LETTER TO THE EDITOR

DEAR SIR:

The use of the Bain circuit has become a widespread practice in North America in the past few years. Its advantages of close control of PaO_2 and simplicity have been recognized. Recently at our hospital two patients undergoing anaesthetics using this circuit had problems which we feel are instructive.

Case 1. A 67-year-old male underwent an abdominal perineal resection for carcinoma of the rectum. The anaesthetic was basically nitrous oxide, oxygen and narcotic with intermittent halothane 0.5 per cent or enflurane 0.5 per cent. Enflurane was substituted when the patient's blood pressure dropped below what the anaesthetist felt to be an optimal level. All told, enflurane was used for a significant part of the 3.5-hour operation. A Bain circuit was used to administer the gas and vapour. As has been the custom for some years in our hospital, the draping for this procedure made it very difficult to see the patient. Approximately two hours into the operation the surgeon commented that the patient's blood appeared dark in the operative field. At this point, arterial blood gases were obtained and 100 per cent oxygen and manual hyperventilation were begun immediately. To this point in the anaesthetic, with the exception of the hypotension thought to be from the use of halothane, there had been nothing untoward in the monitoring. The EKG pattern was normal throughout with no significant change in rate. Blood pressure had remained stable throughout the hour prior to the incident. At the time of the incident, the patient was receiving enflurane rather than halothane and on examination under the drapes the patient did indeed appear markedly cyanosed. Administration of oxygen improved the patient's colour immediately. The results of the arterial blood gases taken before 100 per cent oxygen administration were: PO_2 29, PCO_2 132, pH 7.017.

An attempt was made immediately to ascertain the cause of the apparent hypoventilation and acute respiratory acidosis. The patient's chest was clear, expanding well, and there was no apparent change in compliance throughout. A repeat test of the Bain circuit as described by Pethick¹ was done, suggesting no problems with the Bain circuit itself. Ultimately it was discovered that fresh gas flow was being lost through the

filling port of the Ohio Ethrane Vaporizer and appropriate steps were taken to remedy the situation. After a brief period of post-operative ventilation the patient was extubated and the post-operative course was uneventful from that point on.

Case 2. A 61-year-old woman underwent an anaesthetic for gastro-oesophagoscopy and cricopharyngeal myotomy, again utilizing the Bain circuit. Nitrous oxide, oxygen, ethrane 0.5 per cent and narcotic made up the anaesthetic. On this occasion again the patient was well covered except for the wound, but it proved much easier to see the patient's colour in the limbs on this occasion. About 35 minutes into this operation the patient's blood appeared darker than would have been expected and examination of the nail beds confirmed the suspicion of cyanosis. In this case, however, there had been tachycardia and systolic hypertension greater than 200 mm mercury systolic from early in the operation. No arrhythmias were noted. Oxygen 100 per cent and hyperventilation were begun immediately. On this occasion, pinpointing the loss of fresh gas flow at the vaporizer took considerably less time. Once this was corrected, the patient's colour, blood pressure and heart rate rapidly returned to the pre-operative figures. No arterial blood gases were determined on this occasion. Post-operatively this patient also did well.

These two cases underline certain basic principles. No patient should be given an anaesthetic blind; i.e. with the anaesthetist unable to assess the colour of the patient. Admittedly, this is a crude monitoring method, but one which is inexpensive and would have led to much earlier detection of problems in both of these cases.

The Bain circuit technique controls PaCO_2 by manipulating fresh gas flow and volume of ventilation. Thus there is a controlled degree of re-breathing in the circuit. If fresh gas flow decreases, the patient's PaCO_2 will rise with the attendant problems noted above. It is wise to remember that, in anaesthetized patients, the response to hypoxia and hypercarbia in our commonly monitored parameters may well be lost as seen in our first case.

With most commonly used vaporizers, if the filling port is not closed the anaesthetist observes spattering of the anaesthetic agent from the port

when fresh gas flow goes through the vaporizer. He therefore gets an unmistakable message that fresh gas flow is being lost and corrects this. The Cyprane vaporizers for enflurane are of this type. The Ohio vaporizer for this agent has a knob which must be unscrewed to fill the vaporizer and is meant to be turned in again after filling. When fresh gas flow is lost from this vaporizer, no tell-tale sputtering takes place and the only obvious sign of leak is the odour of the agent in the operat-

ing suite. In operating rooms with very high turnover of air, even this signal is also lost.

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REFERENCES

1. PETHICK, S.L. (Letters to the Editor). Can. Anaes. Soc. J. 22: 115 (1975).