Evaluation of tracheal intubating condition in adults after coinduction with propofol plus lidocaine and different doses of remifentanil

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ABSTRACT

Objective: To evaluate tracheal intubation condition in adults after anesthetic coinduction with lidocaine and propofol and various doses of remifentanil.

Materials and Methods: In three groups, induction was compared with lidocaine (1.5 mg/kg), propofol (2 mg/kg), and three varying doses of remifentanil (0.5-1-2 µg/kg). Tracheal intubation was graded according to the ease of laryngoscopy, the position of vocal cords, coughing, jaw relaxation and the movement of limbs. Hemodynamic variables were compared during preoxygenation and 45 seconds after induction.

Results: There were 90 ASA I or ASA II patients with 30 in each group. Tracheal intubating condition was regarded as acceptable in 33%, 53% and 90% of patients in groups 1, 2 and 3 respectively. All three groups had a decrease in heart rate and mean arterial pressure after induction but this changes wasn’t clinically significant.
**Conclusion:** Tracheal intubating condition was best after induction with lidocaine 1.5mg/kg, propofol 2mg/kg and remifentanil 2µg/kg. (Rawal Med J 2006;31:20-24)

**Key Words:** Remifentanil, propofol, tracheal intubation, analgesic opioids.

**INTRODUCTION**

Neuromuscular blocking agents provide the ideal agents to facilitate tracheal intubation. Succinyl-choline is a depolarization muscular relaxant with a very short duration effect which is commonly used in tracheal intubation but has side effects including cardiovascular effects (sinus bradycardia, junctional rhythm, ventricular arrhythmias), cardiac arrest resistant to resuscitation in children and triggering of malignant hyperthermia. Using propofol together with adjuvants such as short-acting opioids, adrenergic blockers, and local anesthetics can provide acceptable regimens for laryngoscopy and tracheal intubation without the need for depolarizing or non-depolarizing agents and good effect of propofol plus alfentanil in laryngoscopy and tracheal intubation has been shown.

Remifentanil is a potent and new derivative that has a fast (1-2 min) and short-duration of effect and there is rapid return of spontaneous respiration and airway reflexes and fast recovery from anesthesia without side effects. Lidocaine is a local anesthetic which is used intravenously to attenuate pressure response, to prevent or treat intracranial hypertension due to tracheal intubation, and reduce coughing during tracheal intubation or extubation. Propofol is the newest intravenous anesthetic drug, which can induce fast hypnosis, and its peak effect is seen in 90-100 seconds. Propofol has been used for induction and maintenance of general anesthesia and for sedation may cause myoclonus, apnea, hypotension and rarely thrombophelebitis. Remifentanil is the first ultra short acting opioid which is used as an adjunct in general anesthesia. Aim of this study, therefore, was to evaluate the effects of various doses of remifentanil with lidocaine and propofol on tracheal intubation conditions.

**MATERIAL AND METHOD**

The study population included 90 ASA class I and II elective surgical patients aged between 16-60 yr who required tracheal intubation for their surgery. Patients for neurosurgery and those who had gastro-esophageal reflux, irritable airway, obesity and those with Mallampati scores greater than 2 were excluded. All the patients received 10mg of oral diazepam as premedication.
10 hours before induction. Patients were monitored with electrocardiography, pulse oximetry, heart rate, respiratory rate, and mean arterial pressure using of lohmeier cardiocap. Patients were randomized into three groups, with 30 in each group, by opening unmarked envelopes indicating the induction regime as follows: propofol 2 mg/kg and remifentanil 0.5 µg/kg plus lidocaine 1.5 mg/kg (group 1), propofol 2 mg/kg and remifentanil 1 µg/kg plus lidocaine 1.5 mg/kg (group 2) and propofol 2 mg/kg and remifentanil 2 µg/kg plus lidocaine 1.5 mg/kg (group 3).

After establishing of intravenous access patients were preoxygenated while being monitored with electrocardiogram (ECG), mean arterial pressure, HR, RR, pulse oximetry and end tidal CO₂ after baseline measurements were recorded. The remifentanil solution was diluted to a volume of 10 ml with 0.9% saline. Induction was started with remifentanil as a bolus dose over 30 seconds followed by lidocaine. After the bolus dose of remifentanil and lidocaine, propofol 2 mg/kg was started as a rapid I.V. bolus. With disappearing of patient consciousness, which was judged by loss of response to command and loss of eyelash reflex, mask ventilation was applied by the second anesthetist, who wasn't aware about the induction regime. Ventilation was evaluated by second anesthetist and recorded as easy, difficult or impossible.

After 45 s of induction, vital signs were recorded, loss of consciousness was judged by second anesthetist, if it wasn’t sufficient, further propofol was administered in incremental boluses of 20 mg until good level of hypnosis was achieved. Ninety seconds after completion of induction, laryngoscopy was attempted. During laryngoscopy and tracheal intubation the anesthetist assessed each patient for life variables: Jaw relaxation, exposure of the vocal cords, position of the vocal cords, patient movement and coughing (table 1).

<table>
<thead>
<tr>
<th>Table 1. Intubating condition score</th>
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<tbody>
<tr>
<td>Score</td>
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<tr>
<td>1</td>
</tr>
<tr>
<td>Jaw relaxation</td>
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<tr>
<td>Laryngoscopy</td>
</tr>
<tr>
<td>Vocal cords</td>
</tr>
<tr>
<td>Coughing</td>
</tr>
<tr>
<td>Limb movement</td>
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</tbody>
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Tracheal intubation was considered acceptable when all the variables were in the second row or a lower one (score equal or less than 2). When one of the variables had score 3 or 4, tracheal intubation was considered unacceptable. In the cases of impossible intubation atracurium of
0.5mg/kg was used. Patients who had bradycardia (heart rate less than 50 per minute) were treated with 0.5mg Atropine. In the event of a decrease in mean arterial pressure of greater than 25% ephedrine was administred in 6 mg increments. Anesthesia was maintained with 1.5-2% Isoflurane in 50% nitrous oxide in oxygen at a total flow of 8 liters /min.

Table 2. Patient demographics (mean (SD or range) or number).

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
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<tbody>
<tr>
<td>Sex (m/f)</td>
<td>14/16</td>
<td>13/17</td>
<td>15/15</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>48</td>
<td>45</td>
<td>47</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>73 (15.3)</td>
<td>75 (12.8)</td>
<td>71 (10.9)</td>
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The data were collected and then entered the SPSS software (version 11.5), the quality variables were expressed as percentage and frequency and the quantity variables were expressed as central statistics and dipresion. The difference among the variables in the three groups was studied by the ANOVA test. Pearsons correlation was used to correlate the quantity variables. The significance level (p-value) was considered less than 0.05, and less than 0.01 in some cases of correlation test. The institutional Ethics committee approved the protocol and informed consent was obtained from study subjects.

RESULTS
The age, sex and weight of three groups were comparable (table 2). Intubation was completed successfully in 83 of 90 patients with propofol and remifentanil alone (26 of 30 in group 1, 27 of 30 in group 2 and 30 of 30 in group 3). Two patients in group 1 and one subject in group 2 required atracorium. Additional propofol (20-50mg) was required in eight subjects (Five patients in group1, three subjects in group 2). Patients who required additional propofol or muscle relaxant were considered having unacceptable intubating condition. A score of 2 or less for all of the criteria in table 1 was considered as satisfactory intubating conditions. A score of 3 or greater for any of the criteria was categorized as unsatisfactory. Ten of 30 subjects (33%) in group 1 had satisfactory intubating conditions compared with 16 of 30 (53%) in group 2 and 27 of 30 (90%) in group 3. There was statistically significant difference between groups 1, 2 and 3 (p<0.05). There was increased improvement in intubating condition as the dose of remifeutanil was increased (figure 1)
Difficulty with ventilation and muscle rigidity was noticed in one subject of group 1 who required neuromuscular blocking agent and additional propofol. There wasn’t significant change in heart rate and mean arterial pressure after intubation comparing preinduction period (figure 2).
DISCUSSION
Satisfactory intubating conditions in 60% of patients using only propofol 2.5mg/kg have been reported. In premedicated adult patients successful intubation was achieved in 86% using alfentanil 30µg/kg and propofol 2.5mg/kg.
Similarly, successful intubation was seen in 83% of patients using alfentanil 20µg/kg and propofol 2.5mg/kg. In another study, comparison of intubation conditions following propofol and succinylcholine with propofol and remifentanil 2µg/kg or 4µg/kg, there was similar intubating conditions with remifentanil 4µg/kg and succinylcholine, although in comparison with succinylcholine group, there was significant decrease in mean arterial pressure and prolonged apnea in subjects of remifentanil (4µg/kg) group.

Our study has demonstrated that in healthy adult patients without difficulty in airway anatomy, coinduction of propofol 2mg/kg with lidocaine 1.5 mg/kg and remifentanil 2µg/kg produce acceptable intubating condition. The best intubating condition was achieved with increasing remifentanil dose to 2µg/kg comparing to lower doses. The best intubating conditions have been induced with propofol 2 mg/kg and remifentanil 2µg/kg and acceptable intubating condition were achieved in 80% of patients. In our study, overall intubating conditions were regarded as acceptable in 33%, 53% and 90% of patients in groups 1, 2 and 3 respectively. In addition to improved intubating conditions, there was no significant hemodynamic (HR-MAP) change especially after intubation. In another study, evaluating the intubating conditions, haemodynamic responses and duration of apnea after propofol 2 mg/kg combined with either a bolus of remifentanil 2µg/kg or 4µg/kg, or succinylcholine 1mg/kg, it was demonstrated that patients intubated following remifentanil 4µg/kg and succinylcholine 1mg/kg had similar intubating conditions, although the mean duration of apnea was more than twice as long in the remifentanil group.

Remifentanil is 20 times more potent than alfentanil. The short duration effect of remifentanil confer an advantage over alfentanil where there are problems with prolonged apnea in short surgical cases. Unlike alfentanil, metabolism of remifentanil is independent of cytochrome P450 A34 enzyme system. Remifentanil is metabolized by non-specific tissue esterases and has a reliable half-life of approximately 3min. In prolonged difficult intubation which is predicted or, more importantly unexpected we feel this technique is favorable. It is possible to assess the airway by laryngoscopy and also importantly if oxygenation is possible. Decision can be made whether or not to awaken the patient or proceed. The other advantage of remifentanil is reliable short duration of apnea compared with alfentanil. Duration of apnea with remifentanil is similar to succinylcholine. We recommend this technique in short operations and any case where intubation is necessary without need of neuromuscular block. We also see potential use in patients who neuromuscular blocking agents are contraindicated (myopathies) or in cases where rapid sequence induction is preferred but succinylcholine is contra indicated.
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REFERENCES