JAW THRUST AS A PREDICTOR OF INSERTION CONDITIONS FOR THE PROSEAL LARYNGEAL MASK AIRWAY

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Abstract

We test the hypothesis that the response to jaw thrust is an effective predictor of insertion conditions for the ProSeal laryngeal mask airway (ProSeal LMA). One hundred and sixty patients (ASA grade 1-3, aged >18 yr) were studied. Five anesthetists blinded to the response to jaw thrust participated in the study, each performed >30 insertions. Induction of anesthesia was with propofol titrated to loss of lash reflex and apnea. A standard amount of jaw thrust was applied and any motor response noted by three observers. The ProSeal LMA was inserted using the standard digital technique. Insertion conditions were considered optimal if there was no motor or upper airway reflex response to insertion. There was no response to jaw thrust in 86% (137/160) of patients and insertion was optimal in 76% (121/160) of patients. A response to jaw thrust predicted suboptimal insertion conditions in 74% (17/23) and a lack of response predicted optimal insertion conditions in 84% (115/137). The accuracy, sensitivity and specificity were 0.82, 0.95 and 0.44, respectively. We conclude that jaw thrust is a reliable predictor of insertion conditions for the ProSeal LMA with the digital insertion technique after induction of anesthesia with propofol. We suggest that clinicians learn how to apply the correct amount of jaw thrust and perform this test routinely.

Keywords: ProSeal laryngeal mask airway; clinical test; jaw thrust; complications.

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Introduction

Failure to achieve an adequate depth of anesthesia is perhaps the commonest cause of problems during insertion of extraglottic airway devices in non-paralysed patients. Such problems vary in severity from gagging and coughing to laryngospasm and aspiration. Clearly, a reliable, routinely performed clinical test for depth of anesthesia would help obviate such problems. Potential tests include, loss of lash reflex, jaw relaxation, apnea, ease of face mask ventilation, dropping a weighted syringe, loss of verbal contact, bispectral index and the motor response to jaw thrust. There have only been three studies investigating this issue: two showed that dropping a weighted syringe was unreliable[1,2] and one that loss of verbal contact was unreliable[3].

However, Drage and colleagues found that the motor response to jaw thrust was a reliable indicator for insertion of the classic laryngeal mask airway following induction of anesthesia with propofol[3].

The ProSeal laryngeal mask airway (ProSeal LMA) is a improvement of the classic LMA with a modified cuff to increase the seal and a drain tube to provide a channel for regurgitated fluid, prevention of gastric insufflation and insertion of a gastric tube[4,5]. We test the hypothesis that the motor response to jaw thrust is an effective predictor of insertion conditions for the ProSeal LMA.

Materials and Methods

After Ethics Committee approval and written informed consent, we studied 160 consecutive patients, (ASA 1-3, aged >18 yr) scheduled for elective surgery with the ProSeal LMA as the airway device. Patients were excluded if they had a known difficult airway, jaw pathology or mouth opening less than 5 cm, were at risk of aspiration (unfasted, gastro-esophageal reflux) or had a body mass index greater than 35 $kg.m^{-2}$.

Patients were not premedicated.. A standard anesthesia protocol was followed and routine monitoring was applied. Anesthesia was conducted in the supine position with the patient's head on a standard pillow, 7 cm in height. The patient was pre-oxygenated for 3 minutes. Fentanyl 0.5-1.5 $\mu g.kg^{-1}$ i.v was administered and then propofol titrated at approximately 100 $mg.min^{-1}$ until loss of lash reflex and apnea. The lungs were manually inflated via a face mask using sevoflurane 5% in oxygen 100% for 30 sec. A Guedel airway was not used. The propofol contained lignocaine 1 $mg.ml^{-1}$ to reduce pain on injection.

Jaw thrust was applied by a single operator who had been trained to apply a standard amount of force. The technique involved placing the three middle fingers of each hand behind the angle of the jaw and lifting it anteriorly for 5 seconds using a total of 500g of force. Training involved learning the force required to lift a 500g weight using the middle three fingers of both hands. Any motor or upper airway reflex response was noted by three observers.

The anesthetist, who was blinded to the response to jaw thrust by facing away from the patient during jaw thrust, inserted the ProSeal LMA using the standard digital technique. This involved an assistant opening the mouth, placing the fully deflated cuff flat against the hard palate and pressing the device into and pushing it along the palatopharyngeal curve. A size 4 was used for females and a size 5 for males. Once inserted, the cuff was inflated with air, the proximal tube connected to the anesthesia breathing system and manual ventilation commenced.

A maximum of two attempts were allowed to obtain an effective airway. An attempt was defined as removal of the device from the mouth. An effective airway was defined as two consecutive breaths with an expired tidal volume ≥6 ml/kg. Ease of insertion was scored by the three observers and was graded as:

1) optimal-no motor response or upper airway reflex activation to insertion
2) suboptimal-motor response or upper airway reflex activation to insertion.

The study end-point was a response to insertion or effective ventilation if there was no response to insertion. After the study end-point, the patients was managed according to the preference of the clinician.

All insertions were done by five anesthetists (>6 month training) who were proficient with the ProSeal LMA (>50 uses). Each anesthetist performed >30 insertions. Sample size was based upon a projected difference of 15% for optimal ProSeal LMA insertion conditions, a type I error of 0.05 and a power of 0.90,

and was based on a 87% incidence of optimal insertions conditions from a previous study[3].

Results

The mean (range) age and weight of patients were 47 (18-88) yr and 76 (39-125) kg. There were 78 females and 82 males. The mean ± sd dose of fentanyl and propofol were 1.45 ± 0.23 $\mu g.kg^{-1}$ and 2.53 ± 0.62 $mg.kg^{-1}$, respectively. There were no interobserver variations in observations. There were no differences in performance among anesthetists. The results are presented in Table 1. There was no response to jaw thrust in 86% (137/160) of patients and insertion was optimal in 76% (121/160) of patients. The response to jaw thrust predicted suboptimal insertion conditions in 74% (17/23; 95% CI 54-93%) and a lack of response predicted optimal insertion conditions in 84% (115/137; 95% CI 78-90%). The accuracy, sensitivity and specificity were 0.82, 0.95 and 0.44, respectively. An effective airway was obtained in 94% (114/121) of patients in whom there was no response to insertion.

Table 1

	Optimal conditions	Suboptimal conditions	Total
No motor response to jaw thrust	115	22	137
Motor response to jaw thrust	6	17	23
Total	121	39	160

Discussion

We found that the response to jaw thrust predicted optimal and suboptimal insertion conditions for the ProSeal LMA in 84 and 74% of patients, respectively. This supports the findings of Drage and colleagues[3], who showed that it predicted optimal and suboptimal insertion conditions for the classic LMA in 87 and 80% of patients, respectively, using a similar dose of propofol and a similar insertion technique.

Jaw thrust does not predict the probability of insertion success; it only predicts the probability of patients defense reactions on insertion attempt of a ProSeal LMA. Nevertheless, these defense reactions could not only make insertion more difficult, they may even endanger the patient by regurgitation or they may result in injuries of the upper airway while inserting the ProSeal LMA. Therefore, it could be useful for clinicians to apply the correct amount of jaw thrust before induction of a ProSeal LMA to avoid these unpleasant and potentially dangerous defense reactions. Our study suggests that the response to jaw thrust is sufficiently reliable for routine use when digital insertion and propofol are employed with a ProSeal LMA.

An effective airway was only obtained in 94% of patients despite optimal insertion conditions. This is similar to the established success rate for insertion of the ProSeal LMA using the digital technique[4,5]. The most common causes of failure are an inability to insertion the ProSeal LMA into the pharynx and malposition once in the pharynx[6]. Much higher success rates can be obtained using guided techniques which prevent impaction at the back of the mouth and ensure correct positioning[7].

Our study has several limitations. First, our findings may not apply to other insertion techniques (such as the laryngoscope-guided technique) or other laryngeal mask airway devices (such as the intubating LMA), as the level of stimulation may be different. However, there is indirect evidence that the level of stimulation from other insertion techniques is similar for the ProSeal LMA[7]; and Drage and colleagues showed that the response to jaw thrust is a reliable indicator for classic LMA insertion. Second, our findings may not apply to other induction agents, particularly those that are less effective at obtunding upper airway reflexes, such as thiopentone[8]. Third, we did not determine the optimal level of jaw thrust and our findings may not apply if different level of jaw thrust are used. The optimal amount of jaw thrust would be that with the highest predictive value without morbidity. Finally, we did not formally assess any airway morbidity associated with jaw thrust. Perhaps jaw thrust increases the frequency of jaw ache, as occurs during face mask anesthesia[9].

We conclude that jaw thrust is a reliable predictor of insertion conditions for the ProSeal LMA with the digital insertion technique after induction of anesthesia with propofol. We suggest that clinicians learn how to apply the correct amount of jaw thrust and perform this test routinely.

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