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Original Research Article

Comparative Study of Efficacy of Dexmedetomidine-Propofol vs. Fentanyl-Propofol for Laryngeal Mask Airway Insertion in Elective Surgeries

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Abstract:

Background: Laryngeal mask airway (LMA) is a non invasive supraglottic device which has led to radical change in general anaesthesia. LMA has the advantage of being less stimulating than the tracheal intubation as visualisation of cords and entry into larynx is not required.

Propofol is the most commonly used induction agent for LMA insertion due to its depressant action on upper airway reflexes. Opioids like fentanyl are added which reduce the effective concentration for LMA insertion of propofol for various noxious stimuli with minimal respiratory depression. Dexmedetomidine is a good anesthetic adjuvant that decreases the requirement of propofol and maintains stable hemodynamics intraoperatively.

Aims and Objectives: To study and compare the anaesthetic conditions for laryngeal mask airway insertion between dexmedetomidine - propofol and fentanyl - propofol groups.

Materials and Methods: A total of 60 patients belonging to American Society of Anaesthesiologist Grade 1 & 2, age varying from 20 to 60 years of either sex scheduled for short elective surgical procedures were randomly divided into 2 groups of 30 patients each (Group D and Group F).

In Group D, dexmedetomidine 1mcg/kg diluted in 100 ml normal saline was given over 10minutes. 30seconds later propofol 2mg/kg was given for induction without neuromuscular blocking agents. In Group F, fentanyl 2 mcg/kg diluted in 100 ml normal saline was given over 10 minutes. 30seconds later propofol 2mg/kg was given for induction without neuromuscular blocking agents. LMA was inserted after 60 seconds of injection of propofol. Parameters observed are Apnoea time**,** patient response to LMA insertion like coughing, gagging, lacrimation were noted. Scoring system modified by Muzi and colleagues was followed to assess the tolerance of LMA insertion.

Results: The ease of insertion of LMA was assessed by jaw grade, cough grade. In group F, 5 (16.67%) patients showed unacceptable condition for LMA insertion whereas in the group D, all the patients had optimal conditions for insertion of LMA. Thus, Group D was found to be superior in terms of insertions conditions for LMA than group F. Apnoea time was longer in group F compared to group D.

Conclusion: Dexmedetomidine provides better insertion conditions, that of fentanyl when used along with propofol for insertion of LMA.

Keywords: Laryngeal mask airway (LMA), Dexmedetomidine, Fentanyl, Propofol.
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Introduction

Laryngeal mask airway (LMA) is a non invasive supraglottic device which has led to radical change in general anaesthesia. It is a device, with a lumen that provides a seal around the laryngeal inlet. It has the advantage of being less stimulating than the tracheal intubation as visualisation of cords and entry into larynx is not required. With LMA there is ease of insertion without laryngoscope or muscle relaxant. [1]

Inadequate depth of anaesthesia may provoke coughing, gagging and laryngospasm which may lead to adverse haemodynamic changes and increase incidence of regurgitation and aspiration. Therefore, the optimal condition for LMA insertion mandates a generous use of anaesthetic agent for induction.

Since the time required for LMA insertion was longer with inhalational anesthetics, intravenous agents have been preferred. Among the intravenous agents, Propofol is the most commonly used induction agent for LMA insertion due to its depressant action on upper airway reflexes [2]. When used alone without premedication, propofol provides conditions for LMA insertion that is far

from satisfactory and causes cardio respiratory depression**.**

As propofol itself does not have any analgesic property, opioids are added which reduce the effective concentration (EC_{50LMA}) for LMA insertion of propofol for various noxious stimuli with minimal respiratory depression [3]. Here fentanyl is the opioid of choice. Although in general, incremental doses of fentanyl depress the airway reflex responses in a dose related manner, a small dose does not effectively prevent laryngospasm when normocapnia is maintained [4].

Dexmedetomidine is a pharmacologically active dextromer of medetomidine and a selective alpha-2 receptor agonist activity. It has sedative and analgesic activity without causing post operative respiratory depression. Also, dexmedetomidine is said to be a good anesthetic adjuvant that decreases the requirement of propofol and maintains stable hemodynamics intraoperatively [5].

Thus, in our present study, we intend to compare the conditions for LMA insertion by using dexmedetomidine with propofol and fentanyl with propofol combination. Since such combination has not been studied in our institute in the past.

Method of Study

Study design: Prospective interventional study.

Duration of study: 18 months, from 1 October 2019 to 31st March 2021.

Sample size: 60 patients, divided into two groups as Group D and F, of 30 patients each.

Sampling procedure: Simple random sampling.

This study done at M.R. Medical College, Kalaburagi.

Inclusion Criteria:

1. Age between 20 to 60 yrs of either sex.
2. American society of anaesthesiologists (ASA) grade I & II.
3. Weight 35-70kgs.
4. Patients scheduled to undergo elective surgical procedures.

Exclusion Criteria:

1. Patient with hyper reactive airways.
2. Known egg allergy.
3. Patients undergoing oral surgeries.
4. Patients with neck and facial burns.

Methods:

All patients who are in inclusion criteria was assessed by pre anaesthetic examination.

Data was collected in prescribed proforma meeting the objectives of the study.

Patients were randomly allocated into two groups: Group D and Group F of 30 patients each.

All the LMA insertions were made with classic LMA with standard insertion technique. Size of the LMA to be used in each patient was determined according to their weight. On the day of surgery, after 8 hours of fasting, patients were shifted to the operating room and monitors were connected. Baseline vitals of the patients like NIBP, RR, Pulse rate and SPO2 were noted. All the patients were premedicated with Inj. Glycopyrrolate 0.005mg/kg IV and Inj. Ondansetran 4 mg IV 30 minutes before surgery.

In group D or dexmedetomidine-propofol group, the patients were pre- oxygenated for 3minutes and dexmedetomidine 1mcg/kg diluted in 100 ml normal saline was given over 10minutes. 30seconds later propofol 2mg/kg was given for induction without neuromuscular blocking agents.

In group F or fentanyl – propofol group the patients were preoxygenated for 3 minutes and fentanyl 2 mcg/kg diluted in 100 ml normal saline was given over 10minutes. 30seconds later propofol 2mg/kg was given for induction without neuromuscular blocking agents.

LMA was inserted after 60 seconds of injection of propofol by an anaesthesiologist who was unaware of induction and adjuvant anaesthetic agents.

After successful placement of LMA and confirming its placement, patients were kept on spontaneous ventilation. Anaesthesia was maintained with isoflurane, nitrous oxide, oxygen.

At the completion of surgery isoflurane, nitrous oxide was stopped and LMA was removed. 100% oxygen was given via face mask till recovery.

Parameters observed will be:

Apnoea time: The time from last spontaneous breath after propofol administration to first spontaneous breath was recorded. Patient's response to LMA insertion like coughing, gagging, lacrimation.

Scoring system modified by Muzi and collegues was followed to assess the tolerance of LMA insertion.

I. Scoring system to Grade jaw mobility

1--------Fully relaxed

2--------Mild resistance

3--------Tight but, opens

4--------Close

II. Scoring system to Grade coughing/movement

1-------None

2-------One or two coughs

3--------3 or more coughs

4--------Bucking/movement

III. Other events

Spontan eous ventilation

Breath holding

Expiratory stridor

Lacrimation.

In each category scores <2 was considered optimum for LMA insertion.

Informed consent:

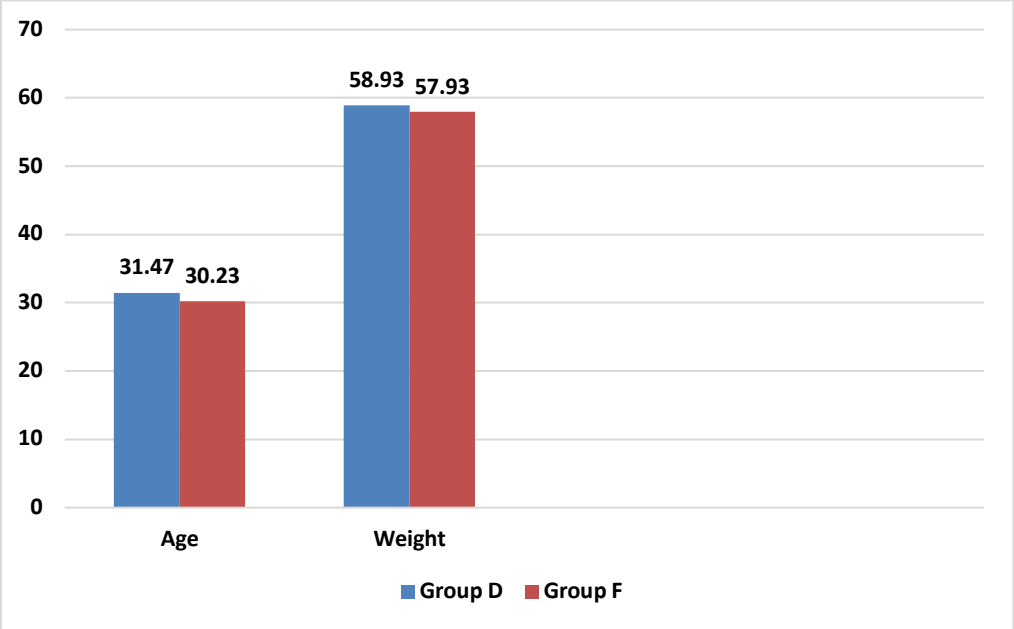
Informed consent was taken in the patients own vernacular language.

Statistical Data Analysis: Statistical analysis will be analysed by using IBM SPSS 20.00 version software. For qualitative data analysis, Chi-square test will be used and for quantitative data analysis, unpaired t test will be applied and for statistical significance if p value is <0.05 is considered as significant.

Observation and Results

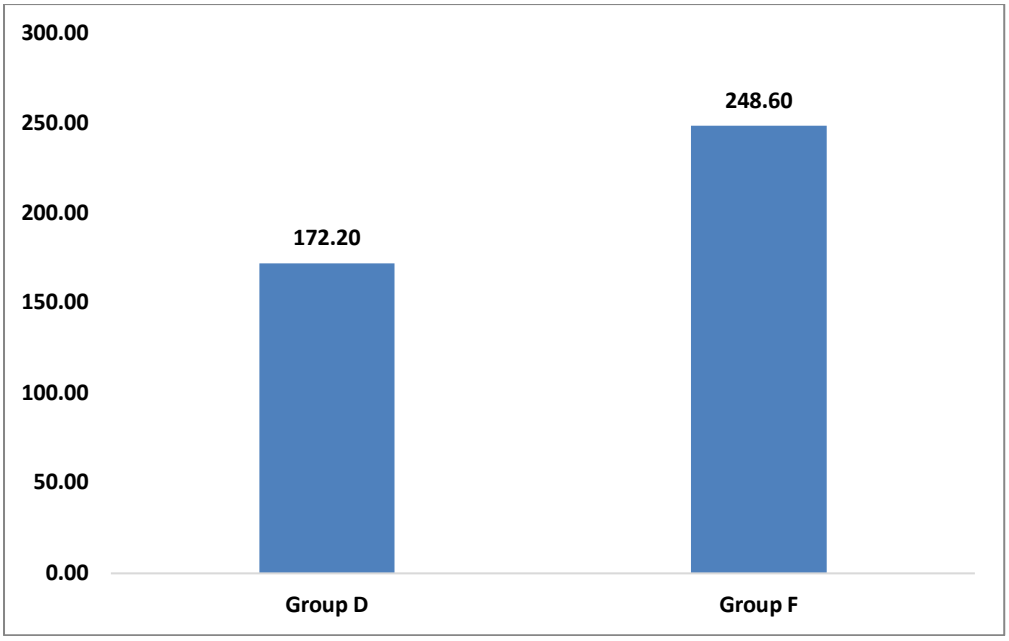
Table 1: Demographic data and duration of apnoea

Variable	Group D	Group F	p value- Student t test
Age	31.47(±7.56)	30.23(±7.79)	0.54
Weight	58.93(±5.25)	57.93(±6.15)	0.50
Duration of apnoea	172.2(±16.78)	248.6(±17.12)	**0.00**



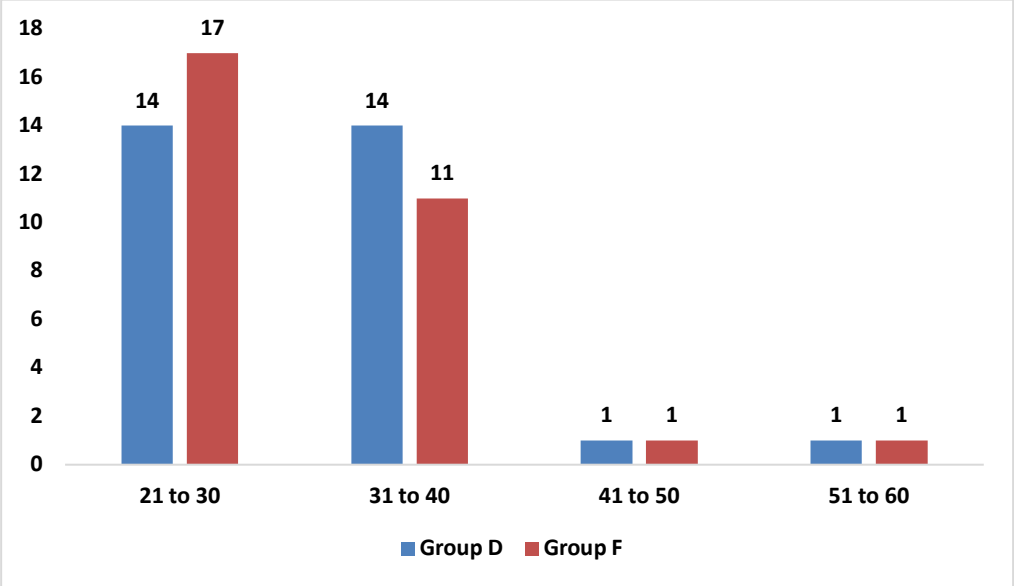
Graph 1: Bar diaphragm represents demographic data

Demographic data like age, weight was comparable in both the groups with p value > 0.05.



Graph 2: Bar diaphragm represents duration of apnoea

The duration of apnoea is longer in fentanyl group (248.6s) when compared to dexmedetomidine group (172.2s) which is statistically significant (p value <0.05).

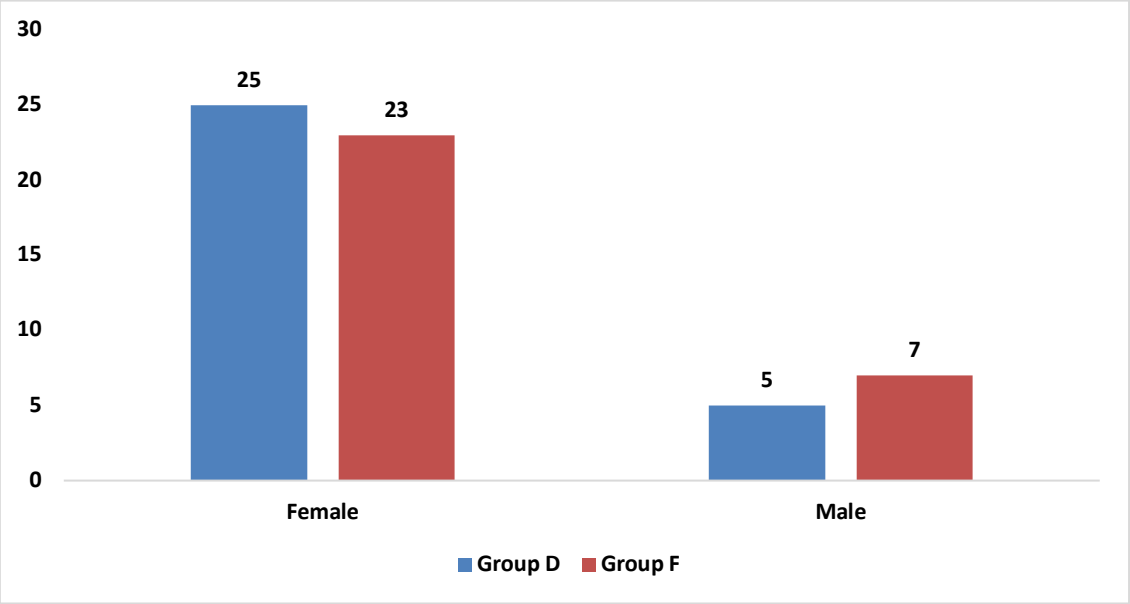


Graph 3: Multiple bar diagram represents Age wise distribution of patients

Table 2: Age wise distribution of patients

Age in years	Groups		Total	p value
	Group D	Group F		
21 to 30	14(46.67%)	17(56.67%)	31(51.67%)	0.885
31 to 40	14(46.67%)	11(36.67%)	25(41.67%)	Chi square
41 to 50	1(3.33%)	1(3.33%)	2(3.33%)	
51 to 60	1(3.33%)	1(3.33%)	2(3.33%)	
Total	30(100%)	30(100%)	60(100%)	

Study observes that maximum number of patients in both groups were 31 cases (51.67%) belongs to age group of 21 to 30 followed by 25 cases (41.67%) which belongs to age group 31 to 40 and least number of cases (3.33%) were in age group 41 to 50 and 51 to 60. There was no statistically significant difference in distribution of age in both the groups.

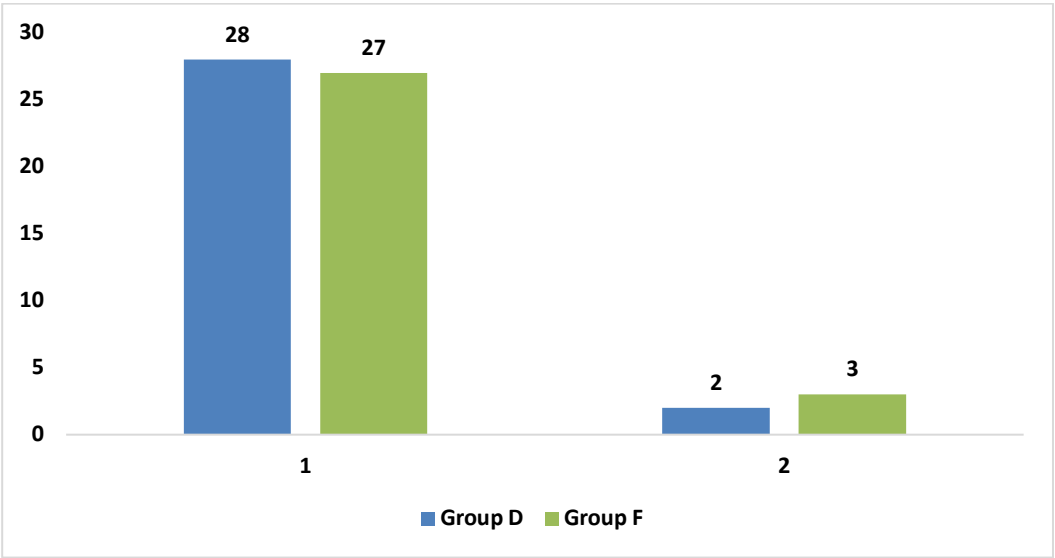


Graph 4: Multiple bar diagram represents gender wise distribution of patients

Table No 3: Sex wise distribution of patients

Sex	Groups		Total	p value
	Group D	Group F		
Female	25(83.33%)	23(76.67%)	48(80%)	0.519
Male	5(16.67%)	7(23.33%)	12(20%)	Chi square
Total	30(100%)	30(100%)	60(100%)	

In my Study, maximum number of patients were females in both the groups. In group D, 83.3 % were females and 16.67% were males. In group F, 76.7 % were females and 23.33% were males. There was no statistically significant difference in distribution of sex in both the groups.

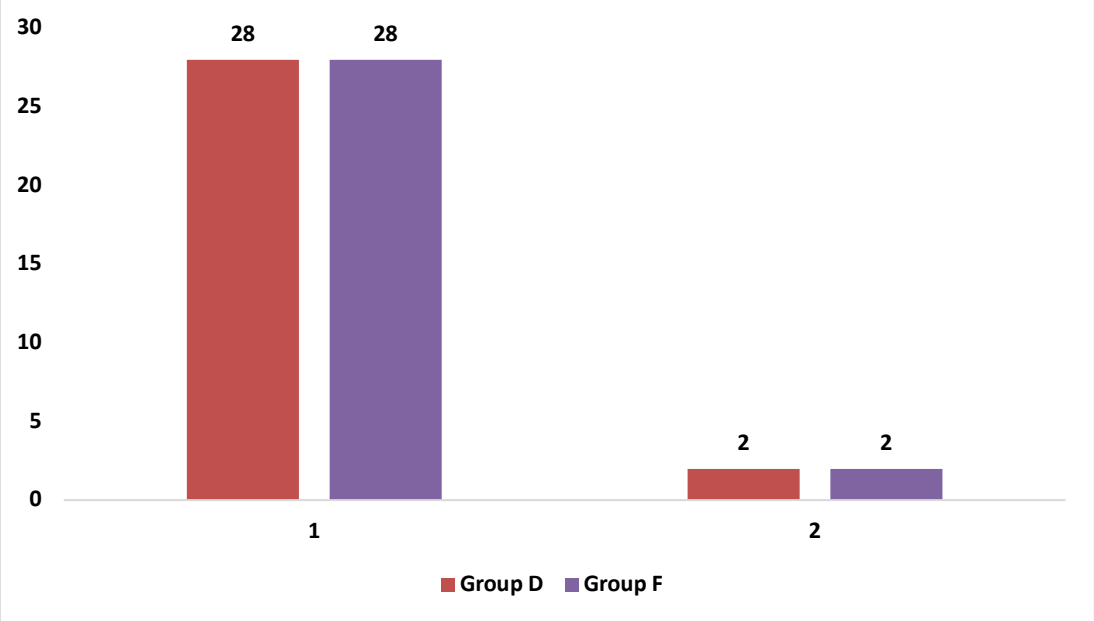


Graph 5: Multiple bar diagram represents ASA Grade wise distribution of patients

Table 4: ASA Grades wise distribution of patients

ASA	Groups		Total	p value
	Group D	Group F		
1	28(93.33%)	27(90%)	55(91.67%)	1
2	2(6.67%)	3(10%)	5(8.33%)	Fishers exact
Total	30(100%)	30(100%)	60(100%)	

In group D, 28 patients (93.33%) and in group F, 27 patients (90%) had ASA grade 1 where as 3 patients had ASA grade 2 in Group F and 2 patients in group D. There was no statistically significance in ASA distribution between two groups.

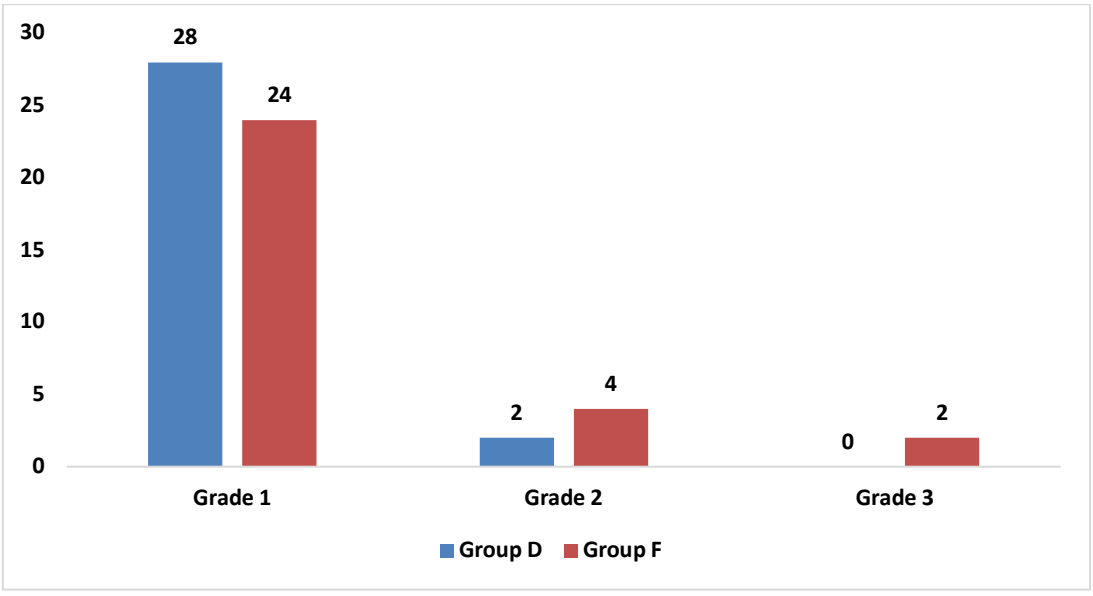


Graph 6: Multiple bar diagram represents MPC Grade wise distribution of patients

Table 5: MPC Grades wise distribution of patients

MPC	Groups		Total	p value
	Group D	Group F		
1	28(93.33%)	28(93.33%)	56(93.33%)	1
2	2(6.67%)	2(6.67%)	4(6.67%)	Fishers exact
Total	30(100%)	30(100%)	60(100%)	

In this study maximum number of patients, 56 (93.33%) belongs to MPC Grade 1 in both the groups. There was no statistically significant difference in distribution of MPC between two groups.



Graph 7: Multiple bar diagram represents Jaw Grades wise distribution of patients

Table 6: Jaw Grades wise distribution of patients

Jaw grade	Groups		Total	p value
	Group D	Group F		
Grade 1	28 (93.33%)	24(80%)	52(86.67%)	0.226
Grade 2	2 (6.67%)	4(13.33%)	6(10%)	Chi square
Grade 3	0 (0%)	2(6.67%)	2(3.33%)	
Total	30 (100%)	30(100%)	60(100%)	

In group D, 28 patients had jaw relaxation grade 1 while the remaining 2 patients had grade 2 jaw relaxation. No patient in group D had jaw relaxation grade of 3 and 4 which was considered unacceptable for LMA insertion.

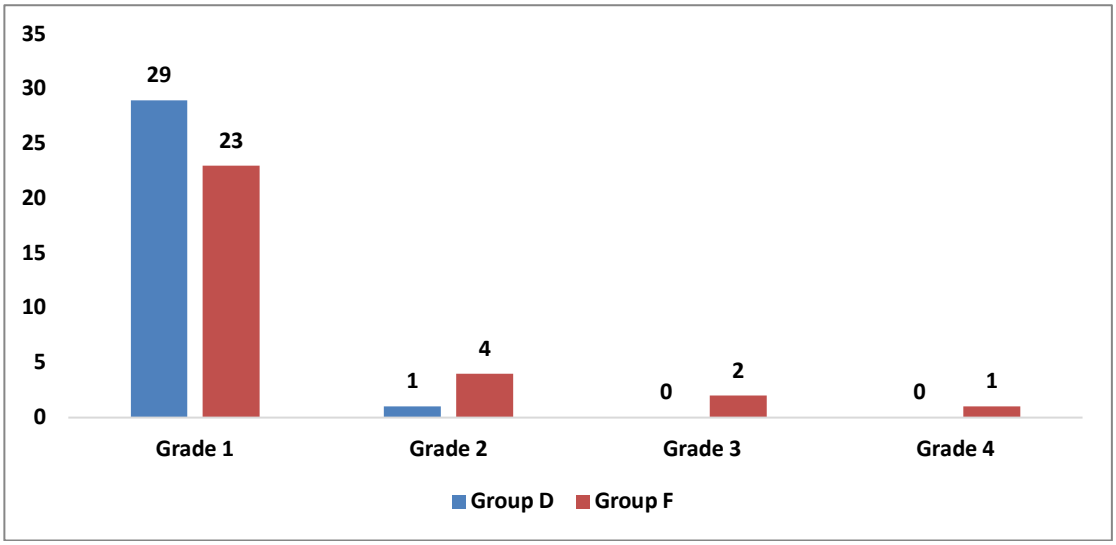
In group F, 24 patients showed jaw relaxation of grade 1, 4 patients had grade 2 jaw relaxation, 2 patients had grade 3 jaw relaxation. As grade 1 and 2 only were considered acceptable for LMA insertion, 2 patients in fentanyl group had jaw relaxation condition which was not optimal for insertion of LMA.

No statistically significant difference noted between two groups in terms of jaw grading as the p value is 0.226.

Table 7: Jaw Grade (Acceptable /Unacceptable) conditions for LMA insertion

Jaw grade	Groups		Total	p value
	Group D	Group F		
Acceptable	30 (100%)	28(93.33%)	58(96.67%)	Fisher's Exact Test
Unacceptable	0 (0%)	2(6.67%)	2(3.33%)	0.492
Total	30 (100%)	30(100%)	60(100%)	

In Group D, all the patients (100%) had jaw relaxation which was optimal for LMA insertion while in the Group F, 93.33% of the patients had acceptable grade for jaw relaxation. No statistically significant difference was observed between two groups in terms of jaw grading as the p value is 0.492.



Graph 8: Multiple bar diagram represents Cough Grades wise distribution of patients

Discussion

LMA has gained wide acceptance for routine airway management, difficult airway and in emergency situation. Safe insertion of LMA requires deep levels of anesthesia with suppression of airway reflexes. [2]

In the past, volatile anaesthetics such as sevoflurane and thiopentone were commonly used as induction agents for LMA insertion. Nowadays, Propofol is most commonly used induction drug for LMA insertion.

Propofol, when administered alone, provides less satisfactory conditions for LMA insertion and more dose of propofol (> 2mg/kg) is needed to achieve optimal insertion conditions for LMA. Propofol at higher doses can cause significant hypotension, bradycardia and respiratory depression. As a result, opioids or other anaesthetic drugs were used as an adjuvant to propofol in attempt to reduce the dose of

propofol and hence the cardiopulmonary system suppression caused by propofol. Opioids increases the incidence and duration of apnoea and many newer drugs are being studied to achieve optimal insertion conditions for LMA with fewer side effects.

Dexmedetomidine is a highly selective alpha 2 agonist with sedative, analgesic, and sympatholytic characteristics. In my study, dexmedetomidine was evaluated in terms of LMA insertion conditions and has been compared to fentanyl propofol combination.

In our study, dose of fentanyl used was 2 mcg/kg, and that was based on a study conducted by Goyagi et al [6] in 41 healthy patients, who found out that pre-administration of fentanyl 2 mcg/kg reduces the requirement of propofol for LMA insertion.

The dose of dexmedetomidine used in my study was 1mcg/kg, and it was based on a study done by Uzümcügil et al [7], which had 52 patients undergoing minor urological procedures. He found that dexmedetomidine 1mcg/kg coadministered with propofol 1.5mg/kg provides successful LMA insertion.

The dose of propofol used in my study was 2mg/kg, we found out that insertion conditions for LMA was better and successful where as study conducted by Blake et al[8] who studied four different propofol induction doses (1.5-2.5mg/kg) and they evaluated that a dose of 1.5 mg/kg iv propofol was not optimum for LMA insertion. Hence, we considered using 2 mg/kg iv propofol for LMA insertion.

Jaw relaxation was comparable in both dexmedetomidine - propofol group and fentanyl-propofol group. In group D, 100% of the patients achieved acceptable jaw grading for LMA insertion while in group F only 93.3% of the patients achieved acceptable grading of jaw relaxation. 2 patients (6.67%) had jaw grade 3 which was considered unacceptable for LMA insertion in group F and these patients received additional dose of propofol (0.5mg/kg) for LMA insertion. In dexmedetomidine group, 100% patient had fully relaxed jaw. We observed a better jaw relaxation with dexmedetomidine group than fentanyl group which is similar to the study done by Surabhi A lande et al [9] where in 96.67% patient had fully relaxed jaw in dexmedetomidine group.

Wong CM [10] et al found that a standard fentanyl dose of 1μ/kg co-administered with propofol 2.5mg/kg, provided optimal conditions in only 65% of cases and reported a higher incidence of resistance to mouth opening with use of fentanyl. However, in our study, we have used 2mg/kg propofol with 2 μ/kg fentanyl and found out that, 93.33% of cases in group F had fully relaxed jaw for LMA insertion with adequate mouth opening.

In our study, both the groups were comparable with respect to cough grading. In group D all the 30 (100%) patients had acceptable cough grading for LMA insertion while in group F only 27 (90%) patients had acceptable grading of cough for LMA insertion. The remaining 3 patients which are unacceptable cough grading in fentanyl group received additional dose of propofol (0.5mg/kg) for LMA insertion. Higher incidence of coughing was seen in fentanyl group compared to dexmedetomidine group in my study which is similar to the study done by Surabhi A lande et al [9].

In present study, all the patients (100%) had optimal insertion conditions for LMA in group D where as in group F, 5 patients (16.67%) had unacceptable conditions for LMA insertion and these results were comparable to study done by A H ramaswamy et al. [11] Thus group D provides better insertion conditions for LMA than group F and can be used for short surgical procedures.

Our study showed that dexmedetomidine provides better insertion conditions, than that of fentanyl when used along with propofol for insertion of LMA.

Conclusion

Dexmedetomidine provides better insertion conditions, than fentanyl when used along with propofol for insertion of LMA for short surgical procedures.

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