryngoscopy) and relaxation of axial and limb stiffness. Following induction he was cardiovascularly unstable requiring ephedrine 30 mg, metaraminol 5 mg and a subsequent norepinephrine infusion to maintain an adequate blood pressure.

Anaesthesia was maintained with fentanyl (100 $\mu g.h^{-1}$) and midazolam (3 $mg.h^{-1}$). He was ventilated using BIPAP (P1: 20, P2: 5 ratio 1 : 1, rate 12 $breaths.min^{-1}$) and his arterial blood gases improved markedly (Fi_{O_2} of 0.45: pH 7.38, P_{O_2} 17.3, P_{CO_2} 6.1, HCO_3 26.7, BE 1.4, Sp_{O_2} 98%).

Fibreoptic bronchoscopy was performed and copious amounts of purulent sputum aspirated. Co-amoxiclav 1.2 g q.d.s and fluconazole 200 mg b.d. were commenced following growth of yeasts and coliforms from lavage fluid. The patient's respiratory function gradually improved and he was extubated and discharged to a high dependency unit 72 h after intubation.

A second deterioration, 4 days after his initial presentation, prompted a second period of ventilation. This time anaesthesia was induced using alfentanil and propofol. Atracurium provided muscle relaxation and intubation was uneventful. He was subsequently weaned from the ventilator once again and eventually discharged to the ward.

Case reports in the neurology literature mention that patients with Stiff–Person Syndrome have received anaesthesia for surgical procedures [2] and periods of ventilation for respiratory failure [3, 4] but no details of anaesthetic management are reported.

Johnson and Millar [5] report a case of hypotonia requiring overnight ventilation after anaesthesia for repair of an intrathecal baclofen pump in 46-year-old woman with Stiff–Person Syndrome. Anaesthesia in this case was induced with intravenous sufentanil 10 μg, thiopental 375 mg and vecuronium 8 mg. The mechanism of the resulting hypotonia was unclear, although a subsequent return to theatre for revision of the baclofen pump was reported as uneventful. They recommended avoidance or judicious use of non-depolarizing muscle relaxants.

In our case, the patient remained sedated to facilitate ventilation and stiffness returned once the initial dose of muscle relaxant had worn off. Despite poor pre-induction posture due to extreme rigidity, we obtained good intubating conditions on two occasions using atracurium for paralysis. We found no complication with the use of a non-depolarizing muscle relaxant in this case.

N. Haslam
K. Price
Newcastle General Hospital,
Newcastle upon Tyne NE4 6BE, UK
E-mail: jahaslam@lineone.net

References

1 Levy LM, Dalakas MC, Floeter MK. The stiff–person syndrome: an autoimmune disorder affecting neurotransmission of gamma-aminobutyric acid. *Annals of Internal Medicine* 1999; **131**: 522–30.
2 Whelan JL. Baclofen in treatment of the 'stiff–man' syndrome. *Archives of Neurology* 1980; **37**: 600–1.
3 Meinck HM, Tronnier V, Reike K, Wirtz CR, Flugel D, Schwab S. Intrathecal baclofen treatment for stiff–man syndrome; pump failure may be fatal. *Neurology* 1994; **44**: 2209–10.
4 Stayer C, Tronnier V, Dressandt J, *et al.* Intrathecal baclofen for stiff–man syndrome and progressive encephalomyelitis with rigidity and myoclonus. *Neurology* 1997; **49**: 1591–7.
5 Johnson JO, Miller KA. Anaesthetic Implications in Stiff–Person Syndrome. *Anesthesia and Analgesia* 1995; **80**: 612–13.

Report of vaporiser malfunction

According to the Association of Anaesthetists of Great Britain and Ireland's (AAGBI) document of 1997 [1], a leak test should be performed during the anaesthetic machine check prior to every operating list. This ensures proper fitment of vaporisers on the back bar and excludes a leak from the vaporiser with back pressure when the vaporiser is in the 'on' and 'off' position.

We encountered a problem while anaesthetising a patient for an aorto-bifemoral graft. We induced anaesthesia in theatre having checked the anaesthetic machine as per the AAGBI guidelines. Several minutes later, during surgical preparation but prior to skin incision, the patient's blood pressure rose. The patient was being ventilated with oxygen in air, 1% isoflurane and had a remifentanil infusion at 0.1 $\mu g.kg^{-1}.min^{-1}$. The isoflurane analyser recorded 0.5–0.7% end tidal concentration. The remifentanil infusion was increased to 0.3 $\mu g.kg^{-1}.min^{-1}$ and isoflurane concentration increased to 5%. As we watched the monitors, we noted that the vapour analyser showed no increase in fractional inspired or end tidal concentrations. The blood pressure remained high and thereafter a bolus of propofol was given, bringing the blood pressure back to normal. The patient came to no harm and had no recall of events or dialogue postoperatively.

On investigating the vaporiser, we were unable to turn the vaporiser on again after turning it off. We removed and replaced the vaporiser, locked it back into place and it turned on again appropriately. We noted that previously, although not attached to the back bar properly, it had been possible to turn the vaporiser on. Some isoflurane had also been detected by the vapour analyser, so perhaps some volatile anaesthetic had been added to the fresh gas flow; alternatively the isoflurane detected could have been residual vapour in the circle system.

Initially, we thought that the desflurane vaporiser flex which was lying between the two vaporisers on the back bar had simply interfered with the isoflurane vaporiser fitment and the locking mechanism on the back bar, thus causing the problem. Desflurane vaporisers should sit on the back bar in the most distal position, with its flex on its right. However, following a meeting with the Datex-Ohmeda representative, David Walker, we decided that the reason for our problem was malposition of the vaporiser. We were able to illustrate that the leak test could be perceived as negative, even if the vaporiser was poorly fitting and not adding any agent to the fresh gas flow, despite seemingly being easy to turn on. Occluding the fresh gas flow outflow caused the bobbins of the oxygen and nitrous oxide rotameters to drop. We repeated the test using Datex-Ohmeda's Low Pressure Leak Test Device [2] and the poorly fitting isoflurane vaporiser was obvious.

We conclude that the vaporiser was fitted wrongly on the back bar, and was not detected despite two negative leak tests. Consequently, should we not be using more sensitive methods, such as Datex-Ohmeda's Low Pressure Leak Device (see Fig. 8), during our anaesthetic machine checks and when vaporisers have been removed for filling or changed for a different vaporiser, rather than relying on a very subjective tactile method?

D. M. MacLeod
L. McEvoy
Grampian University Hospitals,
Aberdeen AB25 2ZD, UK

D. Walker
Datex Ohmeda

References

1 AAGBI. Checklist for Anaesthetic Apparatus. *London: Association of Anaesthetists of Great Britain and Ireland*. March 1997.
2 Ohmeda. Operating Instructions. Low Pressure Leak Test Device.

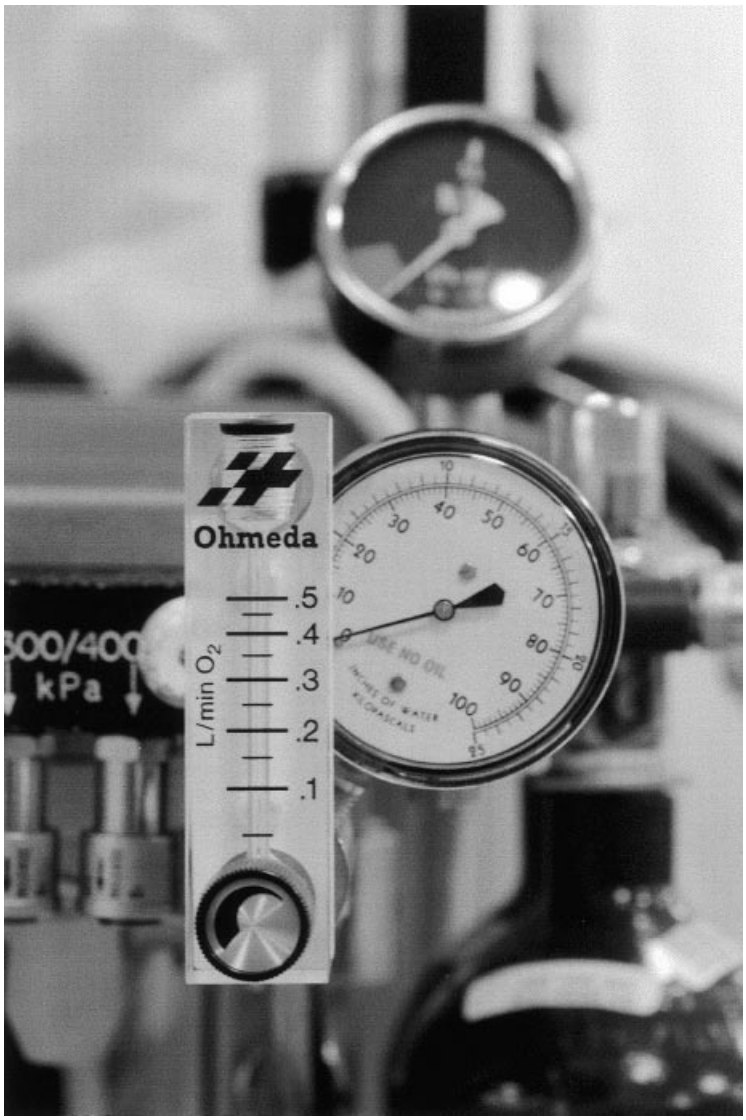

Figure 8

Up-and-down allocation

We would like to congratulate Dr Palm *et al.* on their study quantifying the ropivacaine sparing effect of sufentanil when both are combined for epidural pain relief in labour (Palm *et al. Anaesthesia* 2001; **56**: 526–9). They used the minimum local analgesic concentration (MLAC) model [1] to determine the effect of sufentanil on the median effective concentration (EC50) of epidural ropivacaine. It would appear, however, that they have reported a spuriously low $p < 0.00001$ and tighter 95% confidence intervals than the data as presented in their Fig. 1 suggest.

A problem with the analysis of up-down sequences is that the observations are not independent. Values depend on the previous in the sequence. The simple estimation of the medians (95% CI) using either the binomial or Wilcoxon approaches and their comparison using such as a Mann–Whitney *U*-test are based on the strict assumptions that the data are independent and randomly sampled. Several approaches have been described to deal with this problem, the Dixon and Massey method being one of the more conservative approaches. For completeness we have included some suggested corrections in Table 2 using this method which we hope the authors and readers will find useful, the results still remaining significant at $p = 0.046$.

Also, Fig. 1 may appear to be misleading in that there are $n = 22$ subjects per group rather than $n = 21$ as stated. It is assumed that the last data points plotted in both sequences do not really exist but shown only to identify that the previous data points were effective. There are better ways that these can be plotted such as the use of differing symbols for effective or ineffective tests or if necessary, a line that ends without a point plotted on it showing the projected direction of the sequence.

We look forward to their studies into the effects of oxytocin, something that was raised in a metanalysis of some of the earlier MLAC studies [2]. On a similar theme, Capogna *et al.* [3] in a modification of the MLAC studies, have shown that induction with

Table 2 Amended results.

Group $n = 21$	Minimum local analgesic concentration (%w/v)	95% confidence interval
Ropivacaine	0.128	0.117, 0.140
Ropivacaine + sufentanil	0.094	0.068, 0.120

Welch modified t-test: p = 0.046 (95% confidence interval of difference 0.001, 0.067).
Potency improvement: 1.36 (95% confidence interval 1.01, 1.86).

prostaglandin was associated with a significantly increased requirement for analgesia when compared to spontaneous labour. Again the authors are to be commended for using estimation rather than simple hypothesis testing in continuing to research such effects.

M. O. Columb
S. Maguire
South Manchester University Hospital,
Manchester M20 2LR, UK

References

1 Columb MO, Lyons G. Determination of the minimum local analgesic concentrations of epidural bupivacaine and lidocaine in labour. *Anesthesia & Analgesia* 1995; **81**: 833–7.
2 Columb MO, Lyons G, Polley LS, Capogna G, Benhamou D. Minimum local analgesic concentration of bupivacaine in labour; Factors. *Proceedings of SOAP* 1997; 124.
3 Capogna G, Parpaglioni R, Lyons G, Columb M, Celleno D. Minimum analgesic dose of extradural sufentanil for first stage labour analgesia: A comparison between spontaneous and prostaglandin-induced labours in nulliparous women. *Anesthesiology* 2001; **94**: 740–4.

Wound botulism in injecting drug users

We read with interest the study of two cases of wound botulism in injecting drug users (Mulleague *et al*. *Anaesthesia* 2001; **56:** 120–3). We present a recent, very similar case, occurring in Glasgow.

A 33-year-old male heroin user who admitted injecting by the subcutaneous and intramuscular routes known as 'skin popping' and 'muscle popping', presented at our Accident and Emergency department. He gave a 3-day history of bizarre neurological symptoms including ptosis, dysphagia and poorly defined limb weakness as well as anticholinergic symptoms such as dry mouth and urinary retention. He had an abscess at an injection site on his right buttock. He had short episodes of hypertension thought to be due to autonomic dysfunction but a normal Glasgow Coma Score, was apyrexial and had normal blood biochemistry and haematology. He required intubation and ventilation shortly after admission due to respiratory distress and had a lengthy stay in intensive care due to respiratory failure and neuropathy.

On initial investigation of our patient, we were faced with a differential diagnosis that included intracranial infection, myasthenia gravis, Guillain–Barré syndrome and botulism. Our definitive diagnosis came about partly by exclusion of these other diagnoses. A CT scan of brain and lumbar puncture, both of which were normal, ruled out intracranial infection and helped to exclude Guillain-Barré. Anti-acetylcholine receptor antibody levels were negative, excluding myasthenia gravis.

Nerve conduction studies showed small amplitude compound muscle action potentials without decrements in amplitude with repetitive stimulation. This helped to further exclude myasthenia gravis. Needle EMG showed small, short duration motor unit potentials with moderately reduced recruitment. This suggested that a disorder of the neuromuscular junctions was more likely than of the central nervous system. It was concluded at this stage that our differential diagnosis was of botulism or axonal Guillain-Barré [1].

On day 3 of admission, our microbiologists had cultured a clostridium from his buttock wound and this made the diagnosis of botulism the most likely. We proceeded to give antitoxin and perform diagnostic bioassays for serum toxins. These identified botulinum toxin A, the most common and severe form of wound botulism [2].

We feel that we came to a definitive diagnosis extremely promptly, given the very low incidence of wound botulism, and this led to early anti toxin administration, which greatly improved outcome. Unfortunately, injection drug use is a very real problem in our city. Comparisons must be drawn with this case and last year's outbreak of severe illness and sudden death from Clostridium *novyii* among injecting drug users [3], mainly from Glasgow, Dublin and parts of England. These cases arose as a consequence of injecting heroin contaminated with Clostridium *novyii* spores and have made us more aware of the possibility of infection with unusual clostridial species in injecting drug users.

There has been one other case of wound botulism in Glasgow, which occurred last year and a total of five cases reported in the UK; all have occurred in injecting drug users. Recovery has been over a similar time period of between 5 and 8 weeks, requiring tracheostomy and prolonged weaning from ventilation. Ultimately, full recovery looks likely in our case and it is thought that this has been due to the prompt diagnosis and early administration of antitoxin.

World wide wound botulism has been increasing among injecting drug users, particularly when the subcutaneous or intramuscular routes of injection are used. An epidemic of wound botulism was described in California in 1998 [4] involving black tar heroin contaminated with spores of Clostridium *botulinum*. It was argued [5] that inoculation with Clostridium *botulinum* spores occurred via soiled skin rather than from direct heroin contamination. Obviously these two sources of clostridium spores have different public health implications and if the heroin itself contains spores then there is a

potential for infection among other users injecting from the same batch.

L. McGarrity
Stobhill Hospital,
Glasgow, UK
E-mail: amcgarrity@freeserve.com

References

1 Maselli RA, Bakshi N. Botulism. *Muscle and Nerve* 2000; **23**: 1137–44.
2 Woodruff BA, Giffin PM, McCroskey LM, *et al.* Clinical and laboratory comparison of botulism from toxin types A, B and E in the United States. 1975–88. *Journal of Infectious Disease* 1992; **166**: 1281–6.
3 Christie B. Gangrene bug 'killed 35 heroin users'. *British Medical Journal* 2000; **320**: 1690.
4 Passaro DJ, Werner SB, McGee J, MacKenzie WR, Vugia DJ. Wound botulism associated with black tar heroin among injecting drug users. *Journal of the American Medical Association* 1998; **129**: 221–8.
5 Bamberger J, Terplan M. Reply to Wound botulism associated with black tar heroin among injecting drug users. *Journal of the American Medical Association* 1998; **280**: 1479.

Not quite crystal clear

Recently, it was necessary to administer a solution of 20% Mannitol to a patient. A 500-ml Fresenius Kabi Polyfusor® container of 20% Mannitol was located, but it was noticed that the solution was not totally clear. On closer inspection, a considerable number of needle-shaped crystals were clearly visible (Fig. 9). An alternative solution was located (Baxter Viaflex® container of 20% Mannitol) but this was also found to contain a large number of crystals. Neither solution was administered to the patient, but a clear, crystal free preparation of 10% Mannitol solution was used uneventfully instead.

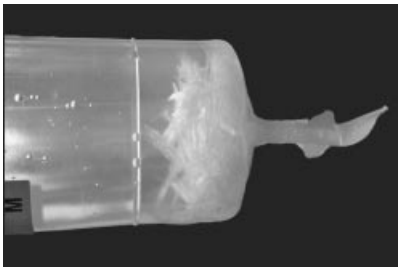

Figure 9

Both of the 20% preparations have clearly marked warnings on their labels, advising the user to check for such crystals immediately before use. Neither we, nor many of our colleagues were aware of this potential hazard. The potential for crystallisation is however, well documented in Martindale [1]. Mannitol solutions with concentrations over 15% are supersaturated and therefore particularly prone to crystallisation. This propensity is increased when the solutions are stored below 20 °C. Mannitol crystals can be redissolved by heating the solution to 60 °C, but should then be first cooled to body temperature before patient use. However, the presence of microcrystals may still remain undetected by visual inspection alone.

Rapoport [2] linked a high incidence of microinfarction in one study to the presence of mannitol microcrystals in infusates. Tomiwa *et al.* [3] reported that prefiltration of Mannitol solutions through a 0.45 μ-diameter filter prevented infarct formation, whereas larger-pore filters did not. Furthermore, Losasso *et al.* [4] reported the detection of mannitol crystals intravascularly by changes in precordial Doppler tones that mimicked venous air embolism.

Both Fresenius Kabi and Baxter have been most helpful in supplying information with regard to this problem. Firstly, they both recommend administering mannitol solutions through particulate filters (Baxter advises 20 μ, whereas Fresenius Kabi advises 5 μ). Importantly, blood giving sets (e.g. Baxter Ref RMC2071B) have a relatively large filter diameter of 200 μ, whereas solution administration sets (e.g. Baxter Ref RMC9608), have smaller 15 μ diameter filters. Second, both companies have confirmed that the risk of crystal formation is significantly reduced in 10% solutions.

Within our own hospital, we have a 'transport rucksack', to be used during interhospital transfers. It contained one container of 20% Mannitol solution, which when checked was also found to be heavily crystallised. It is of course impractical during transfers to redissolve these crystals by heating the solution to 60 °C and then waiting for it to cool. Additionally, there is insufficient room in the rucksack for the necessary heating apparatus! As a result, this solution as well as all 20% mannitol solutions within our department have now been replaced with 10% solutions. We can contemplate only very rare circumstances where a 10% solution could not be used in place of a 20% solution. Furthermore, all mannitol solutions of whatever concentration must first be visually inspected and then if clear to the naked eye only administered through a suitable filter.

A. Kitsberg
J. A. J. Phillips
Princess Alexandra Hospital,
Harlow CM20 1QX, UK

References

1 *Martindale –The Extra Pharmacopoeia* (31st edn).
2 Stanley I, Rapoport MD. Microinfaction: Osmotic BBB opening or microcrystals in infusate? *Journal of Neurosurgery* 1991; **74**: 685.
3 Tomiwa K, Hazama F, Mikawa H. Reversible osmotic opening of the the blood–brain barrier. Prevention of tissue damage with filtration of the perfusate. *Acta Pathol Japan* 1982; **32**: 427–35.
4 Losasso TJ, Muzzi DA, Cucchiara RF. Doppler detection of intravenous mannitol crystals mimics venous air embolism. *Anesthesia and Analgesia* 1990; **71**: 568–9.

Hypotension prophylaxis for Caesarean section

We read with interest the obstetric anaesthesia practice survey (Burns *et al. Anaesthesia* 2001; **56**: 794–8) regarding hypotension prevention and management for women undergoing spinal anaesthesia for elective Caesarean section. The authors appear to suggest that the current literature 'no longer advocates' the use of fluid preloading prior to the administration spinal anaesthesia. Moreover, the authors cite our previous

study [1] and suggest that pulmonary oedema is an important implication that may result from large preload volumes.

We agree that many studies indeed exist that demonstrate a lack of efficacy of individual modalities in preventing spinal anaesthesia-induced hypotension, including fluid preloading [2] However, the limitations of crystalloid preload administration as a single agent directed at the incidence of hypotension should not lead to abandonment of the practice. Minimizing the severity of hypotension, reducing vasopressor requirements [3], and reducing red blood cell loss by haemodilution (prior to the usual blood loss associated with Caesarean delivery) are all meritorious effects. Moreover, the risk of pulmonary oedema with crystalloid volume prophylaxis in the setting of a healthy parturient undergoing elective Caesarean section appears theoretical and does not seem to be a problem in clinical practice. Interestingly, the decreases in colloid oncotic pressure observed in the 20 and 30 $ml.kg^{-1}$ crystalloid preloading groups in our study [1] were equivalent and no cases of pulmonary oedema occurred.

In terms of vasopressor use, we agree that the efficacy of ephedrine when used prophylactically (by 62% of respondents) is variable [4] and likely to be dose dependent [5] when administered as a bolus. However, a point that should be emphasised is that the clinical studies to date have been performed primarily on healthy term parturients undergoing elective Caesarean deliveries. As such, although this survey did specify uncomplicated pregnancies, the emerging trend for titrating pressors to effect while abandoning a fluid preload (12.9% respondents) should not be enthusiastically encouraged; potentially detrimental effects may occur in the setting of placental insufficiency. Prophylactic ephedrine at large doses has been associated with lower umbilical cord venous pH even in healthy term pregnancies [6].

We find the survey results and commentary concerning phenylephrine to be interesting. These note that despite having proven and comparable efficacy with ephedrine in treating maternal hypotension, phenylephrine has not been integrated into clinical practice. We submit that two limited impressions may be responsible for this practice. Firstly, while unopposed uterine vasoconstriction has been observed in the early animal studies, human studies have demonstrated advantageous effects of phenylephrine over ephedrine in terms of neonatal acid base status and catecholamine plasma levels [7]. Second, the concern for significant maternal bradycardia has been cited [8], which required rescue atropine in 11/19 patients with heart rate $< 60.min^{-1}$. However, in this study relatively large median phenylephrine doses (600 μg) were used. We recognise that further clarification of the optimal vasopressor technique for hypotension prophylaxis is needed, particularly in the setting of placental insufficiency. It is possible that a combination of ephedrine and phenylephrine, as observed in a recent study using an infusion of both (ephedrine 2 mg + phenylephrine 10 $\mu g.min^{-1}$) may represent the most efficacious solution [9]. We are currently examining a similar combination (ephedrine 5 mg + phenylephrine 20 $\mu g.ml^{-1}$) in bolus form to treat maternal hypotension in this setting and believe it may be superior to either agent alone.

We conclude that a single perfect antidote to the prevention and treatment of maternal hypotension may never be found. However, a multimodal approach, including fluid preloading and prophylactic vasopressor use, as partially demonstrated by Vercauteren *et al.* [10] may represent the optimal approach.

Y. R. Loughrey
S. Datta
L. C. Tsen
Harvard Medical School,
Boston, MA 02115, USA
E-mail: jloughrey@partners.org

References

1 Park GE, Hauch MA, Curlin F, Datta S, Bader AM. The effects of varying volumes of crystalloid administration before Cesarean delivery on maternal haemodynamics and colloid osmotic pressure. *Anesthesia and Analgesia* 1996; **76**: 299–303.

2 Morgan PJ, Halpern SH, Tarshis J. The effects of an increase of central blood volume before spinal anaesthesia for cesarean delivery: A qualitative systematic review. *Anesthesia and Analgesia* 2001; **92**: 997–1005.

3 Ngan Kee WD, Khaw KS, Lee BB, Wong MMS, Ng FF. Metaraminol infusion for maintenance of arterial blood pressure during spinal anaesthesia for cesarean delivery: The effect of a crystalloid bolus. *Anesthesia and Analgesia* 2001; **93**: 703–8.

4 Tsen LC, Boosalis P, Segal S, Datta S, Bader AM. Hemodynamic effects of simultaneous dministration of intravenous ephedrine and spinal anaesthesia for Cesarean delivery. *Journal of Clinical Anesthesia* 2000; **12**: 378–82.

5 Ngan Kee WD, Khaw KS, Lee BB, Lau TK, Gin T. A dose–response study of prophylactic intravenous ephedrine for the prevention of hypotension during spinal anaesthesia for caesarean delivery, *Anesthesia and Analgesia* 2000; **90**: 1390–5.

6 Rolbin SH, Cole AFD, Hew EM, Pollard A, Virgint S. Prophylactic intramuscular ephedrine before epidural anaesthesia for caesarean section: Efficacy and actions on the foetus and newborn. *Canadian Anaesthesia Society Journal* 1982; **29**: 148–53.

7 LaPorta RF, Arthur GR, Datta S. Phenylephrine in treating maternal hypotension due to spinal anaesthesia for caesarean delivery: Effects on neonatal catecholamine concentrations, acid-base status and Apgar scores. *Acta Anaesthesiologica Scandinavica* 1995; **39**: 901–5.

8 Thomas DG, Robson SC, Redfern N, Hughes D, Boys RJ. Randomised trial of bolus phenylephrine or ephedrine for maintenance of arterial pressure during spinal anaesthesia for caesarean section. *British Journal of Anaesthesia* 1996; **76**: 61–5.

9 Mercier FJ, Riley ET, Frederickson WL, *et al.* Phenylephrine added to prophylactic ephedrine infusion during spinal anaesthesia for elective cesarean section. *Anesthesiology* 2001; **95**: 668–74.

10 Vercauteren MP, Coppejans HC, Hoffmann VH, Mertens E, Adriaensen A. Prevention of hypotension by a single 5 mg dose of ephedrine during small dose spinal anaesthesia in

prehydrated cesarean delivery patients. *Anesthesia and Analgesia* 2000; **90**: 324–7.

A reply

We thank the authors for their excellent letter, which very much represents our own views. We agree that not all current literature advocates abandonment of fluid loading prior to Caesarean section under spinal anaesthesia but are concerned by the trend for recent publications to demonstrate no therapeutic benefit. We believe that the advantages of this therapy far outweigh its largely theoretical hazards. We also agree that a solution to the complex problem of hypotension associated with this procedure will require more sophisticated research techniques than have hitherto been applied.

Presently, we are strongly of the opinion that techniques excluding fluid loading are potentially harmful to both mother and fetus.

R. G. Wilkes
S. M. Burns
C. M. Cowan
Liverpool Women's Hospital,
Liverpool, UK

Epidural catheter

Many complications of epidural catheter placement have been described. I recently experienced an unusual difficulty that has not been described to date. A standard lumbar epidural was performed for obstetric analgesia using a Portex epidural pack. Identification of the epidural space was straightforward and catheter placement was easy. Upon trying to slide the Tuohy needle off the catheter, a severe resistance was experienced and the only way of removing the needle was to cut the catheter at the distal end of the needle with a sterile blade. The epidural filter was then attached to this cut end and the epidural analgesia was successfully initiated.

The needle and remains of the 'jammed' catheter were sent to Portex for further examination. Portex cut through the plastic hub of the needle to demonstrate the obstructed catheter (see Fig. 10).

I, like many other anaesthetists, do not use the feeding guide supplied by the manufacturers with this pack. Portex have suggested that the coiled nature of the epidural catheter can lead to coiling within the hub of the needle if the feeding guide is not used.

I have changed my practice as a result of this experience and suggest that others consider doing the same.

S. Sampathkumar
Broomfield Hospital,
Chelmsford CM1 7HJ, UK

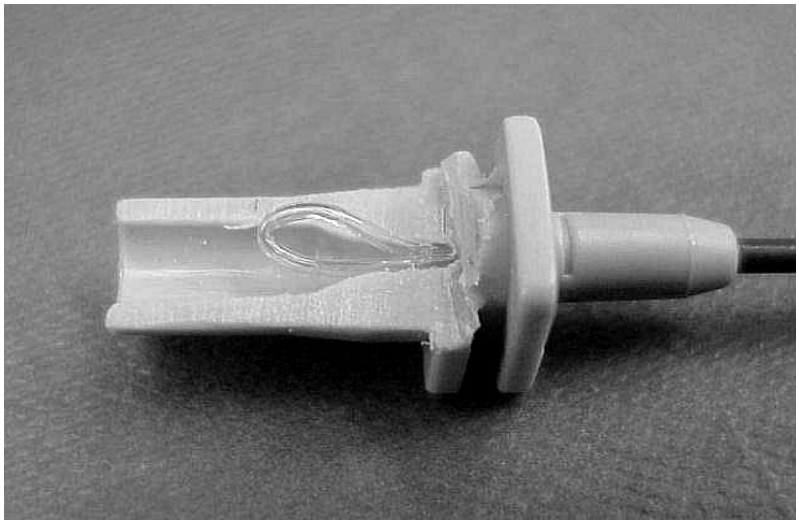

Figure 10

Aspirin and central neural blockade

Within our anaesthetic department of 13 consultants we recently discovered that there was wide difference in opinion regarding the safety of performing spinal and epidural anaesthesia in patients taking aspirin. Subsequently, we performed a postal survey of consultant anaesthetists in the North-west region. We were interested to see whether the dose of aspirin was considered relevant and whether anaesthetists had personally been involved in the care of any patients who had developed a spinal haematoma.

Responses were received from 239 of the 430 questionnaires sent (56%). More people felt an epidural carried greater risk than a spinal. There was considerably more caution with the larger daily dose of aspirin; 2.1% of respondents would not perform a spinal on a patient taking 75 mg daily of aspirin whereas 28% would not perform an epidural on a patient taking 300 mg. Several would perform these blocks if the patient was taking aspirin alone but not if they were also receiving other anticoagulants. Five would perform a bleeding time and would not perform a block if this were prolonged. Many commented that this was an issue of risk vs. benefit and the individual circumstances of each case would determine the technique used.

Of respondents, 23 (9.6%) had personally been involved in the care of a patient who had developed a spinal haematoma and, of these, five had not received spinal or epidural anaesthesia. Eight cases were fully anticoagulated with warfarin or heparin, and in others, coagulation failure was associated with a variety of causes such as septicaemia, renal failure and major transfusion. Another respondent commented that in 11 years as a neuroanaesthetist, he had seen two patients suspected of having spinal haematoma following epidural blockade, neither had a haematoma on investigation.

The American Society for Regional Anesthesia (ASRA) issued a consensus statement regarding antiplatelet drugs and neuraxial block in 1998 [1]. ASRA believe that the use of antiplatelet drugs

alone does not create a level of risk that will interfere with the performance of neuraxial blocks. However, the concurrent use of other medications affecting clotting mechanisms, such as oral anticoagulants, standard or low molecular weight heparin, may increase the risk of bleeding complications in these patients.

The antithrombotic effect of aspirin is seen at low doses (30–300 mg daily). Doses above 30 mg daily result in maximal platelet thromboxane inhibition within 3–5 days and increasing the dose reduces the time to maximal inhibition [2]. This was not reflected in answers to our survey, where more anaesthetists would be cautious if a patient was taking aspirin 300 mg daily and reflects poor understanding of the pharmacodynamics of aspirin. After a single dose of aspirin, platelet regeneration restores platelet cycloxygenase (COX) activity by approximately 10% per day [3]. Normal haemostasis will occur if 20% of platelets have normal COX activity; hence withdrawal of aspirin for 48 h is sufficient to return primary haemostasis to near normal [4]. Patients therefore do not require a prolonged discontinuation of treatment prior to surgery to restore adequate haemostasis.

The evidence suggests that aspirin and non-steroidal anti-inflammatory drugs alone pose only a small increased risk but that in combination with other drugs affecting coagulation, there may be more significant risk. The majority of the anaesthetists we surveyed would balance the small risk of haematoma against the benefits of regional anaesthesia for each patient although a proportion consider aspirin therapy to be an absolute contraindication to regional blockade. A centralised reporting system for serious complications such as this may allow for greater assessment of risk factors and allow for more rational and consistent decision making.

S. A. Harding
A. M. Severn
J. Calvert
Royal Lancaster Infirmary,
Lancaster LA1 4RP, UK

References

1 Urmey WF, Rowlingson JC. Do antiplatelet agents contribute to the development of peri-operative spinal haematoma? *Regional Anesthesia and Pain Medicine* 1998; Supplement 2: 23.
2 Bochner F, Lloyd JV. Aspirin for myocardial infarction. Clinical pharmacokinetic considerations. *Clinical Pharmacokinetics* 1995; **28**: 433–8.
3 Awtry EH, Loscalzo J. Aspirin. *Circulation* 2000; **101**: 1206–18.
4 Sonksen JR, Kong KL, Holder R. Magnitude and time course of impaired primary haemostasis after stopping chronic low and medium dose aspirin in healthy volunteers. *British Journal of Anaesthesia* 1999; **82**: 360–5.

An audit of the use of low molecular weight heparin and epidural anaesthesia

Low molecular weight heparins (LMWHs) are increasingly used as prophylaxis against deep vein thrombosis and there is evidence that they are as effective in orthopaedic patients as standard heparin [1]. The combination of anticoagulation and central nerve blockade has caused concern amongst anaesthetists due to the increased risk of vertebral canal haematoma. This has been fuelled by an increase in vertebral haematomas in North America from 1993 [2].

We conducted a retrospective audit of the use of epidural catheters in 79 patients receiving LMWH therapy who underwent elective major joint replacement and epidural analgesia during a predetermined 6-month period. We recorded the times of administration of low molecular weight heparin and the times of insertion and removal of the epidural catheter. Not all the patients on which the data was collected received LMWH prophylaxis; 76% had enoxaparin 20 mg once daily (od), 6% received enoxaparin 40 mg od, 1% received tinzaparin 1000 mg od and 16% did not have any anticoagulant therapy.

The insertion of the epidural catheter occurred more than 10 h following the last dose of LMWH. The subsequent dosing of LMWH results in 3% of patients receiving LMWH less than 3 h following the insertion of the epidural catheter; 5% of patients had the epidural catheter removed within 10 h of the last dose of LMWH, some within 1–2 h of LMWH. Following the removal of the epidural catheter, 15% of patients received LMWH within 3 h. There were no documented adverse outcomes following the use of epidural analgesia and LMWH in these patients.

LMWHs are fractionated heparin, which, like standarised heparin, bind to antithrombin III to exert its anticoagulant effect through the inhibition of Factor Xa and other clotting factors [3]. The peak effect occurs at 3–4 h following subcutaneous administration and at 12 h the anti-Xa levels are 50%. LMWHs are primarily cleared by the kidneys and are not subject to a saturable pathway like heparin [4]. LMWHs provide accurate and reproducible anticoagulation, which does not require laboratory monitoring or dose adjustment.

Vertebral canal haematomas may occur spontaneously and the relative risk is estimated at one per million population per year [5], many of which had coagulation disorder at the time of development of the haematoma. The risk of developing a vertebral canal haematoma following a central nerve blockade in combination with LMWH prophylaxis is extremely rare, the estimate is 1 : 2 250 000 [6], using the European dosing regimen of enoxaparin 20 mg or 40 mg once daily. The risk factors associated with the development of a vertebral canal haematoma are: degree of coagulation disorder, technical difficulty and repeated attempts at insertion of needle or catheter, and coagulation status at insertion and removal of epidural catheter. Both the insertion and the removal of the catheter are believed to be the times when haematomas may form [7]. The experiences in USA resulted in recommendations being proposed and extended to European practice [4, 6].

The recommendations [4] are:
1 The recommended dose and frequency of the LMWH should not be exceeded.

2 Insertion of the needle and placement of the catheter to be delayed until 10–12 h following the last dose of LMWH.
3 Removal of the catheter should be delayed for 10–12 h following last dose of LMWH.
4 Subsequent doses of LMWH to be delayed for 2 h following insertion or removal of the needle/catheter.

Our audit identifies a number of areas of practice in our hospital that do not adhere to the recommendations. The epidural catheters were all inserted in excess of the recommended time delay; however, subsequent administration of LMWH and manipulations of the epidural catheter did not follow the recommendations.

We do not feel that the practice in our hospital differs significantly from other hospitals in this country. We propose that the time that the prophylactic anticoagulant therapy is administered be standardised where clinically possible to facilitate routine windows of opportunity for safe insertion and removal of epidural. Also the type of anticoagulant therapy should be documented on the epidural observation chart and clear guidelines given regarding the care and removal of the epidural catheter.

The risk of spinal haematoma is rare and none of the patients in this audit suffered any adverse outcome to our knowledge. However, with a little education the risk of such a catastrophic complication could be minimised and practice improved to reach the recommended standards.

G. A. Matthews
Great Ormond Street Hospital for Sick Children, London, UK

K. Davies
Royal Devon and Exeter Hospital, Exeter

References

1 Nurmohamed MT, Rosendaal FR, Buller HR, *et al*. Low molecular weight heparin vs. standard heparin in general and orthopaedic surgery: a meta-analysis. *Lancet* 1992; **340**: 152–6.
2 Wysowski DK, Talarico L, Bacsanyi J, Bostein P. Spinal and epidural haematoma and low molecular weight heparin. *New England Journal of Medicine* 1998; **338**: 1774–5.
3 Weitz IJ. Low molecular weight heparins: a review. *The New England Journal of Medicine* 1997; **337**: 688–98.
4 Horlocker T, Heit MD, John A. Low molecular weight heparin: Biochemistry, peri-operative prophylaxis regimens and guidelines for regional anaesthetic management: a review. *Anesthesia and Analgesia* 1997; **85**: 874–85.
5 Holtas S, Heiling M, Lonntoft M. Spontaneous spinal epidural haematoma: findings at MR imaging and clinical correlation. *Radiology* 1996; **199**: 409–13.
6 Tryba M, Wedel DJ. Central neuroaxial block and low molecular weight heparin: lessons learned from different dosage regimens in two continents. *Acta Anaesthesiologica Scandinavica* 1997; **41**: 100–3.
7 Vandermeulen EP, Van Aken H, Vermylen J. Anticoagulants and spinal-epidural anaesthesia. *Anesthesia and Analgesia* 1994; **79**: 1165–77.

A simple technique to reduce the incidence of accidental dural puncture

We would like to respond to recent comments (Reynolds. *Anaesthesia* 2001: **56**: 1129) on our epidural technique. In our practice we apply loss of resistance to air technique, which helps identify a nick in the dura with a small leak of CSF. On many occasions, only a few drops of CSF and not a constant leak helped identify dural puncture, which could have been missed with the use of saline. Upon inserting the epidural needle, we remove the stylet when the needle is engaged in the interspinous ligament or the ligamentum flavum. Very often, it is difficult for our residents to advance the epidural needle with one hand and apply constant pressure on the plunger with the other hand. Excessive pressure with one hand, by a resident, had caused dural puncture when the needle was pushed in too far. By reinserting the stylet with each advancement of the needle, we remove tissues that may enter and occlude the epidural needle. It is quite possible that constant plunger pressure with saline may also avert this problem.

S. Cohen
R. Chokkra
F. Bokhari
Robert Wood Johnson Medical School, New Brunswick, NJ 08901–1977, USA

Transient neurological manifestations after epidural analgesia with ropivacaine

Different studies and case reports ascribed transient neurological manifestations (TNM) after neuraxial anaesthesia, at least in part, to lidocaine, bupivacaine, mepivacaine and recently to ropivacaine [1–5]. In fact, nerve conduction block could be the expression of a reversible toxic effect [5] and TNM are a moderate expression of this toxicity. During epidural anaesthesia, the transmeningeal transfer of local anaesthetics may result in elevated intrathecal concentrations [1] that probably contribute to TNM.

We report here a case of TNM after epidural ropivacaine. A 58-year-old, ASA II, male patient, underwent a radical prostatectomy under general anaesthesia. The patient was in the supine position peroperatively. The patient's medical history included hypertension and tetracycline hypersensitivity, general anaesthesia for colonoscopy, a thumb fracture reduction, a laparotomy for Meckel's diverticulum, a prostate biopsy, no alcohol intake, he stopped smoking 3 years ago, and his current medication was bisoprolol.

Prior to general anaesthesia, we inserted an epidural catheter through a 17 gauge Tuohy needle in the L3–L4 interspace for postoperative analgesia. We carried out a single needle pass and there was no difficulty in threading the catheter. No pain, paraesthesia or bleeding was elicited at any time. The epidural space was identified using loss of resistance to air.

After a test dose of 3 ml lidocaine 1% with epinephrine 1 : 200 000, which was negative for intrathecal or intravas-

cular injection, a bolus of 7 ml ropivacaine 0.75% was injected through the epidural catheter, resulting in a T10 level of analgesia.

One hour after the initial dose, we started a continuous epidural infusion of ropivacaine 0.2% (the pump speed was 5 $ml.h^{-1}$). Ten hours after starting the pump, the patient complained of slight pain, so proparacetamol 2 g was given twice and the pump speed increased to 7 $ml.h^{-1}$. Epidural analgesia lasted for 72 h.

Twelve hours after discontinuing the epidural ropivacaine, the patient described a violent bilateral burning sensation and pain in the back and the thighs, which spread quickly to the legs and feet. The movement of the lower extremities, the examiner's hand pressure on the limbs, and the orthostatic position of the patient exacerbated this pain. We did not find any reflex or motor abnormalities, or neurological deficit.

The patient was treated with two doses of subcutaneous morphine 10 mg, and intravenous ketoprofen 100 mg. Symptoms started to diminish progressively and disappeared 12 h later without leaving any sequelae. On follow-up 2 weeks later, the patient did not mention any pain or neurological problem.

B. Al-Nasser
M. Négre
C. Hubert
Clinique du Parc Saint Lazare,
60000-Beauvais, France
E-mail:balnasse@aol.com

References

1 Markey JR, Naseer OB, Bird DJ, *et al.* Transient neurological symptoms after epidural analgesia. *Anesthesia and Analgesia* 2000; **90**: 437–9.
2 Ganapathy SG, Sandhu HB, Stockall CA, Hurley D. Transient neurologic symptom following intrathecal Ropivacine. *Anesthesiology* 2000; **93**: 1537–9.
3 Salazar F, Bogdanovich A, Adalia R, *et al.* Transient neurologic symptoms after spinal anaesthesia using isobaric 2% mepivacaine and isobaric 2% lidocaine. *Acta Anaesthesiologica Scandinavica* 2001; **45**: 240–5.
4 Hiller A, Rosenberg PH. Transient neurological symptoms after spinal anaesthesia with 4% mepivacaine and 0.5% bupivacaine. *British Journal of Anaesthesia* 1997; **79**: 301–5.
5 Puolaka R, Haasio J, Pitkänen MT, *et al.* Technical aspects and postoperative sequelae of spinal and epidural anaesthesia: A prospective study of 3230 orthopedic patients. *Regional Anesthesia and Pain Medicine* 2000; **25**: 488–97.

Intrathecal air following spinal anaesthesia

We report an unusual case of transient neurological symptoms (TNS) following spinal anaesthesia. A 49-year old, healthy woman underwent ambulatory surgery for varicose veins under spinal anaesthesia using 2% mepivacaine. Two hours after recovery from the regional anaesthesia, she developed very painful paraesthesia of the lower buttocks and both thighs. Magnetic resonance imaging (MRI) showed two intrathecal air bubbles (Fig. 11). The patient was hospitalised for 5 days and treated with pain medication. She was discharged home without sequelae.

The incidence of TNS following spinal anaesthesia varies [1], and depends on anaesthetic, surgical and patient factors. A history of a radicular disease, a lithotomy position during surgery and early ambulation of patients have been identified as risk factors [2]. It is known that an accidental, subarachnoid injection of air may cause severe headache [3]. Also, air may persist for a long time after an intrathecal injection [4]. We presume that some air was injected in our patient. Also, negative subarachnoid pressure caused by a deep inspiration may be a possible mechanism [5]. Although the air did not compress the cauda equina, it may have caused an irritation of the nerves or meninges. A neurotoxic effect of mepivacaine cannot be excluded, but neither can neural irritation caused by the air; synergism of both mechanisms is possible. Direct needle trauma appears unlikely in our patient since the puncture and the injection were not associated with paraesthesia or discomfort.

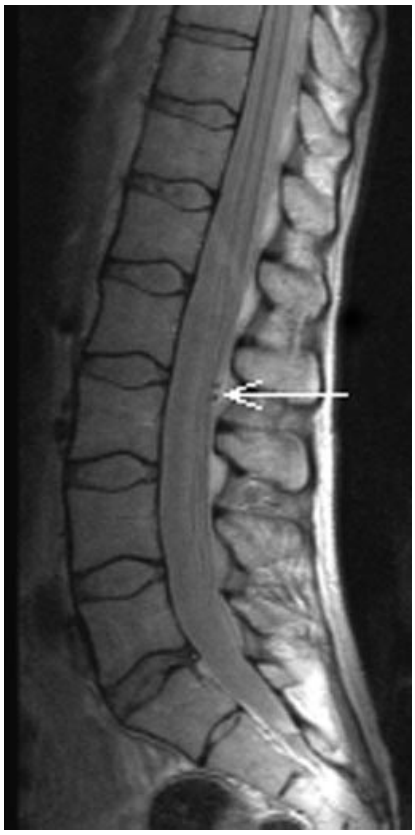

Figure 11 MRI (Siemens Vision, 1.5 Tesla) 30 h after spinal anaesthesia showed two air bubbles (diameters 2–3 mm, arrow) adjacent to the cauda equina.

M. Hübler
R. J. Litz
R. von Kummer
D. M. Albrecht
Carl-Gustav-Carus University Hospital,
01307 Dresden, Germany
E-mail: matthias.huebler@mailbox.tu-dresden.de

References

1 Pollock JE, Neal JM, Stephenson CA, Wiley CE. Prospective study of the incidence of transient radicular irritation in patients undergoing spinal anaesthesia. *Anesthesiology* 1996; **84**: 1361–7.
2 Freedman JM, Li DK, Drasner K, Jaskela MC, Larsen B, Wi S. Transient neurologic symptoms after spinal

anaesthesia: an epidemiologic study of 1863 patients. *Anesthesiology* 1998; **89**: 633–41.
3 Aida S, Taga K, Yamakura T, Endoh H, Shimoji K. Headache after attempted epidural block: the role of intrathecal air. *Anesthesiology* 1998; **88**: 76–81.
4 Tedeschi E, Marano I, Savarese F, *et al*. Neurological deficit following spinal anaesthesia: MRI and CT evidence of spinal cord gas embolism. *Neuroradiology* 1999; **41**: 275–8.
5 Avellanal M, Olmedilla L, Ojea R, Rueda ML, Navia J. Pneumocephalus after spinal anaesthesia. *Anesthesiology* 1996; **85**: 423–5.

Pre-operative fluid fasting for adult elective surgery

Optimal fasting times for adult patients undergoing elective surgery have been a much-discussed problem in the recent past. We conducted a national survey to enquire about current departmental fasting guidelines. Questionnaires were sent to the 283 Royal College tutors, and 167 anaesthetists (60%) replied. Not all respondents answered all questions.

Guidelines are in place in 151 departments (90.4%). The majority of them, 93 departments, follow traditional rules of 'fasting from midnight for morning lists' and fasting from early morning for an afternoon list. However, fluid intake until 4, 3, and 2 h prior to surgery was acceptable in 40, 31, and 71 departments, respectively, already under current guidelines. Day Case Anaesthesia as well as anaesthesia for ECT/cardioversion follow the same guidelines in 149 (89%) and 131 (79%) departments, whereas the corresponding answers for obstetric and MRI anaesthesia were 90 (54%) and 85 (51%).

As far as emergency operations are concerned, 96 respondents (61%) indicated that they would follow the rule of 'fasting for 6 h following food, and 4 h following a drink'. In 15 departments, it was acceptable for patients to have a drink until 2 h prior to the anaesthetic, and 26 respondents replied that individual decisions would be made.

In spite of traditional departmental guidelines still prevailing, many anaesthetists would be happy to accept shorter fasting times for their patients. The minimum fasting times quoted by the highest number of anaesthetists were 2 h for clear fluids (113 anaesthetists, range 0.5–6 h), 4 h for fruit juice (73 anaesthetists, range 1–6 h), 4 h as well for fizzy drinks (74 anaesthetists, range 1–8 h), 6 h for milk (99 respondents, range 2–8 h) and 6 h for solid food (140 respondents, range 3–8 h).

Complications with shorter fasting times were reported in 11 cases, ranging from vomiting, reflux, and regurgitation to aspiration. Whether these problems were due to shorter fasting times, or would have happened in any case, is not known. The risk of acid aspiration resulting in aspiration pneumonia and possibly death of a patient has led to the development of fasting guidelines, in an attempt to allow time for stomach emptying as a means to reduce this risk. This is counterbalanced by the reduction in patient comfort, which is a consequence of prolonged fasting, and it is a problem especially for children and elderly patients, as well as patients undergoing anaesthesia on a warm day, as during prolonged fasting, patients do experience hunger and severe thirst [1].

This survey shows clearly that attitudes have already changed away from traditional fasting guidelines towards shorter fasting intervals. Putting new treatment concepts into practice usually does take longer, but a move in this direction is well under way.

Acknowledgements

We are grateful for the support from the Royal College of Anaesthetists and their provision of College Tutor Addresses.

We are indebted to all College Tutors who participated in the survey.

R. Hebballi
P. J. Desai
S. Jürgens
University Hospital of North Tees,
Stockton TS19 8PE, UK

Reference

1 Sutherland AD, Stock JG, Davies JM. Effects of pre-operative fasting on morbidity and gastric contents in patients undergoing day – stay surgery. *British Journal of Anaesthesia* 1986; **58**: 876–8.

Recording the confirmation of nasogastric tube placement

We would like to congratulate Dr White (White. *Anaesthesia* 2001; **56**: 1123) on his ingenious method of using a capnograph to confirm the correct position of a nasogastric (NG) tube. We recently conducted an audit in our intensive care unit (ICU) and would like to take this opportunity to remind your readers of a simple but apparently neglected method.

In a series of 21 NG tubes in our ICU, we found 13 (62%) were inserted in theatre prior to admission to the ICU, of which 10 (48%) were inserted before or during surgical procedures, allowing the operating surgeon to manually confirm the position of NG tubes intra-operatively. Simple manual palpation enabled us to confirm the position of nearly 50% of NG tubes in our series, and 77% of NG tubes in the 13 postoperative patients. However, the weakness in our procedure is that although the NG tubes are frequently felt and their positions confirmed/altered by the surgeon, this is rarely recorded. We suspect this is also the case in other hospitals.

We would therefore like to highlight the message that it is both helpful to the ICU staff and important in the management of postoperative patients that intra-operative confirmation of NG tube position is documented.

C. Y. Li
M. F. Mayall
Kent & Canterbury Hospital,
Canterbury CT1 3NG, UK

A new angle on a Tuohy needle

We would like to report a manufacturing defect in a Tuohy needle that

reinforces the need to inspect all equipment prior to use.

An Abbott 18G Tuohy/27G Whitacre combined spinal epidural kit (Abbot Critical Care Systems, Sligo, Republic of Ireland) was selected for regional anaesthesia for elective lower segment Caesarean section. Prior to performing combined spinal-epidural anaesthesia, the Tuohy needle was noted to be misaligned in the horizontal plane at the junction of the hub and the shaft at an angle of approximately 10° (Fig. 12). Furthermore, the stylet could not be withdrawn from the Tuohy needle suggesting the Tuohy needle assembly had been damaged during the final packaging process.

Several defects of Tuohy needles have previously been reported including separation of the hub from the needle [1, 2] and protrusion of the stylet beyond the tip of the Tuohy needle [3]. Misalignment between the hub and shaft of Tuohy needles has also been reported [4], however, not to the degree we have observed or with an associated fixed stylet. Had the defect in this case not been recognised prior to use, identification of the epidural space would have been difficult, and inability to withdraw the stylet would have necessitated a second skin puncture.

The importance of checking equipment before use is well recognised and this should also include the Tuohy needle and ease at which the stylet can be removed. We have reported this defect to the manufacturer as a quality control matter.

D. A. Wright
M. W. M. Rucklidge
King Edward Memorial Hospital,
Perth, Australia

References

1 Millman AM. Faulty epidural needle. *Anaesthesia* 1994; **49**: 270.
2 Schlake PT, Peleman RR, Winnie AP. Separation of the hub from the shaft of a disposable epidural needle. *Anaesthesiology* 1999; **68**: 611–13.
3 Stevens J. Faulty Tuohy needle. *Anaesthesia* 1999; **54**: 1120.
4 LeDez K, Kneeling P. 'Malignment' of epidural needles. *Anaesthesia* 1984; **39**: 1255–7.

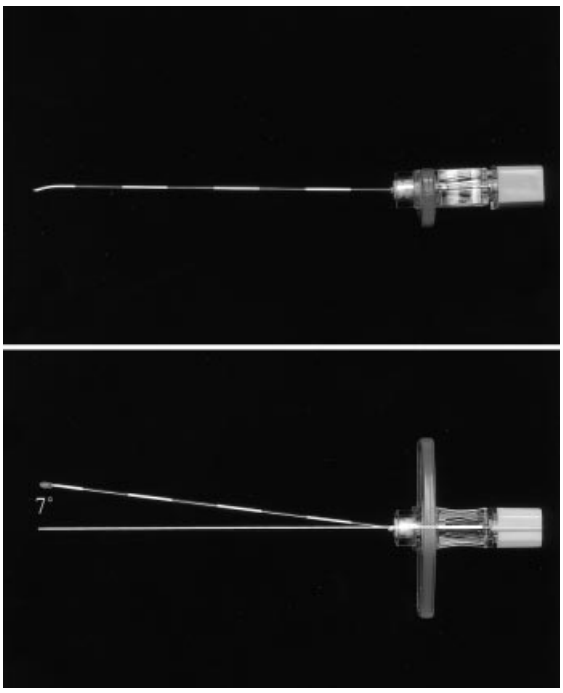

Figure 12

A possible cause of corneal abrasions

I wish to report a possible aetiology for the development of corneal abrasions, which I feel may have been overlooked in the literature. The main identified causes of corneal abrasion in non-ophthalmological anaesthesia is trauma from facemasks, laryngoscopes, and other airway devices but the majority of non-ophthalmological anaesthetic cases of iatrogenic corneal abrasions do not have a distinguishable aetiology [1].

This was not the case in a lady who recently underwent an emergency Caesarean section for failure to progress. The patient had used Entonox via a demand/reducing valve during labour. Whilst spinal anaesthesia was being established, she was given a Hudson mask with 50% oxygen and 50% nitrous oxide at 10 $l.min^{-1}$. Once the block was established, the nitrous oxide was removed from the mixture and the fresh gas flow reduced to 4 $l.min^{-1}$ until the birth of her child. The Hudson mask was used for a total time of 45 min. The patient denied that the Hudson mask entered her eyes at any point during the procedure.

The next day the patient developed severe blepharospasm. The ophthalmological opinion was that the drying effect of the gas had caused bilateral central corneal abrasions, for which they could not offer any published evidence. She made a full recovery with residual corneal scars below the visual axis that do not affect her vision, suggesting that the original cause was drying of the interpalpebral area of the eyes [2].

Despite extensive Medline searches and correspondence with the Drug and Therapeutics agencies, it appears this form of exposure keratopathy had not been reported as an adverse event in awake patients. It may be that we should change our practice to use a mouthpiece and a demand/reducing valve rather than a facemask to deliver Entonox whilst establishing spinal anaesthesia.

H. Pollock
Southampton University Hospital,
Southampton SO16 6YD, UK

References
1 Gild WM, Posner KL, Caplan RA, Chleney FW. Eye injuries associated with anesthesia. A close claims analysis. *Anaesthesiology* 1992; **76**: 204–8.
2 Bready LL. *Complications in Anesthesia.* Edited by John L. Atlee MD. Philadelphia, W.B. Saunder, 1999: 777–81.

A faulty Yankauer suction catheter

We would like to bring to your attention a problem with a Kendall Argyle Yankauer suction catheter (Tyco Ltd), which potentially could have been a hazard to patients.

Whilst restocking the anaesthetic room between cases, a vigilant anaesthetic assistant noticed the faulty suction catheter (Figs 13 and 14) and removed it before use. The catheter was still in its intact sterile packaging. There was no evidence of the missing part of the tip in the packaging. In anaesthetic practice it is common to use Yankauer suction catheters under direct vision using a laryngoscope. However, these catheters are frequently used blindly in a resuscitation setting.

Wherever the setting, had this particular catheter been used blindly, considerable damage to the patient's soft palate could have occurred.

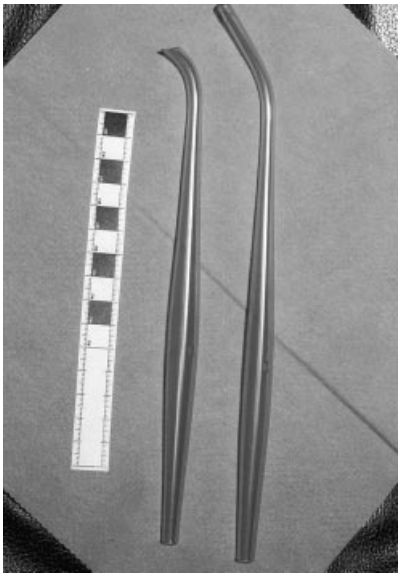

Figure 13

Figure 14

Airway injury during general anaesthesia is a significant source of morbidity for patients and a source of liability for anaesthetists. Perforation of the pharynx or oesophagus is a serious, life-threatening injury [1]. Approximately 6% of claims in the American Society of Anesthesiologists (ASA) Closed Claims database were for airway injury. Of these, injuries to the pharynx (19%) and oesophagus (18%) were amongst the most common [1].

This incident was reported to the Medical Devices Agency and the manufacturers (Tyco Ltd) were contacted. Tyco Ltd informs us that they produce approximately 8 million Yankauer suction catheters per annum. They have reviewed the manufacturing process and have identified the source of the problem, which is thought to be related to the packaging process. This is the first time a problem of this nature has occurred. However, the company is implementing changes in their quality control and is purchasing new packaging equipment to ensure this does not happen again.

M. C. Dickinson
Royal London Hospital,
London, E1 1BB, UK

A. Klein
Homerton University Hospital,
London, UK
E-mail: mcdickinson@doctors.org.uk

Reference
1 Domino KB, Posner KL, Caplan RA, *et al.* Airway injury during anaesthesia: a closed claims analysis. *Anesthesiology* 1999; **91**: 1703–11.

A reply

Thank you for allowing us to comment on Dr Dickinson's letter. The incident described is of great concern to Tyco Healthcare and we have conducted a through investigation. Each step of the manufacturing and packaging process for the Yankauer Suction Instrument was analysed, the potential problem identified, and appropriate corrective action implemented. The photograph provided of the affected product shows a gross defect which would be clearly visible to the clinician prior to use. Further, it is likely that this defect would prevent the product from functioning properly, once again alerting the user.

To put this incident in perspective, during the past year customers around the world have used over 17 million Tyco Yankauer Suction instruments. A review of our complaint history on this product has shown this to be the only reported defect of this type. We sincerely regret the fact that one of our customers received a damaged product. However, we firmly believe that the corrective action we have taken will prevent recurrence of this incident. Further, our data indicate this is an isolated incident.

A. M. Morley
Tyco Healthcare UK,
Gosport PO13 OAS, UK

The significance of post mortem tryptase levels in supporting a diagnosis of anaphylaxis

After reading the case report regarding a lady who suffered a fatal anaphylactic reaction at induction (Konarzewski & De'Ath. *Anaesthesia* 2001; **56**: 497–8) and reply (Girgis. *Anaesthesia* 2001; **56**: 1016–17), we feel neither author emphasised the significance of such a vastly elevated serum tryptase level (185 $\mu g.l^{-1}$, normal $< 1\ \mu g.l^{-1}$). In addition, we would like to reiterate

that the absence of cutaneous and respiratory features of anaphylaxis does not preclude the diagnosis.

Following death, body tissues undergo autolysis and therefore tryptase enzyme leaks from tissue mast cells. This results in elevated serum tryptase levels if blood samples are taken post mortem. This was shown by Randall *et al.* [1], and Edston and Van Hage-Hamsten [2]. The former found that 31 out of 49 autopsy cases had raised tryptase levels when there was no evidence of anaphylaxis. However, of the 31 cases, 24 had values of only 1–5 $\mu g.l^{-1}$, two had values of 5–10 $\mu g.l^{-1}$, five had values of > 10 $\mu g.l^{-1}$ and one had a value of 106 $\mu g.l^{-1}$ The figure of 185 $\mu g.l^{-1}$is far in excess of any of Randall's 31 autopsy cases. Edston and van Hage-Hamsten [2] looked at 193 post mortem patients of known, unexplained and anaphylactic deaths. They found they required a significantly high cut-off tryptase value of 10 $\mu g.l^{-1}$ to provide a specificity for anaphylaxis of 88%. This was increased to 93% if a cut-off of 20 $\mu g.l^{-1}$ was used.

We feel the main reasons for raised post mortem serum tryptase levels are: autolysis, trauma resulting in organ damage (one case had a reported tryptase level of 170 $\mu g.l^{-1}$ following a car accident [2]) and anaphylaxis/anaphylactoid reactions. Autolysis is likely to give low to moderate tryptase levels, i.e. 1–10 $\mu g.l^{-1}$ [1], whereas trauma and anaphylaxis give much higher figures, i.e. > 20 $\mu g.l^{-1}$ [2].

Recent Advances in Histopathology [3] advise that post mortem tryptase levels should be interpreted with caution unless grossly elevated and supported by a suggestive clinical history. The absence of cutaneous and respiratory manifestations of anaphylaxis suggests a rapid onset, for example an intravenous allergen as opposed to an ingested allergen. Out of a series of 56 iatrogenic anaphylactic deaths, none demonstrated cutaneous manifestations, and only 13 demonstrated upper airway oedema and bronchial obstruction [3].

As we have a good case report history (also presented to Konarzewski and De'Ath's anaesthetic department), a tryptase level of 185 $\mu g.l^{-1}$, and no autopsy evidence to dispute the diagnosis of anaphylaxis, we believe this lady died as a result of an anaphylactic reaction.

M. G. Way
C. L. Baxendine
Southampton General Hospital,
Southampton SO16 6YD, UK

References

1 Randall B, Butts J, Halsey JF. Elevated postmortem tryptase in the absence of anaphylaxis. *Journal of Forensic Sciences* 1995; **40**: 208–11.
2 Edston E, van Hage-Hamsten M. Beta-tryptase measurements post-mortem in anaphylactic deaths and in controls. *Forensic Science International* 1998; **93**: 135–42.
3 Ian SD, Roberts R, Pumphrey SH. The autopsy in fatal anaphylaxis. In: Lowe DG, Underwood JCE, eds. *Recent Advances in Histopathology 19* London: Churchill Livingstone, 2000:145–62.

Audit of audit …

In their letter 'An audit of audit and continued educational and professional development' (White & Osmer. *Anaesthesia* 2001; **56:** 1003–4) the authors use the term audit inappropriately. What they in fact describe are the results from a postal survey of 58 UK Anaesthetic Departments on their audit and related activities. Their letter is essentially a description and discussion of a survey. This is data collection, which is just one part of 'audit'.

Audit gained much greater medical and political prominence in the UK with the publication of the Department of Health white paper *Working for patients* in 1989 [1]. Since then, audit has come to mean many things to many people, and therein lies confusion. Whilst definitions of audit vary [2], the principles and characteristics as applied to the medical or clinical setting remain essentially the same. Be it part of a process, trail or cycle, audit consists of four steps. These are:
1 categorisation (defining valid criteria for audit),
2 collection (of relevant performance data),
3 comparison (of data with accepted values) and, importantly,
4 change – improving performance, doing something positive.

For many the 'audit trail' can be a rocky path. Whilst publication of survey data has value, this is but one step along the way to successful audit.

A. Badrakumar
P. Jefferson
D. R. Ball
Dumfries and Galloway
Royal Infirmary,
Dumfries DG1 4AP, UK

References

1 Secretaries of State for Health, England, Wales, Northern Ireland and Scotland. Working for patients Cmd 555. London: HMSO, 1989.
2 What is Audit? In: Irvine D, Irvine S, eds. *Making Sense of Audit*. Oxford: Radcliffe Medical Press, 1991: 16–22.

Radial artery cannulation – a simple positioning aid

The ideal arm position for inserting a radial artery cannula is full supination of the forearm with the wrist fully dorsiflexed. An anaesthetist's assistant is usually press-ganged into holding the arm and wrist in position, with varying degrees of success. Also, increasingly commonly these days, the anaesthetist may be working single-handed and the ODP may well be busy concentrating on other vital duties. To make this procedure a 'one-man' job, the simple solution is a 500-ml bag of normal saline. When the bag is hooked onto the patient's index finger and allowed to hang over the edge of the bed (Figs 15 and 16), a near perfect position is achieved entirely without assistance. Try it – you'll like it!

M. B. Coates
Derriford Hospital,
Plymouth, UK

Blocked emergency syringe

Following a number of letters that have appeared concerning the value, or otherwise, of 'bespoke' prefilled emergency

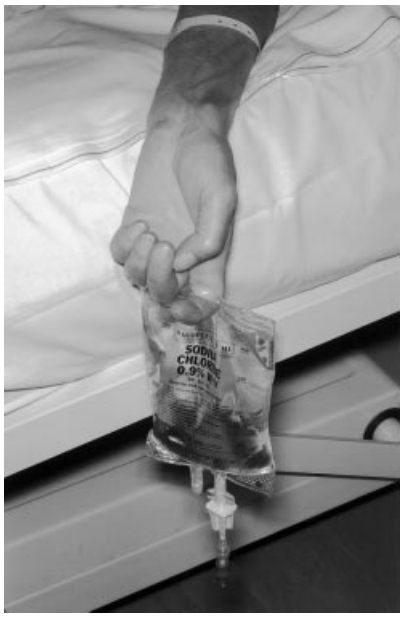

Figure 15

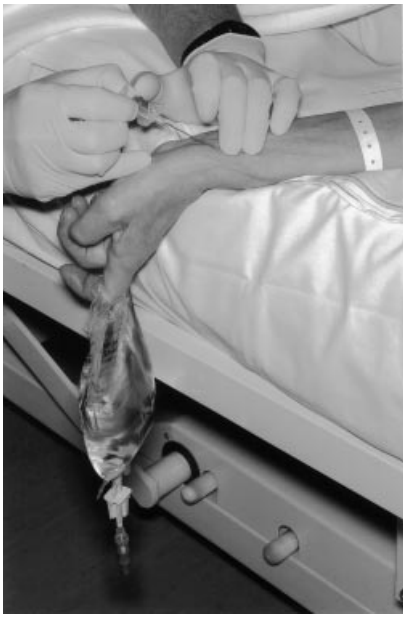

Figure 16

syringes (Webster *et al*. *Anaesthesia* 2001; **56**: 818–20, Rayen & Rasanayagam. *Anaesthesia* 2001; **56**: 711–12, Wikner & Tighe. *Anaesthesia* 2001; **56**: 712), I would like to draw attention to one definite failing of employing them.

During a cardiac arrest on an Intensive Care Unit, a situation arose in which an item as 'simple' as a syringe, failed. A patient required an epinephrine bolus and from the Emergency Drug Box was taken an unopened box containing a prefilled syringe of epinephrine (Martindale Pharmaceuticals). The box was opened, the cap removed [1], and the syringe was applied to one of the Kimal Clave valves that had been used with great success on the Intensive Care Unit. However, it was found that the plunger could not be depressed. Subsequently the syringe was attached to a standard 'three-way' tap. Sadly, again the plunger could not be depressed, and so the syringe was replaced with another, which worked correctly.

Once the incident was over, I found the syringe in question and it appeared to have a blocked nozzle, which no amount of manual pressure was able to dislodge. There was no subsequent problem with the Clave valves reported, although at the time we did not suspect that there would be, so it was not specifically looked for. The syringe was sent back to the manufactures for their analysis. In their reply they suggested that the end was blocked with a piece of plastic that 'may be part of a Kimal Clave valve.' Subsequent discussion revealed that the syringe was known to be incompatible with the Clave device.

I feet it is important not to over dramatise what occurred. No more than a few seconds could have been 'lost' as a result of the failure described above, and so it is doubtful that this significantly affected the patient. That said, I think it is important to highlight this incompatibility between prefilled syringes from Martindale and the Kimal Clave valve system.

D. J. Aldington
Portsmouth Hospital,
Portsmouth, UK

Reference

1 Menon, R. An unusual case of tracheal tube obstruction. *Anaesthesia* 2001; **56**: 700–1.

Malignant hyperpyrexia and a career in Anaesthesia

I read the letter (Tillyard. *Anaesthesia* 2001; **56**: 1020) concerning advising a colleague with a family history of malignant hyperthermia (MH) about a career in anaesthesia. If a sibling (the proband) has confirmed MH, i.e. has been screened by muscle biopsy then your colleague has a 50% chance of being affected. Assuming the proband has been tested in the UK, your colleague will have been offered diagnostic screening as part of the family follow up. Should this show he/she is also susceptible to MH this will not influence his/her career choice with regard to the practice of anaesthesia. We do not advise MH susceptible patients to alter their life style, although the Armed Services do have certain restrictions. We have several MH susceptible patients who work in the operating theatre environment, one of whom was an ENT surgeon who spent most of his working life in non-scavenged theatres using Boyle-Davis gags.

In the laboratory there is an obvious dose/response effect of halothane on MH muscle tissue. It is reasonable to suppose this occurs in the clinical situation although it is by no means the only explanation of the varying severity of a malignant hyperthermia crisis.

P. J. Halsall
St James's University Hospital,
Leeds LS9 7TF, UK

e-Surveys

Surveys on anaesthetic practice are common, and many now appear in this journal. For this year to November 2001, 16 surveys have been published in *Anaesthesia*. The numbers of contacts range from 29 to 735. All except one are to anaesthetic departments or societies and rely on postal questionnaires, usually with a stamped reply envelope to encourage response. Such paper-based surveys present a formidable logistical challenge with significant administrative commitment and high postage costs. Replies must then be collated, usually requiring some form of data entry into a computerised format. This is invariably labourious and error prone. We propose a better way to survey.

Our proposal relies on the participation of a recognised and respected anaesthetic network established nationally and represented at hospital level.

Such networks already exist, in the form of College Tutors and Association Linkmen. We seek either College or Association endorsement to use their networks to participate in national surveys of anaesthetic activity. A network would be linked by electronic mail using a dedicated distribution list. This would require some form of national co-ordination, but the outlay in terms of manpower and money would be relatively modest, probably the present cost of one paper survey. Once implemented, electronic surveys could then be rapidly and cheaply conducted, with all participants gaining benefit from shared information. Comparative data on practice can readily be used for local, regional or national audit. Planning, preparation and participation are crucial for such a collaborative venture.

Whilst a survey reliant on unsolicited E-mail has been recently published [1] the response was low (20%), prompting editorial comment [2]. All exchanged information would necessarily have to comply with the Data Protection Act, but this consideration should not be seen as an impediment to the plan. We christen such a proposal 'e-Surveys', 'e' for electronic, economic, efficient and easy.

D. R. Ball
P. Jefferson
Dumfries and Galloway Royal Infirmary,
Dumfries DG1 4AP, UK

References

1 Soliman HM, Mélot C, Vincent J-L. Sedative and analgesic practice in the intensive care unit: the results of a European survey. *British Journal of Anaesthesia* 2001; **87**: 186–92.
2 Park GR. Sedation and analgesia – which way is best? *British Journal of Anaesthesia* 2001; **87**: 183–85.

Better skin incision for Seldinger dilator insertion

Skin incision for the venous line dilator is usually made along the Seldinger wire with the knife blade facing away from the flexible wire. In our hands there is still a struggle to pass the dilator because the skin has not been cut properly. Rather than removing the metal needle after Seldinger wire passage, we now make the skin cut onto the shaft of the needle before it is withdrawn. This gives a firm support to cut onto, a single clean measured skin incision can be made, and risk of knife damage to the Seldinger wire can be avoided.

P. Nalwaya
W. F. S. Sellers
Kettering General Hospital,
Kettering, Northants NN16 8UZ, UK

Another use for the laryngoscope

As recently described (Holtham & Weaver. *Anaesthesia* 2001; **56**: 1121), we all feel difficulty when introducing laryngeal mask airways, whether the regular or the disposable types. The 'reverse to front' method is fine and so are numerous other methods, but the potential for causing minor or major trauma remains in all methods used. In my opinion and experience, the old laryngoscope should be made use of when difficulty is experienced in placement of a laryngeal mask. One does not have to do 'full' laryngoscopy but use the blade and light to move away the tongue to make that little extra space. This will invariably succeed in almost all cases. The laryngoscope blade here is used only as a sort of tongue depressor!

I hope this will be found useful and feedback will be welcome to help assess this method.

H. S. Bhogal
Alexandra Hospital,
Redditch B98 7UB, UK

All in the name of progress

As a relatively new Senior House Officer in anaesthesia, I feel most privileged to be using new fully computerised anaesthetic machines in our operating theatres. These units (the manufacturer shall remain nameless) are fully computerised with comprehensive monitoring of vital signs, anaesthetic agent and gas concentrations and respiratory parameters. Rotameters are electronically represented. These machines are obviously 'state of the art' and, no doubt, very expensive. It amuses me that, following a number of power cuts and 'software malfunctions', it has become common practice to make sure that there is an Ambubag or similar within easy reach on the back of the machine. All in the name of progress!

R. Langford
Royal Hampshire County Hospital,
Winchester SO22 5DG, UK

Nitrous oxide

Carter, in his reply to my letter on this topic (Carter. *Anaesthesia* 2002; **57**: 82) writes that 'the really exciting use of nitrous oxide is in motor racing where injecting nitrous oxide, either into the fuel line or the air intake, enhances performance'. Sadly, I think Carter has missed the point. What would be really exciting would be to inject nitrous oxide into the surgeon's fuel line or air intake. Would there still be an enhanced performance? If so, nitrous oxide would become the greatest thing since sliced bread!

J. S. M. Zorab
Bristol, UK