

# Attenuation of Cardiovascular Response in Medically Controlled Hypertensive Patients during Laryngoscopy and Intubation Undergoing Abdominal Surgeries under General Anesthesia: A Prospective Study

**Abrar Mohammad**

Assistant Professor, Department of Anesthesia, Prasad Institute of Medical Sciences, India

**Corresponding author:** Dr. Abrar Mohammad, Assistant Professor, Department of Anesthesia, Prasad Institute of Medical Sciences, India

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## A B S T R A C T

**Introduction:** Abdominal surgery requires general anesthesia which in turn needs laryngoscopy and endotracheal intubation. It is associated with sympathomimetic response resulting in tachycardia, hypertension and arrhythmia. These responses may be life threatening. Hypertension is becoming very common problem now a day due to our life style and important risk anesthetist. Both treated and untreated chronic hypertension is not only associated with coronary artery disease but potential target organ damage. This study was conducted to compare the cardiovascular response in different stages of anesthesia in abdominal surgeries in both normotensive and controlled hypotensive patients.

**Material and methods:** Sixty adult patients undergoing different elective abdominal operations under general anesthesia were included. Patients were divided into A and B group. A group consists of normotensive patients while B group consists of controlled hypertensive patients. Their blood pressure were controlled on single antihypertensive drug . B group further divided into B1 and B2. B1 group patients were on calcium channel blockers (CCB) while B2 group patients were on diuretics. Out of sixty patients, 20 were from A group while 20 each were from B1 and B2 group. All these patients do not have any history of coronary artery or other known complication of hypertension. Vitals like systolic arterial pressure (SAP) and diastolic pressure (DP), heart rate (HR) were recorded before induction, after induction, after laryngoscopy and intubation and during surgery were recorded. The data was collected, tabulated, analyzed and following results were obtained.

**Results:** There was decrease in SAP, DP and HR in all groups after induction while there was increase in SAP, DP and HR in all groups after laryngoscopy and intubation. There was minimal rise in SAP, DP and HR in all groups during surgery. There was rise of HR in A group of patients during laryngoscopy only while rise in HR was observed after induction, during laryngoscopy and intubation and during surgery in both B (B1&B2) group of patients. The rise in SAP was comparatively more in diuretics than CCB group during surgery.

**Conclusion:** On the basis of the present observation it can be concluded that cardiovascular response were not attenuated during laryngoscopy and intubation in patients treated with these antihypertensive drugs.

**Keywords:** Pressure Response, Cardiac Response, General Anesthesia, Abdominal Surgery, Controlled Hypertension, Antihypertensive Drugs.

## INTRODUCTION

Despite of introduction of new airway devices in recent years. Rigid laryngoscopy and intubation remains gold standard for GA. Hemodynamic variable alteration is well known phenomenon to occur during laryngoscopy and intubation in patients undergoing abdominal surgeries under general anesthesia. A change in plasma catecholamine concentration have also been demonstrated after laryngoscopy and intubation.<sup>1</sup> The rise in catecholamine is due to laryngeal reflex and increase sympathetic activity resulting in

hypertension, tachycardia and arrhythmia due to tracheal intubation.<sup>2-4</sup>

It is well recognized response of laryngoscopy and intubation after its discovery in 1940.<sup>1</sup> The rise in pulse and blood pressure are usually transitory and unpredictable. These changes are of no consequence and are well tolerated by healthy individuals. But in patients with hypertension, heart disease and coronary artery disease, these changes can result in increase in cardiac work load.<sup>5</sup>

The rise in blood pressure has also a significant importance in neurosurgical patient. sudden rise in blood pressure as seen

during laryngoscopy and intubation can result in a sudden rise in intracranial pressure and consequently, acute cerebral edema and herniation of brain. The aim of this study was to compare the cardiovascular response in different stages of anesthesia in abdominal surgeries in both normotensive and controlled hypotensive patients.

### MATERIAL AND METHODS

This was prospective study conducted at PIMSH during July 2018- Feb 2020 on Sixty adult patients undergoing different elective abdominal operations under general anesthesia were included. Patients were divided into A and B group. A group consisted of normotensive patients while B group consisted of controlled hypertensive patients. Their blood pressure was controlled by single antihypertensive drug. B group further divided into B1 and B2. B1 group patients were on Calcium channel blockers (CCB) while B2 group patients were on diuretics. Out of sixty patients, 20 were from A group while 20 each were from B1 and B2 group. Preoperatively these patients underwent CBC, urine analysis, serum biochemistry (blood sugar, serum cholesterol serum creatinine, serum electrolytes), cardiac evaluation (ECG) and x-ray chest PA view where ever required. Administration of general anaesthesia (GA) was started with premedication with 10 mg diazepam orally night before surgery and 10 mg diazepam orally 2 hours before surgery. Glycopyrrolate (0.2mg) as anticholinergic was administered intramuscularly 45 minutes before induction. Prior to induction of anaesthesia, intravenous line was maintained with 20-22 gauge intravenous catheter and Pentazocine 15 mg plus promethazine hydrochloride 5 mg slowly intravenously were given. After pre-oxygenation for 3

minutes' patients were induced with 2.5% sodium pentothal in a dose of 4-6mg/kg body weight till sleep dose were achieved, followed by Suxamethonium in the dose of 1-1.5 mg/ kg body weight was given. Following this intubation was done with appropriate size of cuffed endotracheal tube with minimal manipulation. Following above intubation anaesthesia was maintained with mixture of oxygen, nitrous oxide (40-60%), halothane (0.5-1%) and Vancronium 60-100 microgram /kg body weight. Continuous vital recording was done during pre and post induction, laryngoscopy and intubation and surgery. All these patients do not have any history of coronary artery or other known complication of hypertension. Vitals like systolic arterial pressure (SAP) and diastolic pressure(DP), heart rate(HR) were recorded before induction, after induction, after laryngoscopy and intubation, during surgery were recorded. Data was collected, tabulated, analyzed and following observations wer made.

### RESULTS

All three groups, normotensive (group A) and hypertensive patients on calcium channel blocker and diuretics (group B1,B2) were comparable with respect to age, sex and ASA physical scale.

Table 1 shows SAP in different group of patients in various stages of anaesthesia. After induction there is fall in SAP in all group of patients. The maximum fall was observed in group B2. There is rise in SAP in all groups of patients during laryngoscopy and intubation and during surgery. But the maximum rise of 24.72% of SAP was observed in B2 group during laryngoscopy and intubation.

Table 2 shows DP in different group of patients in various

Groups	Before induction	After induction		Laryngoscopy and intubation		During surgery	
	Mean ±SD	Mean ±SD	% fluctuation	Mean ±SD	% Fluctuation	Mean ±SD	% fluctuation
A	122.18 ±8.25	115.36±2.59	-5.58	132.84±2.64	+ 8.72	128.11±2.32	+4.85
B1	130.25±3.92	119.90±2.98	-9.94	155.23±3.75	+ 19.17	142.29±3.92	+ 3.07
B2	133.23±4.26	120.50±9.20	-12.73	165.95±9.29	+ 24.72	136.62±8.25	+2.54

A=Normotensive, B1=On CCB, B2= on diuretics

**Table-1:** Systolic arterial pressure in different group of patients in different stages of anaesthesia

Maximum Groups	Before induction	After induction		Laryngoscopy and intubation		During surgery	
	Mean ±SD	Mean ±SD	% fluctuation	Mean ±SD	% Fluctuation	Mean ±SD	% fluctuation
A	78.39±1.29	76.89±1.385	-1.91	81.89±0.039	+4.46	79.99±1.38	+2.04
B1	89.12±2.92	86.32±3.42	-3.14	92.34±3.92	+3.61	90.21±2.95	+1.22
B2	80.92±3.49	78.59±4.09	-2.87	89.72±8.49	+10.87	82.08±4.09	+1.43

A=Normotensive, B1=On CCB, B2= on diuretics

**Table-2:** Diastolic pressure in different group of patients and different stages of anaesthesia

Groups	Before induction	After induction		Laryngoscopy and intubation		During surgery	
	Mean ±SD	Mean ±SD	% fluctuation	Mean ±SD	% Fluctuation	Mean ±SD	% fluctuation
A	95.59±2.57	94.89±2.37	-0.73	100.29±3.99	+4.91	91.81±2.87	-3.95
B1	84.11±3.34	88.05±2.99	+4.68	107.48±3.11	+27.78	102.8±4.29	+22.22
B2	88.12±7.06	80.99±38.52	- 8.09	106.99±10.89	+21.41	103.42±8.52	+17.36

A=Normotensive, B1=On CCB, B2= on diuretics

**Table-3:** Heart rate in different group of patients in different stages of anaesthesia

stages of anesthesia. After induction there is fall in DP in all group of patients. The maximum fall was observed in group B2. There is rise in DP in all groups of patients during laryngoscopy and intubation and during surgery. But the maximum rise of 10.87% of DP was observed in B2 group during laryngoscopy and intubation.

Table 3 shows HR in different group of patients in various stages of anesthesia. There was rise in HR in all the groups and in all the stages of anesthesia. The rise in HR was observed in all stages in B1 group of patients. The maximum rise 27.78% was observed in this group during laryngoscopy and intubation.

## DISCUSSION

Myocardial ischemia occurs often during anesthesia.<sup>6-8</sup> It is even more often in untreated or poorly controlled.<sup>9-12</sup> In the latter group of patients, laryngoscopy and intubation can result in significant rise in both heart rate and arterial pressure.<sup>9,10</sup> To attenuate these circulatory changes many methods like topical anesthesia, intravenous lignocaine, vasodilators, beta adrenoreceptor block, narcotics have been tried. Due to above measures, many of the study reported reduced incidence of ECG directed myocardial ischemia.<sup>13,14</sup> Ischemia was related to episodes of tachycardia.<sup>13</sup>

Hypertension is a common preexisting problem associated with surgical patients. Nearly 1/3<sup>rd</sup> of adult patients presenting for non-cardiac procedures and 2/3<sup>rd</sup> of those undergoing coronary revascularization are suffering from chronic hypertension.<sup>15</sup> It is associated with long term consequences like coronary ischemic heart disease, heart failure, cerebrovascular disease, renal insufficiency which increases perioperative risk.<sup>16,17</sup>

Prys-Robinson concluded that untreated high arterial pressure constituted a serious risk to patients undergoing anaesthesia and surgery. This conclusion was based on the finding of high incidence of myocardial ischemia related to arterial hypertension during steady state of anesthesia in both treated and untreated patients.<sup>9</sup> Later on study have shown that hypertensive patients as much if not more at risk during induction of anaesthesia and during subsequent laryngoscopy and tracheal intubation as they are during steady state of anesthesia.<sup>14</sup>

In the present study we randomly chosen three end points to stress the potency of various treatment regimen. Systolic arterial pressure(SAP) after induction of anaesthesia of  $\leq 90$  mmHg; SAP after laryngoscopy and intubation rising the baseline pre-induction value of 20 mmHg or more and rise in heart rate(HR) more than 20% or more from baseline after laryngoscopy and intubation or HR  $>100$  beat per minute. Some authors have chosen HR  $>100$  or 110 beat per minute, rate pressure product  $>2000$  or pressure  $-$ rate ratio  $>1$  end point of myocardial ischemia.<sup>18,19,22</sup> It is very difficult to say which data is better in the paucity of comparative data. In one publication it was observed that in majority of perioperative ischemic ECG changes occurred without hemodynamic changes before onset of ischemia<sup>18</sup> but in one of the another study, author have noted tachycardia (HR $>110$  beat/ minute) was only hemodynamic abnormality related to intraoperative ischemia.<sup>19</sup> Both these studies were related to cardiac surgery

and unrelated to our study and may not be comparable to hypertensive patient group. A pressure  $-$ rate ratio of  $>1$  be in error.<sup>22</sup> High pressure and fast rate yield a normal ratio, yet the fast rate may be a major contributor to ischemia. A low pressure and slow rate may also be disastrous.

Hemodynamic swing is more common and exaggerated in hypertensive patients as compared to normotensive patients. Rightward shift of autoregulation in hypertensive patients means that organ perfusion occurs at higher mean arterial pressure as compared to normotensive and thus intraoperative hypotension leads to hypo-perfusion and target organ damage during hypotension.<sup>23</sup> A retrospective study has found that intraoperative hypotension but not hypertension is associated with a higher mortality in hypertensive patients undergoing non-cardiac surgery.<sup>23</sup> Even short period of hypotension (mean arterial pressure  $< 55$ mmHg) have been associated with myocardial and renal injury after non cardiac surgery.<sup>25</sup> This does not imply that hypertension should not be treated. It has been observed in one of the study that hypertensive patient and diabetic patients who had cumulative 1hour decrease in mean arterial pressure  $>20$  mmHg or  $<1$ hour decrease of  $>20$  mmHg and 15-minute increase of 20 mmHg were at greatest risk of post operative myocardial ischemia.<sup>26</sup>

Tachycardia and hypertension are well documented sequelae of laryngoscopy and endotracheal intubation. In hypertensive patient's cardiovascular response to laryngoscopy and endotracheal intubation is exaggerated.<sup>12,14</sup> Many drugs like short acting beta blocker, Esmolol, Diltiazem are very promising if given as bolus intravenously before laryngoscopy and endotracheal intubation.<sup>27-29</sup> CCB given to control hypertension does not causes any effect on attenuating pressure response during laryngoscopy and endotracheal intubation.

## CONCLUSION

On the basis of the present observation it can be concluded that cardiac response and pressure response (cardiovascular response) were not attenuated in hypertensive patients treated with these antihypertensive drugs during laryngoscopy and intubation.

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