Correspondence

Cyclosporine-vecuronium interaction

To the Editor:

In a recent article Crosby and Robblee presented a case report involving cyclosporine-pancuronium interaction leading to a prolonged neuromuscular block.[1] Cyclosporine is a new immunosuppressive agent and has been shown to interact with both pancuronium and vecuronium.[2]

We have seen recently a prolonged neuromuscular block in a patient given vecuronium who was on cyclosporine. A 15-year-old girl was anaesthetised for an endoscopy and bone marrow aspiration. She had a five-year history of acute lymphocytic leukemia and had undergone a bone marrow transplant five weeks previously. Immunosuppression consisted of cyclosporine 20 mg IV twice daily and her cyclosporine level at the time of the operation was 138 $\mu g \cdot L^{-1}$ which was within the therapeutic range. Her renal function tests were slightly abnormal with a BUN of 19.9 $mg \cdot 100\ ml^{-1}$ and a creatinine of 102 $mmol \cdot L^{-1}$. There was no clinical or biochemical evidence of hepatic dysfunction and electrolytes, calcium and magnesium levels were within the normal range.

The anaesthetic consisted of 1 $\mu g \cdot kg^{-1}$ fentanyl, 4 $mg \cdot kg^{-1}$ thiopentone, and 0.1 $mg \cdot kg^{-1}$ vecuronium. Her trachea was intubated and anaesthesia was maintained on nitrous oxide, oxygen, and isoflurane. One hour after induction of anaesthesia the neuromuscular block was reversed with 1 $mg \cdot kg^{-1}$ edrophonium and 0.01 $mg \cdot kg^{-1}$ atropine. The train-of-four returned to control but a 50 Hz tetanus could not be maintained and clinically she had residual neuromuscular blockade despite being awake and cooperative. Twenty minutes after the edrophonium she was given 0.03 $mg \cdot kg^{-1}$ neostigmine and 0.015 $mg \cdot kg^{-1}$ atropine with no improvement. The trachea was left intubated and her lungs were ventilated in the PAR because of the incomplete reversal. It was not until three hours and 20 minutes after the vecuronium was given that full neuromuscular function returned. The patient demonstrated the ability to maintain a head lift for five seconds and to have a firm hand grip. At this time the trachea was extubated and following this her course was uneventful.

This case is a further example of a possible interaction between cyclosporine and non-depolarizing muscle relaxants. This may lead to a clinically significant prolongation of neuromuscular blockade in a patient who otherwise would be expected to metabolize the relaxant agent at a normal rate. This case demonstrates that the use of a more rapidly metabolised intermediate acting agent such as vecuronium, compared with pancuronium, may be insufficient to prevent a significant prolongation of paralysis.

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Anaphylactoid reactions following propofol-atracurium sequence

To the Editor:

Propofol (2,6-diisopropylphenol) was formulated previously in cremophor EL but is now prepared in an emulsion. The formulation was changed because the solubilizing agent was held to be responsible for a proportion of anaphylactoid reactions.[1,2] Nevertheless, with the new formulation in ten per cent Intralipid, Doenicke *et al.*[3] reported a slight increase in plasma concentrations of histamine and IgE associated with cutaneous rash and flush in 31 per cent (5/16) of the volunteers anaesthetized with propofol 2 $mg \cdot kg^{-1}$.

Atracurium has the tendency to produce a high incidence of cutaneous manifestations, the majority of which are harmless allergoid reactions resulting in release of skin histamine, rather than of plasma histamine.[4,5] However, North *et al.*[6] showed that on a molar basis d-tubocurarine and atracurium release approximately equal amounts of histamine. In fact, bronchospasm has been reported after atracurium administration.[7]

We would like to report the frequent occurrence of cutaneous manifestations of allergy and bronchospasm following propofol-atracurium sequence. Anaesthesia was induced with propofol followed by atracurium in 13 consecutive patients (seven males and six females) of ASA physical status I undergoing elective surgical procedures. Patients were aged between 16 and 34 years and weighed 50–78 kg. There was no past history of

atopic diseases or drug allergies. No premedication was given.

An intravenous infusion of lactated Ringer's solution in five per cent dextrose was started before induction of anaesthesia. The ECG was monitored continuously and blood pressure was measured by an oscillotonometer (Dinamap). Anaesthesia was induced with propofol 2.5 $mg \cdot kg^{-1}$ injected over 15 seconds into a rapidly flowing IV line. When sleep was induced, atracurium 0.5 $mg \cdot kg^{-1}$ was administered over five seconds in the same IV line. Intubation of the trachea was performed without difficulty in all cases and anaesthesia was maintained with 70 per cent nitrous oxide in oxygen and isoflurane or halothane. Within two minutes of induction, severe diffuse erythema and wheals appeared along the pathway of the vein in which the cannula was sited, and progressed towards the neck and thorax in 11 of 13 patients. Bronchospasm developed in three of the eleven who developed skin rash. In two of these patients marked increased resistance to inspiration (mean peak inspiratory pressure of 40 cm H_2O) was noted, but no wheezing was heard. In the two patients, aminophylline 5 $mg \cdot kg^{-1}$ was adminstered IV followed by an infusion of 0.5 $mg \cdot kg^{-1} \cdot h^{-1}$. This resulted in gradual improvement in total compliance. Cutaneous manifestations disappeared within 20 minutes without treatment. A reduction in BP, from 134/78 to 118/70 $P = 0.0002$, paired t test, was noted after induction. However, this was within the range reported following induction with propofol.[8]

The observations suggest that a combination of propofol and atracurium may be followed by frequent anaphylactoid reactions and bronchospasm. Although we did not measure plasma histamine concentrations, it could be speculated that propofol and atracurium generated a composite anaphylactoid response in our patients.

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Sterilization of anaesthetic equipment

To the Editor:

Sterilization and disinfection of anaesthetic equipment has now assumed greater importance since the advent of AIDS which may be accompanied by many serious infections.[1] Also, to be considered is the recommendation of many manufacturers that their products are for "single use only." If single use is adopted, this would make the cost of anaesthetic equipment very expensive. Some plastic products such as circuits and airways can be resterilized and appear to function satisfactorily on several further occasions.

In light of this, we carried out a written survey of 21 hospitals (mainly teaching hospitals) in Ontario during June and July 1988. A letter was sent to the Operating Room Supervisor of each hospital requesting answers to three questions:

1 How many surgical operations were carried out in your operating rooms in 1987?
2 Do you recycle anaesthetic equipment (circuits, valves, tracheal tubes, airways, ventilator bellows)? If yes, what method of sterilization do you use?
3 Do you use micropore filters? If so, what type?

The answers which we received showed that there was a wide variation in the methods used. The methods of treating equipment may be summarized as:

1 single use, then discarded
2 ethylene oxide sterilization (ETO)
3 steam sterilization
4 disinfection
  a Pasteurmatic method
  b cidematic method
  c soaking in cold germicide, e.g., sporicidin

Table I illustrates the methods which various hospitals used for dealing with anaesthetic circuits, filters and ventilator bellows. This shows that 66 per cent of the hospitals surveyed recycle their anaesthetic circuits. The

TABLE I Results of survey of 21 hospitals in Ontario

Hospital	*Number of operations in 1977*	*Anaesthetic circuit used*	*Recycling of circuit yes/no*	*Method used for recycling circuit*	*Disposable filter used yes/no*	*Method of treating ventilator bellows*
1	124,629	Circle+Bain	Yes	Pasteurmatic	Yes, changed daily	Changed after dirty cases
2	11,326	CPRAM	No	–	No	No set routine
3	7,800	Bain	No	–	Yes (Pall), changed with each case	Changed weekly
4	12,898	Marquest	No	–	Yes (Pall), changed with each case	No set routine
5	24,563	Dryden	Yes	Cidematic	Yes (Inspiron), if indicated	Changed monthly
6	15,000	Bain+Circle+ Jackson Rees	Yes	ETO	Yes, for dirty cases	Changed weekly
7	8,000	Bain	Yes	Pasteurmatic	No	Changed 2×monthly
8	13,626	Marquest	Yes	Pasteurmatic	Yes (Gard II) (Respir-gard), for dirty cases	Changed weekly
9	1,221	Bain+McGil	No	–	No	Changed 2×monthly
10	17,950	Bain	Yes	ETO	Yes (Pall) (Edith), optionally	Not stated
11	14,000	Bain+Circle	No	–	No	Changed after dirty cases
12	8,500	Bain	Yes	Pasteurmatic	Yes, for dirty cases only	No set routine
13	7,792	Bain	Yes	ETO	No	Changed every 2 weeks
14	8,586	Dart	Yes	ETO	Yes (Dryden), for dirty cases only	Not stated
15	15,874	CPRAM	No	–	Yes (Pall), for dirty cases only	Changed weekly
16	8,300	Bain	Yes	Pasteurmatic	Yes (Respirgard), for dirty cases only	Not stated
17	10,946	Coax 2	No	–	Yes (Edith)	No set routine
18	10,540	Bain	Yes	Pasteurmatic	No	No set routine
19	21,000	Bain	Yes	Soak in cold Cidex	Yes (Pall), discretionary	Changed every 2 months
20	18,000	CPRAM	Yes	Pasteurmatic	No	Changed after dirty cases
21	2,450	Bain+Circle	Yes	Cidematic	No	Changed each week

TABLE II Treatment of anaesthetic equipment at Hamilton civic hospitals

Single use followed by incineration	*ETO*	*Steam sterilization 170° for 10 min*	*Pasteurmatic*
Bain circuits	Ventilator bellows once weekly	Laryngoscope blade after each use	Face mask after each use
Pall filter – one for every patient		Bain valve at end of each day	Rubber bag after each use
Plastic oropharyngeal airway			
Plastic tracheal tube			
Nasogastric tube			
Suction catheters			
Rigid plastic suction tubes			
Urinary catheter			
Disposable thermometer probes			
Plastic syringes			
Needles			

figure also shows that there is considerable variation and perhaps uncertainty as to how to deal with the ventilator bellows. Thirty-eight per cent of the hospitals surveyed did not use filters.

It must be appreciated that some of these hospitals may have changed their methods since this survey was taken.

On the basis of this, and after further deliberation, we have put into practice the method illustrated in Table II for

dealing with our anaesthetic equipment at the Hamilton Civic Hospitals. After an infectious case, all items, including anaesthetic valves and ventilator bellows, are removed from the anaesthetic machine which is then wiped down with bleach solution (1:10 sodium hypochlorite). Fresh equipment is then brought in.

Before September 1988, we had been using the Pasteurmatic method for disinfecting our plastic Bain circuits which were reused 15 to 20 times each. The cost of our circuits in 1977 was approximately $50,000.00 (Cdn.). Since we have now changed to single use only, and have added a Pall filter for each patient, we estimate that the annual cost will be approximately $170,000.00 (Cdn.). Our caseload in 1977 was 23,000 operations.

All our anaesthetic equipment is under the care of two respiratory technologists who have been assigned to the Anaesthetic Department.

R.A. Brown MD FRCPC
R. Bell MD FRCPC
W. Pine MD FRCPC
T. Bosnjak RT
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Eliminating needle stick injuries

To the Editor:

The use of needles in medical practice is associated with a well-defined risk of autoinfection.[1] Hepatitis is the leading danger, now compounded by Human Immunodeficiency Virus (HIV). During anaesthesia, the majority of injections are made into IV lines in fractionated doses and the extensive use of needles is dictated by the need to give drugs which are marketed in rudimentary containers. Inserting needles into an ampoule (or latex port) presents a risk of needle stick injury similar to recapping. In addition, ampoules frequently shatter while being opened causing finger lacerations, which provide a port of entry for infection.[2] Glass fragment and bacterial contamination of drugs in ampoules occur frequently.[3] Contamination is also encountered when piercing container seals and IV line ports. When drugs are drawn up using needles, the subsequent administration via needle is encouraged, because needles cannot be removed easily without recapping, despite current safety recommendations.[4]

Several improvements of medical products are required. Needles should incorporate wings on the hub, so that they can be grasped from behind and removed safely without recapping. Needles could be eliminated during IV therapy if drugs were sold in containers with a LUER opening.

Marketing policies contribute to needle usage. Inexpensive and routinely utilized IV administration sets exhibit integrated latex Y-ports and flash-bulbs for drug administration, instead of LUER injection sites. Latex ports are frequently contaminated with blood, even when blood has not been administered through the IV set and blood contamination is not visible.[5] Sets could be marketed with stopcocks instead of latex ports at a comparable price, if the demand was adequate. Conversely, the standard administration sets may be adequate if European IV cannulae (Venflon = prototype/US Viggo Inc., 2007 Pan Am Circle, Tampa FL 33607) were used. These cannulae are not available on the US market although in Canada there are no restrictions on their use. Most European cannulae (EC) have a one-way-injection valve and often a stopcock site as an integrated component. Injection-port catheters have been widely used for over 20 years and provide needleless IV access, eliminate deadspace and disconnections during injections which can be completed with one hand.[6-8] Stopcock injections require two hands to turn the valve and secure the tubing and disconnections are common. Fractionated injections are facilitated with the one-way-injection port, as reflux into the syringe does not occur. Injection manifolds with two to four one-way ports (Medex, Inc. Hilliard Ohio) are also available. The use of EC in anaesthetic practice can contribute to a reduction in needle exposure, and allows the routine and inexpensive introduction of LUER injection ports with IV insertion, and may facilitate emergency therapy.[8] EC are readily grasped and inserted without contaminating the connection site or catheter lumen. North American style catheters have small connector hubs, that are often contaminated during insertion, before the infusion set is connected.[10] The "Venflon" design, with non-removable injection port cap, appears less susceptible to contamination than stopcocks, which are not recapped, or occluded with caps frequently contaminated during handling.[11-13]

Needle-stick injury is likely to be the most important, yet preventable, risk event for health care workers.[1] Reducing needle usage may introduce substantial overall savings by reducing expenditures for the costly elimination of infectious sharp materials and eliminating the costs of treating needle stick infections.[14] Modernizing IV therapy represents a needed and cost-effective way to eliminate this unnecessary health hazard.

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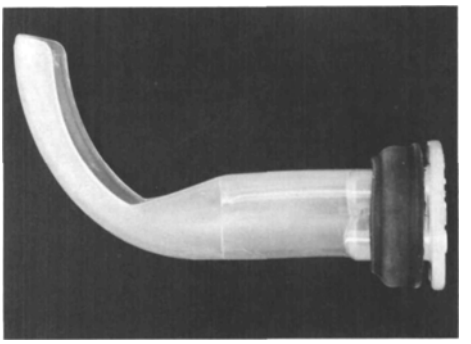
Mechanical airway maintenance

To the Editor:

If the lower jaw is kept sufficiently forward to prevent the base of the tongue occluding the laryngeal outlet in unintubated patients, maintenance of unobstructed ventilation is usually successful.[1] External pressure applied to the angle of the mandible with the mouth open has been described as ideal.[2] However, numerous complications have been described from compression of the underlying anatomy by both the face mask and external devices used to assist airway maintenance.[3-5]



FIGURE

A method of ventilation has been described which eliminates the need for a mask, utilizing the Williams Airway Intubator with a transparent seal over the mouth and nose.[6] With a simple modification to the Airway Intubator the incisors can be used to hold the prognathic thrust required for a clear airway without external pressure. A hole just large enough to accommodate the airway intubator was cut into the plunger of a 60 ml syringe, and this "rubber doughnut" over the airway (Figure) provides an indentation which holds both the upper and lower incisors at the same level. Since the lower teeth are now held forward with the mouth opened by the airway, the desired ideal position for a clear airway is accomplished without external pressure.

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Anaesthetic research

To the Editor:

Duncan and Cohen[1] provide interesting data to suggest that anaesthetic research perhaps lacks imagination. Hamilton[2] has similar worries: "if we persist ... in research directed primarily to measure pharmacological and physiological parameters, the academic world will pass us by."

In Britain the number of published research reports is increasing but the input from academics is decreasing[3]. Duncan and Cohen did not find any change in the distribution of types of research between 1977 and 1986. In Britain the proportion of clinical to experimental reports increased greatly between 1970 and 1985,[3] particularly in abstracts presented to the Anaesthetic Research Society. Duncan and Cohen do not suggest any reasons for the state of anaesthetic research, or what might be done to improve it, and there are many factors that could be responsible. They are not unique to anaesthesia but they have serious implications for the specialty on both sides of the Atlantic.

There are too many anaesthetists doing research that has to provide results in a limited time. Academics are fearful for their next grant; junior anaesthetists have to publish papers in order to gain clinical promotion. In this atmosphere, the course of least resistance is yet another clinical trial, with support from an obliging pharmaceutical company. If an anaesthetist attempts something that is innovative, even if funding can be obtained there is the risk that there will be nothing to show: safer by far to collect two groups of 20 patients and give them drug A or drug B. Safer, but actually clinical trials require great care and application if they are to provide reliable data for future treatments, as Duncan and Cohen stress. Researchers whose primary motive is the collecting of publications to add to their curriculum vitae might not be best suited to this task.

Academics are being denied thinking time[4] by the current obsession with short-term gain and quick results, and also because, in Britain at least, they are coming under an increasing clinical pressure. There is a tendency in medicine to regard academic work as not real work at all. This is partly because many doctors have never learned scientific method. Also, senior academics are sometimes perceived by clinical colleagues to be clinically unskilled. I would not condone poor anaesthetic practice, but it should be realised that not all doctors are necessarily pre-eminent at all the skills that they are supposed to have. Not everyone can teach well, and be an excellent clinician, and do first-rate research.[5] We each have our skills, and should be respected for them. Academics should be challenging perceived wisdom,[4] and should have the time and freedom to do it.

An increase in the volume of research implies more time spent assessing it. Assessing good research by interested workers is a pleasure; assessing the work of uninterested junior anaesthetists asking pointless questions, work which is often seriously flawed and badly written, is a chore and a waste of time.

Duncan and Cohen[1] uncovered flaws in design in many of the articles that they reviewed, and they were probably over-charitable in assuming that the statistical analyses "had been appropriately reviewed by the ... editorial process"; many published articles have serious statistical errors.[5]

In Britain there have been some eloquent pleas for support of basic science[7] and we need similar support for anaesthesia if the specialty is not going to sink into a mediocrity of over-production.

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Early ether anaesthesia

REPLY

I would like to thank Dr. Maltby for his clarification (March 1989). I used the term "North American city"[1] in my article as a synonym for a major medical centre. The administrations referred to by Dr. Maltby took place in locations which fell

within the Boston sphere of influence, including those in the future Maritime provinces. This probably reflected a pattern where a centre tried ether successfully, inspiring similar attempts by physicians in the surrounding area. MacDougall stresses the influence exerted by Boston on the dental profession of Saint John, New Brunswick as an important factor contributing to the first ether anaesthetic in British North America.[2]

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Safety of anaesthetic machines

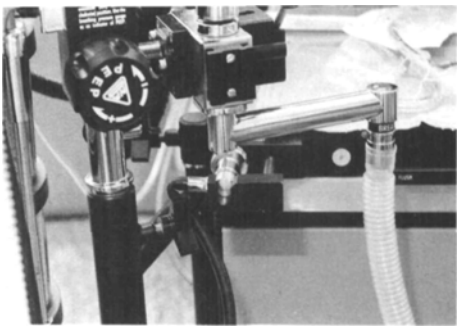
To the Editor:

Recently much emphasis has been placed on safety feature design of anaesthetic machines. The Canadian Standards Association continues to initiate and standardize many of these improvements.[1,2] Private manufacturers with user input also perform much research and development. However, the development of these new products is not a guarantee that equipment hazards cease to exist.

In November of 1988 a Dräger anaesthetic machine model 2B was installed at our hospital as part of a three-week trial evaluation. Initially this machine functioned very well with no noted deficiencies. To accommodate a complex neurosurgical case, the operating room furniture was re-configured making it necessary to rotate the carbon dioxide absorber and its mounting device toward the machine. At the time of the pre-anaesthetic check the attending anaesthetist noted that this had resulted in kinking of the fresh gas hose. As can be seen in the Figure the fresh gas hose of the common gas outlet is positioned at nine o'clock by a fresh gas locking device. In this position the wing nut from the absorber mounting bracket can easily kink the fresh gas hose when the absorber is rotated toward the machine (Figure).

Previous anaesthetic machine models allowed for the fresh gas hose to be positioned vertically at 6 o'clock. The fresh gas hose may not be positioned vertically with the Dräger 3B as this restricts the opening of the anaesthetic machine's upper drawer and charting shelf. Mounting the fresh gas hose male fitting at 12 o'clock also causes the hose to kink because of its weight and position.

There are a number of possible solutions to the problem of inadvertent fresh gas hose occlusions with this anaesthetic machine;



FIGURE

i Re-design of the fresh gas hose and locking device.
ii Removal of the charting shelf and upper drawer to permit positioning of the fresh gas hose in a vertical and downward direction.
iii Use of non-kinkable materials in the manufacture of the fresh gas hose.

This report underlines the importance of a pre-anaesthetic check procedure. The fact that the anaesthetic machine is of recent design and manufacture is no guarantee that malfunction or design faults will not occur.

R.M. Friesen MD
Winnipeg, Man.

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2 Continuous-Flow Inhalational Anaesthetic Apparatus (Anaesthetic Machines) for Medical Use CAN3-Z168.3-M84 Canadian Standards Association.

REPLY

Thank you for providing us with a copy of the letter to the editor by R.M. Friesen, M.D., concerning an alleged incident with a Narkomed anaesthesia machine. The incident had been reported to us in the past, and our investigation has revealed the following.

North American Drager anaesthesia machines are shipped disassembled to the local distributors. This disassembling process includes the removal of the swivel mounting of the absorber system. When assembly of the machine in question was performed by the distributor, due to an oversight on his part the pins which limit the swivel action of the absorber were not inserted, thus permitting the absorber arm to move extensively to the front of the anaesthesia machine.

The incident in question does, therefore, not generally exist in all Narkomed anaesthesia machines but only in the unit used on trial in the St. Boniface General Hospital. Furthermore, our engineering validation department has performed tests based on the pictures provided with your correspondence. During a condition where the hose is kinked into a 45 degree angle as shown in the picture, freshgas flow is not totally interrupted, but a freshgas flow of 2.3 litres per minute is maintained as long as the setting at the bank of flowmeters exceeds this flow.

As a result of the report received from the hospital, North American Drager has notified once more all distributors to be sure that the pins which restrict the movement of the support arm are securely attached prior to releasing any machine for use.

Peter J. Schreiber
North American Dräger
Philadelphia, Penn.

Blood pressure monitoring during mediastinoscopy

To the Editor:

Mediastinoscopy is becoming an increasingly frequent procedure as a diagnostic biopsy tool and aid to determine the resectability of lung cancers. When no contraindication to resection is found at mediastinoscopy then wedge resection of the lung, lobectomy or pneumonectomy may be carried out during the same anaesthetic.

When the mediastinoscope is introduced between the great vessels and trachea and in particular when introduced caudad sufficiently to assess and sample the tracheobronchial nodes at the carina, the innominate artery is pinched in almost every case, in our experience. Continuous monitoring of the blood pressure in the right arm is recommended as early warning of low or no blood pressure and this is particularly important in the patient with carotid or other cerebral vessel compromise. Monitoring the blood pressure via the right radial artery may be inconvenient for the subsequent thoracotomy position or indeed occasionally impossible because of inability to cannulate an arteriosclerotic or otherwise damaged artery. We have found the pulse oximeter to be a reliable substitute. Its waveform loses volume when there is a sudden drop in pressure and flow and flattens when the innominate artery is occluded.

We recommend using the pulse oximeter on a finger of the right hand when right radial cannulation is (a) inconvenient for subsequent surgery, (b) impossible to achieve, and (c) where infection or dialysis shunt exists on right forearm or hand.

Brendan P. Garry MD
Hollis E. Bivens MD
Houston, Texas

Nasal sensor attachment

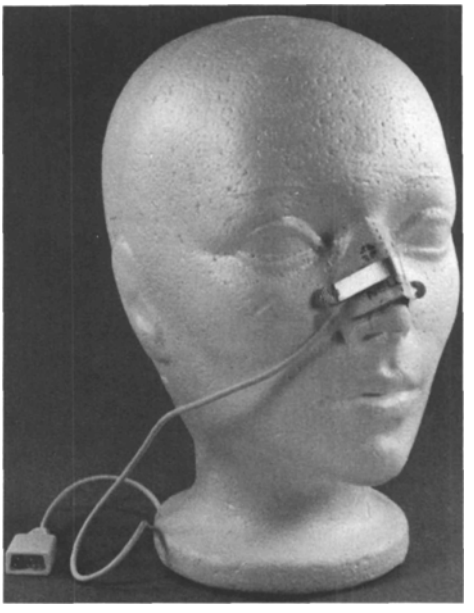
To the Editor:

The nose is a very convenient location to monitor oxygen saturation. It is readily accessible and will often maintain perfusion when more peripheral circulation is compromised.[1] However, current nasal oxygen sensors can be a source of frustration. Despite adequate skin preparation it is often difficult to keep the sensor in place. I have found a simple, reliable way of securing the Nellcor R-15 nasal sensor which I have not seen described elsewhere.

An aluminum noseclip from a disposable oxygen face-mask (Airlife #001206) is attached to the outer surface of the oxygen sensor using waterproof adhesive tape (Figure). This allows the sensor to be fitted closely to the patient's nose. This same modification permits monitoring from the earlobe as well.

I have used such a modified sensor in over 150 cases and have noticed no obvious interference to the sensor signal from the metal of the noseclip, nor have I observed any trauma to either the patient's nose or ear.

In summary, this modification appears to be a simple,



FIGURE

inexpensive and reliable way of securing the Nellcor nasal oxygen sensor.

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Epidural block during labour in hereditary angioneurotic oedema

To the Editor:

One of the most serious manifestations of hereditary angioneurotic oedema (HANE) is the occurrence of an acute airway obstruction due to laryngeal oedema. Laryngeal oedema may, among other causes, be precipitated by the anaesthetist's manipulation of the upper airway (tracheal intubation). Although patients with HANE appear to follow a benign course during pregnancy,[1] fatal complications may occur secondary to tracheal intubation, and/or secondary to perineal swelling which may lead to extensive loss of intravascular volume and shock.[2] We would like to report a vaginal delivery in a patient with HANE that was accomplished under epidural analgesia without oedematous manifestation. V.B., a 25-year-old woman, gravida 1, par 1, was admitted at 20 weeks' gestation to our High-Risk Obstetrical Unit. Past history revealed that she had episodic bouts of swelling of the face and the lips associated, sometimes, with abdominal pain. Two years earlier she had severe recurrent attacks with laryngeal oedema and sub-occlusive syndrome. The diagnosis of HANE was made on a diminished C_1 esterase inhibitor (C_1 INH) 40 per cent of normal value, and a low C_4 level (17 mg%). In our unit clinical examination was unremarkable. Results of laboratory studies, ECG, serum electrolytes, blood urea nitrogen, creatinine, haemogram and clotting variables were all within normal limits. At 39 weeks' gestation, a lumbar epidural block was performed at the beginning of labour. The patient received two units of fresh frozen plasma. Two vials of 10,000 units of C_1 INH concentrate were available in case of an attack of laryngeal oedema. The patient delivered a 2.840 kg male infant (Apgar score 9 and 10 at one and five minutes) after four hours of labour. There was no manifestation of oedema. The patient was discharged on the 6th day post partum.

Although successful general anaesthesia with tracheal intubation has been described in patients with HANE syndrome,[3,4] general anaesthesia should be avoided during labour and delivery because the risk of laryngeal oedema following tracheal intubation is great, especially if emergency obstetrical procedures are necessary and the patient is not sufficiently prepared.[5] Epidural anaesthesia avoids the dangers attendant on general tracheal anaesthesia, and this consideration pertains as well to the anaesthetic management of a Caesarean section. C_1 INH concentrate should be available in the labour room since epidural anaesthesia does not preclude the development of laryngeal and/or perineal oedema.

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Erratum

Lyew MA. "Mechanical airway maintenance."

We apologize for an error in the above letter. Can J Anaesth 1988; 35, 670. In the sixth line of the fourth paragraph "metal" should read "mental."

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