Anaesthesia, 1990, Volume 45, pages 334–344

Correspondence

Sir R.R. Macintosh

It was a pleasure to read the obituary of Sir Robert Macintosh who, with Magill, was, without doubt, one of the two outstanding seminal contributors to modern British anaesthesia.

Although I never was fortunate enough to work with him, I had the privilege of meeting him on a number of occasions after his retirement. His former colleagues have, I imagine, considered the principle of a permanent memorial to his name, but may I ask them to consider its orientation towards the practical aspects of anaesthesia, intensive care or pain relief.

There would, I am sure, be a wide response from even those who knew him only through his publications and equipment, especially if there was a limit to the amount of a contribution.

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A Patent application

A Patent application for an anaesthetic machine which is of considerable interest is reported. It was designed and used about the same time as Boyle's first nitrous oxide/oxygen machine and the circumstances of its use give a striking illustration of the state of the art of anaesthesia during World War I. The use of nitrous oxide with oxygen was pioneered by Hewitt but his apparatus never became popular. Several American machines to deliver the two gases were devised between 1910 and 1915; the most important was probably Gwathmey's.

World War I demonstrated that anaesthesia with chloroform or spinal blockade was extremely dangerous in patients with shock or severe sepsis. Anaesthetics were administered by unit medical officers for the first 2 years of the war in the British medical services. Specialist anaesthetists were appointed in 1916 for the first time as additional officers on the staffs of the casualty clearing stations. Their numbers were insufficient to meet the huge demand and, in 1918, 200 specially trained nursing sisters were appointed.[1] The advent of anaesthetists and the arrival in France of the Americans stimulated interest in the use of nitrous oxide/oxygen anaesthesia. Boyle, who had met Gwathmey in America in 1912, renewed their acquaintance in 1917 when both were serving in France. He was then persuaded to try

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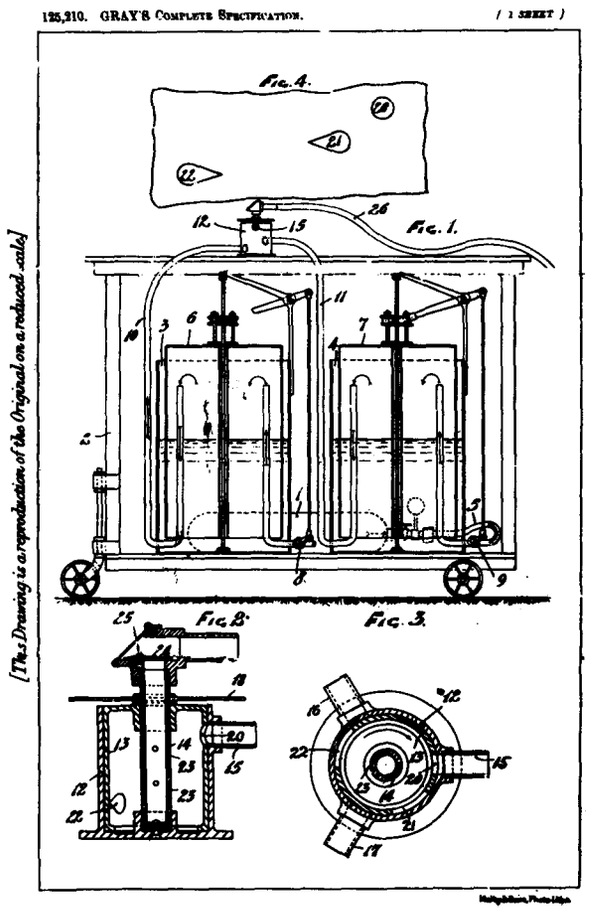

Fig. 1

Gwathmey's machine and this led to the development of the first Boyle machine.

A Patent application, concerning a 'Device for Administering Anaesthetics' in the Department of Anaesthetics in Edinburgh Royal Infirmary is dated April 1918. Cylinders of nitrous oxide and oxygen, each fitted with a pressure gauge and a reducing valve, were connected to two gasometers and a mixing device. The gasometers ensured that the pressures were equalised, and the mixing valve allowed variable concentrations of oxygen/nitrous oxide as well as the admission of air to the patient. The diagram in the patent application is shown in Figure 1.

This machine was designed and used, not by a doctor, but by a Chaplain to the Forces, the late Canon John Allan Gray, CF, MC. He apparently succeeded in doing a short course in anaesthetics and was allowed to administer anaesthetics in emergency operations in the front line while, at the same time, carrying out his priestly ministrations. However, he found that many men died during surgery and devised his own machine which he used regularly with considerable success. Canon Gray's brother, Frank, an engineer, subsequently patented the machine for him (Fig. 2). The machine was given to and used for a time by an Edinburgh surgeon, Harold Styles, after the war.

The Patent and the information about Canon Gray were kindly given to the Department by Cardinal Gray, nephew of Canon Gray and son of Frank Gray.

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Reference

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No. 125210

GEORGE V, BY THE GRACE OF GOD,

Of the United Kingdom of Great Britain and Irelarland and of the British Dominions beyond the Seas King, Defender of the Faith, Emperor of InIndia: To all to whom these presents shall come greeting:

WHEREAS Frank William Gray, of 203 Newhaven Road, Leith, Engin...

hath declared that he is in possession of an inventintion for Device for administering anaesthetics - - - - - -

that the said invention has been communicated to hi him by The Reverend John Allan Gray, b.F. m.b. (Chaplainin to the For...) on active service in F...

that he claims to be the true and first inventor th thereof, and that the same is not in use within the United Kingdom of Great Britain and Irelreland and the Isle of Man by any other person to the best of his knowledge and belief:

Fig. 2.

Unpleasant sequelae of benzodiazepine sedation

Your correspondents (*Anaesthesia* 1989; **44:** 928) give the advice that one should ensure that a female third party is always present when drugs are given which might interfere with normal perception. This good advice has been ignored by several people using intravenous midazolam or diazepam for dental sedation and has resulted in reports of sexual fantasies occurring during sedation for which the administrator was blamed. Several of these have gone to court and as a result their right to practice was withdrawn by the General Dental Council.

Similar events after the use of benzodiazepines for sedation in dental practice, endoscopy, and induction of anaesthesia were reported,[1,2] and noted elsewhere.[3,4]

This activity has resulted in much correspondence and I now have details of 41 possible fantasies or hallucinations. Thirty-three of these occurred in women, 27 during sedation and six during the slow induction of anaesthesia. There was some element of sexual trespass in 27 of these and 20 patients found the experience unpleasant.

It was possible to verify the reports in 25 incidents and in 17 of these there was no possibility of any sexual trespass. These are similar to those described by your correspondents.

It is hoped to describe these in detail later but it is worth noting that in nine out of 13 proven fantasies the event of which the patient complained could be related to something which actually happened.

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References

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Epidural pressure

The article by Johnston *et al.* (*Anaesthesia* 1989; **44:** 750–2) makes some statements which should not go unchallenged.

'The epidural pressure is an indirect indicator of cerebrospinal fluid (CSF) pressure.' This must not be taken to mean that the epidural pressure is the same as the CSF pressure, since this has been shown not to be true.[1] It is not always safe to assume that the CSF pressure in the head is the same as it is in the lumbar subarachnoid space.[2] Shah's concept that the dura mater acts as a movable membrane which allows equilibration of pressure[3] does not take all factors into account, such as the contribution made by the elastic component of the dura mater and the pressure transmitted through the internal vertebral venous plexus, which may affect the epidural pressure.

'The CSF pressure is a reflection of venous pressure.' This concept was put forward by Loman *et al.*,[4] but it was later shown by Ryder *et al.*[5] that changes in CSF pressure could occur independently of, and sometimes inversely to, changes in venous pressure. Usubiaga *et al.*[6] also demonstrated that the lumbar epidural pressure and superior vena cava pressure changes oscillate in opposite directions during normal breathing.

The concept of the elastic 'venous wall' is again from Loman *et al.*[4] The CSF is contained, in their view, between four walls; dura, arteries, capillaries and veins. The dura and arteries are rigid, so would not contribute to changes in CSF pressure, capillaries were less rigid, but veins are elastic, thus the changes in CSF pressure are secondary to changes in venous pressure. This hypothesis cannot stand in the light of our current knowledge of the structure of dura and arteries, and of the other factors which influence CSF pressure.

The suggestion that an increase in pressure on the lumbosacral veins causes a cephalad spread of CSF implies that the spinal dura mater is a rigid container which does not allow caudad spread of CSF. This does not correspond with the work of Martins *et al.*,[7] who demonstrated that the spinal dural sac is a dynamic structure, which expands and contracts in response to changes in CSF and venous pressure. Their work demonstrated that there is caudad spread of CSF when the intra-abdominal pressure is raised, but there was no evidence of a cephalad movement of CSF.

The results demonstrate an increase in epidural space pressure when posture is changed from lateral to supine. This concurs with the work of Shah[8] who produced similar results. If it is assumed, as it is by the authors, that the epidural pressure is an indirect indicator of CSF pressure, then (with the caveats above) it must be assumed that this demonstrates an increase in CSF pressure on change from the lateral to the supine position. This agrees absolutely with the work of Loman *et al.*,[4] who demonstrated the same pressure changes in the CSF.

What, therefore, is the position of the epidural veins? To ensure that the epidural veins are open requires a transluminal pressure in the veins greater than zero.[9] The inferior vena cava is 3.5 cm anterior to the anterior border of the vertebral canal in the supine position.[10] Assuming that the epidural space pressure is the pressure exerted by the dural sac on the wall of the vertebral canal, which is approximately 1.8 kPa of water in the supine position, the venous pressure in the abdomen will have to be greater than (1.8–0.35), i.e. 1.45 kPa. Whether or not this occurred is unknown, since the inferior vena caval pressure was not measured in these patients. These comments must question the validity, however, of a previous article[8] which states that the epidural veins should be engorged in the supine position on all subjects.

Overall, these workers have succeeded in measuring a change in epidural pressure with posture, but have failed to explain what these changes mean. It is hoped that in future studies the role of the internal vertebral venous plexus in the genesis of the epidural pressure and the spread of local anaesthetic solutions will be more closely examined.

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A reply

We thank Dr Harrison for the points that he has raised about our paper. Kerr, Scott and Samuel[1] confirmed by radiological studies that it is normal for the inferior vena cava to be almost completely occluded in the supine position in late pregnancy. The venous return is redirected via collateral channels, principally the azygos and vertebral venous systems (the epidural venous plexus is part of the vertebral venous system).

There has to be a reduction in the sectional volume of the subarachnoid space when there is distension of the epidural veins by a change of posture from lateral to supine. This is achieved by upward movement of the cerebrospinal fluid towards the thoracic region where the epidural veins are not being distended.

'The epidural space pressure is an indirect indicator of CSF pressure.' We did not intend this to mean that epidural space pressure is the same as CSF pressure. There is nothing in our paper that indicates that CSF pressure in the head is the same as it is in the lumbar subarachnoid space. 'CSF pressure is a reflection of venous pressure.' We do not say that changes in CSF pressure cannot occur independently of venous pressure. The paper by Usubiaga *et al.*[2] quoted by Dr Harrison describes preferential increases between the three zones of the epidural space. They confirmed that compression of the abdominal wall increased the subarachnoid and lumbar epidural space pressure; further, it did not increase cervical epidural space pressure. This would be consistent with our hypothesis about movement of CSF.

A vein is by definition elastic if it can restore its previous bulk or shape after having been contracted or dilated. It is convenient to think in terms of a single 'venous wall' rather than countless separate small venous walls.

How can it be considered that the spinal dura mater is a rigid container? How could distension of the epidural veins influence the movement of CSF if this was the case?

We made a point of quoting Marx *et al.*[3] who showed that in the normal pregnant woman at term, in the supine position, CSF pressures are within normal limits. In other words, CSF moves away when the epidural veins become engorged. The recordings of epidural space pressure in our study were made as soon as possible after each new posture had been adopted, since it was the acute changes in which we were interested. This probably accounted for the differences in value which we found, at two separate stages in the sequence of measurements, for the posture of supine with a wedge beneath the right buttock.

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Combined supraclavicular and elbow blocks

We wish to comment on the study by Smith *et al.* (*Anaesthesia* 1989; **44**: 747–9). Their quest was to achieve prolonged postoperative analgesia without motor blockade of the shoulder after upper limb surgery and they evaluated a technique which combined supraclavicular and elbow blocks and the use of unsheathed needles. Plain solutions of 1% prilocaine and 0.5% bupivacaine were used for supraclavicular and elbow blocks respectively. Their technique is illogical and is inefficient, uncomfortable for the patient and increases the hazard of nerve injury.

A well-performed supraclavicular block provides analgesia in all three trunks of the brachial plexus, and supplemental blocks at the elbow are not usually required. The use of unsheathed needles with a nerve stimulator is a contentious point, but their routine use for blocks at the elbow (particularly ulnar block) is, in our opinion, inadvisable. The maximum current from an unsheathed needle emanates 0.5–1.0 cm proximal to the needle tip.[1] This may result in the nerve being entered by the needle before maximum stimulation occurs.[2] Furthermore, would the authors of this study consent to a procedure consisting of five injections (including intravenous access), without additional sedation?

Rather than elbow blocks, with their attendant risks and discomfort, is it not more logical simply to extend the action of the brachial block? The addition of adrenaline to bupivacaine greatly prolongs analgesia. Motor block is also extended, but as Drs Smith *et al.* state, the clinical importance of delayed return of motor function is greatly reduced by the use of 'boxing glove' or 'roller towel' dressings.

We routinely perform continuous brachial blocks using an interscalene or perivascular approach and employ intravenous cannulae modified for use with a nerve stimulator, similar in design to other workers.[3,4] Patients are usually sedated with small amounts of fentanyl and midazolam immediately before the procedure and freshly prepared bicarbonate can be added to local anaesthetic if rapid onset is desired. Analgesia can be extended well into the post-

operative period and the composition of subsequent top-ups can be chosen so as to produce a selective sensory blockade.

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A reply

Thank you for letting me see this letter and for the opportunity to reply to it.

Drs Lee and Ben-David appear to have missed the point of the study completely. There is no doubt that a supraclavicular block can provide excellent anaesthesia for surgery of the forearm and hand. The problem is that in the majority of cases prolonged motor block of the shoulder, upper arm and elbow is both unnecessary and unwanted. Prolonged analgesia of the operative site is usually very desirable. The drawback with continuous catheter techniques is that motor block usually persists for at least the duration of analgesia, if not longer, and clearly the patient cannot be discharged from hospital with a catheter in the plexus. Prolonged motor block does not occur with our technique and most patients leave hospital on the same day, without pain, yet retaining most of their motor functions.

We did state quite clearly, as regards the number of injections required, that the supraclavicular block was performed first. Very few patients feel anything when elbow blocks are performed and it is entirely because paraesthesiae cannot be reported that we use a nerve stimulator and pulse synchronous motor responses to aid nerve location.

The debate about the location of maximal current density with an uninsulated needle is the subject of a study to be reported shortly and we defer detailed comment until that time. We can report, however, that we strongly disagree with the conclusions of Pither *et al.*[1]

It is surprising that the writers are concerned about nerve injury at the elbow resulting from our use of 25-gauge short bevel needles, yet seem quite happy to introduce 22-gauge needles and 20-gauge cannulae into the brachial plexus. We did state that no adverse effects of the blocks were seen, nor have we seen significant nerve injury in our other patients. The suggestion that the addition of bicarbonate to bupivacaine would reduce onset time of the block was shown not to be the case for brachial plexus block over a year ago.[2] The considerable variation in quantity of bicarbonate required for adrenaline-containing solutions also makes this technique unpredictable.[3]

The writers' apparent ease in producing selective sensory blockade of the brachial plexus is hard to accept. This can be achieved to some degree in spinal block but it is almost impossible with the brachial plexus. For a drug preferentially to block the smaller fibre types it must either have low lipid solubility or be delivered in very dilute solution.[4] Most of the clinically available agents in this country have relatively high lipid solubilities and thus a dilute solution must be used, but if given by repeated top-up doses then the interval between doses is too short to be clinically practicable. However, the block is usually patchy if given by continuous infusion, and the technique becomes cumbersome.

Finally, the use of a boxing glove dressing only minimises the drawbacks of motor block in the hand and wrist; it does nothing to address the fundamental problem of motor block in the rest of the arm.

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Reversed connexions of free-standing vaporizers

Free-standing vaporizers are associated with several problems including tipping,[1] raised output when the oxygen flush is used[2] and a twofold increase in halothane output when a Cyprane Fluotec 2 vaporizer was misconnected.[3] Their use has increased since the introduction of isoflurane. A Normac anaesthetic agent monitor (Datex) was connected to the output of an Isotec 3 vaporizer (Ohmeda) in order to estimate the effect when an Isotec was used with reversed flow of gases. Readings were taken at a variety of fresh gas flows and at different vaporizer settings, using 100% oxygen as the carrier gas.

The fresh gas flows (FGF) and the vaporizer setting determined the output after misconnexion which varied between 1.1 and 2.2 times the set value. This error increased with increasing fresh gas flows (Fig. 1). We also confirmed that the increased output was greater with a Fluotec 2 than with a Fluotec 3.

We suggest that, although in practice vaporizer settings are regulated by observation of physiological variables, the possibility of a twofold increase in output combined with the other potential problems suggests that freestanding vaporizers should be used with caution.

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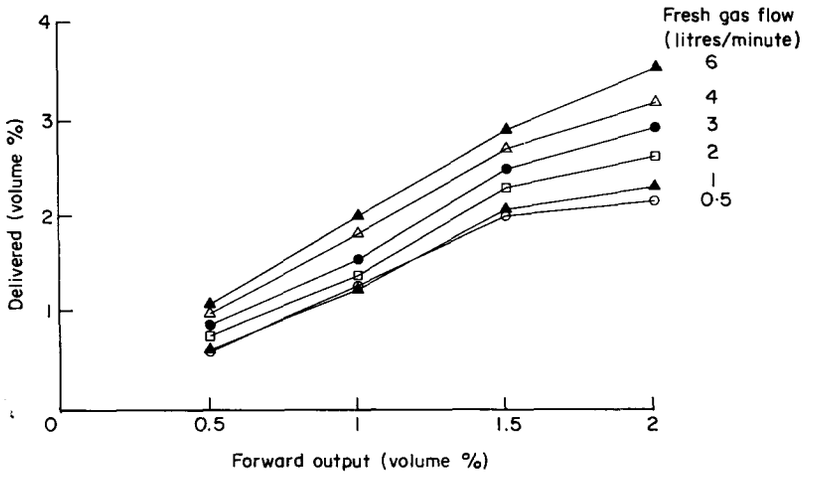

Fig. 1. Comparison of delivered output (volume % Isoflurane) with reversed and correct connexions to Isotec 3 vaporizer.

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Volatile agent use

We read with interest the investigation of Dr Tarpey and Dr Lawler (*Anaesthesia* 1989; **44:** 596–8) into the changes and perceived changes in volatile anaesthetic usage over a 3-year period in their Health District. We were stimulated to look at our department's figures to ascertain whether our experience was similar.

The pattern of change at the Royal Infirmary of Edinburgh and associated hospitals has been different from that in Cleveland. There has been a steady reduction in the use of halothane since the introduction of enflurane, with an apparent acceleration of this process in the year 1986–87, the year in which the Committee on the Safety of Medicines changed their recommendations for halothane (Fig. 1): in that year 32% fewer halothane anaesthetics were given than the previous year. Enflurane has steadily supplanted halothane, whereas isoflurane has made little impact so far.

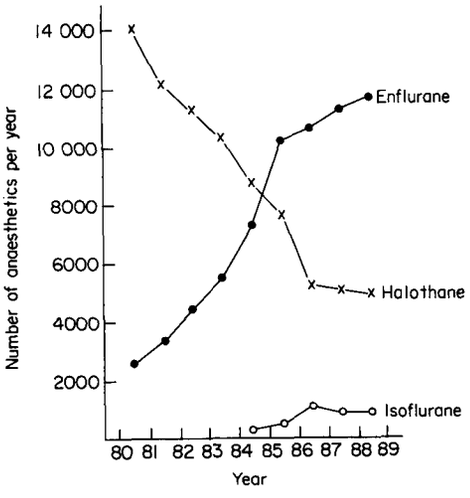

Fig. 1. The number of anaesthetics per year for halothane, enflurane and isoflurane at the Royal Informary of Edinburgh and associated hospitals.

For the year 1987–88, halothane, enflurane and isoflurane accounted for approximately 29%, 65% and 6% of volatile anaesthetics given in the Infirmary and associated hospitals. However, in terms of costs to the pharmacy for the region as a whole, halothane, enflurane and isoflurane accounted for 6%, 56% and 38% of the estimated £144 000 total bill for volatile anaesthetics: the relative costs of halothane and isoflurane to the pharmacy budget then were somewhat similar to that of Cleveland.

Our data on the pattern of volatile agent usage differ from that of Drs Tarpey and Lawler and we therefore caution against extrapolation of the experience of one locality to that which occurs nationwide.

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A reply

We thank Drs Noble and Martin for their interest in our paper and for their comments. We agree that it is inappropriate to extrapolate our findings to other Districts, or even beyond our own survey. We stated that we did not know whether the changes occurring in the 1986 year were abrupt or gradual, because, at that time, our pharmacy data were insufficiently detailed. We were also unable to obtain the data from our pharmacy suppliers, who also did not have sufficiently detailed records. Furthermore, before 1985, we did not possess District data.

We now have data for the 1988–89 year (see Table). These show a further small percentage decrease in halothane usage, with static isoflurane usage. The slack, both absolute and relative, has been taken up by enflurane. The total 'quantity' (MAC hours) of anaesthesia has also decreased, although the number of anaesthetics given is

Table. Anaesthetic delivery: South Tees Health District.

Year	MAC hours/(%)			Total number of anaesthetics	MAC hours per anaesthetic
	Halothane	Enflurane	Isoflurane		
1985–86	17 770 (77.4)	4495 (18.8)	690 (2.9)	21 300	1.08
1986–87	17 888 (69.6)	6026 (23.5)	1773 (6.9)	23 000	1.12
1987–88	12 555 (56.7)	6261 (28.3)	3335 (15.1)	25 000	0.89
1988–89	9925 (50.0)	6870 (34.6)	3057 (15.4)	25 000	0.79

virtually unchanged. We can deduce that volatile agent use has fallen, which has coincided with a further increase in propofol usage.

Halothane remains the dominant volatile anaesthetic agent used in this District (although not in Edinburgh), and this despite our perceptions. However, we can only agree with the comments concerning extrapolation of data, including our own.

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Cord ischaemia

In the report of paraparesis after epidural anaesthesia (*Anaesthesia* 1989; **44:** 831–3) the possible causes of cord ischaemia were discussed, but the authors failed to mention the effect of the adrenaline 1:200 000 which was used.

Adrenaline can cause localised cord ischaemia by a local vasoconstructive action, compounded by systemic hypotension and patient posture, in those patients whose cord blood supply may be more easily compromised because of silent anatomical vascular abnormality.

The use of adrenaline with epidural bupivacaine is, in my view, totally unnecessary and may be a recipe for disaster on some occasions.

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A reply

We agree with Dr Casale that adrenaline may have further impaired cord circulation in our patient. We stated, as a matter of fact in our paper, that 'Intra-operative hypotension . . .' ('which did not require therapy') . . . 'and the use of vasoconstrictors during the anaesthetic could also have acted as ischaemic agents'. However, it should be understood that venous hypertension is thought to be the mechanism responsible for cord hypoxia in spinal dural arteriovenous fistulae, and the role of vasoconstrictors is far from established. Whatever the cause of cord ischaemia, we aimed to call attention to the rare but severe complications of epidural analgesia and we are indebted to the Editor and Dr Casale who gave us another opportunity to do so.

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Neuromuscular blockade in von Recklinghausen's disease

It is reported that patients with von Recklinghausen's disease show an undue sensitivity to suxamethonium, pancuronium and tubocurarine.[1–3] We wish to describe the use of vecuronium in a patient with this condition.

The patient was a 66-year-old man who weighed 45 kg and presented for a cataract extraction. He exhibited multiple neurofibromatoses all over his body. He had a past medical history of hypertension, epilepsy and had suffered a cerebrovascular accident that affected his left side 2 years before this admission (although he had nearly recovered from it). His current medication consisted of carbamazepine 100 mg three times a day, slow-release nifedipine 20 mg twice a day and aspirin 300 mg mane. He had no other complaints; his blood pressure was 150/90 mmHg and his electrolyte analysis was normal.

The patient was premedicated with 10 mg diazepam administered 60 minutes before operation. Monitoring was instituted on arrival in the anaesthetic room with ECG, pulse oximetry and an oscillotonometric blood pressure monitor. Anaesthesia was induced with fentanyl 2 μg/kg followed by thiopentone 250 mg. The patient's lungs were manually ventilated with 70% nitrous oxide in oxygen and 0.5% isoflurane. Neuromuscular monitoring was instituted by stimulation of the ulnar nerve percutaneously at the right wrist with supramaximal stimuli in a train-of-four mode with a peripheral nerve stimulator. The resultant force of contraction of *adductor pollicis* was measured and recorded by a force transducer and a neuromuscular function analyser (Myograph, Biometer Ltd.). Neuromuscular blockade was induced with vecuronium 0.1 mg/kg (4.5 mg) after an initial period of stabilisation and recording of the control response. The onset of complete block occurred in a relatively rapid time of 95 seconds. The first response (T1) in the train-of-four returned at 20 minutes, while the time to

return of T1 to 25% of control was 34 minutes. The train-of-four ratio was greater than 75% after 60 minutes. Isoflurane was discontinued at this stage because the surgery had ended and shortly afterwards the patient started to breathe spontaneously. The patient then showed a sustained response to a tetanic stimulus at 50 Hz. Neostigmine was not administered in view of this. Soon after extubation the patient was responsive to verbal commands, able to cough well and lift his head for 5 seconds.

Previous reports of sensitivity to muscle relaxants in von Recklinghausen's disease have described both sensitivity to suxamethonium with tacrine[2] and resistance to suxamethonium by itself,[1] while sensitivity to tubocurarine and pancuronium is also described.[1,3] This case showed the onset time to maximum block with vecuronium to be more rapid than usual, but the duration of effect was within normal limits.

We were careful to use the patient's unaffected side[4] since neuromuscular monitoring may be misleading when carried out on a limb affected by a stroke.

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Humphrey ADE anaesthetic breathing system

The Humphrey ADE is an efficient anaesthetic breathing system for both spontaneous[1,2] and controlled ventilation,[3] but it is not possible to ventilate the patient's lungs manually in the D/E position because the expiratory valve does not communicate with the breathing amount and there is no route for the escape of expired gases. Manual ventilation in the Mapleson A position, though feasible, is not an efficient method of carbon dioxide elimination. Thus, there is a shortcoming with this breathing system which shows up if the ventilator breaks down or in areas where a mechanical ventilator is not available.

This problem can be overcome by a small modification. Advantage is taken of the fact that the pressure relief valve is in communication with the patient's airway *both* in Mapleson A and D/E position. The modification is achieved by replacement of this valve by one that combines an expiratory and pressure relief valve such as that used in many Bain breathing systems (Fig. 1). The original expiratory valve can then be eliminated.

The ventilator is replaced by a reservoir bag with the new expiratory valve partially closed during manual ventilation, and for controlled ventilation the bag is replaced by the ventilator, and the expiratory valve is completely closed, as is routine with the Bain breathing system. Note that in the original form it was not necessary to close the valve during controlled ventilation because it did not communicate with the breathing system.

This small modification of Humphrey ADE system makes normal ventilation in the D/E position possible and makes it more versatile without changing the basic function.

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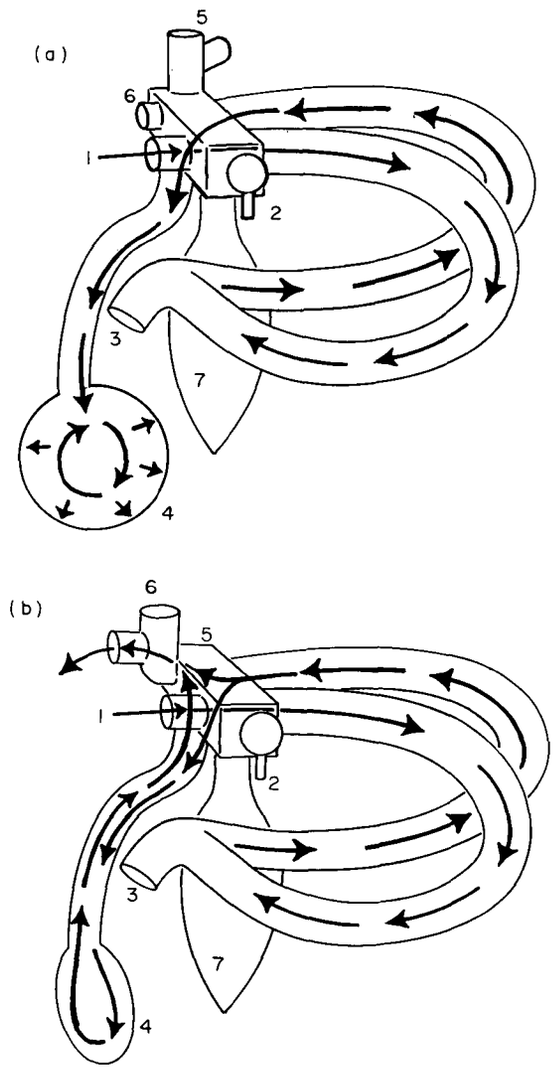

Fig. 1. (a) Humphrey ADE; (b) modified Humphrey ADE. 1. Fresh gas flow; 2. Mode change in D/E mode; 3. Patient end; 4. Reservoir bag; 5. Expiratory valve, eliminated in modification (b); 6. Pressure relief valve replaced by combined expiratory and pressure relief valve in modification (b); 7. Reservoir bag in A mode.

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Pneumothorax after interpleural block in a spontaneously breathing patient

Interpleural analgesia is an accepted mode of pain relief in postsurgical and trauma patients.[1-3] Reiestad and coworkers found no pneumothorax by chest X ray in any of their 81 subjects.[1] Most cases of pneumothoraces are reported in patients whose lungs are ventilated or during placement of an intravenous catheter.[3,4]

A 28-year-old healthy female had an emergency cholecystectomy under standard general anaesthesia. She was awake and breathing spontaneously in the postanaesthetic recovery room and was in the left lateral decubitus position. A single-shot interpleural block was administered above the level of the seventh rib in the posterior axillary line with a 16-gauge Tuohy needle. The patient moved unexpectedly during the administration of 35 ml bupivacaine 0.5% with adrenaline 1:200 000. A chest X ray demonstrated a 25% right-sided pneumothorax, but the patient had no symptoms and vital signs remained stable; complete analgesia was attained. There were still no signs or symptoms of respiratory or cardiovascular compromise 5 hours later and a repeat X ray showed no increase in interpleural gas volume. The patient was subsequently transferred to the ward with oxygen and no supplemental analgesics were required for the next 12 hours. The remainder of her stay in hospital was uneventful.

Pneumothorax is a well known but infrequent complication of interpleural neural blockade, although the exact incidence is unknown. This problem is reported twice,[3,4] but in these cases mechanical ventilation was in use during placement of the interpleural catheter. Our clinical experience agrees with that of previous studies which state that this block provides analgesia of equal duration to intercostal neural blockade but is far simpler to perform.[1,2] This is the first complication we have experienced with this technique without catheter placement in a small series of 30 patients. The advantages of the single shot are its relative ease, avoidance of the theoretical complications of placing an interpleural catheter (e.g. empyema) and lack of resistance during injection which virtually guarantees intrathoracic placement of the local anaesthetic. The disadvantages, as demonstrated in this report, include the inability to both withdraw air or to administer top-up doses for prolonged analgesia.

We consider that the needle should be placed during expiration and a smaller gauge needle, 19–20 Tuohy, instead of 16 or 17, should be used in order to minimise the volume of air trapped.

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A possible hazard

It is a routine practice here to warm patients actively using overhead 'thermal ceiling' (radiant heat supply) after cardiac surgery. This was shown to be effective and prevents some of the hazards associated with passive warming of patients.[1,2]

We have, however, encountered a problem which is worth remembering. The Hewlett Packard System for patient monitoring (Model Merlin M1166A/A68) measures cardiac output by the thermodilution principle, wherein the temperature of the injectate should be at, or below, room temperature. The practice in our institution is to use injectate at room temperature and this is supported by previous studies[3]. With the use of the thermal ceiling where the temperature is about 37°C, the tubes leading to the port of injection are also warmed to this temperature and the monitoring system is unable to determine cardiac output. This is an obvious hazard in a critical situation where rapid determination of cardiac output is essential for proper patient management. The system has often failed.

We recommend that in all patients who are warmed artificially using these thermal ceilings, cardiac output determinations using the thermodilution catheter should ensure that facilities for continuous maintenance of steady-state temperature of injectate be available. Such a device is the CO-Set (Baxter) and although promoted as an effective infection control system, it also ensures constant, correct injectate temperature determination.[4]

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Half a guard is better . . .

Inadvertent damage to teeth or gums associated with laryngoscopy is distressing for a patient and may be expensive to correct. Proper care is, therefore, absolutely necessary.[1] Inconvenient methods tend, unfortunately, to be abandoned when difficulties arise during intubation. We have tried the transparent gumshield (*Anaesthesia* 1989; **44:** 705) which, while it provides adequate protection for the teeth, does restrict access. We suggest the use of a modified Bite-guard (Medasil Surgical Ltd, Leeds), with one-third to one-half of the right-hand side removed (Fig. 1). Laryngoscopy, facilitated by a smear of lubricant, is made easy. Vision is unimpaired and the maximum space is available for manipulation and passage of a tracheal tube. A length of suture secures against displacement or loss. Half a Bite-guard is very much better in our experience than no guard at all.

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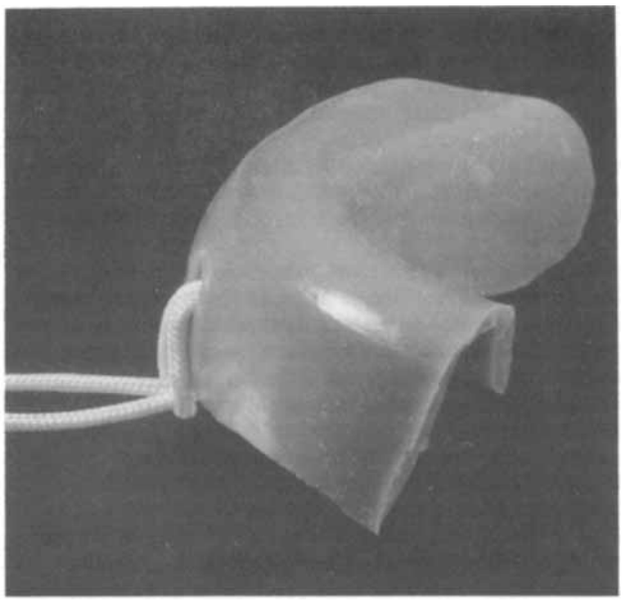

Fig. 1.

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Creasing of a paediatric tracheal tube connector

Plastic 8.5-mm tracheal tube connectors are widely used in paediatric anaesthetic practice. This report describes a problem with one such connector.

Anaesthesia for inguinal herniotomy was induced in a 6-week-old baby with nitrous oxide, oxygen and halothane. Controlled ventilation of the lungs was easily achieved and after the administration of suxamethonium, oral intubation performed with a 3.0-mm blue line Portex tracheal tube on an 8.5-mm plastic connector. Manual ventilation via the tracheal tube, though possible, was difficult and it was immediately removed. The child could easily be ventilated both by facemask, and when re-intubated with another tube of the same size.

Later inspection of the first tracheal tube revealed the abnormalities shown in Figure 1. The wall of the tapered section of the 8.5 mm connector had become creased so that the lumen was partially occluded; furthermore, the remaining space was partly blocked by dried lubricating jelly, used to aid assembly. Neither of these problems was apparent from an external inspection of the tube, but both would have been revealed had the tube been examined by looking through it along its long axis.

A similar problem was previously reported to Portex UK Ltd. and was attributed to excessive twisting during insertion of the connector into the tube. As a consequence, moulding modifications were implemented to increase the connector wall thickness. It is, unfortunately, not possible to determine whether the connector involved in this incident was manufactured before or after this change.

Lubricant jellies are frequently used to aid the insertion of introducers into tracheal tubes. However, when the stylet is removed a proportion undoubtedly remains within the tube, and may be dried by the passage of anaesthetic gases to form a crust, and partially block the lumen.

It would seem sensible to recommend that care is taken when Portex paediatric tracheal tubes are joined to their connectors, that lubricant jellies are avoided, and that an internal visual inspection is undertaken before use to ensure patency.

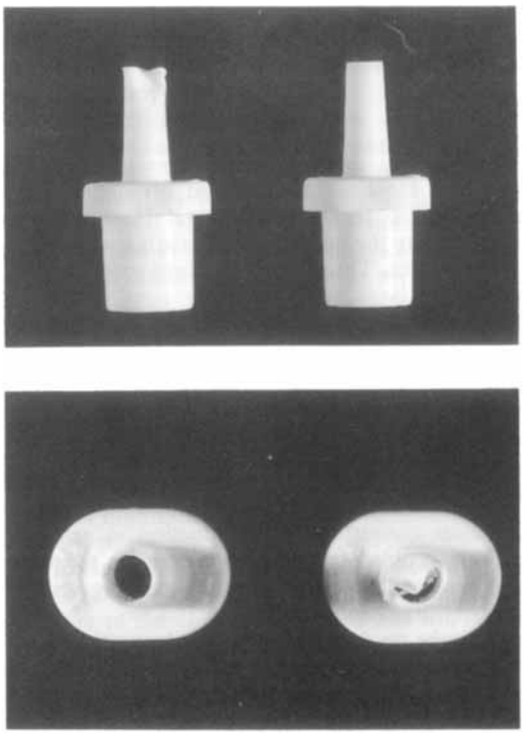

Fig. 1.

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An unusual complication of a central venous line

It is the practice of this hospital to insert two 60-cm 16-G Wallace piggy back central venous catheters via the right internal jugular vein in patients who have coronary artery bypass graft (CABG) surgery. The catheter is threaded through a 14-G plastic cannula and at no stage comes into contact with sharp needles. The use of the long length catheter enables easy access for drug administration (rather than have to search for the end under surgical drapes) but carries the risk of the insertion of too great a length of catheter.

Recently, difficulty was experienced in removing one of these such catheters. The patient had routine CABG and 24 hours after operation one of the catheters was taken out uneventfully; the remaining catheter was 'stuck' and could not be removed: aspiration and flushing were normal and a chest X ray showed the tip of the catheter to be in the right atrium and there were no kinks or knots. A 'J'-shaped wire was fed halfway down the catheter to provide extra support and an extra hard pull was applied to the catheter which came free, revealing a torn but complete end (Fig. 1). It appears that the catheter tip was positioned in the right atrium during surgery and had probably lain close to the venous cannula inserted for bypass. The catheter tip had then been ensnared in the purse string suture which closed the right atrial appendage and made its removal somewhat difficult.

Complications with central venous catheter insertion are numerous; this is another, albeit rare, complication on removal.

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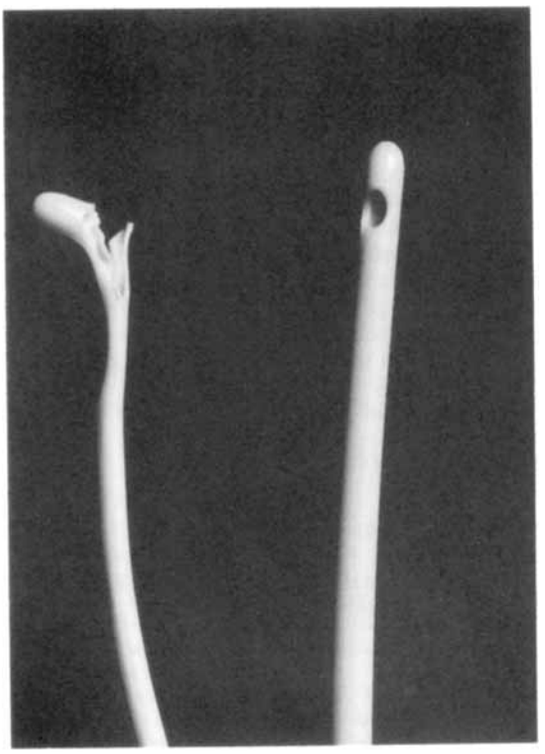

Fig. 1. Damaged catheter on the left compared with normal one on the right.

Pulse oximetry—another problem

Pulse oximetry is a valuable form of monitoring in paediatric practice.[1] However, the amount of paediatric anaesthesia undertaken in District General Hospitals may be small and require the adaptation of existing adult monitors for use in children. The Hewlett Packard oximeter probe is designed for a large range of finger sizes, but children's fingers may be too short to reach the light source and detector. The distal end of the probe has a slit which is designed to accommodate long finger nails and to avoid one cause of inaccurate oximeter readings.[2]

The slit in the distal end of the probe allows children's fingers to reach the light source and detector. Unfortunately, this may produce an inaccurate oximeter reading if the pressure exerted by the probe on the finger produces either venous congestion or a reduction in arterial perfusion. This problem may be overcome by splinting the extensor aspect of the finger with a 3-cm long hemisection of the barrel of a 2-ml syringe (Fig. 1).

There can be no doubt that the ideal situation is to have specifically designed paediatric equipment. However, there will continue to be situations when easily reversible adaptations of adult equipment are required for children. This is a simple modification of the Hewlett Packard probe which we have used to provide accurate pulse oximetry for children in a situation in which the alternative would be no oximetry.

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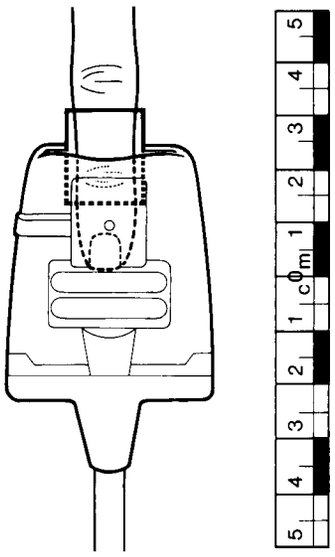

Fig. 1. Oximeter probe with finger and 2 ml syringe barrel *in situ.*

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