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A Comparative Study on the Effects of Intravenous Esmolol, Fentanyl and Lignocaine on Attenuation of Hemodynamic Response to Laryngoscopy and Endotracheal Intubation

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Abstract

Background

This study was conducted to assess the effectiveness and compare the effects of intravenous lignocaine, fentanyl, and esmolol on the reduction of the hemodynamic response to endotracheal intubation and laryngoscopy.

Methods

After receiving approval from the institutional ethics committee and signed informed consent from the study participants, a prospective comparative study based in a hospital was carried out among 267 patients who underwent elective non-cardiac surgeries at the Department of Anaesthesiology, Government Medical College, Thrissur, between January 2020 and January 2021.

Results

Heart rate, systolic and diastolic blood pressure, and mean arterial pressure were measured before premedication (baseline), before drug infusion, during laryngoscopy and intubation, and at 1, 3, 5, and 10 minutes following laryngoscopy and intubation. During laryngoscopy and intubation, the hemodynamic response was attenuated in all three groups (esmolol, lignocaine, and fentanyl). Of these, esmolol demonstrated a significant reduction in heart rate, while fentanyl demonstrated a significant reduction in blood pressure during and for up to 10 minutes following laryngoscopy and intubation.

Conclusion

The study's findings also show that, when administered prior to the procedure, intravenous fentanyl and esmolol are more effective than preservative-free intravenous lignocaine at reducing the pressor response to laryngoscopy

and intubation. Fentanyl has a greater impact on lowering mean, diastolic, and systolic blood pressure than esmolol does on heart rate reduction.

Keywords-Esmolol, Fentanyl, Lignocaine, Stress Response, Laryngoscopy, Intubation.

Introduction

Lignocaine hydrochloride is a class Ib anti-dysrhythmic drug and a local anaesthetic that is amino-ethylamide based. It works by obstructing sodium channels, which lowers the heart rate during contractions. It lessens dysrhythmias and cough reflexes. Decreased is also the rise in intracranial and intraocular pressure.[1] Its direct cardiac depressive action, peripheral vasodilation, and influence on synaptic transmissions are the causes of these beneficial effects.[2] This medication is among the most traditional, affordable, secure, and readily accessible options for reducing the stress reaction before laryngoscopy and intubation. Numerous investigations have compared the effectiveness of different medications at different doses in obstructing the laryngoscopic and intubation stress responses.[3-6] Esmolol, fentanyl, and lignocaine are among these medications that are readily accessible and frequently utilised in our daily anaesthetic practice. There isn't enough research comparing these three medications to determine which is a superior agent in our literature.[7,8] Additionally, lignocaine (2 mg/kg) and fentanyl (3 µg/kg) were used at larger doses in these earlier investigations to compare their effects, or a fixed dose of the medications was used. Therefore, in order to prevent these medications from having negative effects on patients, our goal is to employ smaller dosages of these pharmaceuticals and produce these results.

Aims and Objectives

To compare the efficacy of esmolol, fentanyl and preservative free plain lignocaine with regard to:

- Changes in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure
- Efficacy of attenuation of the above parameters in response to laryngoscopy and endotracheal intubation
- To observe any untoward, adverse, and/or beneficial effects.

Methods

After receiving approval from the institutional ethics committee and signed informed consent from the study participants, a prospective comparative study based in a hospital was carried out among 267 patients who underwent elective non-cardiac surgeries at the Department of Anaesthesiology, Government Medical College, Thrissur, between January 2020 and January 2021.

Inclusion Criteria

1. ASA PS-I and ASA PS-II groups
2. Between 18 and 60 years of age, both sexes
3. Undergoing elective surgeries requiring general anaesthesia and who are receiving either esmolol, fentanyl or lignocaine before laryngoscopy and intubation.
4. Laryngoscopy and intubation time: <15 sec.
5. Intubated in a single attempt

Exclusion Criteria

1. Patients not willing to participate in the study
2. Patient allergic to esmolol, fentanyl or lignocaine
3. Patient with an anticipated difficult airway
4. Patients with hypertension, cardiac, renal, hepatic, cerebral disease; peripheral vascular disease; bradycardia; patients on beta blockers; and obese, pregnant and nursing mothers.

Statistical Methods

The data were entered in Microsoft Excel software, and analysed using IBM SPSS version 25 software.

Results

	Variables	N	Mean	SD	F-Value	P-Value	Pairwise Comparison
Heart Rate	Esmolol	89	84.69	8.37	43.388	<0.001	E vs. F (p=0.360)
	Fentanyl	89	81.73	13.77			E vs. L (p<0.001)
	Lignocaine	89	98.27	14.81			F vs. L (p<0.001)
SBP	Esmolol	89	130.38	11.99	12.171	<0.001	E vs. F (p=1.000)
	Fentanyl	89	130.07	16.04			E vs. L (p<0.001)
	Lignocaine	89	138.76	11.52			F vs. L (p<0.001)
DBP	Esmolol	89	76.64	9.75	8.287	<0.001	E vs. F (p=0.034)
	Fentanyl	89	80.20	10.92			E vs. L (p<0.001)
	Lignocaine	89	82.26	6.79			F vs. L (p=0.426)
MAP	Esmolol	89	94.60	9.41	10.020	<0.001	E vs. F (p=0.432)
	Fentanyl	89	96.76	12.11			E vs. L (p<0.001)
	Lignocaine	89	101.10	7.56			F vs. L (p=0.011)

Baseline Comparison of Heart Rate, SBP, DBP and MAP among Groups

Groups		N	Heart Rate		F-Value	P-Value	Pairwise Comparison
			Mean	SD			
Before Drug Infusion	Esmolol	89	80.87	7.96	51.248	<0.001	E vs. L (p=0.517)
	Fentanyl	89	78.42	13.31			E vs. F (p<0.001)
	Lignocaine	89	95.19	13.68			F vs. L (p<0.001)
During Laryngoscopy and Intubation	Esmolol	89	76.48	7.71	59.767	<0.001	E vs. L (p=0.752)
	Fentanyl	89	74.44	12.84			E vs. F (p<0.001)
	Lignocaine	89	92.18	14.02			F vs. L (p<0.001)
At 1 Minute	Esmolol	89	72.90	6.97	70.929	<0.001	E vs. L (p=0.940)
	Fentanyl	89	71.18	12.37			E vs. F (p<0.001)
	Lignocaine	89	89.53	13.60			F vs. L (p<0.001)
At 3 Minutes	Esmolol	89	69.67	6.41	82.711	<0.001	E vs. L (p=1.000)
	Fentanyl	89	68.20	12.10			E vs. F (p<0.001)
	Lignocaine	89	87.33	13.35			F vs. L (p<0.001)

At 5 Minutes	Esmolol	89	66.44	6.11	95.296	<0.001	E vs. L (p=1.000)
	Fentanyl	89	65.49	12.08			E vs. F (p<0.001)
	Lignocaine	89	85.09	12.61			F vs. L (p<0.001)
At 10 Minutes	Esmolol	89	63.69	5.80	98.857	<0.001	E vs. L (p=1.000)
	Fentanyl	89	63.26	12.26			E vs. F (p<0.001)
	Lignocaine	89	82.82	12.37			F vs. L (p<0.001)

Comparison of Heart Rate Value among Groups at Different Time Intervals

Table 1

The baseline values of heart rate, SBP, DBP, and MAP showed statistically significant differences, according to the ANOVA test. A statistically significant difference in heart rate was seen between esmolol (84.69±8.37) and lignocaine (98.27±14.81), as well as between fentanyl (81.73±13.77) and lignocaine (98.27±14.81), according to post-hoc analysis. There was a statistically significant difference in the mean SBP value between the groups of ignocaine (138.76±11.52), esmolol (130.38±11.99), and fentanyl (130.07±16.04). In comparison to the fentanyl group (80.20±10.92) and the lignocaine group (82.26±6.79), the mean DBP value in the esmolol group (76.64±9.75) was statistically significant. The lignocaine group had a mean MAP value of 101.10±7.56, which was statistically significant when compared to the esmolol group (94.60±9.41) and the fentanyl group (96.76±12.11).

ANOVA testing revealed a statistically significant difference in the groups' mean heart rate values before medication infusion, throughout laryngoscopy and intubation, and at the one, three, five, and ten-minute intervals. In the post-hoc analysis, the mean heart rate values before drug infusion, throughout laryngoscopy and intubation, and at the first, third, fifth, and tenth minute time intervals were substantially lower in the fentanyl and esmolol groups than in the lignocaine group.

Groups		**N**	**DBP**		**F Value**	**P-Value**	**Pairwise Comparison**
			Mean	**SD**			
Before drug infusion	Esmolol	89	74.72	8.12	11.076	<0.001	E vs F (p=1.000)
	Fentanyl	89	75.88	10.29			E vs L (p<0.001)
	Lignocaine	89	80.57	7.73			F vs L (p=0.001)
During Laryngoscopy and Intubation	Esmolol	89	72.31	7.77	26.002	<0.001	E vs F (p=0.001)
	Fentanyl	89	67.83	8.92			E vs L (p=0.001)
	Lignocaine	89	76.71	7.90			F vs L (p<0.001)
At 1 Minute	Esmolol	89	69.91	7.18	34.474	<0.001	E vs F (p<0.001)
	Fentanyl	89	64.37	7.78			E vs L (p=0.002)
	Lignocaine	89	73.89	8.06			F vs L (p<0.001)
At 3 Minutes	Esmolol	89	67.72	6.85	48.022	<0.001	E vs F (p<0.001)
	Fentanyl	89	61.20	7.19			E vs L (p=0.001)
	Lignocaine	89	71.87	7.88			F vs L (p<0.001)
At 5 Minutes	Esmolol	89	65.78	6.84	61.258	<0.001	E vs F (p<0.001)

	Fentanyl	89	58.45	6.93			E vs L (p<0.001)
	Lignocaine	89	70.08	7.48			F vs L (p<0.001)
At 10 Minutes	Esmolol	89	63.57	7.45	68.710	<0.001	E vs F (p<0.001)
	Fentanyl	89	55.72	7.21			E vs L (p<0.001)
	Lignocaine	89	68.15	6.78			F vs L (p<0.001)

Comparison of DBP Value among Groups at Different Time Intervals

Groups		**N**	**SBP**		**F-Value**	**P Value**	**Pairwise Comparison**
			Mean	**SD**			
Before Drug Infusion	Esmolol	89	126.36	9.64	26.329	<0.001	E vs. F (p=0.055)
	Fentanyl	89	122.35	13.33			E vs. L (p<0.001)
	Lignocaine	89	134.37	10.52			F vs. L (p<0.001)
During Laryngoscopy and Intubation	Esmolol	89	121.43	8.04	68.621	<0.001	E vs. F (p<0.001)
	Fentanyl	89	109.20	12.93			E vs. L (p=0.001)
	Lignocaine	89	127.38	10.11			F vs. L (p<0.001)
At 1 Minute	Esmolol	89	117.88	6.86	91.897	<0.001	E vs. F (p<0.001)
	Fentanyl	89	104.49	11.80			E vs. L (p<0.001)
	Lignocaine	89	123.69	9.75			F vs. L (p<0.001)
At 3 Minutes	Esmolol	89	115.28	6.68	122.467	<0.001	E vs. F (p<0.001)
	Fentanyl	89	100.81	10.89			E vs. L (p<0.001)
	Lignocaine	89	120.90	8.42			F vs. L (p<0.001)
At 5 Minutes	Esmolol	89	112.90	6.33	158.206	<0.001	E vs. F (p<0.001)
	Fentanyl	89	97.53	9.89			E vs. L (p<0.001)
	Lignocaine	89	118.44	7.76			F vs. L (p<0.001)
At 10 Minutes	Esmolol	89	110.34	6.97	188.214	<0.001	E vs. F (p<0.001)
	Fentanyl	89	94.02	9.48			E vs. L (p<0.001)
	Lignocaine	89	116.29	7.08			F vs. L (p<0.001)

Comparison of SBP among Groups at Different Time Intervals

Table 2

According to the results of the ANOVA test, there was a statistically significant difference in the groups' mean diastolic blood pressure values before the drug was infused, during the laryngoscopy and intubation, and at the one, three, five, and ten-minute intervals. The mean DBP value before medication infusion was considerably lower in the fentanyl and esmolol groups than in the lignocaine group, according to the post-hoc analysis. When it came to laryngoscopy and intubation, the fentanyl group's mean DBP value was notably lower than that of the esmolol and lignocaine groups at the one, three, five, and ten-minute segments.

According to the results of the ANOVA test, there was a statistically significant difference in the groups' mean systolic blood pressure values before the drug was infused, during the laryngoscopy and intubation, and at the one, three, five, and ten-minute intervals. The mean SBP value prior to medication infusion was considerably lower in the fentanyl and esmolol groups than in the Lignocaine group, according to the post hoc analysis. The fentanyl group had a significantly lower mean SBP value than the esmolol and lignocaine groups during the 1st, 3rd, 5th, and 10th minute time intervals during laryngoscopy and intubation.

Groups		**N**	**MAP**		**F-Value**	**P-Value**	**Pairwise Comparison**
			Mean	**SD**			
Before Drug Infusion	Esmolol	89	91.72	8.08	20.167	<0.001	E vs. F (p=1.000)
	Fentanyl	89	90.91	10.55			E vs. L (p<0.001)
	Lignocaine	89	98.66	7.99			F vs. L (p<0.001)
During Laryngoscopy and Intubation	Esmolol	89	88.72	7.02	47.584	<0.001	E vs. F (p<0.001)
	Fentanyl	89	81.61	9.63			E vs. L (p<0.001)
	Lignocaine	89	93.56	7.80			F vs. L (p<0.001)
At 1 Minute	Esmolol	89	85.91	6.29	67.035	<0.001	E vs. F (p<0.001)
	Fentanyl	89	77.63	8.30			E vs. L (p<0.001)
	Lignocaine	89	90.49	7.81			F vs. L (p<0.001)
At 3 Minutes	Esmolol	89	83.57	6.02	89.418	<0.001	E vs. F (p<0.001)
	Fentanyl	89	74.31	7.69			E vs. L (p<0.001)
	Lignocaine	89	88.19	7.33			F vs. L (p<0.001)
At 5 Minutes	Esmolol	89	81.57	5.77	116.343	<0.001	E vs. F (p<0.001)
	Fentanyl	89	71.46	7.23			E vs. L (p<0.001)
	Lignocaine	89	86.24	6.74			F vs. L (p<0.001)
At 10 Minutes	Esmolol	89	78.83	6.61	127.022	<0.001	E vs. F (p<0.001)
	Fentanyl	89	68.46	7.27			E vs. L (p<0.001)
	Lignocaine	89	84.13	6.08			F vs. L (p<0.001)
Comparison of MAP Value among Groups at Different Time Intervals							
Groups	**Reduction of Heart Rate**				**Kruskal Wallis Value**	**P-Value**	**Pairwise Comparison**
	Mean		**SD**	**Median (IQR)**			
Baseline to Drug infusion	Esmolol	3.82	3.42	3 (2-6)	0.379	0.827	NA
	Fentanyl	3.31	2.04	3 (2-4)			NA
	Lignocaine	3.08	3.66	3 (2-5)			NA
	Esmolol	8.20	3.97	8 (6-10)	12.606	0.002	E vs. F (p=0.168)

Baseline to during Laryngoscopy and Intubation	Fentanyl	7.29	2.59	7 (5.5-9.0)			E vs. L (p<0.001)
	Lignocaine	6.09	5.94	6 (4-8)			F vs. L (p=0.032)
Baseline to 1 Minute	Esmolol	11.79	4.31	12 (9-14)	19.466	<0.001	E vs. F (p=0.168)
	Fentanyl	10.55	3.20	10 (8-12)			E vs. L (p<0.001)

Comparison of Reduction of Heart Rate from Baseline among Groups at Different Time Intervals

Table 3

The ANOVA test revealed a statistically significant difference in the mean MAP value between the groups during the first, third, fifth, and tenth minute time intervals, before drug infusion, during laryngoscopy, and during intubation. The mean MAP value prior to medication infusion was considerably lower in the fentanyl and esmolol groups than in the lignocaine group, according to the post hoc analysis. The fentanyl group's mean MAP value was notably lower than that of the esmolol and lignocaine groups for the 1st, 3rd, 5th, and 10th minute time intervals during laryngoscopy and intubation.

The groups differed statistically significantly in the reduction of heart rate values during laryngoscopy and intubation at the first, third, fifth, and tenth minute time intervals, according to the results of the Kruskal-Wallis test. During laryngoscopy and intubation, at the first and third minutes, the average heart rate reduction was substantially larger in the fentanyl and esmolol groups when compared to the lignocaine group, according to the post-hoc analysis. At the five- and ten-minute intervals, the esmolol group experienced a greater mean reduction in heart rate than the fentanyl and lignocaine groups.

Groups		**Reduction of DBP**			**Kruskal Wallis Value**	**P -Value**	**Pairwise Comparison**
		Mean	**SD**	**Median (IQR)**			
Baseline to Drug infusion	Esmolol	1.92	3.50	2 (1-3)	42.154	<0.001	E vs. F (p<0.001)
	Fentanyl	4.33	3.90	4 (2-6)			E vs. L (p=0.430)
	Lignocaine	1.69	4.93	2 (1-3)			F vs. L (p<0.001)
Baseline to During Laryngoscopy and Intubation	Esmolol	4.33	4.61	4 (2-6)	68.907	<0.001	E vs. F (p<0.001)
	Fentanyl	12.37	9.07	12 (6-18)			E vs. L (p=0.076)
	Lignocaine	5.55	5.96	5 (3-6)			F vs. L (p<0.001)
Baseline to 1 Minute	Esmolol	6.73	5.24	6 (4.0-8.5)	80.074	<0.001	E vs. F (p<0.001)
	Fentanyl	15.83	8.82	15 (9.0-21.5)			E vs. L (p=0.070)
	Lignocaine	8.37	6.07	7 (6-9)			F vs. L (p<0.001)
Baseline to 3 Minute	Esmolol	8.92	5.02	8 (5-12)	89.614	<0.001	E vs. F (p<0.001)
	Fentanyl	19.00	8.60	18 (12.5-25.5)			E vs. L (p=0.093)
	Lignocaine	10.39	5.57	9 (8-11.5)			F vs. L (p<0.001)
	Esmolol	10.87	5.56	11 (7-14)	91.932	<0.001	E vs. F (p<0.001)

Baseline to 5 Minutes	Fentanyl	21.75	8.80	21 (16-27)			E vs. L (p=0.176)
	Lignocaine	12.18	5.69	12 (9.5-14.0)			F vs. L (p<0.001)
Baseline to 10 Minutes	Esmolol	13.07	5.71	12 (9.0-16.5)	95.767	<0.001	E vs. F (p<0.001)
	Fentanyl	24.48	9.13	23 (18-31)			E vs. L (p=0.226)
	Lignocaine	14.11	4.97	14 (11-16)			F vs. L (p<0.001)
Comparison of Reduction of DBP from Baseline among Groups at Different Time Intervals							
Groups		**Reduction of SBP**			**Kruskal Wallis Value**	**P-Value**	**Pairwise Comparison**
		Mean	**SD**	**Median (IQR)**			
Baseline to Drug Infusion	Esmolol	4.02	4.42	4 (2-5)	36.528	<0.001	E vs. F (p<0.001)
	Fentanyl	7.72	5.68	6 (4.0-9.5)			E vs. L (p=0.244)
	Lignocaine	4.39	5.28	4 (3-6)			F vs. L (p<0.001)
Baseline to during Laryngoscopy and Intubation	Esmolol	8.96	6.81	8 (6.0-10.5)	64.656	<0.001	E vs. F (p<0.001)
	Fentanyl	20.87	12.67	20 (10.5-30.0)			E vs. L (p=0.244)
	Lignocaine	11.38	13.20	8 (6.0-11.0)			F vs. L (p<0.001)
Baseline to 1 Minute	Esmolol	12.51	7.82	12 (8.0-14.5)	72.705	<0.001	E vs. F (p<0.001)
	Fentanyl	25.57	12.86	24 (15.5-32.5)			E vs. L (p=0.244)
	Lignocaine	15.08	12.29	12 (9.5-16.0)			F vs. L (p<0.001)
Comparison of Reduction of SBP from Baseline among Groups at Different Time Intervals							
Baseline to 3 Minute	Esmolol	15.10	7.47	14(10-18)	84.132	<0.001	E vs. F (p<0.001)
	Fentanyl	29.26	1303	28(19-37)			E vs. L (p=0.131)
	Lignocaine	17.87	11.99	15(13.0-18.5)			F vs. L (p<0.001)
Baseline to 5 Minute	Esmolol	17.48	7.95	17(12-20)	87.115	<0.001	E vs. F (p<0.001)
	Fentanyl	32.54	12.75	32(22.5-40.0)			E vs. L (p=0.125)
	Lignocaine	20.33	11.30	18(15-21)			F vs. L (p<0.001)
Baseline to 10 Minute	Esmolol	20.04	8.33	19(14.5-24.5)	92.160	<0.001	E vs. F (p<0.001)
	Fentanyl	36.04	12.78	34(26.5-44.0)			E vs. L (p=0.168)
	Lignocaine	22.47	9.47	21(18-25)			F vs. L (p<0.001)

Table 4

The Kruskal-Wallis test revealed a statistically significant difference in the amount that each group's diastolic blood pressure value decreased at the first, third, fifth, and tenth minute time intervals throughout medication infusion, laryngoscopy, and intubation. During medication infusion, during laryngoscopy and intubation, at first and third, fifth, and tenth minute time intervals, the mean reduction of diastolic blood pressure was larger in the fentanyl group compared with the esmolol and lignocaine groups in the post hoc analysis. This difference was statistically significant.

Groups		**Reduction of MAP**			**Kruskal Wallis Value**	**P-Value**	**Pairwise Comparison**
		Mean	**SD**	**Median (IQR)**			
Baseline to Drug infusion	Esmolol	2.88	3.64	2 (1-4)	51.828	<0.001	E vs. F (p<0.001)
	Fentanyl	5.85	4.68	5 (3-7)			E vs. L (p=0.615)
	Lignocaine	2.44	4.79	3 (2-4)			F vs. L (p<0.001)
Baseline to during Laryngoscopy and Intubation	Esmolol	5.88	4.41	5 (4-7)	70.494	<0.001	E vs. F (p<0.001)
	Fentanyl	15.16	9.71	14 (8-22)			E vs. L (p=0.119)
	Lignocaine	7.54	7.82	6 (4-8)			F vs. L (p<0.001)
Baseline to 1 Minute	Esmolol	8.69	5.09	8 (6-10)	82.682	<0.001	E vs. F (p<0.001)
	Fentanyl	19.13	9.76	17 (12.0-25.5)			E vs. L (p=0.088)
	Lignocaine	10.61	7.57	9 (7-11)			F vs. L (p<0.001)
Baseline to 3 Minute	Esmolol	11.02	4.77	10 (7.5-13.0)	92.710	<0.001	E vs. F (p<0.001)
	Fentanyl	22.45	9.51	21 (15.5-29.5)			E vs. L (p=0.078)
	Lignocaine	12.91	7.23	11 (10-13)			F vs. L (p<0.001)
Baseline to 5 Minutes	Esmolol	13.02	4.97	12 (10.0-16.0)	100.647	<0.001	E vs. F (p<0.001)
	Fentanyl	25.30	9.56	24 (18.5-32.0)			E vs. L (p=0.050)
	Lignocaine	14.87	6.67	14 (12.0-15.5)			F vs. L (p<0.001)
Baseline to 10 Minutes	Esmolol	15.76	5.58	15 (12.0-18.5)	99.814	<0.001	E vs. F (p<0.001)
	Fentanyl	28.30	9.70	27 (21-36)			E vs. L (p=0.120)
	Lignocaine	16.97	5.62	17 (14-19)			F vs. L (p<0.001)

Table 5: Comparison of Reduction of MAP from Baseline among Groups at Different Time Intervals

The Kruskal-Wallis test revealed a statistically significant difference in the reduction of the MAP value at the first, third, fifth, and tenth minute time intervals during medication infusion, laryngoscopy, and intubation. During medication infusion, laryngoscopy and intubation, at first, third, fifth, and tenth minute time intervals, the mean reduction of MAP value was larger in the fentanyl group compared with the esmolol and lignocaine groups in the post hoc analysis. This difference was statistically significant.

DISCUSSION

Age and gender disparities between the three groups' participants in this study were not statistically significant, suggesting group comparability. In a similar vein, there was no discernible variation in the individuals' weight

between the three groups. When comparing the heart rates of all groups to the baseline values, our study's hemodynamic parameters showed a considerable drop, with the Esmolol group showing the greatest reduction. In the meantime, all three groups showed a decrease in SBP, DBP, and MAP when compared to the baseline; however, the fentanyl group showed a much larger decrease than the other two.

Tamaskar et al.[9] used esmolol at a lower dose of 1.5 mg/kg for three minutes before inducing anaesthesia, followed by laryngoscopy and intubation, in their investigation on the attenuation of stress responses during laryngoscopy and intubation in ENT operations. This dose was smaller than the one we selected, and there was a lot less time between the drug's administration and intubation than there was during our 10-minute interval. They did, however, succeed in significantly lowering their blood pressure, both diastolic and systolic. However, in contrast to our research, no comparison analysis of various medications was carried out.

In contrast to the control group, Miller et al.[4] observed that lignocaine (1.5 mg/kg) administered 1, 2, or 3 minutes before laryngoscopy did not lessen the cardiovascular response to laryngoscopy and tracheal intubation. In contrast to the baseline readings, the group in our study that got the same dosage of lignocaine showed a drop in MAP and heart rate. The timing of lignocaine administration in our study, which was 10 minutes before laryngoscopy, may be the cause of this discrepancy from the other study.

In our investigation, we discovered that esmolol was more successful in lowering the heart rate response that happens during intubation and laryngoscopy. Similar results were seen in the Parvez et al. investigation.[10] It provides a dependable and persistent defence against an increase in heart rate, which would otherwise raise the risk of myocardial infarction in individuals with impaired cardiovascular function. Esmolol, therefore, becomes the best option for people who already have coronary artery disease. In our investigation, fentanyl was shown to be more effective at lowering blood pressure; as a result, patients with hypertension may find it helpful. It can lessen the need for intraoperative analgesics and serve as an adjuvant to induction agents. On the other hand, lignocaine demonstrated the least reduction in pressor response during intubation and laryngoscopy.

Our study's strengths include the utilisation of the best possible doses of lignocaine, esmolol, and fentanyl, as well as the assessment of baseline and follow-up data to compare hemodynamic parameters at different intervals.

One of the study's limitations is its design; a randomised controlled trial would have been a better way to determine a drug's efficacy and long-term effects. Catecholamine levels in plasma would be a better suitable indicator for determining a drug's efficacy. The results would be skewed if patients with comorbidities were excluded since their pressor reaction to the medication would be impacted.

Conclusion

The outcomes unequivocally show that the patient’s reaction to laryngoscopy and intubation is counteracted by all three medications. However, esmolol and fentanyl significantly lessen the pressor response compared to lignocaine. Esmolol is superior to fentanyl in reducing tachycardia, although fentanyl is superior in lowering blood pressure after laryngoscopy and intubation. Thus, esmolol and fentanyl seem to be a better option than preservative-free lignocaine in patients for whom the pressor response to intubation could be harmful.

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