Original Research Article

To Study Effect of Gabapentin on Attenuation of Pressor Response to Direct Laryngoscopy and Tracheal Intubation and on Perioperative Pain

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Received: 20-06-2021 / Revised: 30-07-2021 / Accepted: 24-08-2021

Abstract

Introduction: Endotracheal intubation has become an integral part of anaesthetic management and critical care since its description in 1921 by Rowbotham and Magill. In 1940 Reid and Brace first described haemodynamic response to laryngoscopy and intubation due to noxious stimuli. Evidence from laboratory data demonstrates that epipharyngeal and laryngopharyngeal stimulation augments cervical sympathetic activity in efferent fibres of the heart. **Materials and Methods:** A clinical comparative study of attenuation of sympathetic response to laryngoscopy and intubation was done in 150 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 Elective surgeries where Intubation is required. Following criteria's were adopted for selecting patients. **Results:** 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 29.27±6.883 and 28.78±8.517 in control and Gabapentin group respectively. There was no significant difference between two groups (p value>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. Gabapentin significantly attenuates the sympathetic response to laryngoscopy and tracheal intubation.

Keywords: Endotracheal intubation, haemodynamic response, heart rate, systolic blood pressures.

Introduction

Endotracheal intubation has become an integral part of anaesthetic management and critical care since its description in 1921 by Rowbotham and Magill.[1]

In 1940 Reid and Brace first described haemodynamic response to laryngoscopy and intubation due to noxious stimuli. Evidence from laboratory data demonstrates that epipharyngeal and laryngopharyngeal stimulation augments cervical sympathetic activity in efferent fibres of the heart.[2]

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 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.

Some authorsinfact 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.

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.[3]

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.

Recommendations for attenuating the reflex hypertension and tachycardia are therefore manifold. The technique besides minimizing 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 Gabapentin 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 150 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.

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Patients undergoing Elective surgeries where Intubation is required. 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.
- Patients with ASA grade I or II.
- Mallampati airway assessment of grade I and II.

Exclusion Criteria

- Age less than 20 and more than 50 years
- Hypertensive, Diabetic, Immunocompromised, Pregnancy
- Predictably difficult airways.
- Obesity (BMI>30) and patients with known allergy to NSAIDS.
- Consumption of antihypertensives, sedatives, hypnotics, antidepressants drugs with effect on CNS.

Patients were selected after thorough preanaesthetic assessment and investigations. An informed consent was taken in all the patients.

150 cases are divided in to two groups.

Group-1 was CONTROL group. In this group placebo capsules were prepared after meticulously emptying of the gabapentin capsules and filled with thin sugar.

Group-2 was GABAPENTIN group. In this group patients received Gabapentin 300mg at noon,18 hours and 24 hours the day before surgery and at 6 am the morning of surgery.

Investigations

- Hb%, TC, DC, and ESR
- Fasting blood sugar.
- Blood urea and serum creatinine,
- Electrocardiogram
- Chest X-ray.
- Serum electrolyte

Premedication

All the patients were visited the day before surgery and preanaestheticcounselling was done. All patients received Omeprazol 40mg orally at night on the day before surgery.

On the day of surgery in operating room 16 G catheter was inserted in a peripheral vein and a Ringer lactate solution was started. All patients received i.v of metoclopramide 10mg 10 min before induction of anaesthesia.

Standard monitoring, consisting of ECG, pulse oximetry, HR and noninvasive blood pressure was used.

Anaesthesia technique

All the patients were pre oxygenated with 100% oxygen for 3 minutes before induction. Induction was achieved with propofol 2.5mg/kg and cis-atracurium 0.15mg/kg to facilitate tracheal intubation.

After induction of anaesthesia (loss of eyelash reflex), heart rate, systolic and diastolic blood pressures were recorded.

Heart rate, systolic and diastolic blood pressure were recorded before and after administration of the i.vanaesthetic.

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.

Heart rate, systolic and diastolic blood pressure were recorded at 1,3,5, and10 minute intervals from the onset of laryngoscopy.

Patients were connected to Bain's circuit and anaesthesia was maintained with oxygen (33%), N2O (67%), halothane 0.5% and nondepolarising muscle relaxant cis-atracurium 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.

Statistical Analysis

Descriptive data presented as Mean ± SD and in percentage. Pair wise comparison between the groups was done by unpaired `t' test. For all values a 'P' value of< 0.05 was considered significant.

Results

Table 1: Age Distribution (in years)

	Control	Gabapentin
Minimum	18	18
Maximum	50	50
Mean	29.27	28.78
Std. Deviation	6.883	8.517

The above table 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 29.27±6.883 and 28.78±8.517 in control and Gabapentin group respectively. There was no significant difference between two groups (p value>0.05).

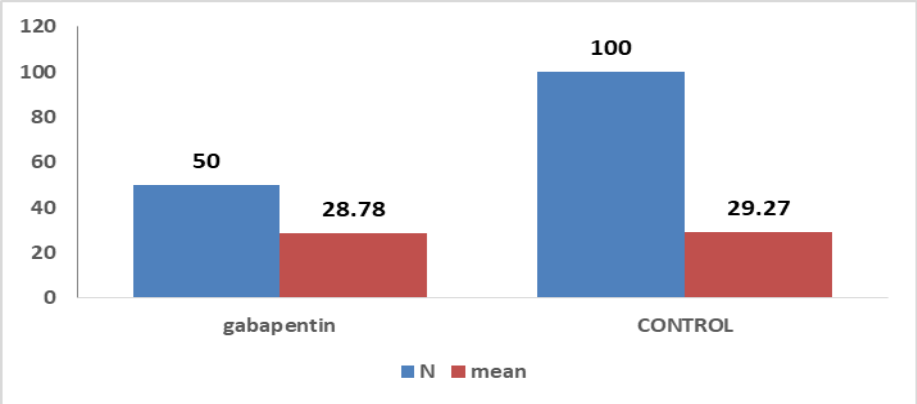

Fig. 1: Age Distribution (in years)

Table 2: Sex Distribution

Sex	Control	Percentage	Gabapentin	Percentage
	Group		Group	
Male	46	46%	23	46%
Female	54	54%	27	54%
Total	100	100%	50	100%

In control group 46% were males and 54%were females. In Gabapentin group also 46%were males and 54% were females. No significant difference was observed in sex wise distribution of the cases between the two groups (p>0.05).

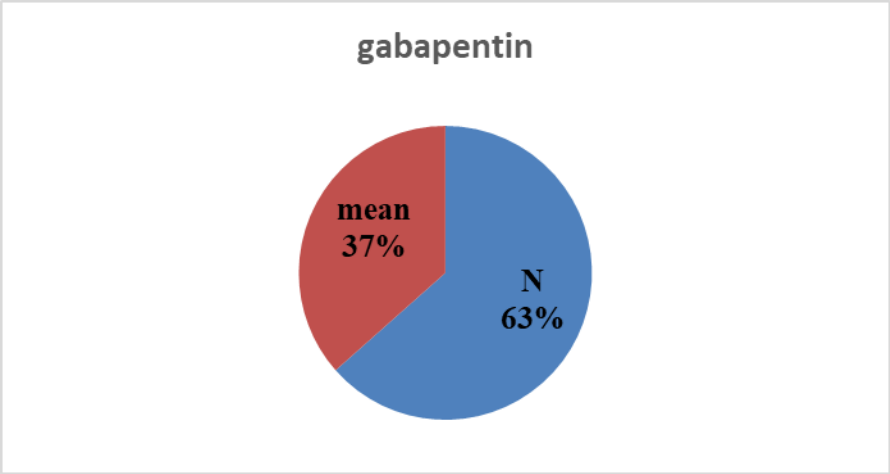

Fig. 2: Sex Distribution

Table 3: Weight Distribution (in Kg)

	Control	Gabapentin
Minimum	50	45
Maximum	75	70
Mean	58.38	58.58
Std. Deviation	6.779	6.078

Mean ±SD OF weight in control group is 58.38±6.779 when compared to 58.58±6.078 in Gabapentin group. There is no much significant difference of weight distribution in two groups.

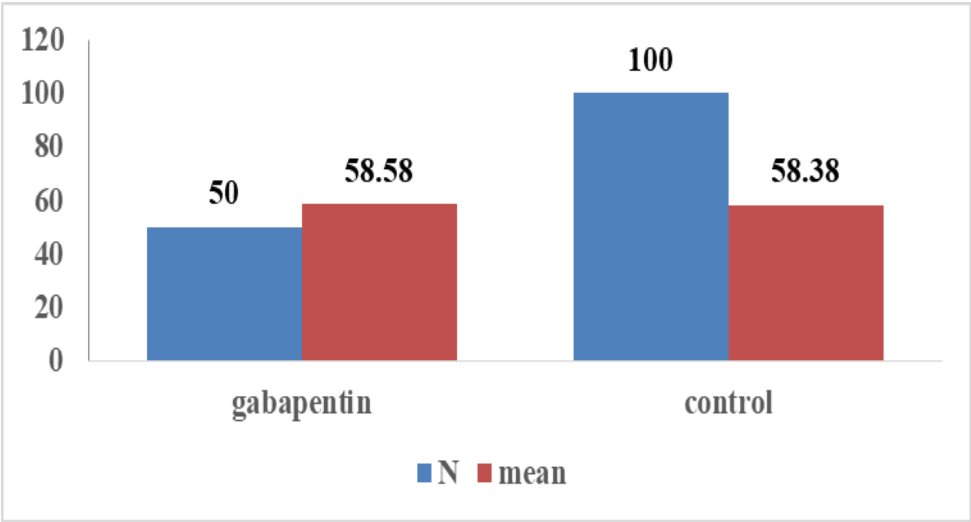

Fig. 3: Weight Distribution (in kg)

Table 4: Comparison of heart rate (in bpm) in between two groups

	Heart Rate		T Test
	Control	Gabapentin	
	Mean±SD	Mean±SD	P Value
Baseline	83.10±7.393	86.60±12.056	0.064
Pre Induction	87.21±6.290	89.32±7.763	0.099
Post Induction	105.14±11.485	89.66±7.922	0.0001
1 Min	109.54±7.867	93.96±7.265	0.0001
3 Min	101.77±8.883	91.40±9.534	0.0001
5 Min	95.85±7.769	89.04±7.529	0.0001
10 Min	89.58±7.482	86.08±6.948	0.006

Analysis of Heart Rate

Statistical analysis of changes in heart rate at pre-induction, post induction and at different time intervals from the onset of laryngoscopy and intubation in control and study groups are presented.

Control Group

The pre-induction mean heart rate and standard deviations in this group were 83.10±7.393 respectively. Before induction there was no significant change in heart rate. Immediately after induction there was significant increase in heart rate with mean values and standard deviation being 105.14±11.485. At 1 min from onset of laryngoscopy and intubation there was significant increase in heart rate with mean values and standard deviation being 109.51±7.867. At 5 min from onset of intubation there was significant increase in heart rate with mean and standard deviation values being 95.85±7.769.

Gabapentin Group

The pre-induction mean heart rate and standard deviations in this group were 89.32±12.056 respectively**.** Before induction there was no significant change in heart rate. Immediately after laryngoscopy and intubation there was increase in heart rate with mean values and standard deviation being 89.66±7.922 which is significant increase from baseline. At 1min from onset of laryngoscopy and intubation there was increase in heart rate with mean values and standard deviation being 93.96±7.265. At 3min from onset of intubation there was increase in heart rate with mean and standard deviation values being 91.40±9.534. At 5 min from the onset of intubation the heart rate values came down

When compared to baseline values with mean and standard deviation values being 89.04±7.529 per minute. The heart rate at the end of 10 min was not significantly higher when compared to pre induction values.

The difference in the heart rate between control and gabapentin groups remain significant at immediately after laryngoscopy and intubation and at 1min,3min and 5 min with p value being(<0.0001) and not much significant at 10 post intubation.

Maximum increase in heart rate is 32.5% in control group and 9.3% in lornoxicam group. It is statistically very significant with p value being (<0.001). These differences in heart rate between control group and lornoxicam group remains statistically very significant at all times except at 10th minute where it is statistically insignificant.

At 1,3 and 5 minutes post laryngoscopy the difference is very highly significant (p <0.001).

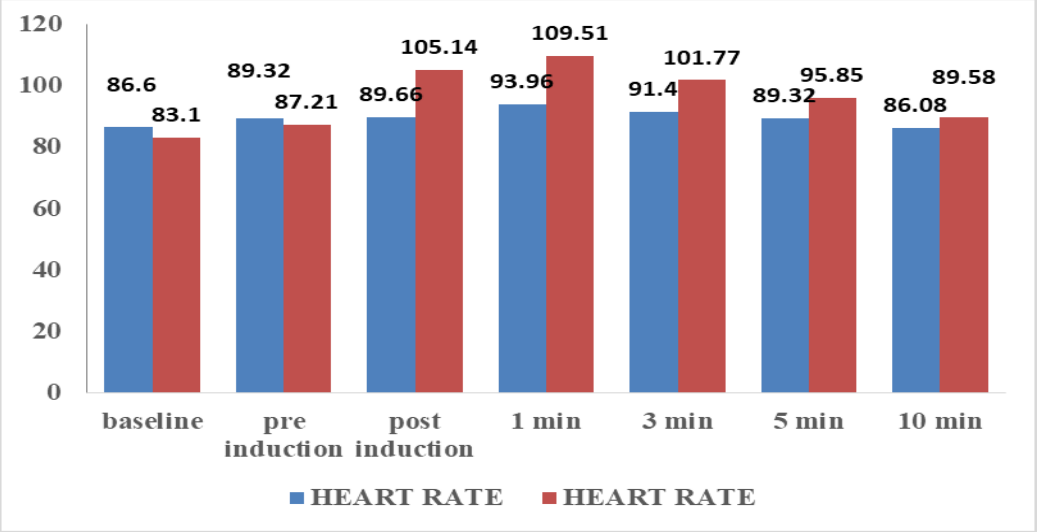

Fig. 4: Comparision of Heart Rate (in BPM)

Table 5: Comparison of systolic blood pressure (in mm of Hg) in two groups

	Systolic Blood Pressure		T Test
	Control	Gabapentin	
	Mean ±SD	Mean ±SD	P Value
Baseline	120.50±7.507	119.70±8.384	0.357
Pre Induction	125.59±4.872	122.80±8.444	0.034
Post Induction	159.72±21.951	123.80±9.560	0.0001
1 Min	168.76±14.52	134.20±9.212	0.0001
3 Min	101.77±8.883	91.40±9.534	0.0001
5 Min	147.14±10.649	127.12±5.021	0.0001
10 Min	128.66±11.404	122.00±9.553	0.0001

Analysis of Systolic Blood Pressure

The changes observed in systolic blood pressure before and after induction and at different time intervals between control and study groups is presented.

Control Group

The mean preinduction systolic blood pressure in this group was 125.59±4.872. At 15 and 30 min after there is no much significant change in systolic blood pressure. Immediately after induction there is increase in systolic blood pressure with mean values being 159.72±21.951. At 1min from the onset of laryngoscopy and intubation there is sudden surge of systolic blood pressure from baseline value, mean value being 168.76±14.521. Starting from 3 min there was fall in systolic blood pressure. At 10min there is further fall in systolic blood pressure with mean value of 128.66±11.404mm of Hg.

Gabapentin Group

Preinduction systolic blood pressure in this group was 122.80±8.444. Post induction there is slight increase in systolic blood pressure with mean values being 123.80±9.560. After 1min of intubation there was increase in systolic blood pressure being 134.20±9.212. At 3min there is decrease with mean value of 91.40±9.534.

In comparison to control group and gabapentin group attenuation of systolic blood pressure is significant in Gabapentin group. The difference in systolic blood pressure between control and gabapentin group remains significant at post induction with P value being 0.0001, immediately after laryngoscopy and intubation and at 1 min,3 min,5 min and 10 min with P value being (<0.0001).

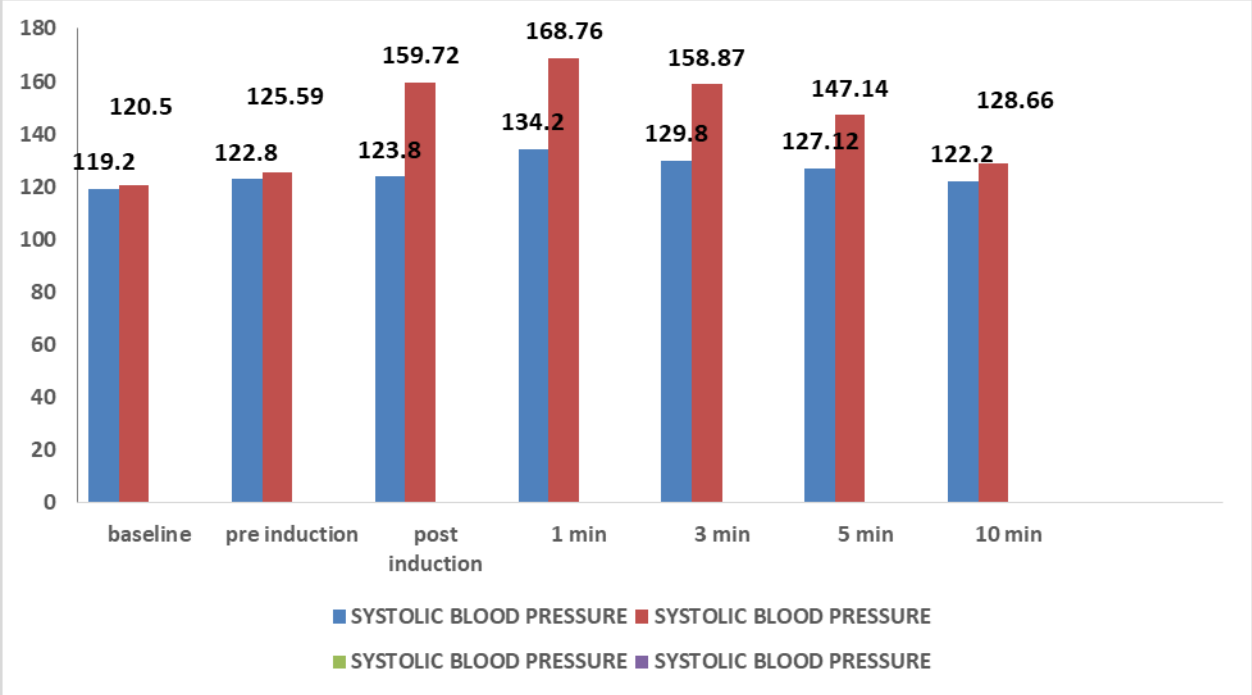

Fig. 5: Comparison of Systolic Blood Pressure (in mm of Hg)

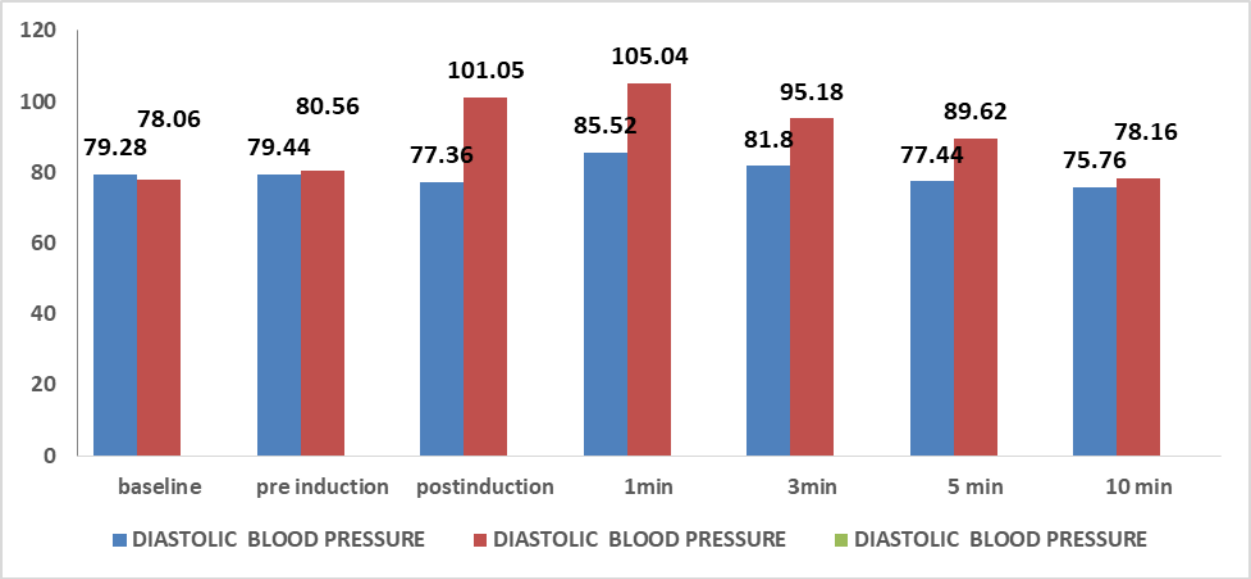

Fig. 6: Comparison of Diastolic Blood Pressure (in mm of Hg)

Analysis of Diastolic Blood Pressure

The changes in diastolic blood pressure assessed pre and post induction and at various time intervals between control and study groups is presented.

Control Group

Mean preinduction diastolic blood pressure in this group was 80.56±7.744. At post induction there was increase in diastolic blood pressure with mean values being 101.05±11.720. At 1min after laryngoscopy and intubation there was rise in diastolic blood pressure with mean being 105.04±9.139. An increase was still maintained at 3min with mean values being 95.18±8.046. It decreased to 89.62±8.693 and 78.16±5.860 at 5 and 10min respectively.

Gabapentin Group

In this group diastolic blood pressure was 79.44±7.965 before induction. Immediately after induction there was decrease in diastolic blood pressure with mean of 77.36±7.148.At 1 min there was increase from baseline with mean value of 85.52±8.716.It came down at 3 min with mean value of 81.80±7.103 It further came down at 5min and 10min with mean values being 77.44±6.322 and 75.76±9.358.

The difference in diastolic blood pressure between control and gabapentin groups remain significant at post induction with P-value being 0.0001,immediately after laryngoscopy and intubation and at 1 min,3 min and 5 min with P-value being(<0.0001).At 10 min no significant difference in diastolic blood pressure as observed with P-value being 0.102.These differences in diastolic blood pressures between control group and gabapentin group remain statistically very significant at all times except at 10 min where is statistically insignificant.

Table 6: Comparison of mean arterial pressure (in mm of Hg) in two groups

	Mean Arterial Pressure		T Test
	Control	Gabapentin	
	Mean ±SD	Mean ±SD	P Value
Baseline	91.69±7.513	93.08±8.595	0.333
Pre Induction	95.60±6.181	93.98±7.288	0.181
Post Induction	120.52±14.459	92.70±6.541	0.0001
1 Min	126.57±8.564	104.18±12.008	0.0001
3 Min	116.53±6.946	97.54±5.786	0.0001
5 Min	108.70±8.379	94.06±5.257	0.0001
10 Min	94.70±6.536	90.36±8.962	0.003

Analysis of Mean Arterial Pressure

Differences in mean arterial pressure at pre induction, post-induction and at various time intervals from the onset of laryngoscopy in control and study groups are presented.

Control Group

Mean arterial pressure before induction in this group was 95.60±6.181. Immediately after intubation there was increase with mean being 120.52±14.459. At 1 min after laryngoscopy and intubation there was increase in mean arterial pressure with mean being 126.57±8.564. It decreased when compared to baseline at 3min. At 5 min and 10 min post laryngoscopy

mean arterial pressures were 108.70±8.379 and 94.70±6.536 respectively.

Gabapentin Group

The preinduction mean arterial pressures in this group was 93.98±7.288. Immediately after intubation there was decrease from baseline with mean value being 92.70±6.54. At 1min after intubation there was increase from baseline with mean value being 104.18±12.008.It decreased at 3 min after intubation with mean value being 97.54±5.786.It further decreased at 5 min and 10 min after intubation with mean values being 94.06±5.251 and 90.36±8.962 respectively.

In comparison to control group and gabapentin group attenuation of mean arterial pressure is significant in gabapentin group. The difference in mean arterial pressure between control and gabapentin groups remains significant immediately after laryngoscopy and intubation and at 1 min,3 min,5 min with P-value being (<0.0001).

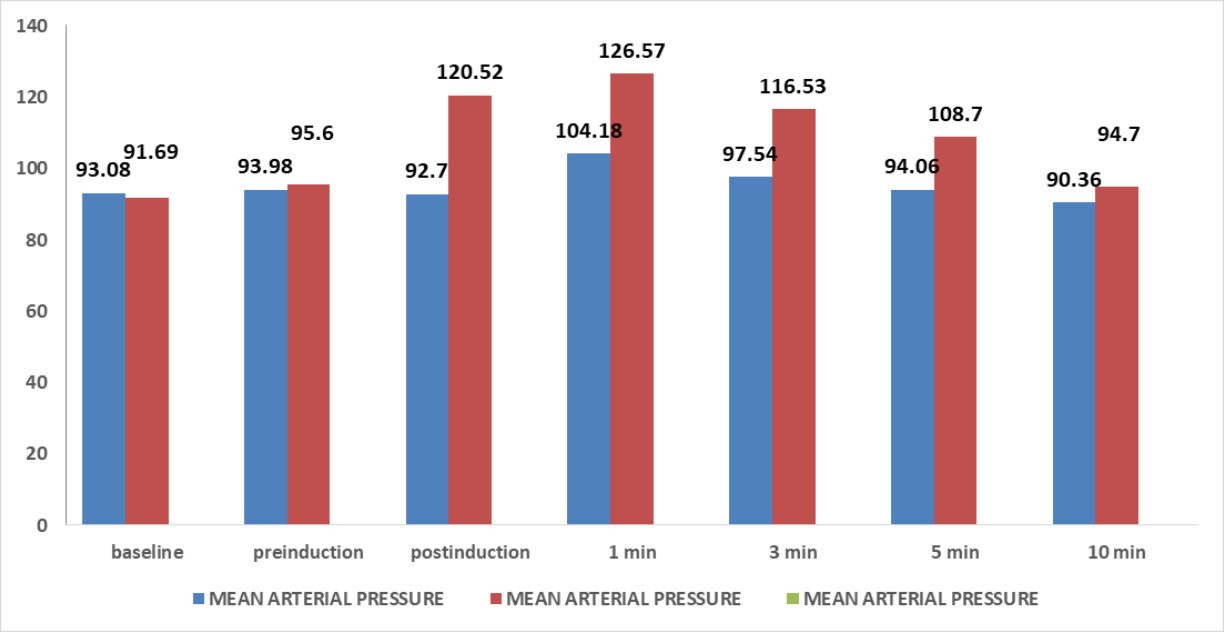

Fig. 7: Comparison of Mean Arterial Pressure (in mm of Hg)

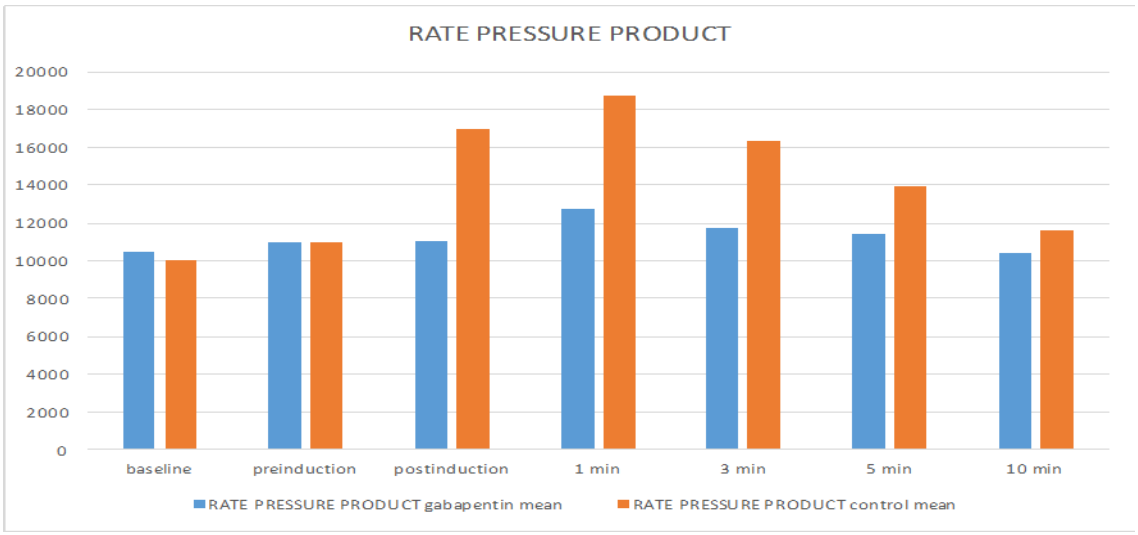

Fig. 8: Rate Pressure Product

Analysis of Rate Pressure Product

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.

Control Group

Baseline rate pressure product before induction was 10061.40±1355.041. Preinduction there was increase from

baseline. Immediately after induction there was increase from baseline with mean value being 16940.44±3600.052. At 1min following laryngoscopy and intubation there was increase in rate pressure product from baseline with value being 18733.72±1988.485.

At 3min the value being reduced with mean value 16326.88±1539.203. The trend was further reduced at 5min and 10min with mean values being13988.98±1890.336 and 11547.98±1593.905 respectively.

Gabapentin Group

Baseline rate pressure product before induction was 10486.08±1666.587. Immediately after intubation there was increase with mean value being 11093.28±1238.260. After 1 min following intubation the rate pressure product was 12784.28±1365.938.

At 3min after intubation the value is 11746.68±1355.529. There was further decrease at 5 min and 10 min values being 11377.60±1018.733 and 10403.40±977.931 respectively.

The difference in rate pressure product between control and gabapentin groups remain significant immediately and at 1 min,3 min,5 min and 10 min with P value being(<0.0001).

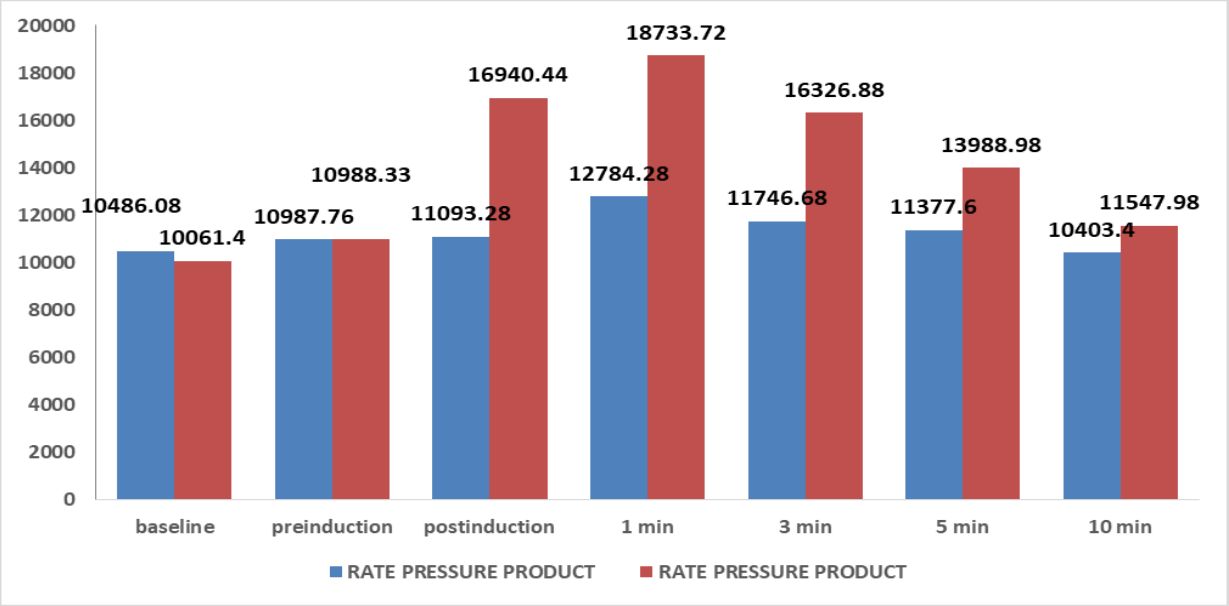

Fig. 9: Comparison of Rate Pressure Product (in mm of Hg*bpm)

Discussion

Our results showed that gabapentin attenuated the pressor response to tracheal intubation, as SAP and DAP, but not HR were significantly lower in the gabapentin vs the control group.

The cardiovascular responses to laryngoscopy and tracheal intubation are well known and linked with increases in catecholamines in blood levels. Shribman and colleagues found that laryngoscopy alone or followed by tracheal intubation increases arterial pressure and catecholamine's levels while intubation significantly increases HR. Barak and colleagues reported that the stress response to tracheal intubation is comparable when using direct laryngoscopy or fibreoptic bronchoscope. These investigators did not find a correlation between the haemodynamic changes and catecholamine levels[4,5].

Several techniques have been proposed to attenuate such responses. Tacycardia and rhythm disturbances as a result of intubation were attenuated by omitting atropine as premedication. Nitroglycerin administrated intranasally attenuated the hypertensive response to laryngoscopy and intubation but tachycardia was observed in both the nitroglycerin and the control group.Also, i.vlidocaine prevented the increase in mean arterial blood pressure but had no effect on the HRs.

Beta- blockers and calcium channel blockers have also been used successfully used to prevent the haemodynamic responses to tracheal intubation. Drugs with rapid onset and short duration of action similar to the beta-blocker esmolol and the opioid remifentanil are particularly useful for the induction-intubation period. The most recent studies regarding prevention of haemodynamic changes after laryngoscopy and tracheal intubation investigate the effect of remifentanil, an opioid with very rapid onset and very short time of action.[6,7]

Remifentanil 1micro gm/kg followed by 0.5 micro gm/kg /min attenuated the pressor response to intubation but was associated with bradycardia and /or hypotension. Other workers found that remifentanil 0.5 micro gm/kg did not prevent hypertension and tachycardia during rapid sequence induction. However remifentanil 1 micro gm/kg was effective while 1.25 micro/kg in some patients caused hypotension. Finally, Hall and colleagues reported that 0.5 micro gm/kg over 30 s followed by infusion of 0.25 micro gm/kg /min was associated with slight changes in haemodynamic responses after laryngoscopy and oro tracheal intubation.[8]

When assessing techniques to ameliorate the cardiovascular responses to intubation the drugs used to induce anaesthesia may influence the results. We induced anaesthesia with Propofol, which produces bradycardia.[9] Thus tachycardia resulting from intubation may have been attenuated by propofol in both groups covering such a possible effect of gabapentin on the HR. Omission of opioids during induction of anaesthesia of patients ASA I-II should not be concern. Besides, propofol produces hypotension more than thiopentone and bradycardia, which may compensate in part the cardiovascular changes attributable to laryngoscopy tracheal intubation.

We did not measure stress mediators such as endogenous plasma catecholamines or cortisone, and we did not score sedation. These can be considered as limitations of the study. Though measurements of endogenous catecholamines would give useful information, scoring sedation before induction of anaesthesia would interfere with the double blinding of the study.[10]

After taking written informed consent 150 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 placebo capsules.

Group-B: Is the group who received oral Gabapentin capsules.

This is a double blind study and both the drug and placebo are given at noon, 18 hours and 24 hours the day before surgery and at 6am the morning of surgery.

After giving the drug haemodynamic parameters are measure before intubation and immediately after intubation and 1, 3, 5, 10 minutes there after. Changes seen in haemodynamic parameters are statistically compared between two groups.

Hypothesis Made Before Study

The hypothesis made before study is, Laryngoscopy and Intubation causes marked stress response caused because of release of catecholamine's which is the cause of morbidity and mortality in patients who are chronically hypertensives or the patients with compromised cardiorespiratory reserve. Hence to attenuate this response many drugs have been studied and in use. Gabapentin 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.

Following parameters have been studied

Haemodynamic parameters before intubation and immediately after intubation and 1,3,5&10 mins there after which included:

1. Heart rate
2. Systolic blood pressure
3. Diastolic blood pressure
4. Mean arterial pressure
5. Rate pressure product.

Demographic Data

Demographic data comparing age, sex, weight shows no statistically significant difference among both the groups.

Heart Rate

Basal heart rates were measured in both the groups. Then heart rate was measure before induction and then immediately after intubation and 1,3,5,10 thereafter. The values are compared in both the groups statistically using "Unpaired T-Test" and the amount of significance was measured using (P-value).

In the present study, baseline heart rates were 83.10±7.393 and 86.60±12.056 in control group and gabapentin group respectively. Maximum increase in heart rate was observed at 1 minute post intubation in control group when compared to gabapentin group with p-value being <0.0001. P value was found to be significant (0.0001) at post-induction 3 min,5 min,10 min after intubation.

Systolic Blood Pressure

Basal systolic blood pressures were measured in both the groups. Then systolic blood pressure was measured before induction and then immediately after induction and 1,3,5,10,15 min after laryngoscopy and intubation there after. The values are compared in both the groups statistically using "Unpaired T-Test" and the amount of significance was measured using (P-value).

In our present study baseline SBP was found to be 120.50±7.507 and 119.20±8.384

In control group and gabapentin group respectively. Immediate post induction SBP was found to be 159.72±21.951 in control group when compared to 123.80 ±9.560 in gabapentin group with p value being 0.0001 which was significant. Maximum increase in SBP was found at 1 min after intubation in control group when compared to gabapentin group with p value being <0.0001 which is very significant. Significant difference in SBP was found at 3 min, 5 min and 10 min with p value being 0.0001,0.0001 and 0.0001 respectively.

Diastolic Blood Pressure

Basal diastolic blood pressures were measured in both the groups. Then diastolic blood pressure was measured before induction and then immediately after induction and 1,3,5,10,15 min after laryngoscopy and intubation there after. The values are compared in both the groups statistically using "UNPAIRED T-TEST" and the amount of significance was measured using (P-value). In the present study baseline diastolic blood pressures were 78.06±8.053 and 79.28±9.910 in control group and Gabapentin group respectively.

Maximum increase in diastolic blood pressure was found at 1 min after intubation in control group when compared to gabapentin group with P-value being <0.0001. Significant difference in diastolic blood pressure was observed in immediate post-induction period and at 3 min, 5 min with P-value being <0.0001, <0.0001, <0.0001 respectively. At 10 min no significant difference was found in two groups.

Basal mean arterial pressure was measured in both the groups. Then mean arterial pressure was measured before induction and then immediately after induction and 1,3,5,10 min after laryngoscopy and intubation thereafter. The values are compared in both the groups statistically using "Unpaired

T-Test" and the amount of significance was measured using (P-value).

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. Gabapentin significantly attenuates the sympathetic response to laryngoscopy and tracheal intubation.

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Conflict of Interest: Nil
Source of support:Nil