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Effect of Midazolam, Fentanyl & I.V Lidocaine to Decrease the Stress Response of Laryngoscopy& ETT Intubation

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Abstract

Objective : The aim of the study to evaluate the role of fentanyl , midazolam & lidocaine in attenuation the hemodynamic response (stress response) of heart rate & blood pressure at induction of anesthesia , laryngoscopy & endotracheal intubation. Endotracheal intubation always associated with marked increases in heart rate and systemic blood pressure [1]. Marked increases in hemodynamic parameters occur after direct laryngoscopy & endotracheal intubation in patients with chronic hypertension. Patient & Methods : A double blind study was done in Aljamhory teaching hospital ,Mosul city ,Iraq .from (December 2012 - May 2014) . All the patients were in the age of 40 - 70 years and ASA II were all hypertensive & they were on routine antihypertensive agents. In this study a(87) patients ,males and females prepared for surgery needed endotracheal intubation ,group A (44 patients) underwent pre medication with fentanyl , midazolam & lidocaine and group B (43 patients) pre medicated with fentanyl & midazolam. Results : The average age in group A is 52.27 years and in group B is 50.46, there was no significant difference in the sex , weight or age distribution of patients. There was no significant difference statistically between the two groups ($P > 0.05$) in heart rate & blood pressure in pre induction , after induction & after endotracheal intubation. Conclusion : Because of stress response due to surgery & anesthesia , most of the patients' needs anxiolytics , sedatives & pain killers as a pre medication , were as every patient complaining from hypertension (ASA II) needs anxiolytic , sedative & narcotic (pain killer) to overcomes the fluctuation in HR & BP .

Keywords: stress response; premedication; midazolam; fentanyl; lidocaine.

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1. Introduction

A laryngoscope is an instrument used to examine the larynx and to facilitate intubation of the trachea.

Direct laryngoscopy and passage of a endotracheal tube are noxious stimuli that can provoke adverse responses in the cardiovascular, respiratory and other physiological systems [4]. Cardiovascular complications are the most common serious adverse event [4], a marked stress response including hypertension, tachycardia, arrhythmias and an increase in intracranial pressure often follows direct laryngoscopy [3]. These hemodynamic changes are well tolerated in normotensive individuals, but are of greater effects in patients with hypertention, and have been recognized as a potential source of a number of complications [1].

This stress response is so marked and sometimes it may lead to sudden elevation in blood pressure or precipitation of ischemic heart attack. The elevation in arterial pressure typically starts within 5 seconds of laryngoscopy, peaks in 1- 2 minutes, and returns to control levels within 5 minutes [4], hemodynamic changes start within seconds of direct laryngoscopy, and there is a further increase in heart rate and blood pressure with passage of the tracheal tube [4]. It has been suggested that laryngoscopic stimulation of oropharyngeolaryngeal structures and distension of the supraglottic tissues may have important role in this hemodynamic stress response [2].

Many drugs and technique have been used to prevent the hemodynamic responses induced by laryngoscopy and endotracheal intubation [7,8]. Hemodynamic changes can be attenuated by intravenous administration of lidocaine, opioids, B-blockers or deeper planes of inhalational anesthesia in the minutes before laryngoscopy. Hypotensive agents, including sodium nitroprusside, nitroglycerine, esmolol and nicardipine [9,10,11]. have also been shown to effectively attenuate the transient hypertensive response associated with laryngoscopy and intubation [5], large doses of narcotics(other than morphine), such as fentanyl 6 u/kg, suppress the hemodynamic response but risk of prolonged respiratory depression [4]. In general, opioids have few direct effects on the heart, whereas larger doses of morphine, fentanyl, sufentanil, remifentanil and alfentanil are associated with a vagus nerve mediated bradycardia [5]. Lidocaine is the most popular local anesthetic as it is safe, rapidly metabolized, and has a short duration of action [6].

The benzodiazepines have minimal cardiovascular depressant effects even at general anesthetic doses, except when they are administered with opioids. Benzodiazepines when given alone causes decrease arterial blood pressure, cardiac output, and peripheral vascular resistance and sometimes increase heart rate. Intravenous midazolam tends to reduce blood pressure and peripheral vascular resistance more than diazepam [5].

Stress response to surgery [6]

The stress response is a physiological response which has evolved to protect the body from injury and to enhance chances of survival. It involves cardiovascular, thermoregulatory and metabolic mechanisms and was first described by Cuthbertson in1929.

Surgery or trauma consistently elicits a characteristic neuroendocrine and cytokine response in proportion to the

extent of injury or metabolic insult. Minor surgery on a limb has a negligible stress response, in contrast to major surgery such as a laparotomy or thoracotomy. There are two principal components to the stress response to surgery: the neuroendocrine response and the cytokine response. The neuroendocrine response is stimulated by painful afferent neural stimuli reaching the CNS. It may be diminished and sometimes eliminated altogether by dense neural blockade from a regional anesthetic technique. The cytokine component of the stress response is stimulated by local tissue damage at the site of the surgery itself and is not inhibited by regional anesthesia. It is diminished by minimally invasive surgery, especially laparoscopic techniques. There is growing evidence that the stress response is detrimental and is associated with postoperative morbidity. It has adverse effects on several key physiological systems, including the cardiovascular, respiratory and gastroenterological systems.

Table 1

Components of the Stress Response to Surgery		
Neuroendocrine Response	***Consequence***	***Result***
Hypothalamic–pituitary–adrenal	ACTH, GH, ADH, β-endorphin, prolactin all increased	Activation of adrenocortical hormones Mobilization of glucose reserves Water retention Protein catabolism and gluconeogenesis
Sympathetic nervous system stimulation	Catecholamines increased	Heart rate and cardiac output increased SVR and arterial pressure increased
	Hypothalamic–pituitary–adrenal	Activation of adrenocortical hormones; mobilization of glucose reserves; water retention; protein catabolism and gluconeogenesis
	Renin–angiotensin–aldosterone	Increased SVR, retention Na^+ and H_2O, secretion K^+
	Increased glucagon	Increased plasma glucose, lipolysis and insulin resistance
	Decreased insulin, testosterone	Hyperglycaemia, catabolic state
	Increased acute-phase proteins (liver)	Decreased liver synthesis of albumin
Cytokine Response		
Cytokine and inflammatory mediator release	IL-1, IL-6, TNF-α	Platelet adhesion
	Prostaglandins increased	Increased coagulation Increased hypothalamic–pituitary–adrenal activity
	Neutrophils increased	Local inflammation, pain
	Lymphocytes decreased	
Pyrexia (due to increased IL-1)	Increased metabolic rate	Increased demand on cardiovascular system

ACTH, adrenocorticotrophic hormone; GH, growth hormone; ADH, antidiuretic hormone; SVR, systemic vascular resistance; TNF-α, tumour necrosis factor alpha.

2. Patient and Methods

A double blind study was done in Aljamhory teaching hospital ,Mosul city ,Iraq .from (December 2012 - May 2014) . All the patients were in the age of 40 - 70 years and ASA II were all hypertensive . In this study a(87) patients ,males and females prepared for surgery needed endotracheal intubation ,included in to two groups :

- GROUP (A) : 44 patients ,those underwent premedication with fentanyl 1u/kg, midazolam 0.01mg/kg and lidocaine intravenously 1mg/kg .
- GROUP (B) : 43 patients premedicated with fentanyl 1u/kg and midazolam 0.01mg/kg .

After venipuncture premedication given according to the group , preoxygenation with 100% oxygen for 3 – 5 minutes . Induction of anesthesia done by 5 mg thiopentone sodium intravenously and after loss of

consciousness ,0.6 mg/kg atracurium (muscle relaxant) was given. After full relaxation endotracheal intubation(ETT) done, maintenance of anesthesia by N2O 1:1 to oxygen and halothane 1.5% . All the patients monitored by EKG lead ll ,pulse oximeter(spo2) and non-invasive blood pressure (BP) by sphygmomanometer.

To determine hemodynamic response during these manipulations ,BP (both systolic SBP and diastolic DBP) and heart rate (HR) were recorded for all patients at pre- induction ,1 minute after induction , 1 minute after ETT , 2 minute after ETT and 5 minute after ETT .

Table 2

HR	Group A	Group B	P-Value
Preoperative	91.93	95.186	0.210607
1 min. after induction	97.02	96.976	0.98793
1 min. post ETT	100.40	99.162	0.688157
2 min. post ETT	97.04	98.023	0.761623
5 min. post ETT	92.18	91.023	0.514983

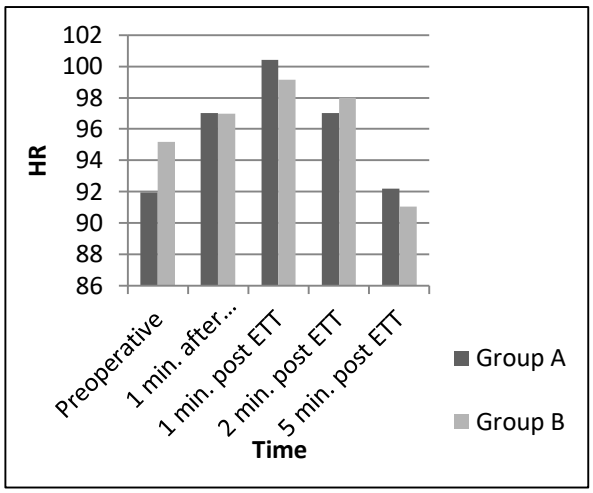

Figure 1

Mean Heart rate

Table 3

SBP	Group A	Group B	P-Value
Preoperative	162.11	163.186	0.721454
1 min. after induction	135.13	134.697	0.390789
1 min. post ETT	146.93	139.93	0.273017
2 min. post ETT	126.65	123.651	0.558292
5 min. post ETT	126.25	121.651	0.347597

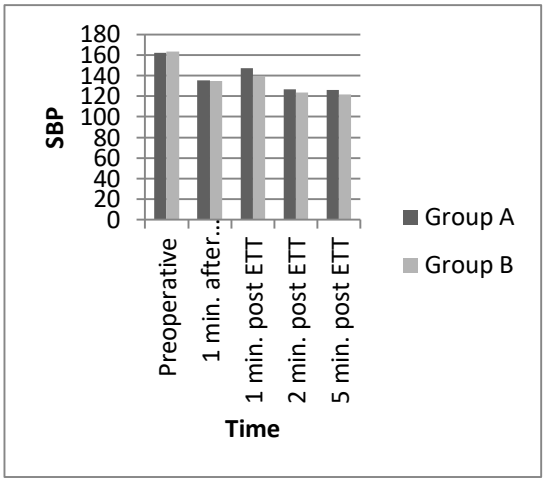

Figure 2

Mean systolic blood pressure

Table 4

DBP	Group A	Group B	P-Value
Preoperative	88.272	90.093	0.455727
1 min. after induction	79.7	78.116	0.55902
1 min. post ETT	90.5	85.232	0.188739
2 min. post ETT	80.86	77.302	0.234345
5 min. post ETT	83.22	77.023	0.065488

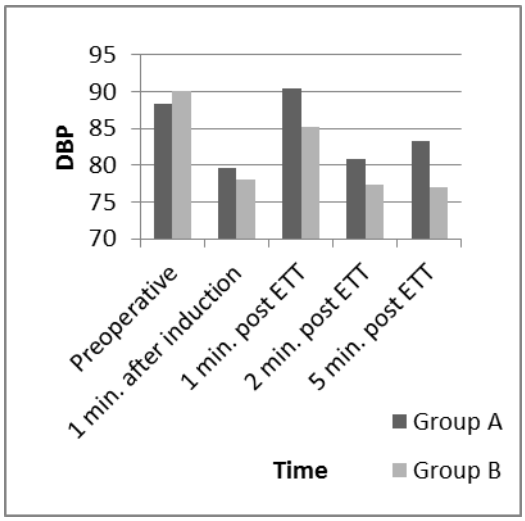

Figure 3

Mean diastolic blood pressure

3. Results

All patients were at age of 40 – 70 years, both males and females of ASA II and all are hypertensives. Mean age in group A is 52.27 years and mean age in group B is 50.46, there was no significant difference in the sex , weight or age distribution . In all patients , heart rate increased above the pre induction values Immediately following the induction of general anesthesia **,** were as systolic and diastolic arterial blood pressure decreased following induction of anesthesia in both groups , then systolic and diastolic slightly increase after endotracheal intubation (ETT) then decreased to approach the pre intubation values .

4. Discussion

Many drugs like : fentanyl , midazolam & lidocaine have hemodynamic stability effect due to stress response by its own mode of action (analgesic like fentanyl , sedative like midazolam & cell membrane - stability like lidocaine) .Pre induction values of heart rate (HR) , systolic & diastolic arterial blood pressure (SBP & DBP) had no significant difference between group A &B (p – value more than 0.05) . After induction of anesthesia : there is no significant difference (statistically according to p – value more than 0.05) in all readings of HR, SBP and DBP in 1 minute before ETT , 1 minute after ETT , 2 minute after ETT & 5 minute after ETT .

Parmod Kumar and his colleagues showed That there was no differences in mean HR, SBP, DBP and MAP were statistically insignificant among both groups conducted by using Fentanyl plus Propofol Versus Fentanyl plus Midazolam.(14). Kawa Dizaye & his colleagues showed that midazolam lidocaine combination was more effective in controlling and stabilizing blood pressure (MBP, SBP, and DBP) than Lidocaine alone(15).

5. Conclusion

Because of stress response due to surgery & anesthesia , most of the patients' needs anxiolytics , sedatives &

pain killers as a pre medication , were as every patient complaining from hypertension (ASA II) to overcomes the fluctuation in HR & BP needs anxiolytic , sedative & narcotic (pain killer) .

Because of the difference between group A & group B is not significant (p – value more than 0.05) in HR , SBP & DBP preoperatively , after induction of anesthesia, after ETT & the rest of the operation .

It's better to use fentanyl and midazolam as a pre medication in hypertensive patients and no need to use lidocaine intravenously unless there is indication .

Acknowledgements

none.

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