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Haemodynamic response to laryngeal mask airway versus endotracheal tube, a clinical comparative study

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Abstract
Background: Laryngeal mask airway is becoming increasingly popular in anaesthetic practice. It has the advantage of maintaining airway both for spontaneous and controlled ventilation without requiring laryngoscopy and tracheal intubation.
Aims: The aim of this study was to measure the haemodynamic response to the insertion of the LMA in normotensive patients and compare it with endotracheal intubation and also chances of regurgitation and aspiration associated with the use of it.
Methods: The study comprised of 100 cases undergoing elective surgery of 45 minutes to 1 hour duration divided into 2 groups of 50 each. In Group 1, endotracheal tube was placed whereas in group 2 LMA was inserted. Pulse, blood pressure and ECG observed after one minute, three minute and five minutes.
Conclusion: The effect of haemodynamic response using two different techniques (ETT and LMA) was similar but the magnitude of response was less with LMA and also the risk of regurgitation with it not greater than ETT at least in short duration elective surgery.

Keywords: laryngeal mask airway, elective surgery

Introduction
A fundamental responsibility of an Aneasthesiologist is maintenance of a patent airway during surgical procedures. Endotracheal intubation for maintenance of airway is one of the most significant developments of anaesthesia and is considered one of the best ways of securing the airway. Though endotracheal anaesthesia is a great achievement for mankind it is not free from any complexities. One of the most important is the deleterious haemodynamic consequences in response to laryngoscopy and intubation due to reflex sympatho-adrenal stimulation. There had been various complications of this pressor response arising from laryngoscopy and intubation which varied from sinus tachycardia to potentially lethal arrythmias, cardiac failure, myocardial infarction, rise in intracranial pressure, etc. It was at this context we thought that an alternate form of effective airway might have a different effect on haemodynamic changes and may lead to a smoother transition from period of induction to period of maintenance. Laryngeal mask airway is becoming increasingly popular in anaesthetic practice. It has the advantage of maintaining airway both for spontaneous and controlled ventilation without requiring laryngoscopy and tracheal intubation. It's insertion requires neither visualization of the vocal cords nor penetration of the larynx, making its placement less stimulating and it may provoke less sympathetic response and catecholamine release. Similarly at any depth of anaesthesia removal of LMA would be expected to be less stimulating then removal of tracheal tube. The cardiovascular response to LMA insertion also includes a transient rise in blood pressure and heart rate.

Aims and Objectives
The aim of this study was to measure the haemodynamic response to the insertion of the LMA in normotensive patients and compare it with endotracheal intubation during induction of anaesthesia with a balanced anaesthesia technique. The chances of regurgitation and aspiration associated with the use of LMA in comparison to ETT was also studied along with it.

Materials and Methods
This study has been conducted in Assam Medical College & Hospital, Dibrugarh after obtaining ethical committee clearance. A written informed consent has been taken from all the patients included in the study. The study comprised of 100 cases undergoing elective surgery of 45 minutes to 1 hour duration. The patients were randomly divided into two groups with Group-I comprising of 50 patients where endotracheal tubes were used and Group-II comprising the other fifty (50) patients where laryngeal mask airway were used.

Inclusion Criteria
- Only ASA1patients were taken for the study.
- Only elective cases were taken.
- Age from 15 years to 50 years.
- Both sexes of patients were included.

Patients with following parameters were excluded from the study
- Physical status other than ASA1.
- Emergency cases.

- Age < 15 years or > 50 years.
- Obese patients.

Patients having following diseases

- Hiatus hernia
- Oesophageal diseases
- Chronic obstructive pulmonary disease
- Difficult airway
- Drug allergy
- Cardiovascular disease
- Bleeding disorders.

On the day of operation patients were examined in the pre-anaesthesia room and all of them received a similar pre-medication of Inj. glycopyrolate0.04mgm/Kg. body weight, Inj. Tramadol 1.5 mgm/Kg. body weight and Inj. Pantoprazole 40 mg iv 5 minutes before operation. A Ryles tube was introduced and through it 5 ml of sterile methylene blue was introduced into the stomach and then the Ryles tube was taken out after cleaning with saline, for assessment of regurgitation.

Pulse, blood pressure and ECG checked at that juncture. All the patients received a standard anaesthesia technique consisting of pre-oxygenation for 3 minutes followed by propofol 2—3 mg/Kg and Atracurium 0.5mgm/Kg.

In Group-I patients following induction endotracheal tubes were introduced and secured followed by controlled ventilation. In Group-II patients following induction laryngeal mask airways were inserted and secured followed by controlled ventilation.

Pulse, blood pressure and ECG taken again and thereafter at one minute, three minute and five minutes. All the patients were ventilated with 33% O2 in N2O and relaxation maintained with atracurium. All the patients were reversed with Neostigmine and glycopyrolate. In all the cases pharyngeal suction was done through mucous sucker after reversal.

Results and Observations

Table 1: Pulse Rate Distribution

Time interval	Group–I Endotracheal tube		Group–II Laryngeal mark airway	
	Mean	S.D.	Mean	S.D.
Before Induction	93.02	± 4.2	91.8	± 6.9
After ETT/LMA	124.66	± 3.8	116.98	± 4.7
At 1 Minute	125.58	± 5.0	99.34	± 5.0
At 3 Minute	115.64	± 6.0	91.32	± 3.8
At 5 Minute	91.08	± 5.15	86.8	± 3.8

This table shows the mean value of the pulse rates of both the groups at each time interval.

Table 2: Percentage change in pulse rate (Group–I)

	Before Induction(I)	After ETT	At 1 Minute	At 3 Minute	At 5 Minute
Mean	93.02	124.66	125.58	115.64	91.08
S.D.	± 4.2	± 3.8	± 5.0	± 6.0	± 5.15
't'–test		37.05	33.21	18.74	4.1
p–value		< 0.001	< 0.001	< 0.001	< 0.001
Percentage change with respect to (I)		+ 34.01	+ 32.1	+ 21.7	– 4.14

Table 3: Percentage change in pulse rate (Group–II)

	Before Induction	After LMA	At 1 Minute	At 3 Minute	At 5 Minute
Mean	91.8	116.98	99.34	91.32	81.8
S.D.	± 6.5	± 4.7	± 5.0	± 3.8	± 3.8
't'–test		22.18	7.1	0.4	3.6
p–value		< 0.001	< 0.001	> 0.5	< 0.001
Percentage change with respect to (I)		+ 27.83	+ 9.4	+ 0.05	– 4.40

Table 4: Systolic blood pressure distribution

Time interval	Group–I Endotracheal tube		Group–II Laryngeal mark airway	
	Mean	S.D.	Mean	S.D.
Before Induction	123.7	± 7.9	122.9	± 3.1
After ETT/LMA	145.94	± 4.3	135.34	± 4.2
At 1 Minute	141.56	± 4.2	126.92	± 2.5
At 3 Minute	135.48	± 3.7	117.28	± 3.1
At 5 Minute	120.74	± 4.4	114.38	± 4.5

This table shows the mean value of the systolic blood pressure of both the groups at each time interval.

Table 5: Percentage change in systolic B.P. (Group–I)

	Before Induction	After ETT	At 1 Minute	At 3 Minute	At 5 Minute
Mean	123.7	145.94	141.56	135.48	116.74
S.D.	± 7.9	± 4.3	± 4.2	± 3.7	± 4.4
't'–test		16.06	12.58	8.01	3.9
p–value		< 0.001	< 0.001	< 0.001	< 0.001
Percentage change with respect to (I)		+ 16	+ 12	+ 7.8	– 5.1

Table 6: Percentage change in systolic B.P. (Group–II)

	Before Induction	After LMA	At 1 Minute	At 3 Minute	At 5 Minute
Mean	122.9	135.34	126.92	117.28	114.38
S.D.	± 3.1	± 4.2	± 2.5	± 3.1	± 4.5
't'–test		17.27	7.1	9.0	6.2
p–value		< 0.001	< 0.001	< 0.001	< 0.001
Percentage change with respect to (I)		+ 10.65	+ 3.2	– 4.6	– 1.9

Table 7: Diastolic blood pressure distribution

Time Interval	Group–I Endotracheal tube		Group–II Laryngeal mark airway	
	Mean	S.D.	Mean	S.D.
Before Induction	81.08	± 3.1	78.44	± 2.3
After ETT/LMA	95.30	± 3.3	90.7	± 2.4
At 1 Minute	92.82	± 2.9	88.78	± 2.2
At 3 Minute	87.38	± 3.6	78.56	± 2.6
At 5 Minute	78.74	± 3.3	73.18	± 4.2

This table shows the mean value of the diastolic blood pressure of both the groups at each time interval.

Table 8: Percentage change in diastolic B.P. (Group–I)

	Before Induction	After ETT	At 1 Minute	At 3 Minute	At 5 Minute
Mean	81.08	95.33	92.82	87.38	76.74
S.D.	± 3.1	± 3.3	± 2.9	± 3.6	± 3.3
't'–test		22.21	19.56	9.5	3.6
p–value		< 0.001	< 0.001	< 0.001	< 0.001
Percentage change with respect to (I)		+ 17	+ 13	+ 7.4	– 3.7

Table 9: Percentage change in diastolic B.P. (Group–II)

	Before Induction(I)	After LMA	At 1 Minute	At 3 Minute	At 5 Minute
Mean	78.44	90.70	88.78	78.56	73.18
S.D.	± 2.3	± 2.4	± 2.2	± 2.6	± 4.2
't'–test		26.6	23.5	1.3	4.7
p–value		< 0.001	< 0.001	> 0.05	< 0.001
Percentage change with respect to (I)		+ 15	+ 12	+ .15	– 6.7

Table 10: Mean pulse rate changes compared between the two groups

Group	Before Induction	After LMA	At 1 Minute	At 3 Minute	At 5 Minute
Group–I	93.02	124.66	125.58	115.64	91.08
S.D.	± 4.2	± 3.8	± 5	± 6	± 5.15
Group–II	91.80	116.98	99.34	91.32	86.80
S.D.	± 6.9	± 4.7	± 5	± 3.8	± 3.8
p–value		< 0.001	< 0.001	< 0.001	< 0.001

The table shows that there are significant difference between the two groups at all the time intervals.

Table 11: Systolic blood pressure changes compared between the two groups

Group	Before Induction	After LMA	At 1 Minute	At 3 Minute	At 5 Minute
Group–I	123.7	145.94	141.56	135.48	116.74
S.D.	± 7.9	± 4.3	± 4.2	± 3.7	± 4.4
Group–II	122.9	135.34	126.92	117.28	114.38
S.D.	± 3.1	± 4.2	± 2.5	± 3.1	± 4.5
p–value		< 0.001	< 0.001	< 0.001	< 0.001

The table shows that there are significant difference between the two groups at all the time intervals.

Table 12: Diastolic blood pressure changes compared between the two groups

Group	Before Induction	After LMA	At 1 Minute	At 3 Minute	At 5 Minute
Group–I	81.08	95.30	92.82	87.38	76.74
S.D.	± 3.1	± 3.3	± 2.5	± 3.6	± 3.3
Group–II	78.44	90.70	88.78	78.56	73.18
S.D.	± 2.3	± 2.4	± 2.2	± 2.6	± 4.2
p–value		< 0.001	< 0.001	< 0.001	< 0.001

The table shows that there is significant difference between the two groups immediately after instrumentation, at 1 minute, at 3 minutes and 5 minutes.

Table 13: Regurgitation

	Group–I endotracheal tube		Group–II laryngeal mark airway	
	Number of cases	Percentage (%)	Number of cases	Percentage (%)
Colour staining of pharyngeal suction material	1	2.00	2	4.00

Discussion

The demographic profiles of the patients were almost similar in both the groups. The operative procedures were mostly surgical of 45 minutes to 1 hour duration, with a few gynaecological and orthopaedic operations.

Pulse rate increased after both ETT and LMA insertion but the magnitude was less in LMA group and also the duration was less as it came down to baseline at 3 minutes in comparison to 5 minutes in ETT group. IG Wilson *et al.* [1] in a similar study found that the increase in heart rate were similar in the two groups but remained elevated for a longer duration in the ETT group. In our study pulse rate was increased in both ETT and LMA group. This variation is probably due to larger number of patients included in our study.

Fuji Y. *et al.* [2] in a similar study found that mean arterial pressure increased immediately after both tracheal intubation and LMA insertion ($p < 0.005$). They remained elevated for three minutes after tracheal intubation in ETT group and for 1 minute after LMA insertion. In our study systolic blood pressure remained elevated for 3 minutes in ETT group while upto 1 minute in LMA group. In hypertensive patients they found that mean arterial pressure increased immediately after tracheal intubation and LMA insertion which was more then in normotensive patients. In our study we included only normotensive patients. In their study they also assessed noradrenaline concentration, we did not asses noradrenaline level rather we measured its effects.

It can be observed that diastolic blood pressure increased in both the groups after instrumentation (ETT/LMA insertion and the rise was statistically highly significant in comparison to baseline value ($p < 0.001$). It remained elevated at 1 minute and at 3 minutes in ETT group but reduced to base line value at 3 minutes in LMA group, while in ETT group it reduced to baseline at 5 minutes. While intergroup comparison shows that the difference between the two groups were statistically highly significant at all the time intervals upto 5 minutes ($p < 0.001$). Sanjay M. Upadhye *et al* [3] in a similar study observed rise in diastolic blood pressure in both ETT and LMA group.

The ECG changes in our study showed sinus tachycardia in both the groups. No other abnormality was observed from the time of instrumentation till 5 minutes.

In our study when effect of regurgitation was assessed by introducing methylene blue through Ryle's tube it was found that one patient in ETT group (2%) and 2 patients in LMA group (4%) showed staining of pharyngeal suction material but none of the patients in both the groups when observed upto 6 hours showed signs of aspiration. Vimi Rewari and H.L. Kaul[4]in a similar study of comparison of regurgitation and a aspiration using both ETT and LMA found that the frequency of regurgitation was 15% with LMA compared to

5% with ETT. However their study included only gynaecological laparoscopy cases. The incidence of regurgitation according to their study was more in comparison to our study probably because laparoscopy by raising the intrabdominal pressure increases the risk of regurgitation whereas in our study all predisposing factors for regurgitation were avoided.

Conclusion

In conclusion we have found that the effect of haemodynamic response using two different techniques (ETT and LMA) were similar but the magnitude of response was less with LMA and the duration was also less with LMA. It can also be concluded that the risk of regurgitation with LMA is also not greater than ETTatleast in short duration elective surgery cases in the abscess of any predisposing factor for regurgitation.

References

1. Willson IG, Fell D, Robison SL, G Smith. Cardiovascular responses to insertion of laryngeal mask. Anaesthesia. 1992; 47:300-302.
2. Fuji Y, Tanaka H, Toyooka H. Circulating responses to laryngeal mask airway insertion on tracheal intubation in normotensive and hypotensive patients.
3. Sanjay MU, Seema RB, Atul PK. Comparison of haemodynamic responses to laryngeal mask airway insertion and endotracheal intubation. J. Anaes. Clin. Pharmaco. 1996; 12:279-281.
4. Vimi Kewari, HL Kaul. Regurgitation and aspiration during gynaecological laparoscopy comparison between laryngeal mask and tracheal intubation. J. Anaes. Clin. Pharmaco. 1999; 15(1):67-70.