Section: Anesthesia

Original Research Article

A COMPARATIVE STUDY OF PROPOFOL-FENTANYL AND PROPOFOL-FENTANYL WITH LOW DOSE SUCCINYLCHOLINE 0.5MG/KG FOR LARYNGEAL MASK AIRWAY INSERTION

T. Muthukumar[1], N. Vijayarahavan[2], M. Shanthi[2], M. Shanthi[2], S. Sharathkumar[2], Ayisha Hafsa Sherin[3]

[1]Senior Assistant Professor, Department of Anesthesia, Government Thoothukudi Medical College and Hospital, Tamilnadu, India
[2]Assistant Professor, Department of Anesthesia, Government Thoothukudi Medical College and Hospital, Tamilnadu, India
[3]Assistant Surgeon, Department of Anesthesia, Melapalayam Government Hospital, Tirunelveli, Tamilnadu, India

Received : 10/05/2023
Received in revised form : 22/06/2023
Accepted : 01/07/2023

Keywords:
Propofol, Fentanyl, Succinylcholine, laryngeal mask airway, LMA.

Corresponding Author:
Dr. S. Sharathkumar,
Email: drssharathkumar@gmail.com

DOI: 10.47009/jamp.2023.5.4.142

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (4); 711-715

Abstract

Background: Although propofol is known to blunt the laryngeal reflexes often, patient movement, coughing, and gagging occur on insertion. Succinylcholine has been established to enable the insertion of the Laryngeal Mask Airway (LMA) without any depression of the respiratory centre. This study aimed to compare the success rate of introducing LMA with low-dose succinylcholine and without succinylcholine after propofol induction. **Materials and Methods:** This is a randomised double-blind controlled trial among a study population of 60 patients scheduled for elective minor surgery under the Department of Anaesthesiology, Govt. Thoothukudi Medical College. Group PF received Inj. Propofol 2mg/kg and Inj. Fentanyl 2mcg/kg, Group SC received Inj. Propofol 2mg/kg, Inj. Fentanyl 2mcg/kg and Inj. Succinyl Choline 0.5mg/kg. Intubation conditions, hemodynamic profile, and side effects were compared between the groups. **Result:** The age, weight, height, BMI, and ASA status were comparable between the succinylcholine-Propofol-Fentanyl group (Group SC) and Propofol-Fentanyl (Group PF). Group SC had significantly higher Mallampati Class I. The number of intubations, jaw relaxation, overall relaxation, Buck/Cough, lacrimation, and overall intubation score was good with Group SC but significantly insignificant. The Apnoea time among Group SC was significantly higher than Group PF. The Haemodynamic parameters were similar, except for a small pulse rate drop at 30 sec. The incidence of side effects such as myalgia, nausea, headache and sore throat were comparable in both groups. **Conclusion:** Low-dose succinylcholine (0.5mg/kg) can be combined with Propofol-Fentanyl induction for laryngeal mask airway insertion, with a safe haemodynamic profile, safe side-effect profile and increased apnoea time.

INTRODUCTION

General anaesthetic procedure necessitates a safe and open Airway. Airway management is a crucial skill for an anesthesiologist. They are used as an alternative to the traditional approaches of airway management: the face mask (FM) and the endotracheal tube (ET). Innovative modalities of airway devices are developed to enable smooth airway manipulation.[1] Two groups of devices, namely tracheal tube guides and supraglottic airway devices (SADs), are presently used. Supraglottic airways are progressively used for airway management in short-length surgeries.[2] Supraglottic Airway Devices (SADs) comprise a vast group of tools designed to provide a means for ventilation, oxygenation and administration of anaesthetic gases during situations of respiratory arrest or in a patient who is submitted to a surgical procedure under general anaesthesia. SADs have permitted more reliable positive-pressure ventilation. They are prepared of disposable materials, have combined bite blocks, are better capable of acting as conduits for tracheal tube engagement, and have reduced the hazard of pulmonary aspiration of gastric content.[3]
In general anaesthetic practice, laryngeal mask airway (LMA) is vital for securing the airway. Laryngeal Mask Airway was first invented by Archie Brain in 1983 as an alternative to a facemask and endotracheal tube. The advantage of LMA is that it is easy to use and reduces injury to airway tissues. Both the hemodynamic disturbances and postoperative

ISSN (O): 2687-5365; ISSN (P): 2753-6556

complications are less.[4-6] Propofol is often used as an induction agent to blunt the laryngeal reflexes. As a sole agent, propofol will not be sufficient to prevent patient movements, coughing, and gagging.[7] Not only additional doses and repeated attempts, but it also causes airway damage and hemodynamic changes.[8] Succinylcholine is faster in onset, a short-acting depolarising muscle relaxant easily available and cost-effective. Succinyl-choline acts by binding to the nicotine receptors at the Neuromuscular junction. It is used as a muscle relaxant during intubation.[9] Succinylcholine was first discovered in 1906 and introduced into the medical field only in 1951.[10] Succinylcholine has been established to insert LMA, with and without an additional agent. Also, there is no depression in the respiratory centre, and it does not influence consciousness.[11-13]

Using Succinyl choline reduces the additional doses of propofol, repeated attempts, decreased airway damage and hemodynamic changes. Various studies have been done on this topic, especially in the Indian context. Therefore, this study compares the success rate of introducing LMA with low-dose succinylcholine and without succinylcholine after propofol induction.

MATERIALS AND METHODS

This prospective randomised double-blind controlled trial study was done in the Department of Anaesthesiology, Thoothukudi Medical College, from December 2019 to June 2021. Sixty patients of either sex ageing 18 to 60 years, scheduled for elective minor surgery, were included. Institutional ethical committee approval and written informed consent was taken from all subjects before the start of the study.

Inclusion Criteria

Patients of either sex ageing between 18 to 60 years with American Society of Anaesthesiologist (ASA) Physical status class I & class II scheduled to undergo elective minor surgical procedures with surgery duration of < 40 mins and patients with Mallampati Classification Grade I and II and BMI < 25 were included.

Exclusion Criteria

Patients with ages < 16 years and > 75 years, ASA Grade III and IV, respiratory disease, pre-existing rhythm disturbance and ECG changes and having the risk of gastric aspiration, patients with uncontrolled systemic hypertension, sinus bradycardia, history of cerebrovascular accidents, coronary artery disease, valvular heart disease, major kidney and liver diseases, allergy to any of above drugs, morbid obesity and oropharyngeal pathology, and patients requiring emergency surgeries were excluded.

Methodology

Patients scheduled for elective minor surgery were included after the pre-anaesthetic assessment if they met the inclusion criteria. Patients were evaluated for any systemic disease. The routine laboratory parameters, ECG, echocardiogram and other investigations as per surgical need were verified. All the patients were given alprazolam 0.25 mg and ranitidine 150 mg orally the night before surgery. The patients were randomly divided into two groups of 30 each in a double-blind manner. Computer-based random numbers are generated. Each patient receives an appropriate randomisation number and is assigned to their group according to the number. Neither the patient nor the doctors are aware of the group assignment. These 60 patients are divided into two groups. Group PF: Inj. Propofol 2mg/kg and Inj. Fentanyl 2mcg/kg, and Group SC: Inj. Propofol 2mg/kg, Inj. Fentanyl 2mcg/kg and Inj. Succinyl Choline 0.5mg/kg.

All patients received premedication with Inj. Glycopyrrolate 0.2mg and Inj. Midazolam 1mg. In Group PF or Propofol – fentanyl group, patients were pre-oxygenated for three minutes and Inj. Fentanyl at 2mcg/kg diluted in 10ml normal saline was given over 2 minutes, and 30 seconds later, Inj. Propofol at 2mg/kg was given without Neuromuscular blocking agents. In Group SC or Propofol – Fentanyl – Succinyl Choline group, the patient is pre-oxygenated for 3 minutes and Inj. and Inj. Fentanyl at 2mcg/kg diluted in 10ml normal saline was given over 2 minutes, and 30 seconds later, Inj. Propofol at 2mg/kg was given, followed by administration of Inj. Succinylcholine 0.5mg/kg diluted to 2ml. Heart Rate <45 were considered as Bradycardia and treated with Inj. Atropine 0.01mg/kg. Maintenance was done with an oxygen and nitrous mixture of 40 and 60 percent with Sevoflurane 0.2 to 1 MAC.

Apnoea time, Haemodynamic parameters such as Heart Rate, Respiratory rate, NIBP, and O2 saturation were recorded before induction, i.e., Baseline, 30 seconds after LMA insertion, and 1, 5 minutes were recorded and monitored throughout the procedure. The patient's response to LMA insertion was noted, like coughing, gagging, or movement.

Scoring system to Grade Jaw mobility: Grade I: Good (adequate jaw relaxation with LMA insertion done without difficulty). Grade II: Incomplete (Inadequate Jaw Relaxation, but LMA insertion is possible with difficulty). Grade III: Poor (Inadequate jaw relaxation and LMA insertion are impossible).

Scoring system to Grade Coughing/movements: Grade I: None, Grade II: Mild (some movement but did not affect the positioning of LMA), Grade III: Moderate (Holding of LMA is required and no need for Inhalational anaesthetic), and Grade IV: Severe I (additional doses of drug required).

Grading for Overall relaxation: Grade I: Excellent (Insertion easy, no reaction from a patient), Grade II: Good (Insertion results in slight Cough or Movement), Grade III: Poor (Insertion possible with marked patients response), and Grade IV: Impossible (Insertion not possible).

Statistical Analysis

Data were entered in an MS Excel sheet and analysed using SPSS software version 16. When a Categorical variable is compared with groups, the variables are

ISSN (O): 2687-5365; ISSN (P): 2753-6556

represented in tables and bar diagrams. For the test of significance, the chi-square test is used. A P-value < 0.05 were considered statistically significant.

RESULTS

Of 60 subjects, 30 (50%) were allocated to Group SC and 30 (50%) to Group PF. The mean age, height, weight, BMI, and ASA status were comparable in both groups (Group SC and Group PF). However, Mallampatti Class distribution and mean apnoea time were statistically significant among both Groups [Table 1].

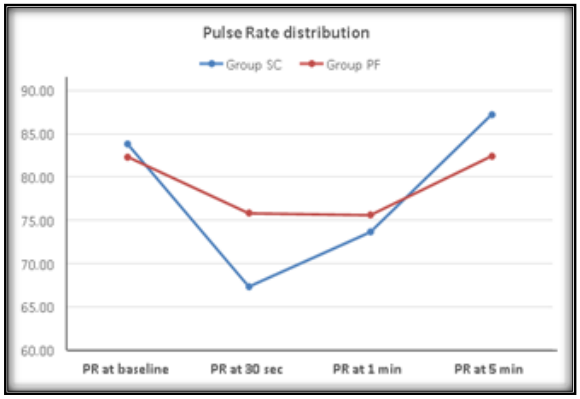

Figure 1: Distribution of pulse rate

The number of Attempts of intubation, Jaw relaxation, overall relaxation, and buck/cough was also comparable in both Group SC and Group PF.

The mean pulse rate (PR) was statically significant ($p<0.05$) in Group PF at 30 sec time. However, it was found comparable at baseline and other time points in both groups.

The hemodynamic parameters such as mean systolic blood pressure (MSP), diastolic blood pressure (DBP), and mean arterial blood pressure were reported as statistically significant ($p<0.05$) among both groups at the baseline but were comparable in both groups at all other points (30 sec, 1 min, 5 min) [Figure 1 and 2].

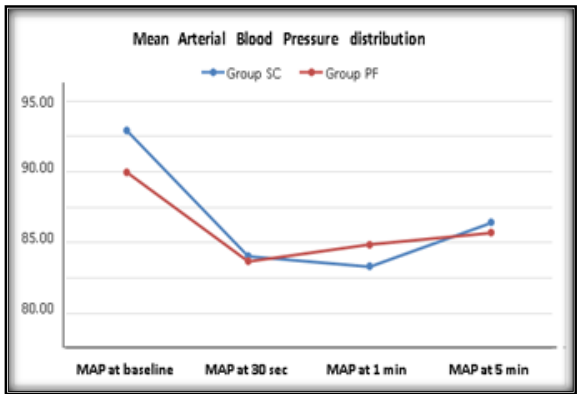

Figure 2: Distribution of mean arterial pressure

The incidences of complications like myalgia, nausea, headache and sore throat were found slightly more in Group SC than in Group PF, but the effect was statically insignificant ($p>0.05$) [Table 2].

Table 1: Observation of demographic and other variables of patients in both groups

Parameters	Group SC N (%)	GROUP PF N (%)	P value
Mean age (years)	26.23 ± 8.37	24.10 ± 8.85	0.341
Mean height (cm)	151.23 ± 6.44	150.43 ± 6.82	0.642
Mean weight (kg)	53.13 ± 5.75	52.27 ± 6.42	0.584
BMI (kg/m2)	22.92 ± 3.17	22.84 ± 3.67	0.924
ASA status			
I	17 (56.66%)	18 (60%)	0.794
II	13 (43.33%)	12 (40%)	
Mallampatti Class			
I	19 (63.33%)	11 (36.66%)	0.039
II	11 (36.66%)	19 (63.33%)	
Number of attempts of intubation			
1	29 (96.66%)	27 (90%)	0.25
2	1 (3.33%)	3 (10%)	
Apnoea time (min)	16.93 ±3.52	8.77± 2.46	0.001
Jaw Relaxation			
Grade I (Good)	29 (96.66%)	28 (93.33%)	0.382
Grade II (Incomplete)	1 (3.33%)	2 (6.66%)	
Overall relaxation			
Grade I (Excellent)	29 (96.66%)	27 (90%)	0.25
Grade II (Good)	1 (3.33%)	3 (10%)	
Buck/cough			
Nil	30 (100%)	30 (100%)	0.00
Lacrimation			
Present	1 (3.33%)	2 (6.66%)	0.382
Nil	29 (96.66%)	28 (93.33%)	
Overall intubation score			
Grade I (Excellent)	29 (96.66%)	26 (86.66%)	0.151
Grade II (Good)	1 (3.33%)	4 (13.33%)	

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 2: Observation of complications among patients of both groups

Parameters		Group SC	Group PF	P value
Myalgia	Present	2 (6.66%)	0 (0%)	0.246
	Nil	28 (93.33%)	30 (100%)	
Nausea	Present	1 (3.33%)	0 (0%)	0.501
	Nil	29 (96.66%)	30 (100%)	
Headache	Present	2 (6.66%)	0 (0%)	0.246
	Nil	28 (93.33%)	30 (100%)	
Sore throat	Present	1 (3.33%)	1 (3.33%)	0.509
	Nil	29 (96.66%)	29 (96.66%)	

DISCUSSION

Propofol is often used as an induction agent to blunt the laryngeal reflexes.[7] Propofol is insufficient to prevent patient movements, coughing, and gagging as a sole agent. Not only additional doses and repeated attempts but also it causes airway damage and hemodynamic changes.[8] Succinylcholine is faster in onset, a short-acting depolarising muscle relaxant easily available and cost-effective.[9,10] Succinylcholine has been established to insert LMA without any depression of the respiratory centre and does not influence consciousness.[12,13] In our study, the mean age, height, weight, BMI, and ASA status were comparable in both groups (Group SC and Group PF). However, both groups found Mallampatti Class distribution and mean apnoea time statistically significant. These observations in the present study follow earlier reported studies.[7,8]

The number of Attempts of intubation, Jaw relaxation, overall relaxation, and buck/cough was also comparable in both Group SC and Group PF. However, the mean apnoea time was statistically significant ($p<0.05$) among both Groups. George LR et al. observed that the relaxation of the Jaw was significantly superior and overall insertion conditions in the 0.25mg/kg succinyl-choline group, with no significant differences in coughing and gagging in the groups.[14] Patient movement, partial laryngospasm and Propofol consumption were more in the placebo group. Ho et al. observed that mini-dose suxamethonium effectively facilitates laryngeal mask insertion, with increased success rates, easy high grades, decreased incidence of swallowing, gagging, and head or limb movements, and the total dose of propofol.[15] They did not observe any significant difference in apnoea time and found an increased prevalence of suxamethonium myalgia and fasciculation. Liao et al., in their systematic review and meta-analysis, observed that the succinylcholine administration decreased the first-attempt LMA insertion failure rate, coughing and gagging and laryngospasm without a significant increase of postoperative myalgia and significant reduction of postoperative sore throat.[16] On the other hand, El-Orbany et al. studied the effect of mini-dose Succinyl Choline (0.6mg/Kg) when combined with lidocaine 30 mg and propofol 2.5 mg/kg, thiopental 5 mg/kg, lidocaine 30 mg and thiopental 5 mg/kg, etomidate 0.3 mg/kg, or lidocaine 30 mg and etomidate 0.3 mg/kg for LMA insertion. They did not observe any significant difference between the groups. They concluded that the usage of succinylcholine 0.6 mg/kg produced the same satisfactory intubation conditions and a reduced apnoea time irrespective of the drug used for induction.[17]

In our study, the hemodynamic parameters such as mean systolic blood pressure (MSP), diastolic blood pressure (DBP), and mean arterial blood pressure was reported as statistically significant ($p<0.05$) among both groups at the baseline but were comparable in both groups at all other points (30 sec, 1 min, 5 min). The mean pulse rate (PR) was statically significant ($p<0.05$) in Group PF at 30 sec time. However, it was found comparable at baseline and other time points in both groups. Gulhas N et al., in their studies, did not observe any hemodynamic instability with the usage of Succinylcholine.[18] Choong et al. did not observe any hemodynamic instability using Succinylcholine in neonates.[19] Whereas Chatrath V et al. observed a hemodynamic instability with the usage of Succinylcholine when compared to Rocuronium and Vecuronium.[20]

In our study, the complications like myalgia, nausea, headache and sore throat were found slightly more in Group SC than in Group PF, but the effect was statically insignificant ($p>0.05$). Succinylcholine-associated postoperative myalgia is a major adverse effect associated with the drug of interest in our study. The drug causes fasciculations in nearly 95% of the recipients, and almost 50% will suffer from myalgia.[21,22] We observed a lower incidence of myalgia, probably due to the lower dose administered in the study. Solatpour et al., and Higgins et al., in their study, observed that succinylcholine was also a strong predictor for the incidence of postoperative sore throat.[23,24] In our study, we observed a lower prevalence of sore throat.

CONCLUSION

The present study concluded that low-dose succinylcholine (0.5mg/kg) could be combined with Propofol-Fentanyl induction for laryngeal mask airway insertion, with a safe haemodynamic profile, side-effect profile and increased apnoea time. The intubation conditions were better in the succinylcholine group but not statistically significant. Studies with larger sample sizes can explore the same better.

Limitations

This is a hospital-based study in a tertiary care setting affiliated with a teaching institution where the skills of the anaesthetists are high, and the study results

ISSN (O): 2687-5365; ISSN (P): 2753-6556

cannot be readily generalised to the resource-limited settings, especially the intubation conditions and complication rate. The study did not have a long-term follow-up of the adverse effects arising after minor surgeries' discharge. Since the study sample size is smaller, there may be unknown confounding factors.

REFERENCES

1. Almeida G, Costa AC, Machado HS. Supraglottic Airway Devices: A Review in a New Era of Airway Management. J Anesth Clin Res. 2016;7:1–9.
2. Verghese C, Brimacombe JR. Survey of Laryngeal Mask Airway Usage in 11,910 Patients. Anesth Analg. 1996;82:129–33.
3. Ramachandran SK, Kumar AM. Supraglottic airway devices. Respir Care. 2014;59:920–32.
4. Brimacombe J. The advantages of the LMA over the tracheal tube or facemask: a meta-analysis. Can J Anaesth. 1995;42:1017–23.
5. Brimacombe J, Holyoake L, Keller C, Brimacombe N, Scully M, Barry J, et al. Pharyngolaryngeal, neck, and jaw discomfort after anesthesia with the face mask and laryngeal mask airway at high and low cuff volumes in males and females. Anesthesiology. 2000;93:26–31.
6. Sharma B, Sahai C, Sood J. Extraglottic airway devices: technology update. Med Devices (Auckl). 2017;10:189–205.
7. Taha S, Siddik-Sayyid S, Alameddine M, Wakim C, Dahabra C, Moussa A, et al. Propofol is superior to thiopental for intubation without muscle relaxants. Can J Anaesth. 2005:249–53
8. Lee MP, Kua JS, Chiu WK. The use of remifentanil to facilitate the insertion of the laryngeal mask airway. Anesth Analg. 2001;93:359-62
9. Succinylcholine (CHEBI: 45652). Available from: https://www.ebi.ac.uk/chebi/searchId.do?chebiId=CHEBI:45652
10. Pharmacology of succinylcholine - Learn Science. Available from: http://www.learnscience.info/pharmacology-of-succinylcholine/
11. 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;83:279–83
12. Salem WT. A comparison of midazolam and mini-dose succinylcholine to aid laryngeal masks airway insertion during propofol anesthesia. J Egypt Natl Canc Inst. 2000;12:65–9.
13. Liou CM, Hung WT, Chen CC, Hsu SC, Lau HK. Improving the success rate of laryngeal mask airway insertion during etomidate induction using fentanyl or succinylcholine. Acta Anaesthesiol Taiwanica Off J Taiwan Soc Anesthesiol. 2004;42:209–13.
14. George LR, Sahajanandan R, Ninan S. Low-dose succinylcholine to facilitate laryngeal mask airway insertion: A comparison of two doses. Anesth Essays Res 2017;11:1051–6.
15. Ho KM, Chui PT. The use of mini-dose suxamethonium to facilitate the insertion of a laryngeal mask airway. Anaesthesia. 1999;54:686–9.
16. Liao AHW, Lin YC, Bai CH, Chen CY. Optimal dose of succinylcholine for laryngeal mask airway insertion: systematic review, meta-analysis and meta-regression of randomised control trials. BMJ Open. 2017;7: e014274.
17. El-Orbany MI, Joseph NJ, Salem MR. Tracheal intubating conditions and apnoea time after small-dose succinylcholine are not modified by the choice of induction agent. Br J Anaesth. 2005;95:710–4.
18. Gulhas N, Topal S, Erdogan Kayhan G, Yucel A, Begec Z, Yologlu S, et al. Remifentanil without muscle relaxants for intubation in micro laryngoscopy: a double-blind, randomised clinical trial. Eur Rev Med Pharmacol Sci. 2013;17:1967–73.
19. Choong K, AlFaleh K, Doucette J, Gray S, Rich B, Verhey L, et al. Remifentanil for endotracheal intubation in neonates: a randomised controlled trial. Arch Dis Childhood-Fetal Neonatal Ed. 2010;95: F80–4.
20. Chatrath V, Singh I, Chatrath R, Arora N. Comparison of intubating conditions of rocuronium bromide and vecuronium bromide with succinylcholine using "timing principle". J Anaesthesiol Clin Pharmacol. 2010;26:493-7.
21. Sane S, Aghdashi MM, Haki BK, Gholamveisi B, Rajabzadeh M, Golabi P. The effect of pregabalin on the prevention of succinylcholine-induced fasciculation and myalgia. J PeriAnesthesia Nurs. 2020;35:255–9.
22. Wong SF, Chung F. Succinylcholine- associated postoperative myalgia. Anaesthesia. 2000;55:144–52
23. Solatpour F, Teymourian H, Mohajerani SA, Shirazi FH, Zadeh SL, Baikpour M, et al. Comparison of the incidence of sore throat after rapid sequence intubation with succinylcholine and cisatracurium. Anesthesiol pain Med. 2014;4: e20030.
24. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. Br J Anaesth. 2002;88:582–4.

ISSN (O): 2687-5365; ISSN (P): 2753-6556