A RAPID INTUBATION TECHNIQUE FOR PREVENTION OF ASPIRATION DURING INDUCTION OF ANAESTHESIA

BY

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SUMMARY

A technique for rapid endotracheal intubation of patients likely to regurgitate during the induction of anaesthesia is described. Two minutes after the injection of tubocurarine 3 mg, anaesthesia is induced with a mixture containing thiopentone sodium 4 mg/kg, or methohexitone sodium 1–1.5 mg/kg and suxamethonium chloride 1.5 mg/kg. Laryngoscopy can be started about 10 seconds after the loss of consciousness. Fasciculations are usually absent. The patients are, therefore, not aware of fasciculations, a possibility that is present when barbiturate-suxamethonium mixtures are used to induce anaesthesia without a preceding dose of tubocurarine. There were no complications from the small dose of tubocurarine used.

Rapid endotracheal intubation after induction of anaesthesia with a barbiturate and suxamethonium is a common method of managing anaesthesia in patients who may have a large amount of residual matter in the stomach. In the conventional technique, suxamethonium is injected after the barbiturate. There is then an interval of about three-quarters of a minute when the patient is unconscious but when the muscles are not sufficiently relaxed to permit intubation. This period may be considerably prolonged if the needle becomes dislodged from the vein. Regurgitation and aspiration can take place during this time.

It seems likely, therefore, that, if this period between the loss of consciousness and completion of endotracheal intubation could be shortened, the aspiration hazard would be reduced. Such a shortening of the risk period is possible by using thiopentone-suxamethonium or methohexitone-suxamethonium mixtures to induce anaesthesia (Khawaja, 1971a, b). It is then possible to introduce the laryngoscope some 20 seconds after loss of consciousness. There is, however, a small chance that the action of suxamethonium will begin before that of the barbiturate and that the patient will remember the suxamethonium fasciculations. In the two studies referred to, 1 of 170 patients regarded the induction as unpleasant because he was aware of fasciculations, and a further 5 patients were found upon direct inquiry to have been conscious of fasciculations but did not consider the experience unpleasant.

When the administration of suxamethonium is preceded by a small dose of a non-depolarizing muscle relaxant, fasciculations are greatly diminished (Churchill-Davidson, 1954; Bryson and Ormston, 1962; Zhorov et al., 1967). It is likely, therefore, that the injection of a small dose of tubocurarine before the barbiturate-suxamethonium mixture would eliminate the possibility of awareness of fasciculations. This paper describes such a technique and the results of its use in 170 adult patients, including 84 emergency cases, in order to assess the patient acceptance and any possible complications of the technique.

TECHNIQUE

Patients for elective surgery were premedicated with morphine 1 mg/stone (6.36 kg) body weight and atropine 0.6 mg, given by intramuscular injection about 1 hour before induction. In emergency and obstetrical cases, premedication consisted of atropine alone, given intravenously before induction of anaesthesia. Where necessary, a nasogastric tube was used to empty the stomach and to reduce intragastric pressure. Obstetrical patients were given a 15-ml dose of magnesium trisilicate mixture (BPC) orally to reduce gastric acidity (Taylor and Pryse-Davies, 1966).
RAPID INTUBATION TECHNIQUE FOR PREVENTION OF ASPIRATION

In the anaesthetic room patients were given tubocurarine 3 mg intravenously. In emergency cases the dose of atropine was given with the tubocurarine. A full 2 minutes were allowed for the tubocurarine to become fully effective. Anaesthesia was then induced with a mixture containing thiopentone sodium (2.5 per cent solution; 90 patients) or methohexitone sodium (1 per cent solution; 80 patients) and suxamethonium chloride (5 per cent solution). The dose of thiopentone was 4 mg/kg and that of methohexitone 1.0–1.5 mg/kg, depending on the condition of the patient. Suxamethonium 1 mg/kg was used in the first 10 (all elective) patients and 2 mg/kg in a further 10. Subsequently, suxamethonium was used in a dose of 1.5 mg/kg (150 patients). The appropriate dose of the relaxant previously drawn up in a separate syringe was drawn into the syringe containing the barbiturate just before injection by inserting the needle of the syringe containing the barbiturate through the nozzle of the second syringe.

The larynx was then intubated in the usual manner after inflation of the lungs with oxygen. In emergency cases the patients were preoxygenated after tubocurarine administration, cricoid pressure (Sellick, 1961) was used to reduce further the risk of regurgitation, and intubation was performed as soon as the jaw was sufficiently relaxed. A note was made of the time taken to complete endotracheal intubation.

On the following day patients were asked for their comments on the induction and asked whether they had felt any fasciculations or tightness in the face or elsewhere before going to sleep, and also whether they had been conscious during intubation.

RESULTS

None of the 170 patients considered the induction of anaesthesia to be unpleasant. Patients who had previously undergone general anaesthesia rated the induction to be at least as pleasant as their previous experience. No patient was aware of any fasciculations or conscious during intubation, and most stated that they would request a similar induction for future operations.

In patients who were given suxamethonium 1 mg/kg the muscles were, on the whole, not well relaxed. In 5 of 10 cases the cords were moving or the patients coughed slightly at the time of intubation. In none of these patients could fasciculations be detected. The muscles of all patients who were given suxamethonium 2 mg/kg were well relaxed. Three of 10 cases in this group had marked and a further 2 moderate fasciculations, though none had memory of this. Subsequently, suxamethonium 1.5 mg/kg was used in 150 patients. This provided good relaxation. Twenty-two patients showed very mild and transient, in some cases doubtful, fasciculations in the eye muscles or in the hands. In none of the other 128 patients could fasciculations be detected.

There were no adverse effects from the small dose of tubocurarine. A slight ptosis could sometimes be detected but patients did not appear to be aware of it. Many factors affect the reappearance of spontaneous respiration after suxamethonium, but as far as could be judged suxamethonium 1.5 mg/kg in this series caused apnoea of similar duration to that produced by suxamethonium 1 mg/kg when not preceded by tubocurarine. In no case was apnoea unduly prolonged.

It is difficult to time accurately the interval between loss of consciousness and the earliest moment when the patient is relaxed enough to permit laryngoscopy. However, as far as could be judged in emergency cases when patients had been preoxygenated laryngoscopy could be started, in most cases, about 10 seconds after loss of consciousness, and intubation completed in about 50 seconds from the beginning of the injection of the mixture. When a barbiturate-suxamethonium mixture without preceding tubocurarine was used adequate relaxation for laryngoscopy did not develop for some 20 seconds after loss of consciousness.

There was no instance of regurgitation or aspiration in this series.

DISCUSSION

Barbiturate-suxamethonium mixtures can be safely used for rapid induction and endotracheal intubation of patients having a full stomach (Khawaja, 1971a, b). The purpose of the present study was to determine whether a small dose of tubocurarine given before the mixture would eliminate awareness of fasciculations and whether such a technique was associated with any complications or disadvantages.
A diagrammatic representation of the sequence of events when anaesthesia is induced with a barbiturate and suxamethonium using the conventional technique and as a mixture both with and without a preceding dose of tubocurarine.

### Table I

<table>
<thead>
<tr>
<th>Conventional method</th>
<th>Barbiturate-suxamethonium mixture</th>
<th>Barbiturate-suxamethonium mixture preceded by tubocurarine</th>
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<tbody>
<tr>
<td>Time scale (sec)</td>
<td>Time scale (sec)</td>
<td>Time scale (sec)</td>
</tr>
<tr>
<td>0 Start of barbiturate injection.</td>
<td>0 Start of injection of mixture.</td>
<td>0 Start of injection of mixture.</td>
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<td>10</td>
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<tr>
<td>20 Onset of sleep. Start of suxamethonium injection.</td>
<td>20 Onset of sleep. Fasciculations begin.</td>
<td>20 Onset of sleep.</td>
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<td>50</td>
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<tr>
<td>60 Fasciculations end. Jaw relaxed.</td>
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Preceding the injection of a barbiturate-suxamethonium mixture by tubocurarine 3 mg permitted smooth induction without fasciculations, which all patients reported to be pleasant. There was no awareness of fasciculations.

There were no complications attributable to the small dose of tubocurarine used. Foster (1960) reported delayed recovery of spontaneous respiration in 4 of 7 patients when suxamethonium was preceded by gallamine. Bryson and Ormston (1962) using a similar technique found the jaw and larynx to be poorly relaxed in patients undergoing Caesarean section. In the present series, however, in no case was apnoea unduly prolonged and good muscular relaxation was present in every case when suxamethonium 1.5 mg/kg or more was used.

A prior injection of a non-depolarizing relaxant has an antagonist effect on the neuromuscular blocking effect of suxamethonium (Foster, 1960; Lamoreaux and Urbach, 1960; Bryson and Ormston, 1962; White, 1962). This was found to be so in this series. Thus, suxamethonium 1 mg/kg produced incomplete muscular relaxation in 5 of 10 patients, but the same dose when not preceded by tubocurarine gave good relaxation (Khawaja, 1971a, b). As far as could be judged, suxamethonium 1.5 mg/kg as used in this series produced relaxation of similar degree to that produced by suxamethonium 1 mg/kg when not preceded by tubocurarine.

When barbiturate-suxamethonium mixtures without tubocurarine were used, relaxation of the jaw sufficient for laryngoscopy did not develop for some 20 seconds after loss of consciousness and the beginning of fasciculations. In the present series laryngoscopy could, in most cases, be started about 10 seconds after loss of consciousness, and intubation completed in a further 20 seconds. This more rapid relaxation was an unexpected finding and the reason for it is not apparent. It may be due to the absence of an initial period of muscle stimulation as shown by fasciculations. Whatever the reason, the more rapid relaxation further reduces the high-risk period during which the patient is unconscious but insufficiently relaxed to allow laryngoscopy and is, therefore, likely to add to patient safety.
Table I shows the sequence of events when anaesthesia is induced with a barbiturate and suxamethonium used separately and as a mixture both with and without tubocurarine.

**ADDENDUM**

Since this report was submitted for publication, the technique has been used in a further 81 emergency cases. One patient reported a momentary inability to breathe before becoming unconscious.

**ACKNOWLEDGEMENT**

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**REFERENCES**


**UNE TECHNIQUE D’INTUBATION RAPIDE POUR PREVENIR L’ASPIRATION DURANT L’INDUCTION DE L’ANESTHESIE**

**RESUMEN**

Es descrita una técnica para la intubación endotraqueal rápida de pacientes que pudieran regurgitar durante la inducción de la anestesia. Dos minutos después de la inyección de 3 mg de tubocurarin se induce la anestesia con una mezcla que contiene tiopentona sódica, 4 mg/kg, o metohexitona sódica, 1–1,5 mg/kg, y cloruro de suxametonio, 1,5 mg/kg. La laringoscopia puede ser iniciada aproximadamente 10 segundos después de la pérdida de conciencia. Generalmente no hay fasciculaciones. Así pues, los pacientes no perciben fasciculaciones, lo cual puede presentarse cuando son usadas mezclas barbiturato-suxametonio para inducir anestesia sin una dosis precedente de tubocurarin. La pequeña dosis de tubocurarin empleada no provocó complicaciones.