Section: Anaesthesia

Original Research Article

COMPARATIVE EVALUATION OF BASKA MASK LMA INSERTION CONDITIONS USING DEXMEDETOMIDINE-PROPOFOL VERSUS FENTANYL-PROPOFOL

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Abstract

Background: Several studies have evaluated the performance of Baska Mask for various types of surgery and have reported a high first-attempt success rate. The present study compared baska mask LMA insertion conditions using Dexmedtomidine-propofol and Fentanyl-propofol. **Materials and Methods:** All 80 patients were randomly divided into groups, namely Group D and Group F, with 40 patients in each group. Group D received 1µg/kg dexmedetomidine diluted, and Group F received a fentanyl Injection of 2µg/kg diluted to 5 ml with 0.9% Normal Saline. Modified Mallampatti (MM) Class, Young's criteria, and Modified Scheme of Lund and Stovener of the patients among the group were evaluated. The side effects experienced by patients among both groups were also recorded. **Results:** Female predominance was reported in both groups of patients. The MM class 1 was observed in more patients in Group D (62.5%), whereas MM class 2 was found in higher patients in Group F (52.5%). Both groups reported most patients in Young's Criteria I (Group D: 95%; Group F: 87.5%). Both groups' modified Scheme of Lund and Stovener showed maximum patients in the excellent category (Group D: 62.5%; Group F: 65%). In Group D, the mean heart rate decreased after induction, whereas in Group F, it increased. In Group D, the side effect of bradycardia was reported in more patients. **Conclusion:** Pre-treating patients with either 1µg/kg of dexmedetomidine or 2µg/kg of fentanyl and propofol yielded satisfactory and comparable insertion conditions for the Baska mask.

INTRODUCTION

Dr Archie Brain's 'Laryngeal Mask Airway (LMA)', a supraglottic device introduced in 1981, made a revolution in the management of the airway, replacing the most commonly used endotracheal tubes for general anaesthesia by negating the need for laryngoscopy and sometimes muscle relaxants.[1] Since then, many other Supraglottic airway devices have been developed and added to the supraglottic airway device family. Supraglottic Airway Devices (SAD) are an alternative to facemasks and endotracheal tubes designed to provide ventilation, oxygenation and administration of anaesthetic gases to patients admitted for a surgical procedure under general anaesthesia or during a respiratory arrest.

Previously, SADs were mainly used for maintenance of a patent airway during elective procedures under general anaesthesia but, during years following the introduction of the prototypical classic LMA, these devices have also found other areas of utilisation, like as conduits for tracheal intubation in difficult airway.[2] or as airway adjuncts in cardiac arrest in prehospital setting.[3] Compared to endotracheal intubation, SAD is associated with stable haemodynamics.[4] intracranial pressure.[5] and intraocular pressure.[6-8] A potential risk of SAD use is incomplete airway sealing, which may cause gastric insufflation at pressures above 20cm H2O by opening the oesophageal sphincter. The newer SADs are designed to decrease aspiration risk and increase the Oropharyngeal Leak Pressure (OLP), improving the airway seal at higher airway pressures during intermittent positive pressure ventilation without significant gastric inflation.

Proseal LMA is a second-generation reusable supraglottic airway device with an airway lumen and a drain tube. The drain tube helps in the decompression of the stomach and drainage of regurgitant material. The median airway seal with aProsealLMA is above 30cm H2O.[9] The PLMA was designed so that the larger, wedge- shaped cuff would plug gaps in the proximal pharynx, and the

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flat dorsal cuff would push the ventral cuff more firmly into the peri-glottic tissues. Evidence shows that the Pro-seal LMA's cuff exerts higher pressure on the laryngopharyngeal mucosa, causing nerve injury and impeding venous and lymphatic return.

The Baska mask is a new SGA device, having a non-inflatable cuff with better sealing pressure that increases with intermittent positive pressure ventilation (IPPV) without gastric inflation and a novel gastric drainage system that reduces the risk of gastric aspiration.[10] As there is no inflated cuff in the Baska mask, neither does it cause tissue or nerve damage nor require intracuff pressure monitoring. The newer Baska mask has many novel features which improve safety when used during controlled ventilation or in spontaneously breathing patients. The device is kink-resistance, with an integrated bite block throughout the entire length of the airway tube to reduce the patient biting and obstructing the airway. The oval-shaped airway tube matches the shape of the mouth and reduces rotation within the pharynx. The operator can use the special hand tab attached to the cuff to adjust the device's position during insertion without manipulating the head and neck. Several studies have evaluated the performance of Baska Mask for various types of surgery and have reported a high first-attempt success rate, easy insertion and a good or oropharyngeal leak pressure above 30 cm H2O with lower incidence of postoperative complications such as sore throat, dysphonia and dysphagia. In the present study comparative evaluation of baska insertion conditions using dexmedetomidine propofol versus fentanyl propofol was carried out

MATERIALS AND METHODS

The prospective randomised, controlled, double-blind comparative study was conducted on 80 patients in Government Theni Medical College, Theni, from April 2021 to September 2022. All 80 patients were randomly divided into groups, namely Group D and Group F, with 40 patients in each group. Group D received 1µg/kg dexmedetomidine diluted to 10 ml with 0.9% normal saline (NS) over ten minutes by an infusion pump, followed by 5 ml of NS over 2 minutes. Group F received 10 ml of NS over 10 minutes by the same infusion pump, followed by an Injection of fentanyl 2µg/kg diluted to 5 ml with 0.9% NS over 2 minutes. Institutional ethical committee approval and written consent were taken before the start of the study.

Inclusion criteria: All patients willing to participate in the study aged 18 to 60 years and undergoing short surgical procedures under general anaesthesia with ASA I and II were included.

Exclusion criteria: Patients with restricted mouth opening and limited neck movements, Modified Mallampati (MM) class less than 3, BMI > 30 kg/cm2 and age less than 18 years, patients with Upper/lower airway obstruction, thyromental distance < 6 cms and patients on beta-blocker therapy or bradycardia (heart rate <60/minute), and patients allergic to study drugs and unwilling to take the test and moribund ill patients were excluded.

Methodology:

The patients were divided equally into groups D and F based on the computer-generated randomisation scheme. The random group allocations were concealed in a sealed envelope by anaesthesiologist A. An anaesthesiologist B, who did not participate in patient management or data collection, opened the sealed envelope and prepared the study drugs accordingly. Patients' baseline parameters such as heart rate, Electrocardiogram (ECG), mean arterial pressure, respiratory rate and oxygen saturation were noted upon arrival at the operation theatre and monitored continuously afterwards. Oxygen at 2l/min was given to prevent desaturation during the study drug infusion over ten minutes. Premedication with IV Injection of Glycopyrrolate 0.004 mg/kg was given.

Group D received 1 µg/kg dexmedetomidine diluted to 10 ml with 0.9% normal saline (NS) over ten minutes by an infusion pump, followed by 5 ml of NS over 2 minutes. Group F received 10 ml of NS over 10 minutes by the same infusion pump, followed by an Injection of fentanyl 2 µg/kg diluted to 5 ml with 0.9% NS over 2 minutes. Thirty seconds after injecting study drugs, anaesthesia was induced with 2 mg/kg of Injection propofol given intravenously over 30 seconds. Ninety seconds after the completion of the injection, Baska insertion was attempted. Anaesthesia was maintained on oxygen, nitrous oxide (50:50) and sevoflurane 1.5 to 2 volumes percent. No muscle relaxant was administered during the study. Ease of insertion of baska was evaluated by the degree of jaw relaxation achieved by using the "Young's Criteria'.[9]

The overall baska insertion conditions were assessed using the Modified Scheme of Lund and Stovener. The respiratory rate and apnoea time (the time between the last spontaneous breath after propofol and the occurrence of the first spontaneous breath) were recorded. Heart rate and blood pressure changes during baska insertion were also recorded at baseline intervals, after study drug infusion, after propofol induction, and at 1, 3, 5 and 10 minutes after the baska insertion. No further data for haemodynamic parameters were recorded. Adverse events such as bradycardia, hypotension, coughing, laryngospasm, bronchospasm, or desaturation, if occurred, were recorded and treated appropriately.

Statistical analysis:

The collected data was entered in Microsoft Excel (windows 10), and analysis was done using the statistical package for social sciences (SPSS-16). To find an association between two categorical variables Pearson chi-square test was used, and the value of $P<0.05$ is considered statically significant

RESULTS

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Eighty patients of either sex, aged 18 to 60, were enrolled for the study and divided into groups, namely Group D and Group F, each with 40 subjects. Female predominance was reported in both groups of patients. The parameters like mean age, BMI and ASA classification were comparable in both groups [Table 1].

Table 1: Demographic and other variables of patients in both groups

Parameters		Observation N (%)		P-value
		Group D (N=40)	Group F (N=40)	
Gender	Male	16 (40%)	11 (27.5%)	-
	Female	24 (60%)	29 (72.5%)	
Age group (years)	20-30	6 (15%)	5 (12.5%)	-
	30-40	5 (12.5%)	13 (32.5%)	
	40-50	17 (42.5%)	12 (30%)	
	50-60	12 (30%)	10 (25%)	
Mean Age (years± SD)		45.65±9.97	42.72±9.74	0.126
Mean BMI (kg/cm^2± SD)		25.21± 1.77	25.11± 1.69	0.727
ASA Classifications	I	25 (62.5%)	23 (57.5%)	0.214
	II	15 (37.5%)	17 (42.5%)	

The MM class 1 was observed in more patients in Group D 25 (62.5%), whereas MM class 2 was found in higher patients in Group F 21 (52.5%). Young's Criteria among the group were observed, and it was found that both groups reported the majority of patients in Young's Criteria I (Group D: 95%; Group F: 87.5%). Modified Schemes of Lund and Stovener of the patients among the group were calculated, and both groups showed the maximum number of patients in the excellent category (Group D: 62.5%; Group F: 65%). Group D reported no patients in the poor category, whereas Group F found 3 (7.5%) patients in the poor category [Table 2, Figure 1].

Table 2: Observation of different evaluation parameters and side effects of both group patients

Parameters		Observation N (%)	
		Group D (N=40)	Group F (N=40)
Modified Mallampatti Class	I	25 (62.5%)	19 (47.5%)
	II	15 (37.5%)	21 (52.5%)
Young's Criteria	I	38 (95%)	35 (87.5%)
	II	2 (5%)	5 (12.5%)
Modified Scheme of Lund and Stovener	Excellent	25 (62.5%)	26 (65%)
	Good	15 (37.5%)	11 (27.5%)
	Poor	0 (0%)	3 (7.5%)
Adverse Effects	Bradycardia	4 (10%)	2 (5%)
	Hypotension	1 (2.5%)	4 (10%)

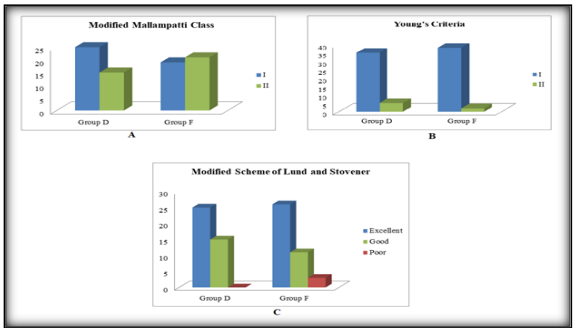

Figure 1: Observation of (A) MM class, (B) Young's Criteria and (C) Modified Scheme of Lund and Stovener

In group D, the mean heart rate decreased after induction between 88.52 bpm to 76.25 bpm. In group F, the mean heart rate increased after induction between 85.5 bpm to 86.05 bpm was observed. The effect was found to be statistically significant ($p<0.05$). However, the mean arterial pressure (MAP) among patients in both groups was reported to be comparable at an all-time point [Table 3].

Table 3: observation of mean heart rate and mean arterial pressure among patients of both group

Variable		Group D (n=40%)	Group F (n=40)	P-value
Mean Heart Rate (bpm)	Baseline	88.52	85.5	0.135
	After Induction	89.12	83	0.008
	1 min	85.85	84	0.257
	3mins	85.02	88.8	0.085
	5 mins	78.55	86.85	0.001
	10 mins	76.25	86.05	0.00007
MAP (mmHg)	Baseline	82.45	82.2	0.459
	After Induction	82.2	82.17	0.495
	1 min	84	82.32	0.227
	3mins	84.17	83.77	0.412
	5 mins	81.02	82.4	0.28

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	10 mins	79.97	82.57	0.128

The side effect among patients of both groups was also observed. In group D, 4 (10%) of patients with bradycardia and 1 (2.5%) with hypotension were observed. In group F, 4 (10%) of patients having hypotension and 2 (5%) patients having bradycardia were observed [Table 2].

DISCUSSION

Insertion of LMA needs adequate depth of anaesthesia to suppress the upper airway reflexes and to achieve good relaxation of the jaw muscles for adequate mouth opening. Previously, volatile anaesthetic agents like sevoflurane and Thiopentone were popularly used as induction agents for the insertion of LMA. Nowadays, propofol is the most commonly used induction agent for the insertion of LMA. When used alone, propofol provides less satisfactory conditions for LMA insertion and more propofol (> 2mg/kg) is needed to achieve optimal insertion conditions for LMA. Propofol at higher doses can produce significant hypotension, bradycardia and respiratory depression.[11] So, Opioids or other anaesthetic agents were being tried as an adjuvant for propofol to decrease the dose of propofol to decrease the suppression of the cardiopulmonary system caused by propofol. Opioids increase the incidence and duration of apnoea, and many newer drugs are being studied to achieve optimal insertion conditions for LMA with fewer side effects.[12]

Dexmedetomidine is a selective alpha 2 agonists known for its sedative, analgesic and sympatholytic properties and in my study, evaluation of dexmedetomidine was done in terms of insertion conditions for LMA, and it has been compared with fentanyl propofol combination. The dosage of fentanyl used in the present study was 2 mcg/kg, and it was based on the study conducted by Goyagi et al. in 41 healthy patients who found that Pre administration of fentanyl 2mcg/kg decreases the propofol requirement for the insertion of LMA. Dexmedetomidine was used in the 1 mcg/kg dosage, and it was based on the study of 22 patients undergoing minor orthopaedic or gynaecological surgeries. He found that the single dose of dexmedetomidine for successful insertion of LMA in 50% of patients was 0.55 mcg/kg when used along with propofol induction at 2mg/kg.[13]

The propofol dose used was 2mg/kg, and it was based on the study conducted by Adachi et al., who studied four induction doses of propofol (1.5-2.5mg/kg) and reported that LMA insertion was less successful at the dose of 1.5mg/kg.[14] In the current study of 80 patients receiving general anaesthesia with Baska mask insertion suggests that1 µg/kg dexmedetomidine with 2mg/kg propofol provides satisfactory Baska mask insertion conditions comparable to that provided by 2 µg/kg fentanyl with 2 mg/kg propofol. Similarly, comparable insertion conditions have been observed in previous studies when the effects of pretreatment of dexmedetomidine and fentanyl on propofol anaesthesia for LMA insertion were assessed.

The demographical data like age, sex, and body mass index were comparable between groups and were statistically insignificant. After induction, there was a statistically significant increase in heart rate in Group D compared to Group F. There will be a decrease in MAP in Group D. These observations follow earlier reported studies.[15] Although the overall insertion conditions, as summed up by the modified scheme of Lund and Stovener, were comparable in both groups, dexmedetomidine provided better jaw relaxation as assessed by Young's criteria, with 95% of patients having relaxed jaw as compared to 87.5% with fentanyl. In the fentanyl group, 12.5% of patients had moderately relaxed jaw and required additional boluses of propofol to facilitate Baska insertion. Though not statistically significant, this was a clinically significant finding as added increments of propofol in group F led to episodes of hypotension (<15% of baseline MAP), which were treated with crystalloids.

Our findings followed a study by Lande et al., who compared dexmedetomidine and fentanyl for LMA insertion and reported 96.6% of patients had relaxed jaw with dexmedetomidine.[16] The superiority of dexmedetomidine over fentanyl in providing better jaw relaxation for insertion of the SAD has been reported by other studies as well. The side effect of bradycardia was more in pretreatment with the dexmedetomidine group and hypotension in the fentanyl group

CONCLUSION

Pretreatment with 1 µg/kg of dexmedetomidine or 2µg/kg of fentanyl and propofol provided satisfactory and comparable insertion conditions for the Baska mask.

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