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Effect of haemodynamic response to laryngoscopy and endotracheal intubation with intravenous lornoxicam-a double blinded control study

A.Adam[1*], Sugandhini Boda[2]

[1]Assistant Professor, Department of Anaesthesiology, Gandhi Medical College, Secunderabad, Telangana State,India*

[2]Post Graduate, Department of Anaesthesiology, Gandhi Medical College, Secunderabad, Telangana State,India

ABSTRACT

Aim: To observe the variations in sympathetic response to laryngoscopy and intubation in patients without measures to attenuate sympathetic response. To study the effectiveness of lornoxicam in attenuating pressor response to laryngoscopy and intubation. **Materials and Methods:** A clinical comparative study of attenuation of sympathetic response to laryngoscopy and intubation was done posted for elective surgery. 60 cases are divided in to two groups 30 in each group. Group-1 was Control group. In this group placebo i.e (Normal saline-4ml) was administered 30 min before intubation. Group-2 was Lornoxicam group. In this group patients received lornoxicam 16mg intravenous 30 min before intubation to attenuate pressor response to laryngoscopy and intubation. **Results:** Sympathoadrenal response to direct laryngoscopy and tracheal intubation invariably results in increases in heart rate and elevation in mean arterial pressure. In some instances arrhythmias can be precipitated. These potentially harmful responses may prove to be detrimental in patient at risk. Many techniques and various drugs have been employed to attenuate these haemodynamic responses. No single drug or technique is totally satisfactory. Thus there is a need to find a simple efficient and reliably consistent method. The present study is a double blinded comparative study conducted in 60 patients belonging to ASA-I and II. One group received placebo(5ml of normal saline)and the other group received Lornoxicam 16mg intravenously half an hour before induction preoperatively. All cases were premedicated with oral diazepam 10mg the night before surgery. Inj Midazolam 0.05mg/kg IM and was administered 45 minutes before laryngoscoopy. Anaesthesia was induced with Inj thiopetone 5mg/kg IV. Succinylcholine was used for relaxation at a dose of 2mg/kg IV. Laryngoscopy and intubation was limited to 20 seconds in all case. Anaesthesia was maintained with O2 (33%), N2O (67%), sevoflurane and intermittent vecuronium 0.05 mg/kg IV and IPPV using Bain's circuit. Hemodynamic parameters recorded include heart rate, systolic and diastolic blood pressure before induction, post induction and after 1,3,5 7 and 10 minutes from the onset of laryngoscopy. In the control group heart rate, systolic, diastolic and mean arterial blood pressures showed wide fluctuation, a maximal increase at 1 minute post laryngoscopy and returned gradually to basal values over 10 minutes. In Lornoxicam group significant suppression of heart rate and blood pressure was observed when compared to control group which returned to baseline at the end of 10min. **Conclusion:** Lornoxicam significantly attenuates the sympathetic response to laryngoscopy and tracheal intubation.

Key words: Lornoxicam, Laryngoscopy, Hemodynamic parameters.

Introduction

Endotracheal intubation has become an integral part of anaesthetic management and critical care since its description in 1921 by Rowbotham and Magili[1].In 1940 Reid and Brace first described haemodynamic response to laryngoscopy and intubation due to noxious stimuli[2].Evidence from laboratory data demonstrates that epipharyngeal and laryngopharyngeal stimulation augments cervical sympathetic activity in efferent fibres of the heart[3]. King et al. (1951) described the circulatory responses to laryngeal and tracheal stimulation following laryngoscopy and tracheal intubation as reflex sympathoadrenal stimulation[1-3]Even though the elevation in blood pressure and heart rate due to laryngoscopy and intubation are brief, they may have detrimental effects in high risk patients

**Correspondence*

Dr. A.Adam

Assistant Professor,Department of Anaesthesiology, Gandhi Medical College, Secunderabad, Telangana State,India

Email: dradamamararapu@gmail.com

including myocardial infarction, cardiac failure, intracranial hemorrhage and increases in intracranial pressure. Laryngoscopy and tracheal intubation induces changes in circulating catecholamine levels significantly. Norepinephrine, epinephrine and dopamine levels rise, but the raise in norepinephrine levels is consistently associated with elevation of blood pressure and heart rate[4]. Some authors infact consider the intubation period as one of the greatest risk phase in the surgical patients with coronary artery disease and patients with intracranial aneurysms. Although the response may be transient, it is invariable, significant, often persistent and of great concern[5].The techniques of laryngoscopy and tracheal intubation are not confined only to the operating room, but are also employed for non anaesthetic purposes. Few instances are diagnostic laryngoscopy, fibreoptic bronchoscopy, intubation may be required for prevention of aspiration and protection of airway and during mechanical ventilation. All these procedures can also produce sympathetic responses and one should keep in mind that many of these patients are critically ill and at increased risk. Hence it is important to find an effective means of attenuating sympathetic responses to laryngoscopy and tracheal intubation. Many strategies have been advocated to minimise these hemodynamic adverse responses and aimed at different levels of the reflex arc[5]. Block of the peripheral sensory receptors and afferent input – topical application and infiltration of local anaesthetic to superior laryngeal nerve. Block of central mechanism of integration and sensory input – fentanyl, morphine etc. Block of efferent pathway and effector sites i.v. lignocaine, b blockers, calcium channel blockers, hydralazine etc. No single drug or technique is satisfactory. Recommendations for attenuating the reflex hypertension and tachycardia are therefore manifold. The technique besides minimising the cardiovascular responses to anaesthesia for patients at risk must also satisfy the following requirements.

1. It must be applicable regardless of patient's collaboration.
2. It should prevent impairment of cerebral blood flow and avoid arousal of the patient.
3. It should neither be time consuming nor affect the duration or modality of ensuing anaesthesia. The present study is to evaluate the efficacy of Lornoxicam in attenuation of pressor response to laryngoscopy and intubation with minimal side effects and better pharmacological profile.

Materials and methods

A clinical comparative study of attenuation of sympathetic response to laryngoscopy and intubation was done in 60 patients posted for elective surgery. Study was conducted in Gandhi Hospital, Secunderabad after obtaining approval of the hospital ethical committee and written informed consent from the patients. General anaesthesia was provided with endotracheal intubation in all patients. Patients undergoing various orthopaedic, ENT, Gynaecological, General Surgical, Neurosurgical and Laparoscopic procedures were selected. Following criteria's were adopted for selecting patients.

Inclusion Criteria: Patients scheduled for elective surgeries, Age between 20 to 50 years of both the sexes, with ASA grade I or II, Mallampati airway assessment of grade I and II.

Exclusion Criteria: Those who had taken drugs that could influence haemodynamic and autonomic function. Patients with risk of pulmonary aspiration. Predictably difficult airways. Successful intubation after more than one attempt. Obesity(BMI>30) and patients with known allergy to NSAIDS. Patients with renal or hepatic dysfunction.

Patients were selected after thorough pre-anaesthetic assessment and investigations. An informed consent was taken in all the patients. 60 cases are divided in to two groups 30 in each group. Group-1 was Control group. In this group placebo i.e (Normal saline-4ml) was administered 30 min before intubation. Group-2 was Lornoxicam group. In this group patients received lornoxicam 16mg intravenous 30 min before intubation to attenuate pressor response to laryngoscopy and intubation. Investigations like Hb%, TC, DC and ESR, Fasting blood sugar, blood urea and serum creatinine, electrocardiogram and chest X-ray.

Pre-medication: All the patients were visited the day before surgery and pre-anaesthetic counselling was done. All patients received Diazepam 10mg orally at night on the day before surgery. On the day of surgery intravenous line was secured with and following pre-medications were given 45 minutes before induction. Inj. Midazolam 0.05mg/kg IM, Inj Tramadol 1.5-2mg/kg IV given for analgesia before induction in both groups. Patients were monitored by pulse oximeter. On entering the operation theatre, pulse oximeter, non invasive blood pressure and ECG monitors were connected. A preinduction heart rate, systolic and diastolic blood pressures were recorded IV infusion of DNS solution was started. All the patients were preoxygenated with 100% oxygen for 3 minutes before induction. Induction was achieved with Inj. Thiopentone sodium 5mg/kg IV given in 2.5% solution. Inj. Glycopyrrolate 0.2mg IV was given along with Thiopentone. After induction of anaesthesia (loss

of eyelash reflex), heart rate, systolic and diastolic blood pressures were recorded. Succinylcholine was administered at a dose of 2mg/kg IV. Laryngoscopy was done using rigid laryngoscope with standard Macintosh blade. Intubation was done with appropriate sized, disposable, high volume low pressure cuffed endotracheal tube. Oral intubation was done for all surgical procedures. Laryngoscopy and intubation was done within 15 to 20 seconds. Heart rate, systolic and diastolic blood pressure were recorded at 1,3,5,10 and 15 minute intervals from the onset of laryngoscopy. In Group-1 Placebo (normal saline-4ml) was administered 30 min before intubation. In Group-2 Lornoxicam 16 mg was administered through intravenous route 30 min before intubation.

Figure 1 shows diagrammatic representation of timings of administration of drugs and laryngoscopy and intubation.

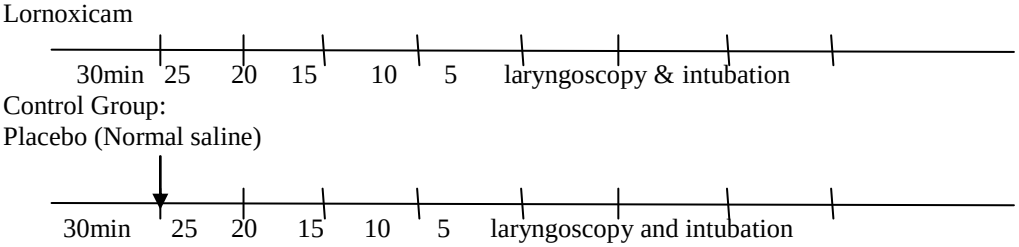

Fig 1: Diagrammatic representation of timings of administration of drugs and laryngoscopy and intubation. Lornoxicam Group

Patients were connected to Bain's circuit and anaesthesia was maintained with oxygen (33%), N2O (67%), halothane 0.5% and non depolarising muscle relaxant vecuronium bromide at a dose of 0.05 mg/kg IV and IPPV. Adequacy of ventilation was monitored clinically and SPO2 was maintained at 99-100%. Positioning, epinephrine infiltration throat packing and surgery were withheld till the completion of recording. At the end of the surgery reversal was done with inj. Neostigmine 0.05 mg/kg and inj.Glycopyrrolate 0.01mg/kg IV. An observation was made related to adverse effects of drugs and anaesthesia related problems and were attended to appropriately.

Results

A clinical comparative study of attenuation of sympathetic response to laryngoscopy and intubatied patients posted for elective surgery.

Table 1: Demographic details

Age	Control	Lornoxicam	P-Value
Minimum	18	18	
Maximum	50	50	0.1518
Mean	31	28	
Standard Deviation	8	8	
Sex			
Male	14	14	
Female	16	16	1.00
Weight			
Minimum	50	45	
Maximum	75	70	0.5548
Mean	59	58	
Std Deviation	7	6	

Table 1 shows shows the age distribution in years in control and the two study groups. The age range was 20-50 years for control and study groups. The mean values of age with standard deviation are 31±8 and 28±8 in control and Lornoxicam group respectively. There was no significant difference between two groups (P- value>0.05) with P- value being 0.1518. In control group 46.6% were males and 53.3% were females. In Lornoxicam group also 46.6% were males and 53.3% were females. No significant difference was observed in sex wise distribution of the cases between the two groups (P- value>0.05) with P- value being 1.00 calculated with Fisher's exact test. Mean ±SD OF weight in control group is 59±7 when compared to 58±6 in Lornoxicam group. There is no much significant difference of weight distribution in two groups with P- value being 0.5548 calculated with unpaired t test.

Table 2 : Comparison of hemodynamic variables in between two groups

Variables	Heart rate				T-test	
	Control		Lornoxicam			
	Mean±sd	(%)diff	Mean±sd	(%)diff	P value	T value
Baseline	83±8	-	86±12	-	0.2592	1.1393
15 min pre-induction	86±7	3.61%	88±7.7	2.3%	0.2969	1.0527
30 min pre-induction	87±7	4.8%	89±7.4	3.5%	0.2866	1.0754
Post-induction	89+_8.2	7.22%	94±7.7	9.3%	0.0180	0.0180
1 min	110±7.5	32.5%	94±7.5	9.3%	<0.0001	8.2624
3 min	102±8.2	22.8%	91±8.9	5.8%	<0.0001	4.9786
5 min	96±7	15.6%	89±7.1	3.5%	0.0003	3.8454
10 min	90±7	8.4%	85±7.1	1.2%	0.008	2.7467
15 min	82±7	1.2%	83±5	3.5%	0.5268	0.6367
Systolic blood pressure						
Baseline	120±7.8	-	118±8.7	-	0.3524	0.9375
15 min pre-induction	123±6.8	2.5%	122±8	3.4%	0.6039	0.5217
30 min pre-induction	125±5	4.1%	123±8.27	4.2%	0.2617	1.1335
Post-induction	123±10	2.5%	133±9.9	11.2%	0.003	3.8924
1 min	169±15	41%	134±8.7	13.5%	<0.0001	11.0553
3 min	159±9.7	32.5%	130±5.5	10.2%	<0.0001	14.2447
5 min	147±11	22.5%	127±4.7	7.6%	<0.0001	9.1577
10 min	129±12	7.5%	122±8.9	3.4%	0.0129	2.5663
15 min	122±8.2	1.7%	120±8.5	1.7%	0.3575	0.9275
Diastolic blood pressure						
Baseline	78±8	-	79±9	-	0.6509	0.4549
15 min pre-induction	79±9	1.3%	79±8.6	0.5%	1.0000	0.0000
30 min pre-induction	80±8	2.6%	80±8	1.3%	1.0000	0.0000
Post-induction	78±7.1	-1.15%	84±12	6.3%	0.02	2.3570
1 min	105±8.9	34.6%	85±8.7	7.6%	<0.0001	8.8017
3 min	96±8	23%	82±7.1	3.8%	<0.0001	7.1690
5 min	90±9	15.4%	78±6.6	1.3%	<0.0001	5.8891
10 min	78±6	0.8%	76±9.4	3.8%	0.3300	0.9823
15 min	76±8	2.6%	75±8.8	5%	0.6468	0.4605
Mean arterial pressure						
Baseline	92±8	_	93±8.9	_	0.6489	0.4577
15 min pre-induction	94±8	2.2%	92.8±7.5	0.2%	0.5513	0.5994
30 min pre-induction	95±6	3.3%	94±7.3	1.1%	0.5644	0.5796
Post-induction	93±7	1.1%	103±10	10.8%	<0.001	4.4871
1 min	127±8.5	38%	104±11	11.8%	<0.0001	9.0621
3 min	117±7.1	27.2%	98±5.7	5.4%	<0.0001	11.4298

5 min	109±8.1	18.5%	94±5.5	1.07%	<0.0001	8.4395
10 min	95±6.8	3.3%	91±8.8	2.15%	0.0536	1.9700
15 min	91±6.8	1.1%	89±8.2	4.3%	0.3081	1.0283

At 10 min there was significant difference in heart rate with P- value being 0.008. The heart rate at the end of 15 min was not significantly higher when compared to pre induction values.At 15th minute there is no much significant difference with P-value being 0.35. Maximum increase in systolic blood pressure at 1min after intubation with 41% increase in control group when compared to 13.5% in lornoxicam group. It is statistically very significant with P-value being(<0.001). These differences in systolic blood pressure between control group and lornoxicam group remains statistically very significant at all times except at 15th minute where it is statistically insignificant. At 1 and 3 min post laryngoscopy the difference is very highly significant (P <0.001).Changes in diastolic blood pressure assessed pre and post induction and at various time intervals between control and study groups is presented.. Maximum increase in mean arterial pressure at 1min after intubation with 38% increase in control group when compared to 11.8% in Lornoxicam group. It is statistically very significant with P-value being(<0.0001). These differences in mean arterial pressure between control group and lornoxicam group remains statistically very significant at all times except at 15th minute where it is statistically insignificant and at 10th min where it is slightly insignificant.

Table 3: Comparison of rate pressure product (in mm of Hg*bpm) in between the groups

	Rate pressure product				T-test	
	Control		Lornoxicam			
	Mean±sd	(%)diff	Mean±sd	(%)diff	P value	T value
Baseline	10047±1432	_	10429±1532	_	0.3226	0.9977
15min preinduction	10579±1297	5.3%	10674±1332	2.34%	0.7806	0.2799
30min preinduction	10966±1122	9.14%	11016±1316	5.6%	0.8772	0.1553
Post-induction	10983±1348	9.3%	12564±1517	20.5%	<0.001	4.2671
1 min	18870±1943	87%	12761±1381	22.4%	<0.0001	14.0367
3 min	16355±1570	62.7%	11735±1289	12.5%	<0.0001	12.4571
5 min	14189±1655	41.2%	11314±970.6	8.5%	<0.0001	8.2075
10 min	11564±1619	15%	10357±984.4	0.7%	0.0009	3.4891
15 min	10052±1088	0.05%	10026±847.3	3.9%	0.9181	0.1033

Shows differences in rate pressure product at pre induction, post-induction and at various time intervals from the onset of laryngoscopy in control and study groups are presented. The difference in the rate pressure product between control and Lornoxicam groups remain significant at immediately after laryngoscopy and intubation and at 1min,3min and 5 min with P-value being(<0.0001) and at 10th minute where the P-value being 0.0009. At 15th minute there is no much significant difference with P-value being 0.918. Maximum increase in rate pressure product at 1min after intubation with 87% increase in control group when compared to 22.4% in Lornoxicam group. It is statistically very significant with P-value being(<0.0001). These differences in rate pressure product between control group and Lornoxicam group remains statistically very significant at all times except at 15th minute where it is statistically insignificant.

Discussion

The sequence of induction of anaesthesia, laryngoscopy and tracheal intubation are associated with marked haemodynamic changes and autonomic reflex activity which may be a cause of concern in many high risk patients. Laryngoscopy and intubation is associated with rise in heart rate, blood pressure and incidence of cardiac arrhythmias. These potentially dangerous changes disappear within 5 minutes of onset of laryngoscopy[6]. Although these responses of blood pressure and heart rate are transient and short lived they may prove to be detrimental in high risk patients especially in those with cardiovascular disease, increased intracranial pressure or anomalies of the cerebral blood vessels. An average rise in mean arterial pressure of 25mm Hg and 47.7 mmHg have been

documented. An increase in mean arterial pressure of 26.5 mm Hg and 20 to 40 torr when compared with awake control levels and 35 to 60 torr when compared with preintubation values[7,8]have been reported after placement of an endotracheal tube. A rise in mean heart rate of 29.9 beats/min has also been noted[15]. Many factors influence the cardiovascular changes associated with laryngoscopy and intubation. Age, drugs, type and duration of procedures, depth of anaesthesia, hypoxia, hypercarbia etc., influence the pressor response. Variations of heart rate changes decrease with increasing age. Young patients show more extreme changes. Marked fluctuations in haemodynamic responses are often seen in geriatric patients. In our study we selected the optimal age range of 18 to 50 years. **Bachofen M[10]** stated the criteria for selection appropriate drug to prevent sympathetic response. The drug must be applicable regardless of patient collaboration, prevent impairment of cerebral blood flow and avoid arousal of the patients. It should neither be time consuming nor affect the duration and modality of ensuing anaesthesia. Intravenous Lornoxicam is found to fulfill the above criteria. Lornoxicam is a NonSteroidal Anti-Inflammatory Drug (NSAID) that belongs chemically to the oxicams and has been successfully used as a perioperative analgesic agent with a better safety profile regarding renal and hepatic function tests, in addition to better gastrointestinal tract tolerability compared to selective COX- 2inhibitors. There are very few studies done using Lornoxicam in attenuating haemodynamic changes seen with laryngoscopy and intubation. Hence the need for this study to evaluate the efficacy of intravenous Lornoxicam in attenuating pressor response to laryngoscopy and intubation. Lornoxicam has been used successfully to treat post operative pain. It was reported that intravenous 8mg was equianalgesic with 20mg of morphine,50mg of pethidine and intravenous 16mg is superior to the analgesic potency of 100mg tramadol and is comparable to 100 micrograms fentanyl to relieve pain in day care surgeries. The study entitled "**Effect of haemodynamic response to laryngoscopy and endotracheal intubation with intravenous lornoxicam-a double blinded control study"** was undertaken in GANDHI HOSPITAL ,SECUNDERABAD after obtaining approval of ethics committee of hospital and written informed consent to evaluate the efficacy of Lornoxicam in attenuating pressor response to laryngoscopy and intubation. After taking written informed consent 60 patients who belong to ASA -I &ASA-II between age groups 20-50yrs were randomly allocated in to two groups. GROUP –A: Is the control group who received 5ml of normal saline as placebo. GROUP-B: Is the group who received intravenous Lornoxicam. This is a double blind study and both the drug and placebo are given 30 min before induction of Anaesthesia and intubation. After giving the drug haemodynamic parameters are measure every 15 min before intubation and immediately after intubation and 1,3,5,10,15 minutes there after. Changes seen in haemodynamic parameters are statistically compared between two groups. The hypothesis made before study is, Laryngoscopy and Intubation causes marked stress response caused because of release of catecholamines which is the cause of morbidity and mortality in patients who are chronically hypertensives or the patients with compromised cardiorespiratory reserve[11,12]. Hence to attenuate this response many drugs have been studied and in use. Lornoxicam is one such drug which has minimal side effects and wide margin of safety which is found to attenuate the pressor response to laryngoscopy and intubation.

Demographic Profile: Demographic data comparing age, sex, weight shows no statistically significant difference among both the groups and has been compared with other studies.

Age: In present study mean age group of Lornoxicam and control group was 28±8 and 31±8 respectively which was comparable to the study conducted by M.Daabiss M.Hashish (2010) in which the mean age group of Lornoxicam and control group was 33.1±4.4 and 31.5±5.6 respectively.

Sex: In present study the sex ratio is 16:14 in both the groups which is coming to 53.3% females and 46.6% males. In the study conducted by M.Daabiss et al[8](2010) the total number of patients taken are 50 among which the sex ratio(female:male) is 12:13 in lornoxicam group i.e.48% females and 52% males and in control group the ratio is 10:15 which comes to 40% females and 60% males which shows that the sex distribution is comparable to the present study.

Weight Distribution: In present study weight distribution in kg in Lornoxicam group is 58±6 and in control group it is 59±7.In the study conducted by M.Dabiss etal.[8] the weight distribution in Lornoxicam and control group is 66.9±6.7 and 69.7±4.2 respectively.

Heart Rate: In the present study baseline heart rates were 83±8 and 86±2 in control group and Lornoxicam group respectively. Maximum increase in heart rate was observed at 1min post intubation in control group with 32.5% increase when compared to 9.3% in Lornoxicam group with P-value being <0.0001. Pvalue was found to be significant(<0.05) at post induction 3min ,5min and 10min after intubation. In the study conducted by **M.Daabiss and M Hashish**(2010) in

which 50 patients were scheduled for general anaesthesia the baseline heart rates were recorded and heart rates were compared at 0,1,2,3 min up to 10min every minute after intubation between control group and Lornoxicam group with P-value being 0.000, 0.000, 0.019, 0.036 respectively at 0,1,2,3 min which was found to be significant. In another study conducted by **W.Raid and A.Moussa[13]**(2008) in which 50 patients who were scheduled for general anaesthesia were taken to evaluate the efficacy of Lornoxicam(8mg) in attenuation of intubation response in placebo(saline) controlled study where parameters taken were heart rate, SBP, DBP, MAP at baseline, post induction,1min, 3min, 5min, 10min after intubation, significant increase in heart rates have been found in control group when compared to Lornoxicam group at 1,3,5,10 min with significant P- value being <0.05. **Systolic Blood Pressure:** In our present study baseline systolic blood pressure was found to be 120±7.8 and 118±8.7 in control group and Lornoxicam group respectively. Immediate post induction systolic blood pressures were found to be 133±9.9 in control group when compared to 123±10 in Lornoxicam with P-value being 0.003 which was significant. Maximum increase in systolic blood pressure was found at 1min after intubation with 41% increase in control group when compared to 13.5% increase in Lornoxicam group with P- value being <0.0001 which is very significant. Significant difference in systolic blood pressure was found at 3min,5min and 10min with P-value being <0.0001, <0.0001 and 0.012 respectively. In the study conducted by **M Daabiss and M Hashish**(2010) there was significant difference in systolic blood pressure in Lornoxicam group when compared to control group(saline group) at 0min, 1min, 2min, 3min, after intubation with P-value being 0.0001, 0.005, 0.014, 0.037 respectively. Though the study was conducted up to 10min, as the values were not mentioned in the original article they were not mentioned in the above table. In another study conducted by **W Raid and A Moussa[13]**(2010) systolic blood pressure was found to be significantly elevated in control group when compared to Lornoxicam group at 1min, 3min, 5min and 10 min after intubation with P-value being <0.05. In another study conducted by **Soliman, W.R Moussa, et al[14]**(2007) on preoperative Lornoxicam attenuating haemodynamic response to intubation on 50 patients of elderly age group significant increase in systolic blood pressure has been observed in control group when compared to Lornoxicam group at 1min,3min,5min,10min after intubation with P-value being(<0.05).

Diastolic Blood Pressure: In the present study baseline diastolic blood pressures were 78±8 and 79±9 in control group and Lornoxicam group respectively. Maximum increase in diastolic blood pressure was found at 1min after intubation in control group when compared to Lornoxicam group with 34.6% increase in control group when compared to 7.6% increase in Lornoxicam group with P-value being <0.0001. Significant difference in diastolic blood pressure was observed at immediate post induction and at 3min, 5min with P-value being 0.02, <0.0001, <0.0001 respectively. At 10min and 15 min no significant difference was found in two groups. In the study conducted by **M Daabiss and M Hashish** (2010) significant difference diastolic blood pressure was found in control group when compared to Lornoxicam group at 0min, 1min, 2min, 3min with p value being 0.000, 0.007, 0.02, 0.043 respectively. In the another study conducted by **W.Raid and A.Moussa** (2008)in 50 patients significant difference in diastolic blood pressure was found in control group when compared to Lornoxicam group at immediate postinduction, 1min, 3min, 5min, 10min with p value being <0.05. In another study conducted by **Soliman, W.R ; Moussa et al** (2007) significant difference in diastolic blood pressure has been observed at 1min, 3min, 5min, 10 min post intubation with P-values being <0.05 between control group and Lornoxicam group. **Mean Arterial Pressure:** In the present study baseline mean arterial pressures were found to be 92±8 and 93±8.9 in control group and Lornoxicam group respectively. Significant increase in mean arterial pressures was found at immediate postinduction with p value being <0.001. Maximum increase in mean arterial pressures were found at 1min after intubation with increase of 38% in control group when compared to 11.8% in Lornoxicam group with P- value being <0.0001. Significant difference was found at 3min and 5min after intubation with p value being <0.0001 and <0.0001 respectively. At 10 th minute difference was slightly insignificant with P- value being 0.0536. At 15 min no significant difference in mean arterial pressure was found in control group when compared to Lornoxicam group. In the study conducted by **M Daabiss and M Hashish**(2010) P- value immediately postinduction was found to be 0.055. Significant increase in mean arterial pressures in control group when compared to Lornoxicam group was found at 0min, 1min, 2min, 3min after intubation with P- value being 0.000, 0.008, 0.024 respectively. In another study conducted by **W Raid and A Moussa[13]**(2008)significant increase in mean arterial pressures in control group when compared to Lornoxicam group was found at 1min, 3min, 5min,10min with p value being <0.05. In another

study conducted by **Soliman.W.R; Moussa A et al[14]**(2007)in elderly significant increase in mean arterial pressures in control group when compared to Lornoxicam group was observed at 1,3.5.10 min with P- value being <0.05.

Rate Pressure Product: In the present study maximum increase in rate pressure product which is the product of systolic blood pressure and heart rate in both groups was at: GROUP-A (control): A maximum increase of 87% was observed in rate pressure product at 1min after laryngoscopy and intubation. GROUP-B (Lornoxicam): A maximum increase of 22.4% was observed at 1min after intubation which is comparable to control group with p-value showing significance. Immediate postinduction significant difference in rate pressure product has been observed with p value being <0.001. Significant increase in rate pressure product has been observed in control group when compared to Lornoxicam group at 3min, 5min and at 10 min with p value being <0.0001, <0.0001, 0.0009 respectively. At 15^{th} min no significant difference has been found with p value being 0.9181. The present study observation has been supported by study conducted by **M Daabiss and M Hashish[8]** who have observed significant increase in rate pressure product in control group when compared to Lornoxicam group at 0min, 1min, 2min and 3min after intubation with p value being <0.05.

Conclusion

Based on the present clinical comparative study the following conclusions can be made: In patients with no drugs to attenuate the sympathetic response to laryngoscopy
and intubation the maximum raise in heart rate, systolic, diastolic and mean arterial blood pressures were statistically and clinically very highly significant and can be detrimental in high risk patients. Lornoxicam significantly attenuates the sympathetic response to laryngoscopy and tracheal intubation.

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