INHALATION INDUCTION OF ANAESTHESIA WITH ISOFLURANE IN CHILDREN

Sir,—The article concerning the incidence of respiratory complications and hypoxic episodes during inhalation induction with isoflurane in children [1], raises several interesting points.

The authors compared the incidences of three respiratory complications: coughing, breath-holding and laryngospasm during induction of anaesthesia; unfortunately, these complications were not clearly defined. Were they severe enough to be clinically significant, and was intervention (100% oxygen, neuromuscular blocking drugs, tracheal intubation) required at any time? Clearly, all three may vary from mild to complete airway obstruction.

Warde, Nagi and Raftery [1] also presented the results of minimum arterial oxygen saturation (minimum $Sp_O_2$) during induction as incidence within the following ranges: < 71, 71-80, 81-90 and 91-100 %. The majority of the children were within the uppermost range. Why were these ranges chosen; could the range 91-100 % be further subdivided? Other investigators have used widely differing ranges: Sampaio and colleagues [2] used the ranges < 95 % and 95-100 % for minimum $Sp_O_2$ to compare airway complications, and Phillips, Brimacombe and Simpson [3] used an uppermost range of $\geq$ 85 % as part of a scoring system, but also presented the raw data for the minimum $Sp_O_2$ during induction.

At what point does oxygen desaturation become clinically significant? Motoyama and Glazener [4] investigated hypoxia in a group of children after general anaesthesia: 43 % developed an $Sp_O_2$ of < 91 % in the early postoperative period. These authors stated that (assuming a normal acid-base balance and haemoglobin-oxygen affinity) an $Sp_O_2$ of < 91 % corresponds to a $Pa_O_2$ of $< 8.0$ kPa, which is the value at which the hypoxic ventilatory response becomes evident in awake adult humans. Two children in their study developed an $Sp_O_2$ in the range 70-74 %. Neither developed cyanosis, bradycardia or increased ventilation; one child was “lightly snoring”, the other did not have any evidence of upper airway obstruction.

Finally, which pulse oximeter was used during the study by Warde, Nagi and Raftery [1]? Two recent articles [5, 6] have reviewed potential errors in pulse oximetry. I would suggest that errors in measurement during an investigation might be sufficient to alter the incidences of minimum $Sp_O_2$ values recorded.

Respiratory complications leading to “severe” obstruction result rapidly in oxygen desaturation in children, and pulse oximetry rightly has come to be regarded as essential monitoring during anaesthesia. The relationship between oxygen saturation and “minor” respiratory complications is less clear, and oximetry perhaps is less useful if it distracts the anaesthetist from assessing and managing the airway. Potential errors and significance of pulse oximetry during induction of anaesthesia must also be considered carefully both in clinical practice and in experimental study.

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REFERENCES

Sir,—Thank you for the opportunity of replying to the letter received from Dr Lewis. Respiratory complications described by us were defined as follows: coughing = any coughing whatsoever from commencement to completion of induction; breath-holding = periods of apnoea during induction exceeding 20 s approximately; laryngospasm = presence during inspiration of a typical “crowing” sound accompanied by the hallmarks of respiratory obstruction in the case of partial spasm, occasionally progressing to absence of sound accompanied by the same clinical signs when spasm was complete (as defined by Patrick [1]). The clinical significance of each of these taken in isolation is not easy to establish. However, the fact that trough $Sp_O_2$ during induction was less in the 30 children who developed one or more of these complications than in the 45 who did not, leads us to believe that they were important. Six children, all of whom had respiratory complications, required one or more interventions referred to by Dr Lewis. Three in group A (two with persistent coughing and one with laryngospasm) were given 100 % oxygen, while three in group B (three of the four in this group who developed laryngospasm) required the same intervention. One of this latter trio underwent tracheal intubation without use of a neuromuscular blocking drug when $Sp_O_2$ decreased to 54 %. No child in group C required any alteration to the planned induction technique.

Regarding the $Sp_O_2$ ranges used, these were chosen in an attempt to reduce the risk of errors in measurement. We consider that to subdivide the range 91-100 % would increase the potential risk for such errors. The oximeter used in all cases was the Critikon Oxyshuttle. We have been happy with its performance for some 3 years and would point out that the trough $Sp_O_2$ readings obtained with it in group A children in
the present study were similar to those in group NI children in an earlier paper on isoflurane induction in children published by two of us [2].

We agree with Dr Lewis’s opinion that oximetry becomes less useful if it distracts the anaesthetist from assessing and managing the airway, but suggest that this is much less likely to occur if an induction technique with a low incidence of respiratory complications and consequent desaturations (such as that used in our group C children) is used.

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REFERENCES

UNEFFECTED, DIFFICULT LARYNGOSCOPY

Sir,—Williams, Carli and Cormack [1] have misread the paper by Dore and myself [2], and have drawn some erroneous conclusions. In several places they maintain that the incidence of difficult laryngoscopy was 1 in 300 in our study, the incidence of grade 3+4 difficult laryngoscopy [3] was 1 in 292, that the anaesthetist failed to see the cords only once in 292 patients, and that he had an incidence of grade 3 laryngoscopy of one in 292 patients.

We reported on 19 patients “in whom tracheal intubation proved particularly difficult”, that is, those who had “more severe degrees of difficulty” at intubation, associated with difficulty at laryngoscopy “such that the anaesthetist could only see the epiglottis (sometimes not even that)”. Six of these patients had cervical arthritis, and the overall prevalence of this particularly difficult intubation was 0.5%.

It is inappropriate to exclude patients with neck pathology when quoting the incidence of intubation difficulty. None of our 14 control patients had angle B (V21, our measurement of atlanto-occipital extension) less than 115°, while only three of our difficult intubation patients had a measurement of more than 115° for this angle. Wilson and colleagues [4] found that 46% of their difficult laryngoscopy patients had a clinically appreciable reduction of atlanto-occipital extension.

The Cormack and Lehane grading of difficult laryngoscopy had not been described when our study began, nor did we purport to include all those patients in whom the larynx could not be exposed at laryngoscopy. We did not count those patients whose difficulty of intubation was “inconsequential”, but adopted “the more stringent criteria”, “admitting only those patients with more severe degrees of difficulty”. Wilson and colleagues [4], and now Williams and colleagues [1], giving the same reason, both point out that the incidence of difficult tracheal intubation should be less than the incidence of difficult laryngoscopy.

For these reasons, Williams and colleagues cannot take the results of our study to “obviate some of [their] reservations” that the “original estimate of Grade 3 frequency [at] 1 in 2000...may be too low”.

Wilson and colleagues [4] found the incidence of Cormack and Lehane grade 3 (when laryngeal pressure was applied) was 5.4% in a retrospective series (they suggest eagerness in reporting or a lower proportion of experienced anaesthetists), and 1.3% in a prospective series; their incidence of grade 4 was 0.5% and 0.3% in the retrospective and prospective series, respectively. Of course the frequency with which these grades occurs varies from one group of 1000 patients to the next, but my unpublished experience leads me to support the figures reported by Wilson and colleagues.

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REFERENCES

Sir,—May we comment briefly on the letter from Dr Bellhouse.

Patients with neck pathology. These were excluded from our unexpected difficult intubation group because difficulty in such cases is not unexpected, or should not be. In our 1984 study, we stated that if Caesarean section is to be carried out in a patient with neck pathology, such as in Still’s disease, a senior anaesthetist must be notified. Two years later, a Confidential Enquiry [1] reported a death in a severely arthritic patient—the registrar had carried out a standard failed intubation drill to the best of his ability, but fatal Mendelson’s syndrome occurred. Was he wise to start this case on his own?

Patients without neck pathology. The study by Bellhouse and Dore [2], in which they claimed to be able to predict nearly all difficult intubations is well known, and rightly so. Scurr remarked many years ago that an experienced anaesthetist may know when trouble is brewing, although he may be unable to state the reasons. Unfortunately, it has become clear that, for most of us, this is not true. Despite world-wide efforts to solve this problem, the results have been disappointing—for example, a recent survey [3], using both Mallampati’s sign and Wilson’s risk-sum method, found that 50% of the difficult cases were missed. Clearly, this strategy is not going to work unless the methods can be improved.

Thus difficulty is easy to predict in arthritic patients and trouble can be forestalled; the problem cases are those which are difficult despite the absence of neck pathology. After subtracting the arthritic patients from the data of Dr Bellhouse, the incidence of unexpected difficulty is 0.3%, as we stated, not 1.3%.

It is perhaps an academic question which of these figures is correct, as the main conclusion is the same from both, namely that junior anaesthetists will have had little or no experience in handling difficult intubations by the time they start doing “full-stomach” cases on their own. It follows that a training...