fibreoptic intubation is very well (and arguable best) managed in anaesthetized, apnoeic patients, without any patient discomfort or added risk, and without the delay inherent in the awake fibreoptic intubation.[2,3] The number of available patients in whom the technique may be used to learn and maintain fibreoptic intubation skills (i.e., all patients for elective tracheal intubation) is much greater than the number requiring awake fibreoptic intubation. Secondly, asleep fibreoptic intubation is an accepted tool or "strategy" in the management of the unsuspected difficult laryngoscopic intubation.[4] No classification based on physical examination in current use has proved to be effective in prospectively identifying more than 50% of difficult intubations. Given the increasing trend to intubate the trachea after non-depolarizing relaxants rather than after succinylcholine, it seems logical to expect that anaesthetists will increasingly encounter unexpectedly difficult intubations, where skill with asleep fibreoptic intubation would prove valuable, if not life-saving.

Morris noted "fibreoptic intubation under general anaesthetic requires two skilled individuals".[1] We agree, but training of the assistant can be brief. We routinely utilize respiratory therapists or nurses who appreciate the importance and effect of three manoeuvres: (1) neck extension,[5] (2) jaw thrust ,[5] and (3) lingual traction.[6,7]

Studies comparing intubation times between rigid and fibreoptic techniques (during anaesthetic induction) consistently find that fibreoptic intubation, while taking 20–40 sec longer, does not result in clinically important oxygen desaturation, provided patients are adequately pre-oxygenated.[8-11,2,3] Oxygen insufflation by catheter into the mouth and pharynx at 4–6 $L \cdot min^{-1}$ prevents oxygen desaturation during fibreoptic intubation.[2,12] The one article which showed oxygen desaturation during fibreoptic intubation under general anaesthesia[13] was performed with patients breathing spontaneously. We suggest that intubation under general anaesthesia without muscle relaxants by any technique is liable to result in breath-holding, coughing, and/or laryngospasm with resultant hypoxemia.

Schaefer and Marsch said of fibreoptic intubation that "it may become the method of choice for many anaesthetists rather than reserved for patients in whom rigid techniques have proven to be unsuccessful."[11] We completely agree.

A.F. David Cole MD FRCPC
Joseph S. Mallon MD FRCPC
Stephen H. Rolbin MB BCh FRCPC
Department of Anaesthesia
Mount Sinai Hospital
600 University Avenue
Toronto, Ontario M5G 1X5

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REPLY

Fibreoptic intubation can be performed in the unconscious apnoeic individual, but is most useful in the patient who is predicted to be a difficult intubation, and in this setting the margin of safety is maximizing by performing the procedure with patient awake. Fibreoptic intubation under general anaesthesia can be difficult. Cole et al. reported two fibreoptic intubation failures in 33 patients under general anaesthesia.[1] Schaefer et al.[2] reported one patient who required two fibreoptic attempts before successful intubation in a series of 50 patients and Smith et al.[3] reported two failed fibreoptic intubations in 50 patients. Furthermore these studies excluded patients who were predicted to be a difficult intubation[1,3] or had abnormal airway anatomy.[2] Smith et al.[4] reported a series of 60 patients predicted to be a difficult intubation who underwent fibreoptic intubation

during spontaneous ventilation following induction of general anaesthesia.[4] *All patients were successfully intubated but the mean time from induction to intubation was 13.2 mins (range 5–28 mins) and in 18 patients arterial oxygen saturation decreased to <90%.*

From a teaching perspective, I agree that clinical exposure to the technique can be vastly increased by its use in anaesthetized patients presenting for elective surgery. Experience with fibreoptic intubation in this setting can only be beneficial, although increased difficulty may be encountered in patients with abnormal airway anatomy. In awake fibreoptic intubation, the introduction of the bronchoscope and subsequent intubation is not a difficult skill to master. Achieving adequate regional anaesthesia of the airway, however, can be difficult and requires practice.

Fibreoptic intubation in the unconscious patient is an accepted strategy in the management of the unsuspected difficult laryngoscopy, but the emphasis should be on careful airway examination to predict possible difficult intubation, and awake intubation when difficulty is anticipated.[6] *Thorough examination of the airway using multiple parameters such as tongue vs pharyngeal size, atlanto-occiptal extension, the anterior mandibular space, and anterior mandibular movement can be effective in predicting difficult intubation.*[5–8] *The risk of a failed intubation must be carefully considered when the use of succinylcholine or a longer-acting non-depolarizing muscle relaxant is contemplated.*

Apnoea does indeed impose a time limit on intubation. In the six studies quoted by Cole et al., the time required to achieve fibreoptic intubation was "20–40 seconds" longer than that required for intubation by direct laryngoscopy. Four of these studies, however, excluded patients predicted to be a difficult intubation,[1–3,9] *and the remaining two did not comment specifically on the airway anatomy.*[10,11] *Oxygen desaturation of haemoglobin has been reported during fibreoptic intubation in the apnoeic as well as the spontaneously ventilating patient under general anaesthesia.*[4,12] *Pharyngeal insufflation of oxygen has been shown to prevent arterial desaturation for as long as ten minutes of apnoea in anaesthetized paralyzed ASA I or II patients without symptomatic pulmonary disease,*[13] *but to be effective this technique requires a patent airway.*

In conclusion, fibreoptic intubation under general anaesthesia can be used as an alternative intubation technique in patients with normal airway anatomy and can be a valuable teaching modality. While not diminishing the importance of skill in fibreoptic intubation of patients with normal airways under general anaesthesia, skill in local airway anaesthesia and awake fibreoptic intubation is essential and must not be de-emphasized.

Ian R. Morris BEng MD FRCPC(Anaesthesia & Emerg Med) FACEP DABA
Dalhousie University
Halifax

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Adaptation of ICU ventilator to deliver isoflurane

To the Editor:

Inhaled anaesthetic agents are recognized as a useful therapy for status asthmaticus refractory to standard medical management.[1,2] Isoflurane is the agent of choice because of its limited biotransformation.[2,3] We have encountered problems delivering this therapy at our hospital because it requires the transfer of critically ill patients from the ICU to the operating room. Certain ICU ventilators have the capability of delivering inhaled agents,[1–3] but we do not have access to these ventilators in our ICU. Therefore, we have developed a system which can be attached to an ICU ventilator to allow the delivery of isoflurane in an ICU setting.

The system is constructed as follows: an oxygen tube connects the flow-meter of an air-oxygen mixer (Sechrist 3500H2) to a #5.0 mm ETT connector, which is attached to a 15 mm intubation adapter and then to a six inch disposable large bore tube which is attached to the inlet of the vaporizer (Ohio Model 100F). A two foot ventilator tube is placed on the outlet of the vaporizer and attached to the outlet of the ventilator humidifier via a standard