Lack (modified Mapleson A), Magill (Mapleson A) and the Bain (modified Mapleson D) systems,[3] and clearly showed the Bain to cause marked rebreathing compared to the other systems when employing a fixed fresh gas flow of $70 \, ml \cdot kg^{-1} \cdot min^{-1}$. The minimum inspired CO_2 tensions were 0.07 kPa, 0.33 kPa and 3.74 kPa respectively, while end-expired CO_2 tensions were 6.43 kPa, 6.93 kPa and 7.55 kPa respectively. Even if attempts were made by patients to compensate for this hypercarbia by increasing minute ventilation, the Bain caused a mean rise of 1.12 kPa in end-expired CO_2 tension compared to the Lack which, somewhat surprisingly, proved to be more efficient than the Magill.

What is indisputable from all the literature is that Mapleson D or E systems do *not* function as efficiently as Mapleson A systems for spontaneous respiration. The Lack, shown to be about 30 per cent more efficient than the Magill and three times more so than the Bain,[3] should perhaps be recommended as the system of choice. However, the combination of the principles of both the Lack for spontaneous respiration and the Bain for controlled ventilation into one system would seem to be advantageous. Such a system combining Mapleson A, D and E principles has recently been described.[4] Independent reports[5,6] confirm that this new ADE system achieves its goal, is simple to use and allows ease of control of theatre pollution. For spontaneous respiration low fresh gas flows between 46 and 56 $ml \cdot kg^{-1} \cdot min^{-1}$ were all that were required (3.2–4.0 $litres \cdot min^{-1}$ for a 70 kg subject) to prevent rebreathing. For controlled ventilation the ADE behaved identically to the Bain,[6] normocarbia being maintained with a fresh gas flow of $70 \, ml \cdot kg^{-1} \cdot min^{-1}$. This versatile system, available in both coaxial and non-coaxial forms, would therefore appear to offer a solution to the controversial use of the Bain circuit for spontaneous respiration, and eliminate further concern about high fresh gas flows, consequent operating room pollution and increased costs with the Bain during this mode of use.

David Humphrey MBBS DA
Department of Physiology
University of Natal
Durban, Natal, South Africa

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Complete endotracheal tube obstruction after nasotracheal intubation

To the Editor:

We recently encountered a case in which the tracheal tube was obstructed completely by a dislodged inferior turbinate after nasotracheal intubation.

A 53-year-old woman was scheduled for drainage of paravertebral abscess and anterior arthrodesis for tuberculous infection of the thoracic spine. We chose nasotracheal intubation because long-term mechanical ventilation was anticipated following the operation. There was no history of pre-existing nasal disease.

After application of phenylephrine to the right nasal mucosa, intravenous diazepam, 10 mg, morphine, 40 mg and succinylcholine 50 mg was administered to facilitate laryngoscopy. Nasotracheal intubation was attempted using a generously lubricated Portex® ID 8 mm endotracheal tube. Passage of the tube through the nares was not difficult.

Immediately after the placement of the tube into

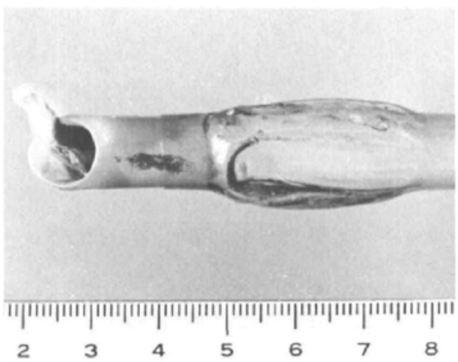

FIGURE Endotracheal tube completely obstructed by foreign body.

the trachea under direct vision, we tried to ventilate the patient and recognized marked difficulty to inflate the lungs through the tracheal tube. Deflating the cuff did not improve the situation. A suction catheter inserted through the tube failed to go beyond the tip, we removed the tube immediately and were able to inflate the lungs, using the mask. We then inserted a new tracheal tube (Portex® ID 8 mm) via the contralateral nares without any trouble.

The endotracheal tube shown in the Figure was completely obstructed by a dislodged bone fragment from the tip to 2 cm proximal. We concluded that this foreign body was probably inferior turbinate, based on roentogenographic examination after the operation. The tissue dislodged was not examined by a pathologist.

No epistaxis occurred during the procedure. The patient had no postoperative problems relating to the dislodged bone fragment.

Several reports have described complete obstruction of a tracheal tube immediately after nasotracheal intubation.[1,2] Stoelting[3] warned that when pharyngeal tonsils are prominent, it is preferable to perform all nasotracheal intubations under direct vision to prevent carrying a dislodged piece of tonsil into the trachea with the tube. In our case, however, even under direct vision, complete obstruction of tracheal tube occurred following nasotracheal intubation.

In a recent case report, Scamman *et al.*[4] warned that nasal integrity must be preserved by such simple precautions as adequate decongestion, inspection of the airway, the choice of an appropriate-sized tube, and avoidance of excessive force during nasal intubation.

Use of a small size tube should prevent or minimize the retropharyngeal trauma associated with nasotracheal intubation. Stoelting[3] advised that a 7.0 to 7.5 mm internal diameter tube is usually adequate in the adult. In our case, the slightly larger tube than is normally used in a woman might be a contributing factor to the problem.

In addition, using a balloon[5] or suction catheter[6,7] in advance, coupled with a smaller size tube may be advisable, especially in blind nasotracheal intubation, in order to avoid such a trauma. If we used this technique, the obstruction of the tube might have been prevented.

Finally, when normal ventilation is impossible immediately after nasotracheal intubation, the anaesthetist must keep in mind that the airway obstruction may be the result of a dislodged foreign body, and the only method to improve the situation is to remove the tube.

Takahisa Mayumi MD, Dai Horikawa MD,
Masayuki Miyabe MD, Shuji Dohi MD
Department of Anaesthesia, Asahikawa City Hospital, Asahikawa, Hokkaido 070 and the Institute of Clinical Medicine, The University of Tsukuba, Ibaraki 305, Japan

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