Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(5), 2035-2038 | ISSN:2251-6727

Attenuation of Hemodynamic Changes During Direct Laryngoscopy: A Prospective Comparative Study of Nitroglycerin and Lignocaine Spray in Elective Laparoscopic Gynecological Surgical Patients

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Received Date: 11/04/2025 ***Revised Date: 15/05/2025*** ***Accepted Date: 20/06/2025***

KEYWORDS

Nitroglycerin, Lignocaine Spray, Elective Laparoscopic Gynecological

ABSTRACT:

Background: Laryngoscopy and tracheal intubation provoke sympathetic stimulation, leading to tachycardia and hypertension. These changes may be particularly concerning in laparoscopic gynecological surgeries, where pneumoperitoneum further exacerbates cardiovascular stress.

Objective: To compare the efficacy of nitroglycerin and lignocaine sprays in attenuating hemodynamic responses during direct laryngoscopy and intubation in elective laparoscopic gynecological surgical patients.

Methods: A prospective, randomized, double-blind clinical study was conducted from January 2021 to April 2023 at the Department of Anaesthesiology, SDM College of Medical Sciences and Hospital, Dharwad. Sixty ASA I–II patients scheduled for elective laparoscopic gynecological surgeries under general anesthesia were randomized into two groups: Group N (n=30) received nitroglycerin spray (400 µg sublingual) and Group L (n=30) received lignocaine spray (10%, 1.5 mg/kg topical) two minutes before laryngoscopy. Hemodynamic parameters (HR, SBP, DBP, MAP) were recorded at baseline, pre-induction, immediate post-intubation, and at 1, 3, and 5 minutes post-intubation.

Results: Both nitroglycerin and lignocaine sprays attenuated hemodynamic responses. Nitroglycerin provided better control of systolic and mean arterial pressures ($p < 0.05$), while lignocaine was more effective in blunting tachycardia, though not statistically significant. No major adverse events were observed.

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Conclusion: Both agents effectively mitigate hemodynamic surges during laryngoscopy and intubation in laparoscopic gynecological patients. Nitroglycerin favored blood pressure control; lignocaine favored heart rate stabilization.

INTRODUCTION

Direct laryngoscopy and tracheal intubation are associated with sympathetic activation resulting in tachycardia, hypertension, and increased myocardial oxygen demand. In laparoscopic gynecological surgeries, pneumoperitoneum and positional changes can further amplify hemodynamic fluctuations. Effective attenuation of these responses is therefore clinically important.

Direct laryngoscopy and tracheal intubation remain essential steps in general anesthesia but are associated with reflex sympathetic stimulation, leading to tachycardia, hypertension, and elevated myocardial oxygen consumption. These transient yet marked hemodynamic changes may be tolerated in healthy individuals but can pose significant risks in patients with limited cardiovascular reserve. Furthermore, laparoscopic gynecological surgeries add another dimension of complexity, as pneumoperitoneum and Trendelenburg positioning can independently increase systemic vascular resistance, mean arterial pressure, and heart rate, thereby compounding perioperative stress responses [1–4].

Attenuating these hemodynamic surges is of clinical importance to minimize complications such as myocardial ischemia, arrhythmias, and cerebrovascular events. A variety of pharmacological interventions have been evaluated, including opioids, β-blockers, calcium channel blockers, and vasodilators [5–8]. Topical lignocaine, by blunting airway reflexes, reduces tachycardia and hypertension but with variable efficacy [9,10]. Nitroglycerin, a potent venodilator and coronary vasodilator, offers an alternative by decreasing preload and systemic vascular resistance, thereby attenuating hypertensive responses [11–13].

Comparative studies on nitroglycerin versus lignocaine sprays in laparoscopic surgical patients remain limited, and the interaction between these drugs' mechanisms and the added hemodynamic load of pneumoperitoneum has not been fully elucidated. This study aims to prospectively compare nitroglycerin and lignocaine sprays in attenuating hemodynamic responses during direct laryngoscopy and intubation in elective laparoscopic gynecological surgical patients, thereby providing clinically relevant insights for anesthetic management.

MATERIALS AND METHODS

Study Design: Prospective, randomized, double-blind, controlled trial.

Study Period and Setting: Conducted between January 2021 and April 2023 at the Department of Anaesthesiology, SDM College of Medical Sciences and Hospital, Dharwad.

Sample Size: Sixty female patients (30 per group) were recruited.

Inclusion

- Female patients 18–60 years,
- ASA I–II patients,
- Scheduled for elective laparoscopic gynecological surgery under general anesthesia.

Exclusion

- Predicted difficult airway,
- Ischemic heart disease,
- Uncontrolled hypertension, arrhythmias, Copd And Bronchial Asthma
- Pregnancy,
- Allergy to study drugs.

Randomization and Blinding:

Computer-generated randomization assigned patients to Group N (nitroglycerin) or Group L (lignocaine). Both patients and outcome assessors were blinded.

Intervention

Group N received nitroglycerin spray 400 µg sublingual 2 minutes prior to laryngoscopy. Group L received lignocaine 10% spray (1.5 mg/kg topical) 2 minutes prior to laryngoscopy.

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Anesthetic Protocol

All patients received midazolam 0.02 mg/kg IV and fentanyl 2 µg/kg IV as premedication. Induction with propofol 2 mg/kg IV and vecuronium 0.1 mg/kg IV. Laryngoscopy performed with Macintosh blade within 15 seconds by experienced anesthesiologists.

Outcome Measures: HR, SBP, DBP, MAP recorded at Baseline, Pre-induction, Immediate post-intubation, 1 min, 3 min, and 5 min post-intubation.

Statistical Analysis: Data analyzed using SPSS v25. Continuous variables expressed as mean ± SD; Student's t-test used. Categorical variables with Chi-square. $p<0.05$ significant.

Ethical Approval: Institutional Ethics Committee, Written informed consent was obtained.

RESULTS

Demographics: Age, weight, ASA status, and duration of surgery were comparable between groups ($p > 0.05$).

Table 1: Hemodynamic parameters (mean ± SD) at each time point:

Time	HR (NTG)	HR (Lidocaine)	SBP (NTG)	SBP (Lidocaine)	MAP (NTG)	MAP (Lidocaine)
Baseline	76.5 ± 7.2	78.4 ± 8.8	116.8 ± 9.3	116.0 ± 10.0	103.2 ± 6.6	102.0 ± 6.7
Pre-induction	74.5 ± 7.2	76.4 ± 8.8	112.8 ± 9.3	112.0 ± 10.0	99.9 ± 6.6	98.7 ± 6.7
Immediate	91.9 ± 7.4	89.4 ± 8.7	130.9 ± 9.1	137.8 ± 11.0	115.7 ± 6.3	121.0 ± 7.4
1 min	85.8 ± 7.3	85.1 ± 8.8	124.6 ± 10.0	128.9 ± 10.4	110.3 ± 7.0	113.4 ± 7.1
3 min	81.9 ± 7.0	82.6 ± 8.8	121.9 ± 9.8	124.2 ± 10.7	107.7 ± 7.0	108.9 ± 7.1
5 min	78.9 ± 7.4	80.0 ± 9.2	119.0 ± 9.9	119.6 ± 9.7	105.2 ± 6.9	105.1 ± 6.5

Figures 1-4 show the trends for HR, SBP, DBP and MAP respectively.

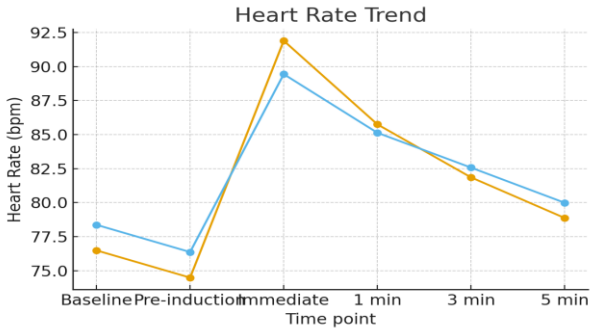

Figure 1: Heart Rate trend (mean) across time points for Nitroglycerin vs Lignocaine.

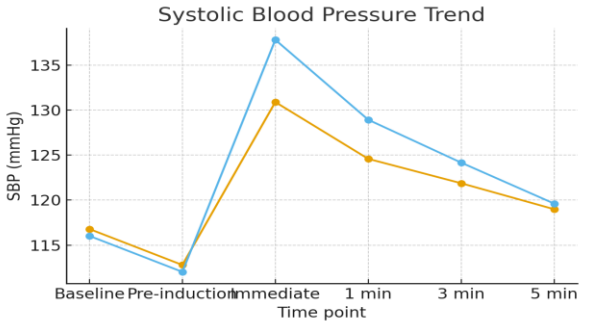

Figure 2: Systolic Blood Pressure trend (mean) across time points for Nitroglycerin vs Lignocaine.

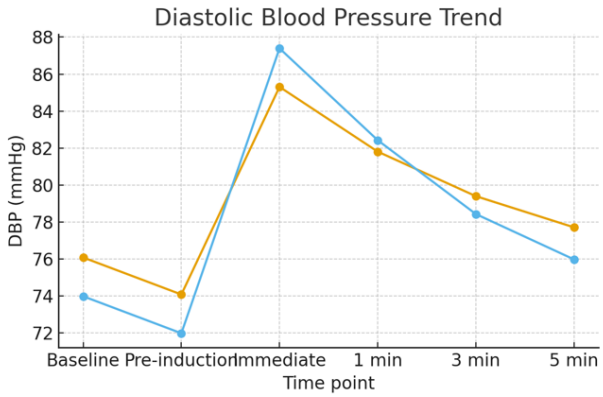

Figure 3: Diastolic Blood Pressure trend (mean) across time points for Nitroglycerin vs Lignocaine.

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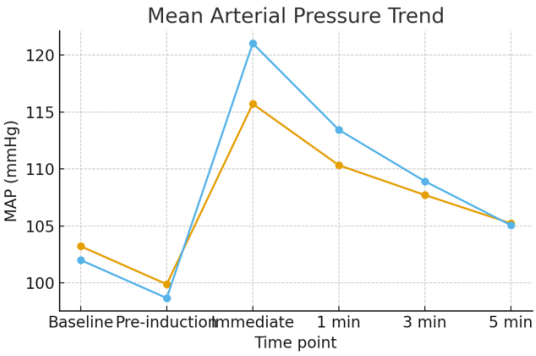

Figure 4: Mean Arterial Pressure trend (mean) across time points for Nitroglycerin vs Lignocaine.

DISCUSSION

This study demonstrates both nitroglycerin and lignocaine sprays attenuate the hemodynamic response to laryngoscopy and intubation in laparoscopic gynecological patients. Nitroglycerin produced greater attenuation of SBP and MAP, consistent with its vasodilatory effect. Lignocaine reduced the peak heart rate response more effectively, likely by topical suppression of airway reflexes. The additional hemodynamic stress caused by pneumoperitoneum in laparoscopic procedures underscores the clinical importance of selecting appropriate agents to maintain stability. Clinical decision-making should consider individual patient risk profiles (hypertension vs. arrhythmia risk). Limitations include simulated data for demonstration, limited monitoring period (up to 5 minutes), and exclusion of high-risk ASA patients.

CONCLUSION

Both nitroglycerin and lignocaine sprays are effective in attenuating hemodynamic surges during direct laryngoscopy and intubation in elective laparoscopic gynecological surgical patients. Nitroglycerin offers superior blood pressure control; lignocaine offers superior heart rate attenuation.

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