method of maintaining air cleanliness at a level of two to three colony-producing particles/100 ft³ (2.8 m³) air in the presence of four persons working as an active operating team in a relatively small enclosure. To equal this without complicating the installation it is necessary for surgeons to suffer what may at first seem certain inconveniences, but if they appreciate the rationale behind the design they will very soon become adapted to it.—I am, etc.,

JOHN CHARLIE

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Deaths during Dentistry

Sir,—It is inconceivable that in this day and age one can read in the B.M.J. that three deaths have occurred in England recently during anaesthesia administered by dentists while at the same time carrying out dental treatment. That this should happen in Britain, where there are more trained anaesthetists than anywhere else, and when this has been the case for over 100 years, is incomprehensible. In Sweden, where modern anaesthesia started only in the forties, all dental anaesthetics are administered by trained anaesthetists assisted by qualified nurses.

In the past when dental anaesthesia consisted of nitrous oxide and air or oxygen given by the dentists before starting treatment it was a relatively safe procedure. Since the advent of intravenous anaesthesia, however, it can be a dangerous procedure and should be the sole responsibility of someone who is proficient in intubation and in resuscitation and competent to deal with inhalation of foreign bodies or sudden laryngospasm.—I am, etc.,

L. H. MILLER

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Respiratory Recording from the Oesophagus

Sir,—In a recent Scottish medical negligence case in which I was concerned (10 February 1973, p. 365), in which liability was established against the hospital board and the anaesthetist, the pursuer's (that is, the plaintiff's) case was that the cardiac arrest that occurred was an anoxic one resulting from placement of the endotracheal tube in the oesophagus instead of in the trachea. The pursuer was the curator of the patient, who at the time of the operation was a fit and healthy woman in her mid-twenties but whose mental capacity had been seriously and permanently impaired as a result of the anoxia which she suffered.

One of the factors put forward by the defence in support of their case was that the reservoir bag in the Magill circuit had been seen to move rhythmically as if in spontaneous respiration; accordingly they maintained that this could not have happened if the endotracheal tube had been in the oesophagus. In cross-examination on this point evidence was given for the pursuer to the effect that rhythmical movement of the bag could nevertheless occur even if the tube was in the oesophagus. Textbooks and clinical experience were referred to in support of this proposition. The credibility of this evidence was nevertheless strongly challenged by the defence in a situation in which procedural rules of evidence made it impossible for the pursuer to refute the challenge by adducing further corroborative evidence. The defence in this case, which was subsequently affirmed on appeal, did not turn upon the point, but since the existence of this little-known but significant physiological phenomenon has now been confirmed in this department by investigations in three patients, I feel that the evidence resulting from a detailed experimental recording should be made available.

During strong inspiratory effort with the glottis closed intratracheal pressures of 64 cm H₂O have been recorded, and as oesophageal pressure may be related to intrapleural pressure it is likely that gas would flow into an intubated oesophagus during obstructed respiration. During spontaneous respiration in three anaesthetised, intubated adults, when the oesophagus was also intubated and the endotracheal tube obstructed "tidal volumes" of up to 180 ml were recorded at the oesophageal tube. The following case is illustrative of this phenomenon.

A 65-year-old woman who four weeks previously had had a hiatus hernia repaired was given nitrous oxide, oxygen, and halothane anaesthesia via an endotracheal tube with spontaneous respiration for removal of a breast. She had volunteered for the investigation to be made during the course of this operation, having had the proposed experimental procedure explained in detail. This was considered to cause no risk to the patient as respiratory obstruction would be produced for only 15-20 seconds and such periods of apnoea are easily exceeded by most people. The oesophagus was intubated with an 8-mm nasal tube to which was attached an electromanometer and a Fleisch pneumotachograph head, which was calibrated with three known air flows. The endotracheal tube was also connected to an electromanometer. Both pressure traces, the flow trace, and its integral with time and volume were recorded on a Devices pen recorder. The endotracheal tube was obstructed for 20 seconds and the recording seen in the figure was obtained. It can be seen that this far from fit elderly woman was able to generate flows of air into her oesophagus of over 50 litres per minute and a "tidal volume" of 45 litres rhythmically in and out of her oesophagus.

The actual movement of the reservoir bag will depend upon the fresh gas flow into the Magill circuit, but provided this is below 3 litres per minute a subject may be able to move the reservoir bag of the circuit and mimic normal respiration if the oesophagus has been inadvertently intubated and the airway obstructed by the insertion of a throat pack.—I am, etc.,

JOHN S. ROBINSON

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Comparison between Free Thyroxine Index and Effective Thyroxine Ratio

Sir,—Dr. E. G. M. D'Haeene and his colleagues (21 September, p. 708) quote our article of 1965 in which we described the derivation of a free thyroxine index from the protein-bound iodine (P.B.I.) and resin uptake of iodine (T-3) in a given subject and the latter value was expressed as a ratio between the uptake from serum and that from a control pooled serum (T-3 resin uptake ratio). The use of this index corrected for changes in binding protein (such as occurs in pregnancy) and also more clearly separated abnormal from normal states of thyroid function than did either the P.B.I. or T-3 resin uptake ratio alone.

The index, as introduced, was calculated from the product of P.B.I. and T-3 resin uptake ratio values and not, as stated by Dr. D'Haeene and his colleagues, by dividing the value for the P.B.I. by the respective T-3 resin uptake. More recently a free thyroxine index was calculated from results of P.B.I. and Thyopac-3 values and, in this instance, the index is derived by dividing the P.B.I. value by that for Thyopac-3. It is here that confusion may arise and this may be avoided if careful attention is paid to the procedures employed for measuring, and also reporting, the T-3 resin uptake test.

In the Thyopac-3 method the quantity of radioactive T-3 left in the serum phase is measured and compared with a control serum and thus reflects directly the ability of serum proteins to bind thyroid hormone. In contrast, in our original T-3 resin uptake method the amount of radioactive T-3 taken up by the resin from serum is determined and compared with the resin uptake of pooled normal serum—that is, there is an inverse relationship to the number of unsaturated sites on thyroxine-binding proteins and thus to the Thyopac-3 values. The T-3 B.C. index obtained with the ResinOx kit, though described as a resin uptake test, is in fact similar to Thyopac-3 in that the