- 6 Iseri PR. Arterial to end-tidal CO₂ differences during neurosurgery in humans. *J Neurosurg Anesthesiol* 1993; 5: 315.

REPLY

We agree with Dr. Iseri's statement that "the prediction of PaCO₂ from capnography is unreliable." To ascertain this from our data, we would have to formulate a least squares regression equation. This was not the purpose of our study. Our objective was to examine the variation in the PaCO₂-PETCO₂ difference during prolonged neurosurgical anaesthesia. We concur that the difference between the PaCO₂ and the PETCO₂ can vary widely in a given patient (0.8–9.3 mmHg in our study). However, once this difference is known, it remains stable over time.

Dr. Iseri states in his study¹ that 18% of PaCO₂-PETCO₂ differences varied in the same patient by ≥ 4 mmHg. Unfortunately from this abstract there is not enough information to comment fully. There are many factors which influence the production and elimination of carbon dioxide (i.e., metabolic rate, temperature, physiologic dead space, minute ventilation). The period from induction of anaesthesia to the beginning of surgery is an inherently unstable time (i.e., decrease temperature due to exposure of the patient during positioning, haemodynamic and metabolic rate changes as central lines are inserted, head pins applied or surgery is begun.) In our study, initial measurements of the PaCO₂-PETCO₂ difference were obtained after the start of surgery when all of these factors were stable. In Dr. Iseri's study, only 176 arterial blood-gases (ABG) were measured in 96 patients and it appears that, at most, each patient had two ABG samples. If the first PaCO₂-PETCO₂ difference measurement was during this unstable presurgical period, this may account for the gradient varying later during surgery. It is also interesting to note in his study that knowledge of the PaCO₂ caused a change in management of only 17% of patients. Therefore, 83% of patients could have been managed successfully with the end-tidal PCO₂ alone. He concludes (as we do) that at least one ABG be measured during the case.

We do not feel equating elective operative neurosurgical patients to intensive care patients is a fair comparison.^{2,3} In Russell's article,² the size of the PaCO₂-PETCO₂ difference correlates with changes in mean arterial pressure, FIO₂ and PaCO₂ under a wide range of physiological conditions. There is no comment on the PaCO₂-PETCO₂ difference variation in individual patients over time. Similar arguments can be applied to Engoren's article³ which consisted of 14 neurointensive care patients, nine of whom were studied after motor vehicle accidents.

We conclude that end-tidal PCO₂ can be used as a reliable guide to estimate arterial PCO₂ in healthy patients during elective neurosurgical procedures of prolonged duration once the PaCO₂-PETCO₂ difference has been established.

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3 Engoren M. Evaluation of capnography to predict arterial CO₂ in neurosurgical patients. *J Neurosurg Anesthesiol* 1992; 4: 241–4.

Fibreoptic intubation in the anaesthetized patient

To the Editor:

Fibreoptic techniques have become the method of choice for managing the difficult intubation in the elective setting. The advantages and disadvantages of awake versus asleep fibreoptic intubation have been discussed previously,¹ and have been commented on more recently.² Physical examination is inadequate in predicting difficult intubation and fibreoptic intubation is a useful strategy in the management of patients in whom preoperative assessment did not suggest a difficult intubation.³

We would like to suggest an alternative, two-operator fibreoptic intubation technique under general anaesthesia. We recently anaesthetized a patient whose preoperative assessment revealed good mouth opening, a Mallampati class 1 airway, good flexion/extension of the cervical spine and a normal thyromental distance. At laryngoscopy a Cormac and Lehane⁴ grade 4 view of the larynx was obtained. Blind insertion of a gum elastic bougie into the trachea was attempted unsuccessfully. A size 3 laryngeal mask airway was inserted and a second attempt to insert the gum elastic bougie into the trachea, on this occasion via the laryngeal mask, was unsuccessful. It was then decided to proceed with a two-operator fibreoptic intubation technique. Following removal of the laryngeal mask, the first operator attempted to obtain a good view of the larynx as possible with a conventional Mackintosh laryngoscope and blade (size 3). The second operator then handed the first operator the distal end of the fibreoptic bronchoscope with a well lubricated endotracheal tube premounted on it in the usual way. The first operator positioned the tip of the bronchoscope, with the tip flexed anteriorly, as close as possible to the laryngeal inlet. Following instructions from the second operator, the first operator advanced the bronchoscope according to what the second operator visualized through the fibreoptic bronchoscope. This technique has been repeated successfully and intubation was possible in <45 sec.

The concomitant use of a Mackintosh laryngoscope to facilitate fibreoptic intubation has been described previously⁵ and is particularly useful when there are two operators available. The main advantage of this technique is that direct vision of the tongue and pharynx by the first operator makes it easier to keep the distal end of the scope in the mid-line and away from mucosal surfaces. This provides optimum positioning of the bronchoscope and facilitates visualization of laryngeal structures by a second operator.

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