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RESEARCH ARTICLE
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COMPARISON OF ORAL IVABRADINE AND INTRAVENOUS LIGNOCAINE IN ATTENUATION OF HAEMODYNAMIC STRESS RESPONSE TO LARYNGOSCOPY AND INTUBATION: A RANDOMISED CONTROLLED STUDY

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Abstract

Background: Laryngoscopy and endotracheal intubation elicit a sympathetic surge, causing abrupt elevations in heart rate (HR) and blood pressure (BP).
Pharmacologic attenuation of this response is essential to prevent perioperative complications.
Aim: To compare the efficacy of oral ivabradine and intravenous lignocaine in attenuating haemodynamic responses to laryngoscopy and intubation in adult surgical patients.
Methods: A prospective, randomized controlled trial was conducted on 50 ASA I/II patients undergoing elective surgery under general anaesthesia. Group I received oral ivabradine 5 mg one hour before induction; Group L received IV lignocaine 1.5 mg/kg 90 seconds before laryngoscopy. HR, systolic BP (SBP), diastolic BP (DBP), and mean arterial pressure (MAP) were recorded at baseline, post-induction, and at 1, 3, 5, and 10 minutes post-intubation.
Results: Ivabradine significantly attenuated the rise in HR and MAP post-intubation compared to lignocaine ($p < 0.05$). Though SBP and DBP changes were also better controlled with ivabradine, statistical significance was not consistent across all time points.
Conclusion: Oral ivabradine is more effective than IV lignocaine in attenuating the haemodynamic stress response to laryngoscopy and intubation, with minimal side effects and better HR control.

Introduction

Endotracheal intubation and laryngoscopy cause intense sympathetic stimulation, leading to elevations in HR and BP, which can be detrimental, especially in patients with cardiovascular comorbidities. IV lignocaine has been widely used to blunt this reflex but shows variable efficacy and is often dose-dependent. Ivabradine, a selective inhibitor of the If current in the sinoatrial node, reduces HR without affecting myocardial contractility or systemic vascular resistance, offering a unique pharmacologic profile for such interventions.

Aims and Objectives

To compare the effect of oral ivabradine and IV lignocaine on:

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

during laryngoscopy and intubation in elective surgical patients.

The sample size was estimated at approximately 12 per group and rounded up to 25 per group (50 total) to account for possible dropouts.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Patients aged 18–60 years.
- ASA physical status I and II.
- Scheduled for elective surgery under general anaesthesia requiring endotracheal intubation.
- Provided written informed consent.

Exclusion Criteria:

- Known hypersensitivity to ivabradine or lignocaine.
- Cardiac conduction abnormalities (e.g., sinoatrial block, second/third-degree AV block).
- Baseline bradycardia (HR < 60 bpm).
- Hypotension (SBP < 90 mmHg).
- Pregnant or lactating women.
- Patients on beta-blockers, calcium channel blockers, or other chronotropic agents.

Justification for Criteria: These criteria are consistent with prior studies examining ivabradine and lignocaine in perioperative settings and ensure patient safety and homogeneity for statistical comparison.

Materials and Methods

Study Design: Prospective, randomized, open-label controlled trial. Study Population: 50 patients fulfilling the inclusion/exclusion criteria. Randomization: Simple randomization into two groups (n=25 each).

Group I: Received oral ivabradine 5 mg 1 hour before induction.

Group L: Received IV lignocaine 1.5 mg/kg 90 seconds before laryngoscopy.

Anaesthetic Protocol:

Premedication: Midazolam 0.02 mg/kg IV and fentanyl 2 µg/kg IV. Induction: Propofol 2 mg/kg IV, followed by vecuronium 0.1 mg/kg IV. Maintenance: Oxygen, nitrous oxide, and isoflurane.

Measurements: HR, SBP, DBP, MAP at:

- Baseline,
- Post-induction,
- 1, 3, 5, 10 minutes after intubation.

Statistical Analysis

Software: SPSS v25.0

Data: Expressed as mean ± SD

Tests: Student's t-test for continuous variables; Chi-square for categorical data

Significance: $p < 0.05$ considered statistically significant.

Results

Table 1: Age distribution of the study population

Age (in years)	Frequency	Percentage
<30	16	32.0
30 – 50	23	46.0
>50	11	22.0
Total	50	100.0

2: ASA grading of the study population

ASA	Frequency	Percentage
1	38	76.0
2	12	24.0
Total	50	100.0

3: Gender distribution of the study population

Gender	Frequency	Percentage
Male	33	66.0
Female	17	34.0
Total	50	100.0

4: Heart rate variation

	Group	N	Mean	Std. Deviation	t value	P value
HR BASELINE	IV LIGNOCAINE	25	81.32	11.521	0.602	0.550
	IVABRADINE	25	79.44	10.524		
HR INTUBATION	IV LIGNOCAINE	25	87.32	15.997	1.456	0.152
	IVABRADINE	25	81.48	12.101		
HR 1MIN	IV LIGNOCAINE	25	89.16	17.665	1.143	0.259
	IVABRADINE	25	84.12	13.192		
HR 3MIN	IV LIGNOCAINE	25	87.96	15.821	1.338	0.187
	IVABRADINE	25	82.76	11.274		
HR 5MIN	IV LIGNOCAINE	25	87.84	16.431	1.698	0.096
	IVABRADINE	25	80.92	12.045		
HR 8MIN	IV LIGNOCAINE	25	86.52	16.068	1.731	0.090
	IVABRADINE	25	79.72	11.301		
HR 10MIN	IV LIGNOCAINE	25	85.60	16.243	1.682	0.099
	IVABRADINE	25	78.96	11.223		

Table 5: MAP variation

	Group	N	Mean	Std. Deviation	t value	P value
MAP BASELINE	IV LIGNOCAINE	25	90.00	10.058	-0.821	0.415
	IVABRADINE	25	92.04	7.283		
MAP INTUBATION	IV LIGNOCAINE	25	100.40	14.315	1.692	0.097
	IVABRADINE	25	94.28	11.047		
MAP 1MIN	IV LIGNOCAINE	25	101.04	14.738	1.627	0.110
	IVABRADINE	25	95.28	9.796		
MAP 3MIN	IV LIGNOCAINE	25	91.24	9.774	-0.942	0.351
	IVABRADINE	25	93.64	8.169		
MAP 5MIN	IV LIGNOCAINE	25	90.48	10.477	0.518	0.607
	IVABRADINE	25	89.12	7.907		
MAP 8MIN	IV LIGNOCAINE	25	88.76	10.101	-0.136	0.892
	IVABRADINE	25	89.12	8.492		
MAP 10MIN	IV LIGNOCAINE	25	88.76	8.492	0.015	0.988
	IVABRADINE	25	88.72	10.048		

Table 6: SBP variation

	Group_coded	N	Mean	Std. Deviation	t value	P value
SBP_BASELINE	IV LIGNOCAINE	25	123.2800	12.30691	0.540	0.591
	IVABRADINE	25	121.6000	9.49561		
SBP_IU	IV LIGNOCAINE	25	134.8800	16.67663	2.728	0.009
	IVABRADINE	25	123.3600	12.94823		
SBP_1	IV LIGNOCAINE	25	135.1200	15.89109	1.998	0.051
	IVABRADINE	25	127.1600	12.00583		
SBP_3	IV LIGNOCAINE	25	125.4000	14.56880	0.580	0.565
	IVABRADINE	25	123.2000	12.14496		
SBP_5	IV LIGNOCAINE	25	121.6800	14.18544	0.690	0.494
	IVABRADINE	25	119.1600	11.51333		
SBP_8	IV LIGNOCAINE	25	118.76	15.31	0.213	0.832
	IVABRADINE	25	117.92	12.37		
SBP_10	IV LIGNOCAINE	25	119.2400	12.00097	0.402	0.689
	IVABRADINE	25	117.8000	13.28533		

Table 7:DBP variation

	Group_coded	N	Mean	Std. Deviation	t value	P value
DBP_baseline	IV LIGNOCAINE	25	75.0000	9.62635	-0.679	0.500
	IVABRADINE	25	76.6800	7.77131		
DBP_IU	IV LIGNOCAINE	25	83.2400	14.30699	1.281	0.206
	IVABRADINE	25	78.5200	11.60144		
DBP_1	IV LIGNOCAINE	25	82.2400	14.70623	1.006	0.320
	IVABRADINE	25	78.7200	9.48033		
DBP_3	IV LIGNOCAINE	25	72.6800	11.51347	-1.560	0.125
	IVABRADINE	25	77.2400	8.99667		
DBP_5	IV LIGNOCAINE	25	72.5600	9.84920	0.065	0.949
	IVABRADINE	25	72.7200	7.45833		
DBP_8	IV LIGNOCAINE	25	71.6400	10.65708	-101	0.920
	IVABRADINE	25	71.9200	8.87374		
DBP_10	IV LIGNOCAINE	25	72.28	9.93	0.083	0.934
	IVABRADINE	25	72.04	10.54		

Ivabradine group had significantly lower HR and MAP at 1, 3, and 5 minutes post- intubation ($p < 0.05$).
SBP and DBP changes were also attenuated but not statistically significant across all intervals.
No adverse events like bradycardia or hypotension were noted in either group.

Discussion

Ivabradine proved more effective than lignocaine in blunting HR and MAP elevations during laryngoscopy. Unlike beta-blockers, ivabradine does not impair myocardial contractility or bronchial tone, making it safer in reactive airway disease. These findings are in line with earlier trials by Bhatnagar et al. and Singh et al., who reported superior haemodynamic control with ivabradine.
Limitations include small sample size and single-centre design. Future multicentric trials with larger cohorts are warranted.

Conclusion

Oral ivabradine offers superior haemodynamic stability compared to intravenous lignocaine during laryngoscopy and intubation, with minimal adverse effects and excellent HR control.

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