



## Assessment of Mini-dose Succinylcholine Effect on Facilitating Laryngeal Mask Airway Insertion

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### ABSTRACT

**Introduction:** Laryngeal Mask Airway (LMA) has gained wide acceptance for routine airway management and with increasing emphasis on day care surgery it is widely used. The aim of this study was to assess the effects of mini dose succinylcholine (0.1mg/kg) with semi-inflated cuff on facilitation of laryngeal mask airway insertion in order to achieve more satisfaction yet less complications. **Methods:** In a randomized double-blinded study, sixty ASA 1, 2 and 3 patients aged 20-60 years scheduled for urologic surgical procedures were included. Thirty patients received succinylcholine (Group S), and thirty received 0.9% sodium chloride as a placebo (Group C). **Results:** Coughing occurred in 33.3% of patients in the control group and there was no incidence in succ group ( $P=0.002$ ). Head or limb movement occurred in 70% of the patients in the control group vs. 10% in succ group ( $P<0.001$ ). Laryngospasm occurred in 36.6 % of the patients in the control group but there was no incidence in succ group ( $P=0.004$ ). Additional propofol was required in 53% of the patients in control group vs. 10% for succ group ( $P=0.001$ ). Ease of insertion and first successful attempt of LMA were achieved in 93.3% and 90% of the patients respectively in group S ( $P<0.05$ ). Myalgia and sore throat occurred in 66.7 % of patients in the group C in comparison with 33.3% in group S ( $P=0.06$ ). **Conclusion:** The combination of propofol with mini dose succinylcholine, provided a significantly better method for LMA insertion, while reduced propofol doses were needed and number of attempts decreased.

### Introduction

Patient safety and acquiring skilled practice has always been of great importance for the physician of all eras.<sup>1-27</sup> The laryngeal mask airway (LMA), being firstly introduced in 1983, fills the gap between the face mask and tracheal tube. It causes minimal disturbances in cardiovascular and respiratory systems.<sup>28</sup> As outpatient surgery continues to grow over the world, the emphasis on day case anaesthesia is increased which in turns has led to increasing use of the laryngeal mask airway instead of face mask or tracheal tube. Some complications including gagging, coughing and laryngospasm may occur in response to inserting an LMA which may make correct positioning difficult or impossible.<sup>29</sup> Although LMA is a popular device between anesthesiologists, an optimal induction technique to insert an LMA has not been defined. For most anesthesiologists, propofol is the agent of choice for LMA insertion as

this agent best obtunds oropharyngeal reflexes.<sup>28,29</sup> The standard dose of propofol (2-3 mg/kg) is accompanied by a higher failure rate; however, its use in doses which allow adequate jaw relaxation and prevent patient's reaction to LMA insertion commonly results in hypotension and prolonged apnea as the drug's side effects.<sup>28</sup> A number of studies applied different induction methods and insertion techniques to find the best method for LMA insertion.<sup>30</sup> Intravenous induction technique either with a single or two drugs is commonly used to insert an LMA. In the latter method, propofol is used with another anesthetic drug such as thiopentone or a volatile agent, a muscle relaxant or local anesthetic.<sup>29,30</sup> Drugs commonly used as sedative premedications include benzodiazepines, opioids and lidocaine which blunt laryngeal reflexes and may be useful in facilitating LMA insertion. Since the duration of action of these drugs is rather long, their use in short term surgeries may be contraindicated. Use of low dose

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neuromuscular blocking drugs was firstly started by Dr. AIJ Brain which used a small dose of alcuronium (0.2mg kg-1) before LMA insertion and has continued till now. Later, some studies showed that relaxation was not essential for LMA insertion but the upper airway reflexes must be reduced for insertion to be successful.<sup>31</sup>

## Materials and methods

We conducted a double-blinded randomized study to investigate ease of LMA insertion after the induction of anesthesia with propofol supplemented with mini-dose of succinylcholine.

Approval was obtained from our local hospital research ethics committee. Informed written consent was obtained from participating patients. Then, we included sixty American Society of Anesthesiologists (ASA) 1, 2 and 3 patients of either sex, aged 20 to 60 years, scheduled for a day urologic procedures, lasting for not more than 1 hour.

Selection of the patients was made as per criteria excluding the confounding factors in order to make the valid conclusion.

Patients with following conditions, were excluded from the study:

- pharyngeal pathology.
- any anatomical abnormality of mouth, pharynx and larynx.
- risk of aspiration (History of gastroesophageal reflux or upper gastrointestinal surgery).
- full stomach (pregnancy, hiatal hernia).
- high airway resistance
- difficult airway
- low pulmonary compliance (severe obesity).
- previous history of hypersensitivity to any of study drugs.
- previous history of malignant hyperthermia

All patients were randomly allocated to one of the 2 groups, with 30 patients in each group. Group control (Group C) received a bolus dose of 2 ml of 0.9% sodium chloride I.V post induction. Study Group (Group S) received a bolus of succinylcholine 0.1 mg/kg diluted in 2 ml of 0.9% sodium chloride I.V post induction.

A uniform general anesthesia technique was applied in all patients.

Preoxygenation was performed for 3 minutes before induction and then premedication was performed with midazolam 0.01 mg/kg, and fentanyl 1 µg/kg and induction was performed using propofol 2 mg/kg. Thirty seconds later patients received either 2 ml of 0.9% sodium chloride (control group) or a bolus dose of succinylcholine 0.1 mg/kg diluted in 2 ml of 0.9% sodium chloride (succinylcholine group). Thirty seconds after that, LMA was inserted by a blind investigator using a semi-inflated LMA technique, while assessing the condition during LMA insertion. Additional doses of propofol were given where conditions for LMA insertion were poor, or before

second attempt.

If there were airway reflexes preventing LMA insertion, inability to ventilate after insertion of the LMA, or limb and head movement requiring restraint in the patient, another dose of propofol 0.5 mg/kg bolus was given, followed by another attempt at LMA insertion 30 seconds later. This cycle was repeated until the LMA was successfully inserted. The numbers of attempts were recorded, but ease of insertion was assessed only during the first attempt.

An investigator blinded to the patient group collected the following data: Demographic data: age, sex

Incidence of cough and gagging, laryngospasm. Head and limbs movement was evaluated as follows<sup>31,32</sup>:

1. None
2. Mild
3. Moderate
4. Severe

Ease of Insertion of LMA and the overall insertion conditions were evaluated as following<sup>31,33</sup>:

1. Easy
2. Difficult
3. Impossible

Post operative myalgia and sore throat were evaluated as following<sup>31</sup>:

1. None
2. Mild
3. Moderate
4. Severe

The degree of myalgia was scored according to the severity from 1 to 4. Pain was assessed by a visual analogue self rating method.<sup>34</sup>

## Results

The demographic data were comparable among the two groups in terms of age and gender ratio. There was no significant difference between the groups with respect to age and sex.

Gagging occurred in up to 23 (76.7%) of patients in group C of which it was mild in 10 patients, moderate in 10 patients and severe in 3 patients. This rate was 16.6% in group S of which it was mild in 4 patients and moderate in 1 patient. The difference among them was statistically significant ( $P<0.001$ ).

Coughing occurred in up to 7 (33.3%) patients in group C of which it was mild in 7 patients and moderate in 3 patients. There was no incidence of coughing in group S and the difference was statistically significant ( $P=0.002$ ).

Laryngospasm occurred in 11 (36.6%) patients of the control group of which it was mild in 6 patients, moderate in 4 patients and severe in 1 patient.

There was no incidence of laryngospasm in succinylcholine group and the difference was statistically significant ( $P=0.004$ ).

Head or limb movement occurred in 21 (70%) patients of group C of which it was mild in 7 patients, moderate in 10 patients and severe in 4 patients. This rate was

10% (3 patients) in group C and they all were mild in severity and the difference was statistically significant ( $P<0.001$ ; Table 1).

The first attempt in LMA insertion was successful in up to 27 (90%) patients in group S whereas this rate was 46.6% (14 patients) in group C. LMA was successfully inserted in the second or further attempts 10% (3) patients and 53.4% (16) patients in succinylcholine and the control groups respectively. The difference was statistically significant ( $P=0.001$ ).

The standard dose of propofol for induction of anesthesia was defined as 2 mg/kg and if there was a need to excess doses of propofol, bolus doses of 0.25 mg/kg was administered again.

Additional propofol was required in 53% of patients in group C, whereas this rate was 10% for group S, respectively (Table 1). The difference among them was statistically significant ( $P=0.001$ ).

Myalgia and sore throat occurred in (66.7 %) patients of the control group of which it was mild in 12 patients and moderate in 8 patients. The incidence of myalgia and sore throat was 43.3% (13 patients) in group S of which it was mild in 12 patients and moderate in 1 patient. The difference was not statistically significant ( $P=0.06$ ). The first attempt to LMA insertion was successful in up to 90% (27 patients) in group S whereas this rate was 46.6% (14 patients) in group C. Success in insertion of LMA was achieved in second or more attempts of 3 (10%) patients of group S and 16 (53.4%) patients in group C. The difference was statistically significant ( $P=0.001$ ; Table 2).

**Table 1.** Demographic Data

	Group control No(%)	Group succ No(%)	P value
<b>Excess Propofol</b>			
Yes	16(53.4)	3(10)	$P=0.001$
no	14(46.6)	27(90)	
<b>Number of attempts</b>			
1	14(46.6)	27(90)	$P=0.001$
≥2	16(53.4)	3(10)	

**Table 2.** Postoperative Myalgia and sore throat

	Group control No(%)	Group succ No(%)	P value
No	10(33.3)	17(56.7)	0.06
Yes	20(66.7)	13(43.3)	

## Discussion

Since the introduction of the laryngeal mask airway, various methods have been evaluated in order to make its insertion smooth, with least side effects and cost effectiveness. The insertion of an LMA requires suppression of upper airway reflexes to prevent coughing, gagging or laryngospasm<sup>31</sup> Since propofol is the induction agent of choice for LMA

insertion but propofol alone, in standard dose does not provide the best insertion conditions.<sup>28-31</sup>

The use of minidose of muscle relaxant provides a better insertion condition for propofol and thiopentone as induction agent. Depolarizing muscle relaxants have a far better effect than non-depolarizing drugs.<sup>30</sup>

Succinylcholine is the only available depolarizing neuromuscular blocker. It is characterized by rapid onset of effect and ultrashort duration of action. Administration of 1 mg/kg of succinylcholine results in complete relaxation in 60 seconds and recovery requires 9-13 minutes. Probable side effects are prolonged apnea, anaphylaxia, and myalgia. Intubating dose of succinylcholine is 1-2 mg/kg and a very small dose of succinylcholine (0.1 mg/kg) is effective in relieving laryngospasm without prolonged apnea.<sup>35</sup>

In our study ease of insertion of LMA and the excellent insertion conditions were obtained in 93.3% of patients in group S compared to 36.6% of group C ( $P<0.001$ ). There was no incidence of head and limbs movement, coughing or laryngospasm in group S. Gagging was significantly less observed in the Group S compared to the Group C.

Coughing, head and limbs movement and laryngospasm occurred less frequently in the Group S compared to the Group C. These findings are consistent with those by Korula et al.<sup>31</sup> compared succinyl choline 0.35 mg/kg with 0.08 mg/kg of atracurium for LMA insertion during thiopentone induction and they found that succinyl choline provided better insertion conditions as there was no coughing or gagging, and minimal patient movement. Monem and Chohan, comparing succinylcholine 0.35mg/kg with atracurium 0.06mg/kg under thiopentone induction, found excellent insertion conditions with succinylcholine group in 83% as against 46% for that of atracurium. There was no failure in the succinylcholine group compared with 17% failure rate with atracurium.<sup>36</sup>

We used the minimum dose of propofol (2 mg/kg) for the induction of anesthesia. If there were airway reflexes coughing, gagging, head or limb movement preventing LMA insertion, excess dose of propofol was needed, followed by another attempt at LMA insertion 30 seconds later. In our study, the overall amount of propofol used in the control group, was higher than succinylcholine group. Smooth LMA insertion using the defined propofol dose, was possible in only 46% of patients in the Group C and excess dose of propofol was needed in 53% of patients. The average propofol used was  $206 \pm 50.2$  mg in the control group and  $162 \pm 21.3$  mg in succinylcholine group. The difference was statistically significant ( $P<0.001$ ).

Smooth LMA insertion with defined propofol dose, was possible in about 90% of patients in group S and excess dose of propofol was needed in only 9.9% of patients; these findings were consistent with those of Jamil et al. in which LMA insertion was easy with less swallowing, gagging or coughing in succinylcholine group. Less amounts of propofol ( $2.05 \pm 0.07$  mg/kg in respect to

2.85±0.07 mg/kg) were required in succinylcholine group; hence reduced side effects of propofol were observed in this group.<sup>28</sup> The success rate of LMA insertion in the first attempt was 90% in succinylcholine group and 46% in control group and the difference was statistically significant ( $P=0.001$ ). Mean number of attempts was 1.1±0.3 in succinylcholine group and 1.7±0.6 in control group. W.T. Salem and S. Jamil reported successful LMA insertion in 90% of patients in the first attempt in succinylcholine group.<sup>28,37</sup>

Postoperative sorethroat and myalgia was seen with a higher incidence in control group (66.7%) than succinylcholine group (33.3%) and the difference was not statistically significant. ( $P=0.06$ ) Chui and Ho in a study reported a higher incidence of myalgia in control group than in succinylcholine group which was statistically significant.<sup>38</sup> Similar results were achieved by Chae YK and coworkers.<sup>39</sup> Monem A. and Chohan U. comparing succinylcholine 0.35 mg/kg with atracurium 0.06mg/kg under thiopentone induction reported a similar incidence of post-operative myalgia (3.3%) in each group.<sup>36</sup> Usually atracurium is not associated with postoperative myalgia but the incidence of myalgia in atracurium group has been reported and could be because of factors like positioning of patient during surgery and early ambulation.<sup>31</sup> Waters hypothesized that post suxamethonium myalgia is due to the shearing of soft tissues by the asynchronous muscle contractions. Therefore, a lesser dose of the drug will cause less myalgia.<sup>40</sup>

In this study, as well as several other studies in this respect, the incidence of sore throat and myalgia was higher in the control group. The most likely reason for this lower incidence of sore throat and myalgia in the succinylcholine group may be due to reduced number of attempts and minimal manipulation of upper airway and pharynx.

## Conclusion

Propofol as the only anesthetic was not helpful in ease of insertion of LMA but in combination with mini dose succinylcholine, LMA was easily inserted. It seems that use of mini dose succinylcholine, reducing upper airway reflexes, is successful in ease of insertion of LMA and reducing propofol dose needed and a reduction in number of attempts. Reduced number of attempts was accompanied by less upper airway and pharynx manipulation resulting in a lower incidence of myalgia and sore throat.

**Competing interests:** The authors had no competing interests to declare in relation to this article.

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