

Rapid Intravenous Induction Followed by Self-Applied Cricoid Pressure and Rapid Intubation

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Summary

A COMBINATION OF methods is described for rapid and safe intubation and is suitable for the anaesthetist working alone or without competent help. It is for the prevention of regurgitation during induction of anaesthesia by a provision for rapid induction followed by self-applied cricoid pressure during the dangerous phase of 'going-under' up to the time just prior to laryngoscopy. Rapid laryngoscopy and intubation follows in the safe period. The author finds it suitable for use in obstetric anaesthesia and in other patients predisposed to regurgitation.

The factors predisposing to regurgitation are well described (Dinnick, 1967). These include food and fluid in the stomach or a distended stomach (Robson, 1959); incompetent cardia (e.g. hiatus hernia, Dinnick, 1961); presence of a gastric tube; intermittent positive pressure ventilation (a potent factor); raised intra-abdominal pressure such as during suxamethonium fasciculations; lowered intra-oesophageal pressure such as active respiration during induction and respiratory obstruction (O'Mullane, 1954); cough, and straining (Marchand, 1957) and hiccoughing; relaxation of the cricopharyngeus muscle; light general anaesthesia; and hypotension which may provoke vomiting in twilight states.

Thus the patient, for emergency anaesthesia, unlikely to regurgitate is one who is well preoxygenated, rapidly and safely induced and rapidly and completely paralysed in the horizontal position and neck flexed.

The technique described is suitable for the emergency anaesthetist working alone or without the assistance of a competent nurse or technician, a situation sometimes happening at night and weekends; and in district hospitals.

Details of Methods

The patient, preferably premedicated with an antiemetic, e.g. hyoscine 0.3 mg is placed on the tilting operation table (Wylie, 1956, Steel, 1961). Normally other patients are often anaesthetized on the trolley in the Induction Room. Anti-emetics also reduce post-operative sickness (Riding, 1963).

The stomach and oesophagus may be, if deemed necessary, be decompressed or emptied by passage of a No. 10 oesophageal tube, or by inducing rapid gastric emptying by use of metoclopramide (Maxolon; in obstetric anaesthesia, McGarry, 1971) in the absence of an acute abdomen or bowel obstruction. The gastric tube is removed (and re-inserted later) because its presence tends to trip the integrity of the cardiac sphincter and interferes with cricoid compression (Sellick, 1961).

The patient is checked for any possibility of difficult intubation, which may be present especially in the obstetric patient, who may also have a functional hiatus hernia (Dinnick, 1961, 1967). Equipment for management of failed intubation (bougie, stylets, etc) should always be ready.

Preoxygenation

This is an integral part of this technique. Preoxygenation by the patient herself holding the mask or by a harness (later removed) for 5 minutes, which

is also the time spent in checking and getting anaesthetic equipment ready and setting up a free flowing drip, with intravenous placement of plastic cannula under local analgesia.

Complete denitrogenation results in an alveolar po_2 of about 673 mmHg, arterial po_2 of 640 mmHg and 100% arterial saturation. It obviates the need for intermittent positive pressure ventilation for at least one minute; and reduces the hazard of an episode of hypoxia.

Preoxygenation for 2 minutes may not be sufficient in the presence of lung diseases, leaks around the mask etc.

The suction apparatus, preferably high flow suction is checked.

Position of the Patient for Intubation

The patient lies supine in a horizontal position most suitable for intubation, that is, with the neck flexed and head extended and steadied on a head ring.

In Sellick's manoeuvre (Sellick, 1961), the patient is placed in the tonsillectomy position with the head and neck down and extended to stretch the oesophagus and to minimise its lateral displacement; at the same time assist the flow of regurgitated fluid away from the larynx should it occur. But this position is not ideal for easy laryngoscopy and rapid intubation.

In the horizontal position, extension at the atlanto-occipital joint creates a small pocket or reservoir in the posterior part of the oro-pharynx, laryngo-pharynx and post-nasal space, in which any regurgitated material collects after the self-applied cricoid pressure is lifted (Figure II).

In the horizontal position, the long axis of the trachea and larynx is inclined at an angle of $25^\circ - 30^\circ$ downwards and backwards; and the upper third of oesophagus and crico-pharyngeus $20 - 25^\circ$. A head down slope of more than 30° is necessary for gravity to protect the laryngeal aditus. Laryngoscopy and rapid intubation may be difficult in this steeply inclined position for the unfamiliar anaesthetist.

A method of intravenous induction for rapid intubation: The intravenous agent, such as for Caesarean section, is methohexitone (1 - 1.5 mg/kg) while thiopentone (3 - 4 mg/kg) is for other patients. Intravenous titration of the sleep dose is not done.

Half the amount of methohexitone (for example, total dose of 70 - 100 mg) premixed with 0.6 mg atropine is drawn up in a 10 ml syringe, while the remaining half dose is mixed with 75 to 100 mg of suxamethonium (freshly prepared), in another 10 ml syringe.

The first half of the barbiturate is rapidly given through the rubber injector of the tubing to give a bolus effect and flushed; immediately the premixed methohexitone-suxamethonium mixture follows

Fig. I

SELF APPLIED CRICOID PRESSURE PRIOR TO LARYNGOSCOPY



Fig. II

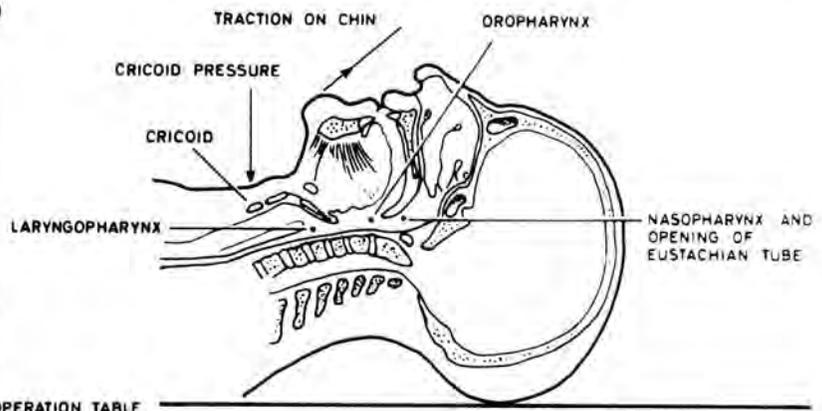
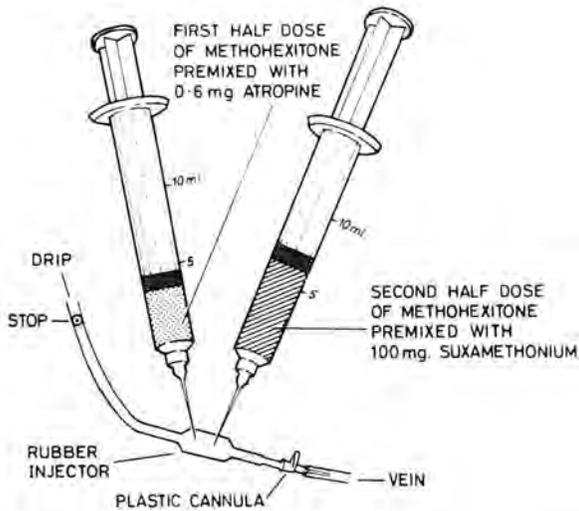


Fig. II

A SAGITTAL SECTION THROUGH THE HEAD AND NECK TO SHOW THE SUBDIVISIONS OF THE PHARYNX. POSITION SUITABLE FOR EASY INTUBATION, SELF APPLIED CRICOID PRESSURE AND CHIN TRACTION.

(Figure IIIa). The dose of suxamethonium is large to avoid the danger of a partial neuromuscular blockade. The disadvantages of I/V methohexitone are hiccoughing and hypotension (though the hypotensive index is less than that of thiopentone). Note that injections are given rapidly without fear of affecting the foetus in obstetric anaesthesia; too slow the mother may not become unconscious and yet paralysed.

Fig. III a



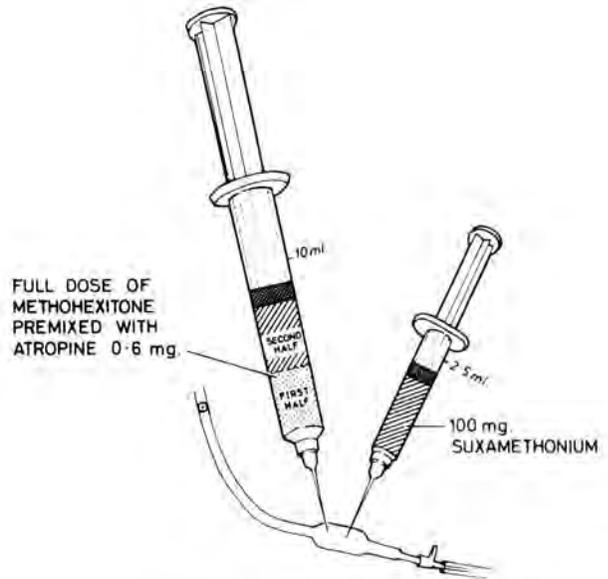
METHOD OF RAPID INTRAVENOUS INDUCTION

Alternatively (Figure IIIb) thiopentone or methohexitone premixed with 0.6 mg atropine is drawn up in a 10 ml syringe and suxamethonium 75 to 100 mg in a 2.5 ml syringe. Half the barbiturate is given and drip flushed; immediately the remaining half is injected simultaneously with the suxamethonium to get a premixed effect. The drugs are flushed into the venous circulation by the drip full on to produce a "crash" or "short gun" induction.

The initial half of the barbiturate will tend to minimize the chance of the patient being aware of the suxamethonium fasciculations (Khawaja, 1971 a, b) whether they be pleasant or unpleasant. The occurrence of scoline pains is a price to pay for producing rapid and profound relaxation. This method of injection has the effect of a premixed barbiturate-suxamethonium mixture, which has been established to produce conditions for rapid intubation (Khawaja, 1971a, b).

In the conventional method, suxamethonium is injected after the barbiturate in which complete relaxation comes only after 45 - 65 secs. The high

Fig. III b



ALTERNATIVE METHOD OF INJECTION

risk period is about 45 secs stretching from the 20th second (loss of consciousness) to the 65th second; and will be much longer if the needle comes out of the vein during the change over of syringes.

With the author's method, the period between loss of consciousness and total paralysis is shortened to about 20 to 25 seconds from about the 20th-25th second to the 40th or 45th second.

Hypotension (in short-gun or crash-induction, Bonica 1967) is uncommon except in the presence of hypovolaemia; and supine hypotensive syndrome of late pregnancy (Scott, 1968), latent or overt, which can be obviated by the left lateral tilt top table technique. The hypertensive response to intubation is a feature of methohexitone-suxamethonium intubation sequence.

Method of Self-applied Cricoid Pressure prior to Laryngoscopy.

After the completion of the injections, the anaesthetist commences to apply increasing (moderate and then firm) pressure on the cricoid which has been previously identified and marked or ringed with a ball-point. At this time, the patient is just becoming unconscious if it is less than 20 seconds after injection. He uses the left thumb and index

finger, whilst his right hand applies traction on the chin in an upward and cephalic direction to tauten the oesophagus, and to avoid fumbling with the cricoid cartilage (Fig. I, II, Fig IV).



Fig. IV

Cricoid pressure manoeuvre can withstand reflux pressures of up to 100 cm H₂O (Sellick, 1961). Once the fasciculations are over and profound relaxation achieved in about 40 - 45 seconds, the anaesthetist abandons the cricoid pressure, and commences the conventional laryngoscopy and endotracheal intubation.

It is probable that the mean intra-gastric pressure, normally 7 cm H₂O (in elective surgical patients, Spence 1967) or twice that in pregnancy, would have returned to normal after an initial rise, even to more than 20 cm H₂O, as a result of suxamethonium fasciculations (Anderson 1962; Roe 1962). The cardia is probably competent when the intra-gastric pressure does not exceed 20 cm H₂O. With coughing and straining it can reach in excess of 60 cm H₂O (Spence 1967).

Regurgitation is very unlikely during laryngoscopy in the completely paralysed and flaccid patient, since the normal cardiac sphincter is unaffected by general anaesthesia, relaxants or autonomic drugs, (O'Mullane, 1954).

If regurgitation occurs, reliance is based on tipping and efficient suction of the pharynx. Avoid intermittent positive pressure ventilation as this is a sure way to pump regurgitated material into the trachea, and to churn up more vomitus in your way.

This technique of rapid intubation to seal off the airway may be further assisted by use of a pre- and over-inflated balloon of the cuff of the endotracheal tube.

Discussion

By combination of a method of achieving a short injection-intubation time with self-applied cricoid pressure up to the time of laryngoscopy, the hazard of regurgitation and aspiration of vomitus is very distant.

In Sellick's method (Sellick, 1961), cricoid pressure must be exerted by a technician, who must be, albeit easily, taught or has previous experience. Pressure may be applied, though gently, even before onset of unconsciousness. The method allows intermittent positive pressure ventilation through a mask or mouth to mouth. Also posterior displacement of the larynx facilitates, sometimes, intubation. It is contra-indicated in active vomiting such as in the conscious or semi conscious patient.

The author's method relies mainly on preoperative preparation; use of I/M hyoscine as a premedicant; and I/V premixed atropine as an anti-emetic and antisialagogue and to doubly strengthen the cardiac sphincter to withstand pressure from the gastric aspect (Clark, 1962) but does not offer resistance to pressure from above such as ventilation prior to intubation; generous preoxygenation and non-ventilation; a method of rapid intravenous induction akin to premixed barbiturate-suxamethonium technique; self-applied cricoid pressure just prior to or from the onset of unconsciousness till laryngoscopy; laryngoscopy and intubation in the easy position.

The patient can still regurgitate during the short period of laryngoscopy when cricoid pressure has to be lifted. Here the anaesthetist need to perform lightning intubation.

In Sellick's series (Sellick, 1961), release of cricoid pressure after intubation was followed promptly by gastric reflux of gastro-oesophageal contents in 3 cases out of 26 high risk cases.

It has been stated that there is no fool-proof method of prevention of regurgitation and the subsequent aspiration of vomitus into the respiratory tree (Mendelson's or acid-aspiration syndrome, Mendelson, 1946). The ideal anaesthetic for operative obstetrics does not exist (Utting and Gray, 1968). The watch word is great care, competence in preventing regurgitation and commonsense in management should it occur. The anaesthetist, often working alone, should develop and use a technique that he is most familiar with in a difficult situation.

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