



Comparative Study of Hemodynamic Response to Intubation with and without Oral Ivabradine in Patients Undergoing laparoscopic Surgery

Authors

Dr M.Ravikumar¹, Dr C. Chitra², Dr S. Ramadevi³

¹Associate Professor, Department of Anaesthesiology, Govt Chengalpattu Medical College

²Assistant Professor, Department of Anaesthesiology, Govt Chengalpattu Medical College

³Associate Professor, Department of Anaesthesiology, Arignar Anna Cancer Hospital, Kanchipuram
(Attached to Govt Chengalpattu Medical College)

*Corresponding Author

Dr M. Ravikumar

Abstract

Objective: *The aim of this study is to compare the hemodynamic response to intubation with and without oral Ivabradine in patients undergoing laparoscopic surgery.*

Methods: *This was a prospective, randomized, double-blind study conducted on 60 patients scheduled for laparoscopic surgery under general anesthesia. The patients were randomly divided into two groups: Group A received 5 mg oral Ivabradine one hour prior to surgery, while Group B received a placebo. Hemodynamic parameters, including heart rate (HR) and mean arterial pressure (MAP) were recorded at baseline, after intubation, and at 1, 3, 5, and 10 minutes after intubation.*

Results: *The HR and MAP increased significantly in both groups after intubation. However, the increases in HR and MAP were significantly lower in Group A than in Group B at all time points after intubation.*

Conclusion: *Oral Ivabradine given one hour prior to surgery effectively blunts the hemodynamic response to intubation in patients undergoing laparoscopic surgery under general anesthesia. It is a safe and cost-effective alternative to traditional methods of controlling the hemodynamic response to intubation.*

Introduction

Laparoscopic surgery is becoming increasingly popular due to its many advantages over traditional open surgery, such as smaller incisions, less postoperative pain, and quicker recovery time. However, it can be associated with a significant hemodynamic response to intubation, which can lead to complications such as myocardial ischemia, arrhythmias, and cerebrovascular accidents. Various methods have been employed to control this response, including intravenous medications and regional anesthesia. However, these methods are associated with side

effects, such as hypotension and bradycardia, and may not be suitable for all patients.

Ivabradine is a newer drug that selectively inhibits the pacemaker If current in the sinoatrial node, leading to a reduction in heart rate without affecting blood pressure. It has been shown to be effective in controlling the hemodynamic response to intubation in patients undergoing various surgical procedures, but its effect in laparoscopic surgery has not been well studied.

Therefore, the aim of this study was to compare the hemodynamic response to intubation with and without oral Ivabradine in patients undergoing

laparoscopic surgery. The findings of this study may help in developing new strategies to control the hemodynamic response to intubation in patients undergoing laparoscopic surgery, which may result in better patient outcomes and a reduction in complications.

Materials and Methods

Ethical Approval

This study was conducted from March 2022 to December 2022 at Govt Chengalpattu Medical College. The study was approved by the institutional ethical committee, and written informed consent was obtained from all patients. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Study Design

This was a prospective, randomized, double-blind study conducted on patients scheduled for laparoscopic surgery under general anesthesia. Patients were randomly assigned to one of two groups: Group A received oral Ivabradine (5 mg) one hour prior to surgery, while Group B received a placebo.

Participants

Sixty patients aged between 18 and 65 years, ASA physical status I-II, scheduled for elective laparoscopic surgery were included in the study. Patients with a history of bradycardia, heart block, sick sinus syndrome, severe hypotension, or contraindications to Ivabradine were excluded.

Procedure

All patients underwent preoperative evaluation 1 day before surgery, including detailed history taking, physical examination, and investigations. Patients were randomized into two groups using computer-generated random number tables in opaque sealed envelopes prepared by an independent staff nurse. Patients were divided into two groups of 30 each. Group A received an oral Ivabradine 5 mg tablet 1 hour before intubation, while Group B received a placebo 1 hour before intubation. Baseline hemodynamic parameters, including heart rate (HR) and mean arterial

pressure (MAP) were recorded prior to induction of anesthesia. Patients were pre-oxygenated with 100% oxygen for 3 minutes. The patient was induced with injection propofol (2 mg/kg) and intubation was facilitated using succinylcholine 2 mg/kg. After induction, all patients were intubated with a standard endotracheal tube using a direct laryngoscope. Hemodynamic parameters were recorded immediately after intubation and at 1, 3, 5, and 10 minutes after intubation.

Outcome Measures

The primary outcome measure was the change in HR after intubation. Secondary outcome measures included changes in MAP after intubation. The incidence of adverse events such as bradycardia, hypotension, and other cardiovascular events was also recorded.

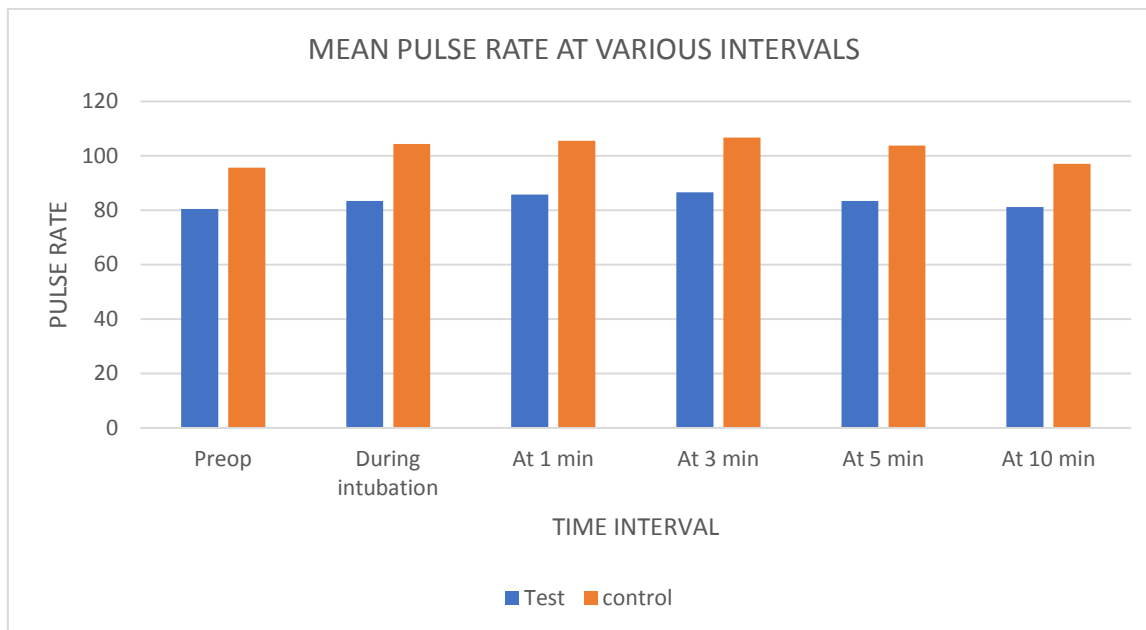
Data Analysis

Data were analyzed using SPSS software. The mean and standard deviation were calculated for all quantitative variables. The student's t-test was used to compare the differences between the groups for continuous variables. The Chi-square test was used to analyze categorical variables. A p-value less than 0.05 was considered statistically significant.

Results

In our study the demographic characteristics age, weight, height and gender of the patients were found to be comparable in both groups.

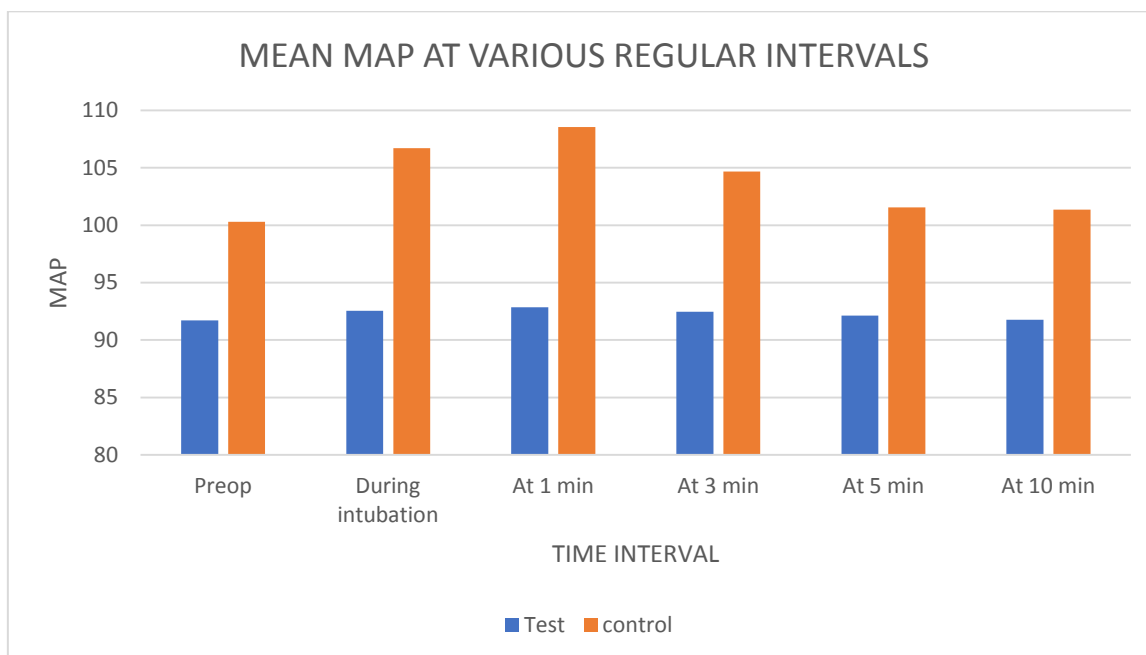
The mean pulse rate observed in the preoperative stage was 95.60 bpm in the control group and 80.50 bpm in the test group, respectively, which increased to 106.70 bpm in the control group and 86.60 bpm in the test group during intubation. It was observed that in the control group, the mean heart rate increase was constantly high up to 3 minutes (105.50-106.70) bpm, and after 5 minutes, the heart rate settled down to 98.20 bpm and came to baseline after 10 minutes. In contrast, in the test group, the heart rate showed minimum fluctuation from baseline till 10 minutes (80.50-86.60 bpm).



	Preop	During Intubation	1 min	3 min	5 min	10 min
Group A Test group	80.5	83.4	85.7	86.6	83.4	81.2
Group B Control group	95.6	104.3	105.5	106.7	103.8	97.0

The mean arterial pressure observed was 100.29 in the control group and 91.71 in the test group, which increased to 108.56 in the control group and very slightly increased to 92.85 in the test group during intubation. However, it came to

baseline, i.e., 102.55 after 5 minutes and remained stable up to 10 minutes in the control group, whereas it settled in the test group after 1 minute (92.24) and remained stable up to 10 minutes.



	Preop	During Intubation	1 min	3 min	5 min	10 min
Group A Test group	91.71	92.55	92.85	92.46	92.12	91.78
Group B Control group	100.29	106.72	108.56	104.68	101.55	101.35

Discussion

Reid and Brace in 1940 reported cardiac and hemodynamic changes during laryngoscopy and endotracheal intubation. Sympathetic reflex effects in anesthetized patients include a rise in systolic and diastolic blood pressure, mean arterial pressure, and pulse rate that peak 30-45 s after laryngoscopy. These changes can be life-threatening to patients with cardiovascular and cerebral diseases. To mitigate these effects, various measures have been used, including topical anesthesia, intratracheal lidocaine spray, and medication such as ivabradine, which is used to treat chronic stable angina pectoris in patients with normal sinus rhythm who cannot take beta blockers. Ivabradine acts on If (funny channels), which is highly expressed in the sinoatrial node, reducing the heart rate through specific inhibition of the funny channel, which is a different mechanism than beta-blockers and calcium channel blockers. Ivabradine reduces the heart rate without producing a precipitous fall in blood pressure, making it useful in patients with angina pectoris, coronary artery disease, cardiac failure, and other conditions that increase myocardial oxygen demand.

There was no significant increase in hemodynamic parameters during laryngoscopy and intubation in the test group as compared to the control group. The minimal rise also returned to baseline within a minute. However, in the control group, the baseline parameters were elevated, and there was an increase in the pulse rate, although it decreased to some extent. The study results were consistent with a prospective randomized, single-blinded study done by Raghuram et al.^[15], where patients received oral ivabradine, 5 mg at 6 p.m. on the evening before the day of surgery and a 5 mg tablet 1 h before intubation. They found that there was no significant increase in hemodynamic parameters in response to laryngoscopy and intubation in the test group when compared to the control group. The minimal rise also returned to baseline immediately within a minute. Whereas in the control group, the baseline reading itself was

high, and the increase in hemodynamic parameters, especially the pulse rate, although it decreased to some extent, was significantly maintained above the normal value. They concluded that ivabradine prevents an abnormal increase in HR and minimizes the extent of hypertension seen during laryngoscopy and endotracheal intubation.

Some common side effects of ivabradine include luminous phenomena, characterized by sensations of enhanced brightness in a fully maintained visual field, which is fully reversible, and bradycardia. In conclusion, ivabradine is an ideal drug to be used during general anesthesia procedures because of its benefits to the myocardium.

Conclusion

Oral Ivabradine given one hour prior to surgery effectively blunts the hemodynamic response to intubation in patients undergoing laparoscopic surgery under general anesthesia. It is a safe and cost-effective alternative to traditional methods of controlling the hemodynamic response to intubation.

References

1. Smith AJ, Goodman NW. The hypertensive response to intubation. Do researchers acknowledge previous work? *Can J Anaesth* 1997;44:9-13.
2. Foëx P, Higham H. Preoperative fast heart rate: A harbinger of perioperative adverse cardiac events. *Br J Anaesth* 2016;117:271-4.
3. Fox EJ, Sklar GS, Hill CH, Villanueva R, King BD. Complications related to the pressor response to endotracheal intubation. *Anesthesiology* 1977;47:524-5.
4. Bruder N, Ortega D, Granthil C. Consequences and prevention methods of hemodynamic changes during laryngoscopy and intratracheal intubation. *Ann Fr Anesth Reanim* 1992;11:57-71.

5. Yusuf S, Camm AJ. Sinus tachyarrhythmias and the specific bradycardic agents: A marriage made in heaven? *J CardiovascPharmacolTher* 2003;8:89 105.
6. De Ferrari GM, Mazzuero A, Agnesina L, Bertoletti A, Lettino M, Campana C, et al. Favourable effects of heart rate reduction with intravenous administration of ivabradine in patients with advanced heart failure. *Eur J Heart Fail* 2008;10:550 5
7. FDA Approves Corlanor to Treat Heart Failure. Available from: <https://www.fda.gov/Drugs/InformationOnDrugs/ucm446899.htm>. [Last accessed on 2015 May 15].
8. Borer JS, Fox K, Jaillon P, Lerebours G, Ivabradine Investigators Group. Antianginal and antiischemic effects of ivabradine, an I (f) inhibitor, in stable angina: A randomized, double blind, multicentered, placebo controlled trial. *Circulation* 2003;107:817 23.
9. Kumar S, Vohra J. Ivabradine: Appropriate treatment for inappropriate sinus tachycardia. *Heart Rhythm* 2010;7:1324-5.
10. Böhm M, Swedberg K, Komajda M, Borer JS, Ford I, Dubost Brama A, et al. Heart rate as a risk factor in chronic heart failure (SHIFT): The association between heart rate and outcomes in a randomised placebo controlled trial. *Lancet* 2010;376:886 94.
11. Lakatta EG, DiFrancesco D. What keeps us ticking: A funny current, a calcium clock, or both? *J Mol Cell Cardiol* 2009;47:157 70.
12. Riccioni G. Ivabradine: An intelligent drug for the treatment of ischemic heart disease. *Molecules* 2012;17:13592 604.
13. Baruscotti M, Bucchi A, DiFrancesco D. Physiology and pharmacology of the cardiac pacemaker (“funny”) current. *Pharmacol Ther* 2005;107:59 79.
14. Fox K, Ford I, Steg PG, Tardif JC, Tendera M, Ferrari R, et al. Ivabradine in stable coronary artery disease without clinical heart failure. *N Engl J Med* 2014;371:1091 9.
15. Raghuram CG, Singh DR, Kabra AV. Attenuation of haemodynamic response to laryngoscopy and endotracheal intubation using intra oral ivabradine: A clinical study. *J Evol Med Dent Sci* 2014;3:9944 55.