

Effect of Intravenous Lignocaine versus Fentanyl on Hemodynamic Response to Laryngoscopy & Endotracheal Intubation in General Anaesthesia: A Comparative Study

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Abstract

Background: Laryngoscopy and endotracheal intubation provoke a transient sympathoadrenal response resulting in tachycardia and hypertension, which may be detrimental in susceptible patients. Various pharmacological agents are used to attenuate this response.

Objective: To compare the efficacy of intravenous lignocaine and fentanyl in attenuating the hemodynamic response to laryngoscopy and intubation.

Methods: This randomized double-blind study was conducted on 80 patients (ASA I-II) undergoing elective abdominal surgery under general anesthesia. Patients were allocated into two groups: Group L received intravenous lignocaine 1.5 mg/kg, and Group F received fentanyl 2 µg/kg, administered 3 minutes before intubation. Hemodynamic parameters (HR, SBP, DBP, MAP) were recorded at baseline, post-drug, post-induction, at intubation, and at 1, 3, and 5 minutes after intubation. Statistical analysis was performed using SPSS, with $p < 0.05$ considered significant.

Results: Both groups were comparable in demographic parameters. Hemodynamic variables increased significantly at intubation in both groups. However, fentanyl demonstrated significantly better attenuation at 1 minute post-intubation: HR ($p=0.039$), SBP ($p=0.007$), DBP ($p=0.00029$), and MAP ($p=0.005$). No significant differences were observed at later time intervals. Incidence of side effects (bradycardia, hypotension) was comparable between groups.

Conclusion: Fentanyl (2 µg/kg) is more effective than lignocaine (1.5 mg/kg) in attenuating the acute hemodynamic response at 1 minute following intubation, with comparable safety profiles.

Keywords: Laryngoscopy, Intubation, Lignocaine, Fentanyl, Hemodynamic response.

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Introduction

Laryngoscopy and endotracheal intubation are routine and essential procedures in the administration of general anesthesia. However, they are associated with a significant sympathetic response, resulting in transient increases in heart rate and blood pressure.

This response occurs due to stimulation of the epipharyngeal and laryngopharyngeal structures, leading to catecholamine release, and is usually most pronounced within the first minute after intubation [1,3].

While these changes are generally well tolerated in healthy individuals, they may pose serious risks in

patients with underlying cardiovascular or cerebrovascular diseases. Complications such as myocardial ischemia, arrhythmias, and increased intracranial pressure have been reported in such situations [8].

To minimize this pressor response, various pharmacological agents have been studied, including opioids, local anesthetics, beta-blockers, and alpha-2 agonists [2]. Among these, lignocaine and fentanyl are widely used in clinical practice because of their availability and established safety profiles.

Lignocaine, a class Ib antiarrhythmic and local anesthetic, acts by stabilizing neuronal membranes and suppressing airway reflexes, thereby reducing the intensity of the hemodynamic response [2,4]. In contrast, fentanyl, a potent synthetic opioid, exerts its effect centrally by reducing sympathetic outflow, leading to a decrease in heart rate and blood pressure [5]. Several studies have evaluated the efficacy of these agents, with many suggesting that fentanyl provides better attenuation of the immediate hemodynamic response following intubation [6–8]. However, the available evidence remains variable, and a clear consensus is lacking.

In view of this, the present study was undertaken to compare the effects of intravenous lignocaine and fentanyl in attenuating the hemodynamic response to laryngoscopy and endotracheal intubation.

Methods

Study Design and Setting: A prospective, randomized, double-blind controlled study conducted in the Department of Anaesthesiology at Government Medical College, Kota, Rajasthan.

Study Population: Eighty patients aged 18–55 years, ASA grade I–II, undergoing elective abdominal surgeries under general anesthesia.

Inclusion Criteria

- Age 18–55 years
- ASA I–II
- Elective surgery under GA

Exclusion Criteria

- Cardiovascular, renal, hepatic, or endocrine disorders
- Difficult airway or BMI >30
- Allergy to study drugs

Randomization and Groups

- **Group L (n=40):** Lignocaine 1.5 mg/kg IV
- **Group F (n=40):** Fentanyl 2 µg/kg IV

Drugs were administered 3 minutes before intubation.

Anesthetic Technique

- Standard premedication with midazolam, glycopyrrolate, and ondansetron.
- Induction with propofol and succinylcholine.
- Intubation using Macintosh laryngoscope within 30 seconds.

Monitoring Parameters

- Heart Rate (HR)
- Systolic Blood Pressure (SBP)
- Diastolic Blood Pressure (DBP)
- Mean Arterial Pressure (MAP)

Time Points

- Baseline
- After drug administration
- After induction
- At intubation
- 1, 3, and 5 minutes post-intubation

Statistical Analysis: All statistical analyses were performed using SPSS version 25. Continuous variables were expressed as mean ± standard deviation (SD). As the study involved comparison between two independent groups, the Student's unpaired t-test was used to analyze continuous variables, while categorical variables were compared using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1: Demographic Characteristics

Parameter	Lignocaine	Fentanyl	p-value
Age (years)	42.15 ± 7.03	41.60 ± 6.55	0.357
Gender (M/F)	16/24	17/23	0.4
Weight (kg)	57.37 ± 5.31	56.52 ± 6.44	0.261

Table 2: Baseline Hemodynamics

Parameter	Lignocaine	Fentanyl	p-value
HR	78.72 ± 5.65	78.67 ± 6.64	0.485
SBP	124.62 ± 6.68	122.65 ± 7.75	0.113
DBP	80.62 ± 3.32	81.65 ± 3.20	0.082
MAP	95.17 ± 2.56	95.32 ± 3.29	0.410

Table 3: Hemodynamic Changes at 1 Minute

Parameter	Lignocaine	Fentanyl	p-value
HR	76.25 ± 4.73	74.17 ± 5.64	0.039
SBP	128.22 ± 5.04	124.10 ± 9.20	0.007
DBP	82.27 ± 3.10	79.07 ± 4.70	p<0.001
MAP	100.12 ± 2.75	97.90 ± 4.57	0.005

Table 4: Hemodynamic Changes at 3 Minutes

Parameter	Lignocaine	Fentanyl	p-value
HR	77.15 ± 5.43	75.42 ± 5.75	0.085
SBP	126.38 ± 4.92	123.95 ± 10.77	0.099
DBP	80.57 ± 3.97	79.10 ± 4.17	0.086
MAP	98.17 ± 2.70	97.25 ± 5.40	0.167

Table 5: Hemodynamic Changes at 5 Minutes

Parameter	Lignocaine	Fentanyl	p-value
HR	78.07 ± 6.83	76.02 ± 6.98	0.084
SBP	124.85 ± 5.62	121.80 ± 11.03	0.126
DBP	79.92 ± 2.89	78.70 ± 5.12	0.095
MAP	95.75 ± 2.80	94.62 ± 7.63	0.192

Table 6: Side Effects

Complication	Lignocaine	Fentanyl	p-value
Bradycardia	7.5%	2.5%	NS
Hypotension	2.5%	7.5%	NS

Discussion

The present study demonstrates that both lignocaine and fentanyl are effective in attenuating the hemodynamic response to laryngoscopy and endotracheal intubation. However, fentanyl was found to provide better control during the immediate post-intubation period.

The hemodynamic response to intubation is known to be most pronounced within the first minute, primarily due to a surge in sympathetic activity. This explains why the differences between the two drugs were most evident during this early phase. Similar findings have been reported in previous studies evaluating various pharmacological agents used to blunt the intubation response [9,10].

In the present study, fentanyl showed significantly better attenuation of heart rate and blood pressure at 1 minute following intubation. These findings are consistent with earlier studies that have also demonstrated improved hemodynamic stability with fentanyl compared to lignocaine during the immediate post-intubation period [11,12].

It has also been observed that fentanyl is more effective in reducing the pressor response, particularly during the early phase after intubation (13). In addition, effective reduction in hemodynamic fluctuations during intubation has been reported in different patient populations, including elderly individuals [14].

However, beyond the initial few minutes, no statistically significant difference was observed between the two groups in the present study. This suggests that although fentanyl provides better early attenuation, both drugs show comparable effects over time. Similar trends have been reported in studies where different agents demonstrated equivalent efficacy after the initial response phase [15].

The superior effect of fentanyl may be attributed to its central mechanism of action, which reduces sympathetic outflow and enhances parasympathetic activity. In contrast, lignocaine primarily acts by suppressing airway reflexes and may have a relatively limited role in modulating central sympathetic responses.

Both drugs were well tolerated, with minimal and comparable adverse effects, indicating their safety in routine clinical practice.

Conclusion

Fentanyl (2 µg/kg) was found to be more effective than lignocaine (1.5 mg/kg) in controlling the immediate rise in heart rate and blood pressure following laryngoscopy and endotracheal intubation, especially within the first minute. However, both drugs showed similar effects at later time intervals and had comparable safety profiles. Overall, fentanyl provides better early hemodynamic stability and can be preferred in routine clinical practice for attenuating the stress response during intubation.

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