ORIGINAL RESEARCH PAPER

Anaesthesiology

A COMPARATIVE STUDY BETWEEN DEXMEDETOMIDINE WITH PROPOFOL VERSUS FENTANYL WITH PROPOFOL FOR INSERTION OF PROSEAL LARYNGEAL MASK AIRWAY IN ADULTS

KEY WORDS:
Dexmedetomidine-Propofol, Fentanyl-Propofol, ProSeal Laryngeal Mask Airway

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ABSTRACT

Background and Objectives: Dexmedetomidine and Fentanyl are effective adjuvants used with Propofol to assess the hemodynamic response and insertion conditions of ProSeal Laryngeal Mask Airway. This study was conducted to do a comparative analysis between these two drugs with respect to PLMA insertion conditions, hemodynamic changes and adverse effects. **Materials and methods:** 80 ASA grade I and II patients were randomly allocated into two groups receiving Dexmedetomidine with Propofol(Group D) and Fentanyl with Propofol(Group F).The size of ProSeal LMA used in this study was Size 3. PLMA insertion condition was measured according to the Muzi scoring system.Score≤2 was considered optimal for PLMA insertion. **RESULTS:** 90% in Group D whereas only 65% of the cases in Group F had fully relaxed jaw (p=0.0078). Hemodynamic stability was maintained in both the groups. But the attenuation to hemodynamic responses was statistically more significant in Group D. **Conclusion:** Dexmedetomidine is a better adjuvant used with Propofol for insertion of PLMA with better hemodynamic profile and insertion conditions than Fentanyl.

INTRODUCTION:

The gold standard for providing a safe glottic seal is the cuffed endotracheal tube.[1]The disadvantages of tracheal intubation are concomitant haemodynamic responses, injury to tracheal mucosa and post operative sore throat. This precludes the global utility of the tracheal tube and requires a better alternative.[2]Therefore an airway that is less invasive than intubation called supraglottic airway devices(SAD) have been introduced.[3] The ProSeal laryngeal mask airway(PLMA) was introduced to overcome the perceived shortcomings of the Classic laryngeal mask airway(CLMA),such as the lack of protection against aspiration and a low pressure seal.[4]Propofol is the most preferred agent for the laryngeal mask airway(LMA) insertion.[5]Propofol has a short duration of action and suppresses pharyngeal and laryngeal reflexes. However,it causes dose- dependent cardiorespiratory depression[6] when used alone for PLMA insertion. Different adjuvants such as opioids, benzodiazepines, low dose muscle relaxants etc.[8] have been used with propofol to improve insertion conditions of PLMA.Fentanyl is an opiod which suppresses the reflex responses during manipulation of the airway. Dexmedetomidine is a highly selective alpha2 adrenoceptor agonist. It reduces required doses of propofol both during induction and maintenance.[7].The main aim of our study is to compare the effects between dexmedetomidine and fentanyl when co-induced with propofol on ease of PLMA insertion as per Muzi scoring system,hemodynamic changes and adverse effects.

METHODOLOGY: The study was a prospective, randomised, double blinded study conducted under the Department of Anaesthesiology and Critical care in Silchar Medical College and Hospital during the period from 1.06.2020 to 31.05.21 in 80 patients aged 18-60 years of both sexes, weighing between 30-50 kg belonging to ASA grade I and II undergoing elective short surgical procedures of upto 1 hour under general anaesthesia.

INCLUSION CRITERIA:

- ASA Class I/II
- Informed consent form
- Aged 18-60 years of either sex
- Weight between 30-50 kg
- Elective short surgical procedures (upto 1 hour)

EXCLUSION CRITERIA:

- Patient refusal
- Anticipated difficult airway
- Systemic diseases
- Pregnant females
- Allergic to propofol, fentanyl, dexmedetomidine and latex

The patients satisfying inclusion criteria were randomly allocated into two groups of 50 each based on computer generated random numbers. Group D received Dexmedetomidine 1mcg/kg with Propofol 2mg/kg IV and Group F received Fentanyl 1mcg/kg with Propofol 2mg/kg IV. The study drugs were diluted in 10 ml NS and administered intravenously over 5 minutes.

History taking, weight measurement, general and systemic examination were conducted. Investigations like CBC, KFT, LFT, CXR PA view and ECG was done. Patients were given Tab. Alprazolam 0.25 mg and Tab. Ranitidine 150 mg orally on the previous night of the surgery and fasted for 8hrs prior to administration of general anesthesia.

In the operating room, I.V. access was secured with a size 18 Gauze cannula and 500ml of isotonic fluid was started in all patients. Pulse oximeter, non invasive blood pressure monitoring, end tidal CO_2 and ECG leads were put in place and connected to standard monitor. Baseline heart rate, systolic blood pressure (SBP), diastolic blood pressure (DBP), Mean arterial pressure (MAP) and SPO2 were recorded. All the patients were pre- medicated with Inj. Glycopyrrolate 0.2mg, Inj. Ranitidine 50 mg and Inj. Ondansetron 4mg given intravenously 30 minutes prior to induction. The study drugs were administered intravenously over 5 minutes.

The patients were pre-oxygenated with 100% oxygen for 3 minutes. Ten minutesafter the administration of study drug, induction was done in both groups with i.v. propofol 2 mg/kg without neuromuscular blocking agents. Ninety seconds after propofol injection, jaw relaxation was assessed and PLMA of size 3 inserted. The following criteria were used for grading the insertion condition: jaw mobility (1: fully relaxed, 2: mild resistance, 3: tight but opens, and 4:closed), coughing or movement (1:none, 2: 1 or 2 coughs, 3:3 or more coughs, and 4: bucking/ movements). Score ≤2 was considered optimal for PLMA insertion. If there was any movement before or after

PLMA insertion, propofol 0.5 mg/kg was added and waited for 30 sec before the next attempt was made. After insertion, the cuff was inflated with air. Effective ventilation was confirmed by adequate chest movement and a capnograph trace and the PLMA was fixed in position and connected to the anaesthesia machine and put on spontaneous ventilation. Anaesthesia was maintained with sevoflurane 0.4%, N2O and O2 (50%:50%) in both the Groups. Heart rate (HR), systolic blood pressure(SBP), diastolic blood pressure (DBP), mean blood pressure(MAP) and SpO2 were recorded at baseline, after induction, during insertion and 1 min, 2 min, 3 min, 5 min and 10 min after PLMA insertion.

Satistical analysis: All data are presented as Mean±SD (Standard Deviation). Bar diagram and line diagram weres used to describe the descriptive statistics. Chi square test was used to evaluate association between categorical variables. Data were checked for normality using Kolmogorov-Smirnova and Shapiro-Wilk test. Independent T test is used to compare mean

difference between two groups. For non-normal data Mann Whitney was used. ANOVA test was used for testing statistical significance. P-value < 0.05 was accepted as statistically significant (S).

RESULTS: 80 patients were enrolled in the study. The two groups were comparable in terms of patient characteristics such as age, sex, ASA grading, weight and height [Table 1].

TABLE 1 : DEMOGRAPHIC PROFILE OF STUDY POPULATION

CATEGORY	GROUP D	GROUP F	p-Value
Age(in years) Mean+SD	32.15 ± 12.71	36.23 ± 11.06	0.13(NS)
Sex Male Female	15(37.50%) 25 (62.50%)	18(45%) 22(55%)	0.496(NS)
ASA Physical Status I II	31(77.50%) 9(22.50%)	28(70%) 12(30%)	0.446(NS)
Weight(kg) Mean+SD	47.45±1.921	47.65±1.95 5	0.615(NS)
Height(cm) Mean+SD	153.75±4.62 3	154.6±5.425	0.453(NS)

*SD-Standard deviation, NS – Not significant, ASA- American Society of Anaesthesiologists

Table 2: Parameters for Proseal laryngeal mask airway insertion conditions modified from Muzi and colleagues

Parameters	Group D	Group F	p value
fully relaxed jaw	36(90%)	26(65%)	0.0078
mild resistance	4(10%)	10(25%)	0.0794
tight but opens	0(0%)	4(10%)	0.0414
Closed	0(0%)	0(0%)	1.0000
no coughing	40(100%)	39(97.5%)	0.3173
1-2 bouts	0(0%)	1(2.5%)	0.3173
≥3 bouts	0(0%)	0(0%)	1.0000
Bucking	0(0%)	0(0%)	1.0000
Movements	3(7.5%)	8(20%)	0.2382

In Group D, 5 patients had Muzi score >2. Two patients who had mild resistance to jaw mobility also had movements during PLMA insertion. But none had coughing or bucking during the insertion of PLMA. Whereas in Group F, fourteen patients had Muzi Score >2; out of which five patients with mild resistance to jaw mobility also moved during PLMA insertion. One patient with mild resistance to jaw mobility had both coughing and movement. Three patients whose jaw was tight but could be opened also moved during PLMA insertion. Adequate jaw mobility (Muzi score<2) was observed in Group D with full relaxation in 90% of the cases, whereas only 65% of the cases in Group F had fully relaxed jaw (p=0.0078)(Table 2) making it statistically significant.

Baseline values for heart rate, systolic blood pressure, diastolic blood pressure and mean blood pressure were comparable in both the groups.

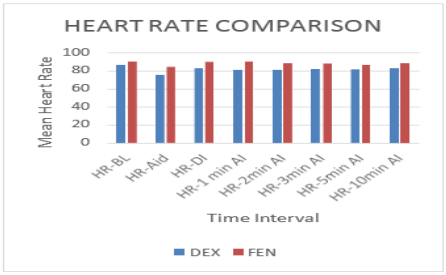

Fig No 1: Bar diagram showing comparison of mean heart rate between Group Dexmedetomidine with Propofol and Group Fentanyl with Propofol

In Group-D and Group-F there was a gradual decrease in HR after administration of the study drug which remained statistically significant at each time period of the study interval between the groups. Patients in Group D showed a greater decrease in HR as compared to patients in Group F.

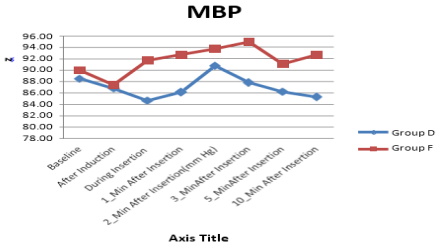

Fig No 2: Line diagram showing comparison of mean blood pressure between Group Dexmedetomidine with Propofol and Group Fentanyl with Propofol.

Mean blood pressure in Group F was higher when compared to Group D during insertion and at 1st, 2nd, 3rd, 5th and 10th minutes post insertion which was statistically significant (p<0.05).

TABLE 3 : ADVERSE EFFECTS

Parameters	Group D	Group F	p value
Bradycardia	4(10%)	1(2.5%)	0.1685
Arrhythmia	0(0%)	0(0%)	1.000
Tachycardia	9(22.5%)	17(42.5%)	0.058
Hypertension	0(0%)	0(0%)	1.000
Hypotension	0(0%)	0(0%)	1.000

Incidence of bradycardia was more in Group D and tachycardia was more in Group F. But was statistically not significant (p>.05)

DISCUSSION:

The choices of airway management before the introduction of LMA-Classic by Dr.
Archie Brain, were either facemask or tracheal tube. LMA insertion is accompanied by minimal cardiovascular responses than those associated with direct laryngoscopic endotracheal intubation, so it can be used for patients in whom a marked pressor response would be deleterious. [8] It was observed by Scanlon P et al., that when propofol was used

as a single induction agent in patients who had not received any premedication, doses exceeding 2.5 mg/kgwere required to allow smooth and atraumatic LMA insertion.[5] But elevated propofol doses are not desirable as the cardiorespiratory depression is dose dependant as observed by Gupta A et al.[9] So, opioids or other anaesthetic agents are being tried as adjuvants for propofol.

In our study the patients in both the groups were demographically similar as regards to their demographic profile including age, sex, height and weight distributions. Insertion conditions were assessed using the scoring system modified by Muzi *et al*.[10] The conditions were labeled as acceptable if the score was ≤2 and accordingly 36(90%) patients in Group D had acceptable conditions, whereas 26 patients (65%) in Group F had acceptable PLMA insertion conditions, which was statistically significant (P<0.05). As compared to fentanyl, dexmedetomidine provided better jaw relaxation, lesser bouts of cough and better control of movements during the procedure. Lande et al[11], in his study found that the dexmedetomidine group had a more relaxed jaw than the fentanyl group.

The mean baseline heart rate were comparable between the two groups. (p>0.05). In Group-D and Group-F there was statistically significant decrease in heart rate following induction, followed by a transient rise in heart rate during insertion of PLMA followed by decrease in pulse rate which continued throughout 1st to 10th minute post insertion. All the recorded values during the course of observation for both the groups were lesser than baseline heart rate.The observations were similar to the findings of Uzümcügil et al.[12], Prashant Vadigeri et al.[13] and Choudhary, et al.[14]

The mean blood pressure(MBP) in group D had no significant rise or fall. In Group F, the mean blood pressure decreased from baseline after induction and increased during insertion and continued to do so at 1st, 2nd, 3rd, 5th and 10th minute post-insertion which was statistically significant (p<0.05). Similar trend in the mean blood pressure was observed by Singh et al.[15] but the values continued to decrease below baseline values even after 5minutes of LMA insertion. It could have been because of the use of higher doses of fentanyl (2µg/kg) and propofol (3.5 mg/kg).

In the study by Jayaram et al.[16](2014) and Prashant Vadigeri et al.,[13] (2009), it was observed that in comparison to fentanyl-propofol, the combination of dexmedetomidine-propofol provided more stable haemodynamics with minimal fluctuations.

Adverse Effects:

Bradycardia was seen in 4 Group D patients and 1 Group F patient which was statistically not significant and was promptly treated with Inj.Atropine. This was similar to the study conducted by Choudhury et al.,[14] where the incidence of bradycardia were seen in 5 patients receiving dexmedetomidine with propofol and in one patient receiving fentanyl with propofol which was not statistically significant. Rise in heart rate >100 bpm was noted in 9(22.5%) patients in Group D and in 17 (42.5%) patients in Group F, which was not statistically significant. Out of 80 patientsnone had any rhythm changes or ventricular premature beats. No patient from both the groups had any episode of hypertension and hypotension.

CONCLUSION:

In conclusion, Dexmedetomidine used in a dose of 1mcg/kg gives better insertion conditions for ProSeal LMA in short surgical procedures and better attenuation of hemodynamic parameters compared to Fentanyl used in a dose of 1mcg/kg when used as an adjuvant with propofol.

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Conflicts of interest: None declared

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