

Assessment of Effect of Low Dose Succinylcholine on Facilitating Insertion of Laryngeal Mask Airway- A Single-blind Randomised Study

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ABSTRACT

Introduction: Laryngeal Mask Airway (LMA) insertion is often associated with complications such as gagging, laryngospasm and mobility of the head and neck while insertion. To overcome this and achieve a smooth insertion, many drugs are tried one of them is being succinylcholine.

Aim: To assess the effects of low dose succinylcholine (0.1 mg/kg) on facilitation of LMA insertion to achieve adequate conditions with fewer or no side effects.

Materials and Methods: Sixty patients of American Society of Anesthesiologists (ASA) I and II grade were posted for elective surgeries under general anaesthesia with LMA. Patients were randomly allocated into two groups of 30 each. Control group (Group C) received a bolus dose of 2 mL of 0.9% sodium chloride IV post induction. Study Group (Group S) received a bolus of succinylcholine 0.1 mg/kg diluted in 2 mL of 0.9% sodium chloride IV post induction. Following activities like

jaw relaxation, coughing/gagging, head and limb movements, presence or absence of laryngospasm and duration of apnea were noted and were compared using chi-square test, while performing LMA insertion under general anaesthesia.

Results: It was found that the number of incidences of gagging (mild) and coughing (mild) in Group S was 3.33% and 0%, respectively, while it was 23.33% and 26.66% in Group C. It was found that group S had excellent insertion conditions in 94% of patients as compared to 36% of group C ($p < 0.001$). In 93.33% of patients, LMA was inserted in 1st attempt in group S, whereas 40% of patients in group C required more than one insertion attempt and also 93.3% of patients in group S did not require excess propofol, whereas supplement doses of propofol in control group was required in 60% of patients.

Conclusion: Low dose succinylcholine provides better LMA insertion conditions with reduced number of attempts, incidences of gagging and coughing.

Keywords: Coughing, Daycare surgery, Gagging, Low dose, Postoperative myalgia, Propofol

INTRODUCTION

The LMA is a supraglottic device which provides a safe and effective method of securing an airway in anaesthesia and critical care setting. With the increasing trend of day care surgery, day care anaesthesia has increased leading to increasing use of the LMA instead of facemask or tracheal tube. It is a better and safer alternative in emergency situations to secure airway or in situations where difficult airway is anticipated. Complications such as gagging, coughing and laryngospasm may occur in response to inserting LMA making its correct positioning difficult and leading to difficulty in insertion of LMA [1].

This may also increase the number of attempts of insertion leading to increase in incidence of sore throat. In spite of being used commonly, the technique for its insertion varies. Most commonly Propofol is preferred as it suppresses upper airway reflexes and provides adequate jaw relaxation [2,3]. However, side effects such as prolonged apnea and hypotension accompanies the drug [4,5]. Use of rapid onset, short acting neuromuscular blocking drugs such as succinylcholine suppress laryngeal reflexes but also leads to prolonged apnea, myalgia on administration of intubating dose (1-2 mg/kg) [6]. Therefore, low dose succinylcholine has been used. Low dose signifies the minimum dose at which adequate suppression of laryngeal reflexes occur with minimum or no incidence of myalgia [6].

Thus, this study was designed to assess the effects of low dose succinylcholine (0.1 mg/kg) with semi-inflated cuff on facilitation of LMA insertion as the primary objective. The secondary objective was to assess the avoidance of side effects associated with succinylcholine with use of lower dose (0.1 mg/kg).

MATERIALS AND METHODS

A single-blinded randomised study was done in Acharya Vinobha Bhawe Rural Hospital, Sawangi in unit of Jawaharlal Nehru Medical College, Sawangi in July 2019 after approval from the Institutional Ethics committee. (RefNo. DMIMS(DU)/IEC/2019/7942).

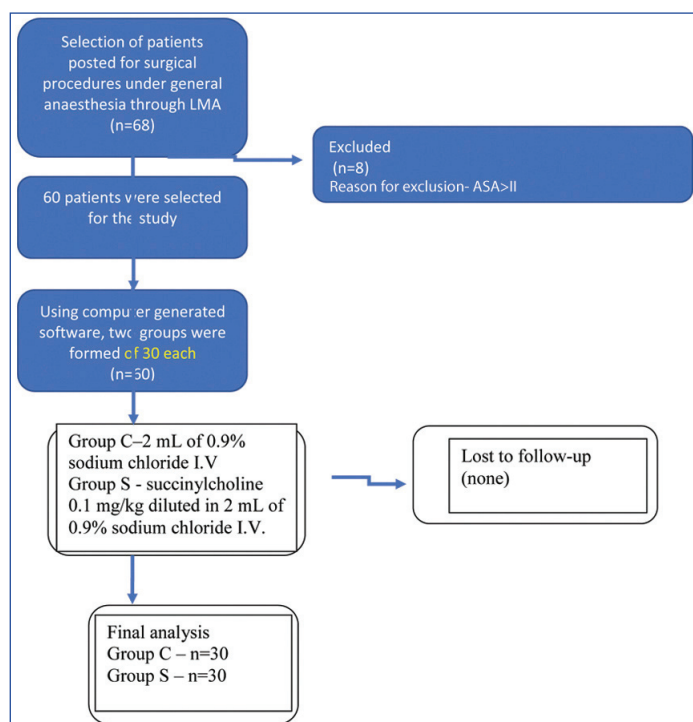
Sample size was derived using software OpenEpi (openepi.com). For the sample size, the power was set at 80% ($\beta = 0.2$) with an odd ratio of 30. The significant level was set as 5% ($\alpha = 0.05$, two-tailed). The calculated sample size was minimum 28, so taking potential drop-outs into consideration; the sample size was set as 30 for each group. A total of 60 American Society of Anesthesiologists.

Inclusion criteria: (ASA) class I and II patients of either sex, aged 20 to 60 years scheduled for surgical procedures under general anaesthesia lasting for less than one hour were taken for the study. A written and informed consent was derived from all patients.

Exclusion criteria: Following patients were excluded from the study:

- ASA class >II
- Patients having any anatomical abnormality of mouth, pharynx and larynx.
- Risk of aspiration (gastroesophageal reflux or upper gastrointestinal surgery).
- Full stomach (pregnancy, hiatal hernia).
- High airway resistance
- Anticipated difficult airway
- Low pulmonary compliance (severe obesity).
- History of hypersensitivity to study drug

Sixty patients were randomly divided into two equal groups using computer generated software. Control group (Group C) was given 2 mL of 0.9% sodium chloride IV. Study Group (Group S) was given succinylcholine 0.1 mg/kg diluted in 2 ml of 0.9% sodium chloride I.V. Distribution of the patients presented in [Table/Fig-1].



[Table/Fig-1]: Flowchart of patients enrolled in study.

Patients were preoxygenated for three minutes before induction and then premedication were given with inj. glycopyrrolate 0.004 mg/kg, inj. midazolam 0.01 mg/kg, and inj. fentanyl 1 µg/kg. Induction was done with inj. propofol 2 mg/kg. The effectiveness of drug was confirmed when the patient had lost consciousness, assessed by failure to respond to verbal commands and loss of eyelash reflexes. LMA was inserted 30 seconds later and the insertion conditions were noted.

If any airway reflexes, improper ventilation after insertion of the LMA, or limb and head movement, was seen then second dose of propofol 0.5 mg/kg bolus was given, after which next attempt at insertion was given 30 seconds later. This was done till successful insertion and number of attempts were recorded. On the contrary, ease of insertion was assessed only during the first attempt. Jun JH et al., described ease of insertion as “easy” if the first attempt of insertion was successful, “difficult” when second or third attempt was a success and “failure” when all three attempts fails. [7]. This classification was used in the index study.

A blinded investigator to the patient group collected the following demographic data: age, sex, weight, height. Incidence of cough and gagging, laryngospasm, head and limb movements, number of attempts, use of excess propofol and postoperative myalgia incidence was evaluated.

STATISTICAL ANALYSIS

The parameters and patient data were recorded and entered in Microsoft Excel sheet. (SPSS Inc. Chicago, IL, USA) version 20.0 software for windows was used for analysis. Incidence of emetic episodes was compared in different study groups and the results was analysed by chi-square test. $p < 0.05$ was considered to be significant.

RESULTS

The two groups were comparable in terms of age and gender as shown in [Table/Fig-2].

Variables	Group S	Group C	p-value
Age (years)	28.5±2.12	30±7.07	0.27
Sex (m/f)	16/14	17/13	1
Weight (kg)	61±1.40	60.5±1.6	0.2
Height (cm)	157±15.5	152±14.14	0.19

[Table/Fig-2]: Study population.

[Table/Fig-3] showed that in 93.33% of patients LMA was inserted in 1st attempt in group S, whereas 40% of patients in group C required more than one insertion attempt.

No. of attempts	Group C (Control)	Group S (Succinyl)	p-value
1	18 (60%)	28 (93.33%)	0.0025*
≥2	12 (40%)	2 (6.67%)	0.0025*

[Table/Fig-3]: Number of attempts for LMA insertion amongst two groups.

*Statistically significant; Chi square test

[Table/Fig-4] showed incidence of Gagging in two groups and it was statistically significant ($p < 0.05$). [Table/Fig-5] showed that there was no incidence of coughing in group S and the difference was statistically significant ($p = 0.0026$).

Gagging	Group C	Group S	p-value
Mild	7 (23.33%)	1 (3.33%)	0.023*
Moderate	6 (20%)	1 (3.33%)	0.046*
Severe	2 (6.6%)	0	0.475

[Table/Fig-4]: Incidence of gagging.

*Statistically significant; Chi square test

	Group C	Group S	p-value
Mild	8 (26.66%)	0	0.0026*
Moderate	0	0	ND
Severe	0	0	ND

[Table/Fig-5]: Incidence of coughing among two groups.

*Statistically significant; Chi square test; ND: Not defined

“Easy” insertion conditions were obtained in 94% of patients in Group S compared to 36% of Group C. ($p < 0.001$).

Head or limb movement occurred in 20 (66.6%) patients of group C, whereas it was not seen in group S ($p < 0.001$)

[Table/Fig-6] showed that 93.3% of patients in group S did not require excess propofol.

Excess propofol	Group C	Group S	p-value
Yes	18 (60%)	2 (6.66%)	<0.0001*
No	12 (40%)	28 (93.3%)	<0.0001*

[Table/Fig-6]: Use of excess of propofol in two groups.

*Statistically significant; Chi square test

[Table/Fig-7] showed that group S had postoperative myalgia in 26.66% cases while it was 13.33% in group C, results being statistically insignificant.

Postoperative myalgia	Group C	Group S	p-value
Yes	4 (13.33%)	8 (26.66%)	0.20
No	26 (86.66%)	22 (73.33%)	0.20

[Table/Fig-7]: Incidence of postoperative myalgia in two groups.

Chi square test

Laryngospasm occurred in 13 patients of the group C. There were no incidences of laryngospasm in succinylcholine group and the difference was statistically significant ($p = 0.04$).

DISCUSSION

The LMA has been a breakthrough in airway management with its introduction in 1983 [8]. Salem WT obtained that in 75% of

patients coughing and gagging was observed when LMA was inserted using only propofol and in only 60% of patients it was successful at the first attempt [9].

Succinylcholine is a depolarising neuromuscular blocker with side effects such as prolonged apnea, anaphylaxis, and myalgia are associated with intubating dose of succinylcholine (1-2 mg/kg). Thus, a low dose of succinylcholine (in this study 0.1 mg/kg) was used for achieving adequate LMA insertion conditions without side effects [6].

Therefore, objective of this study was to assess the effectiveness of low dose of Succinylcholine in facilitation of LMA insertion, but with minimal or rather no side effects related to succinylcholine. Various studies have been conducted comparing different low doses of succinylcholine to have adequate LMA insertion conditions with minimal side effects, as larger doses that resulted in significant postoperative myalgia. Yoshino A et al., compared 0.25 with 0.5 mg/kg of succinylcholine and found that 0.5 mg/kg of succinylcholine had better diminution of airway reflexes facilitating LMA insertion. They used thiopentone as an inducing agent without an opioid. But, this dose resulted in more postoperative myalgia [8]. George LR et al., compared two different doses of succinylcholine 0.1 mg/kg and 0.25 mg/kg for LMA insertion and observed that overall insertion conditions were better in 0.25 mg/kg group than 0.1 mg/kg group [10].

Aghamohammadi D et al., found that use of low dose of succinylcholine with supplementation of propofol had better LMA insertion conditions and use of excess propofol and number of attempts reduced significantly [11]. In this study, ease of insertion of LMA and the excellent insertion conditions were obtained in 94% of patients in Group S compared to 36% 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 occurred less frequently in the Group S compared to the Group C. These findings were consistent with Aghamohammadi D et al., where ease of insertion with 0.1 mg/kg succinylcholine was 93.33% and in normal saline group it was 36.66% ($p < 0.001$) [11]. Korula S et al., did a comparative study for LMA insertion using succinyl choline 0.35 mg/kg and 0.08 mg/kg of atracurium and concluded that succinylcholine had better insertion conditions with minimal incidence of coughing, gagging and limb movements [12].

Similarly, Moneni A also did a comparative study for LMA insertion using succinylcholine 0.35 mg/kg and 0.06 mg/kg of atracurium and concluded that in succinylcholine group 83% patient had excellent insertion conditions, whereas it was only 46% with atracurium [13].

In the present study, for any airway reflexes, head or limb movement during LMA insertion, excess dose of propofol was given, following which another attempt at insertion was taken 30 seconds later. The amount of excess propofol used in the control group, was higher than succinylcholine group. In 60% patients of Group C excess dose of propofol was needed against 6.66% of Group S. The difference was statistically significant. ($p < 0.001$). These findings were consistent with those of Jamil SN et al., [14].

In this study, LMA insertion in first attempt was found to be 93.33% in succinylcholine group whereas it was 60% in the control group. The difference was statistically significant. ($p = 0.0025$). It is similar to Aghamohammadi D et al., where successful LMA insertion in first attempt in 90% patients in succinylcholine group was found and it was 46.6% patients in control group [11]. Ho KM and Chui

PT also found that LMA insertion in first attempt was higher in the succinylcholine group [15].

Postoperative sore throat and myalgia was seen with a lesser incidence in control group (13.33%) than succinylcholine group (26.66%) and the difference was not statistically significant ($p = 0.2$). It was similar to findings of Gunaseelan S and Prabhu RK, who also concluded the incidence of postoperative myalgia as statistically not significant [16]. Ho KM and Chui PT reported a higher incidence of myalgia in control group than in succinylcholine group which was statistically significant [15]. Also, Waters DJ and Mapleson WW gave a hypothesis that postsuccinylcholine myalgia is due to the shearing of soft tissues by the asynchronous muscle contractions. Thus, lesser dose of the drug will cause less myalgia [17].

Limitation(s)

The type of LMA used was not defined, so insertion conditions with different generation LMAs are not comparable. Also, patients with pseudocholinesterase enzyme deficiency were the limitation of the study.

CONCLUSION(S)

The use of low dose succinylcholine, reduced upper airway reflexes, also lead to ease of insertion of LMA and reduction in number of attempts. Reduced number of attempts hereby lead to less upper airway manipulation resulting in a lower incidence of myalgia and sore throat. Thus, low-dose succinylcholine (0.1 mg/kg) when compared to standard dose of propofol facilitated LMA insertion. The supplemental doses of propofol were also significantly reduced.

REFERENCES

- [1] Asida SM, Ahmed SS. Ease of insertion of the laryngeal mask airway in pediatric surgical patients: Predictors of failure and outcome. *Saudi J Anaesth [Internet]*. 2016;10(3):295-300. Available from: <https://pubmed.ncbi.nlm.nih.gov/27375384>.
- [2] Gavel G, Walker RWM. Laryngospasm in anaesthesia. *Contin Educ Anaesth Crit Care Pain [Internet]*. 2013;14(2):47-51. Available from: <https://doi.org/10.1093/bjaceaccp/mkt031>.
- [3] Nirmala BC. A comparative study for ease of insertion of laryngeal mask airway with propofol and thiopentone sodium. *IOSR J Dent Med Sci*. 2014;13(1):64-69.
- [4] Folino TB, Parks LJ. Propofol. In: StatPearls Publishing LLC. Treasure Island (FL); 2020.
- [5] Dinis-Oliveira RJ. Metabolic profiles of propofol and fospropofol: Clinical and forensic interpretative aspects. *Biomed Res Int*. 2018;2018:6852857.
- [6] Naguib M, Lien CA. Pharmacology of Muscle Relaxants and their Antagonists. In: Miller RD. *Miller's Anesthesia*. 2010:859-911.
- [7] Jun JH, Baik HJ, Kim JH, Kim YJ, Chang RN. Comparison of the ease of laryngeal mask airway proseal insertion and the fiberoptic scoring according to the head position and the presence of a difficult airway. *Korean J Anesthesiol*. 2011;60(4):244-49.
- [8] Yoshino A, Hashimoto Y, Hirashima J, Hakoda T, Yamada R, Uchiyama M. Low-dose succinylcholine facilitates laryngeal mask airway insertion during thiopental anaesthesia. *Br J Anaesth*. 1999;83(2):279-83.
- [9] Salem WT. A comparison of midazolam and mini-dose succinylcholine to aid laryngeal mask airway insertion during propofol anaesthesia. *J Egypt Natl Canc Inst*. 2000;12(1):65-69.
- [10] George LR, Sahajanandan R, Ninan S. Low-dose succinylcholine to facilitate laryngeal mask airway insertion: A comparison of two doses. *Anesth essays Res [Internet]*. 2017;11(4):1051-56. Available from: <https://pubmed.ncbi.nlm.nih.gov/29284874>.
- [11] Aghamohammadi D, Eydi M, Hosseinzadeh H, Rahimi M, Golzari SEJ. Assessment of mini-dose succinylcholine effect on facilitating laryngeal mask airway insertion. *J Cardiovasc Thorac Res*. 2013;5:17-21.
- [12] Korula S, Abraham V, Afzal L. Evaluation of low dose succinyl choline for insertion of laryngeal mask airway during thiopentone induction: A comparison with atracurium. *J Anaesthesiol Clin Pharmacol [Internet]*. 2010;26(3):355-59. Available from: <http://www.joacp.org/article.asp?issn=0970-9185>.
- [13] Moneni A. Comparison of low dose succinylcholine with low dose atracurium to evaluate LMA insertion during thiopentone induction. *J Anaesthesiol Clin Pharmacol*. 2004;20:39-44.
- [14] Jamil SN, Singhal V, Habib SK. The effect of mini-dose suxamethonium to facilitate laryngeal mask airway insertion under propofol anesthesia. *Rawal Med J*. 2010;35(1):02-05.
- [15] Ho KM, Chui PT. The use of mini-dose suxamethonium to facilitate the insertion of a laryngeal mask airway. *Anaesthesia*. 1999;54(7):686-89.

[16] Gunaseelan S, Prabu RK. Comparison of two doses of succinylcholine to facilitate the Laryngeal mask airway insertion under propofol anaesthesia in adult patients undergoing elective minor surgical procedures. *Asian J Med Sci.* 2017;8(4):21-26.

[17] Waters DJ, Mapleson WW. Suxamethonium palsy: Hypothesis and observation. *Anaesthesia.* 1971;26(2):127-41.

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