circuitry. The oxygen flush valve must not be used to verify the integrity of the anaesthetic machine low pressure gas circuitry.

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Detecting disconnections within anaesthetic machines

To the Editor:

I was very interested in the report of the hidden disconnection of an anaesthetic machine common gas line downstream from the vaporizers.¹ We experienced a similar disconnection several years ago following a change of vaporizers by hospital staff. The anaesthetist involved had no knowledge of this maintenance activity. The disconnection was hidden behind a suction control device mounted on the gas machine (an Ohio 30/70 Proportioner model).

In our case, the leak was not suspected for well over an hour. Despite severe hypercarbia and hypoxia (PaO_2 28 mmHg or 3.2 kPa), the patient had no neurologic sequelae and, even more surprising, had no recall of the surgical procedure.

We undertook a critical-incident review following our near-disastrous mishap in North Bay. Several important

discoveries were made that are not emphasized in Berner's case report.

First, this occurrence was reported in 1982 by Comm and Rendell-Baker.² The machine in their case was an Ohio Omnitrol model. These authors emphasized that the presence of a one-way (or "check") valve between the fresh gas outlet and the vaporizers is the important factor in this type of incident. The patient circuit can be airtight after pressurization by the oxygen flush despite a large leak upstream of the one-way valve.

Tests which can detect this are mentioned in the article (the Ohio negative pressure leak test or "bobbin bounce") but there is another test which can be done. The circuit is first pressurized to 30 cm H_2O with the rotameters off. After confirming the patient circuit is leak-free, the oxygen flowmeter is turned on. If the circuit is intact upstream of the one-way valve, the patient circuit pressure will increase above 30 cm H_2O . If a leak of greater than 3 L $\cdot$ min⁻¹ at 30 cm H_2O pressure is present, no increase in patient circuit pressure will be noted.

Another factor of significance is that Berner was using a "hanging bellows" type ventilator. A "floating bellows" ventilator will not create a negative pressure in the patient circuit and therefore no room air will be sucked into the circuit. The floating bellows would slowly collapse in this situation and the anaesthetist would be alerted to a problem much earlier.

Following our critical incident review in North Bay, we decided on the following steps to prevent future similar accidents:

- 1 A large sign is placed on any anaesthetic machine following any servicing so the anaesthetist is aware that he or she is the first to use the gas machine. This results in a higher index of suspicion for machine faults if there are intraoperative difficulties.
- 2 Anaesthetists are now all aware of pre-anaesthetic tests required in addition to simple tests of patient circuit integrity (e.g., negative pressure bulb tests and tests of fresh gas flow into a pressurized patient circuit).
- 3 The suction control devices are now installed behind the piping for the fresh gas flow.
- 4 A patient circuit oxygen concentration monitor is now in place on each gas machine (in addition to the proportioner valve).
- 5 All patients undergoing general anaesthesia are now monitored by pulse oximetry.
- 6 All new ventilators purchased by our department will be of the floating bellows type with built-in low pressure alarms.

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REPLY

Dr. Dodgson addresses an extremely important issue that I omitted from my discussion. He stresses the necessity of testing separately for leaks in the anaesthetic machine (as opposed to the breathing circuit) by pressurizing the anaesthetic system using normal or low flows. This argument is well taken. I would however point out that it is also important to verify independently the integrity of the oxygen flush bypass circuit.

As in Dr. Davies' report, the disconnection we experienced also occurred shortly after anaesthetic machine maintenance. His protocol for preventive measures merits careful attention. Both Drs. Dodgson and Davies describe the problem that the hanging bellows on anaesthetic ventilators do not collapse in the face of major leaks.

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General anaesthetic management for laser resection of central airway lesions

To the Editor:

We read with interest the article by Perera and Mallon¹ on the general anaesthetic management for laser resection of central airway lesions. They cite the use of Nd:YAG laser in this type of surgery and include pulse oximetry in the monitoring of their patients.

Eye protection for personnel in the operating room during Nd:YAG resection requires the wearing of goggles. These goggles completely surround the orbital margins and the patient is viewed through a coloured filter. We have noted that this filter impairs the visual assessment of a patient's colour, making pulse oximetry essential. It also hinders the ability to appreciate both digital and trend displays on the oximeter and other monitors. The degree of interference varies with different filter colours and monitors.

We caution anaesthetists prior to the purchase of protective goggles for this application to verify that the ability to read monitor displays is not adversely affected.

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REFERENCE

- 1 Perera ER, Mallon JS. General anaesthetic management for laser resection of central airway lesions in 85 procedures. Can J Anaesth 1987; 34: 383-7.

Fracture of a RAE endotracheal tube connector

To the Editor:

We recently experienced an unusual problem caused by the fracture of a RAE oral endotracheal tube connector. We were anaesthetizing an infant for a major craniofacial reconstruction. The patient was paralyzed and ventilated using a 4.0 uncuffed oral RAE endotracheal tube (Mallinckrodt, Glen Falls, NY). The tube was in a satisfactory position and secured to a tooth using a wire suture.

During the course of the procedure secretions accumulated and it became necessary to suction the endotracheal tube. It was difficult to disconnect the metal collar of the CO₂ analyzer from the 15 mm connector of the endotracheal tube with one hand, while holding the tube securely with the other hand and working under the drapes.

The breathing circuit suddenly came free from the endotracheal tube by breaking at the neck of the 15 mm connector, leaving the larger part connected to the breathing circuit and the smaller part stuck in the endotracheal tube. It would have been difficult to replace the endotracheal tube rapidly with the old tube stitched in position. Mouth to tube ventilation might have been possible as a temporary expedient. In a previous similar case involving a 4.0 Portex connector, apposition of the broken ends enabled ventilation to continue pending reintubation.¹ Fortunately the connector of a 3.5 Portex endotracheal tube was at hand and this could be fitted into the stub of the old connector, which remained stuck in the RAE endotracheal tube (see Figure). A cable tie ("Panty," Panduit Corp., Tinley Park, IL) was used to provide additional security. The CO₂ analyzer was temporarily removed and ventilation of the patient resumed.