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Responses To Low Dose Propranolol In Haemodynamic Changes Produced By Stress During Surgery

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Abstract **Original Research Article**

Introduction*:** Anxiety is considered as a major complaint in majority of the patients who are supposed to consult with surgeons for a possible surgical procedure and also as an effective and preventing factor in patients' resistance to surgical procedures. Preoperative anxiety and its associated problems such as severe changes in hemodynamic parameters, the occurrence of arrhythmia with occasional dangerous hemodynamic complications are more common during anesthesia**.** ***Objective*:** To assess the effects of low dose propranolol to haemodynamic Changes produced by Stress during Surgery. ***Materials and Methods*:* A prospective observation study was carried out at the Dept. of Anesthesia, 250 Bedded General Hospital, Noakhali, Bangladesh from January to December 2021. Ninety (90) patients of ASA physical status admitted in hospitals for abdominal diseases had undergone operation of an average duration of 30 to 60 minutes under general anesthesia were selected for the study. Both male and female patients within age group 18-65 years were included. The anaesthetic procedures were explained and reassured to each patient after arrival of patient in operation theatre. Intravenous access was secured. ***Results*:** In our study both groups were homogenous as regard to age, weight, height and ASA physical status. The duration of surgery was also statistically matched with each other. The effects of placebo and propranolol on heart rate, systolic arterial pressure and rate pressure product immediately after intubations and during pre-operative period showed significant differences than that of base line values.It was shown the baseline values of heart rate of the two groups were similar. Base line systolic arterial pressures (SAP) were also similar. But it was significantly different within groups. Heart rate was significantly higher in placebo group (Group A) immediately after intubation and at 5, 15, 30, 60 minutes of per-operative period compared to the propranolol group (Group B). Systolic arterial pressure (SAP) values were found to be significantly higher in placebo Group. Immediately after intubations and at 5, 15, 30, 60 minutes of per-operative period compared to the propranolol group. In our study the baseline values of systolic arterial pressure (SAP) of the two groups were similar. But it was significantly different between groups. ***Conclusion*:** It is concluded that oral pre medication with low dose propranolol could attenuate the heart rate response and limit the development of ischaemia, might substantially reduce long-term cardiac complications. From this study it may be assumed oral pre-medication with low dose propranolol significantly attenuates stress induced haemodynamic changes in upper abdominal surgery.

Keywords: Low Dose Propanolol, Haemodynamic Change, Stress During Surgery.

INTRODUCTION

Anxiety is considered as a major complaint in majority of the patients who are supposed to consult with surgeons for a possible surgical procedure and also as an effective and preventing factor in patients' resistance to surgical procedures. Preoperative anxiety and its associated problems such as severe changes in hemodynamic parameters, the occurrence of arrhythmia with occasional dangerous hemodynamic complications are more common during anesthesia. Propofol, by

dilating veins and hence facilitating the outflow of blood from the surgical field, can induce anesthesia and sedation. Dexmedetomidine is a selective α2-adrenergic receptor agonist, which can decrease mean arterial pressure (MAP) and heart rate by reducing norepinephrine release, and it is known to be an analgesic drug with sympatholytic, anesthetic-sparing, and hemodynamic-stabilizing properties[1]. Increased hypothalamic activity induced by nociceptive stimulation is accompanied by an increased traffic in sympathetic efferent tracts resulting in adrenergic response [2, 3]. Thus it has been proposed that an abrupt increase in circulating catecholemines may be associated with potentially severe hypertension, tachycardia, which in turn may cause cardiac arrhythmias, myocardial ischemia, left ventricular dysfunction and rupture of cerebral aneurysm [4, 5] in susceptible individuals [6, 7]. However, there is growing evidence that stress response is actually detrimental and is associated with post- operative morbidity. It has adverse effects on several key physiological systems like cardiovascular, respiratory and gastrointestinal. In cardio vascular system- stress response activates sympathetic nervous system, which increases myocardial oxygen demand by increasing heart rate and arterial pressure. In nineties demonstrated that in standardized clinical conditions, there was an increase in adrenaline production in patients receiving a balanced general anaesthesia as opposed to those receiving an epidural technique or a combination of both [8]. Pre-medication is used to provide sedation and anxiolysis and to enhance the quality of induction, maintenance and recovery from anaesthesia. The ideal pre-medicant should be effective orally, with analgesic and non-emetic properties. A recent study has suggested that different pre-medication may lead to an alteration in sympatho-adrenal stress responses during surgery [2]. Even a single dose of a â-blocker given as premedication decreases the incidence of episodes of myocardial ischaemia [6]. Propranolol has been shown to exert an alleviating effect in anxiety. There are several pieces of evidence to suggest that β blocker work through a peripheral mechanism rather than within the CNS, although propranolol is relatively lipophilic and does gain entry to the CNS and it is most effective in performance anxiety & thus stress, while other beta-blockers do not [9]. There is limited information on haemodynamic changes to propranolol produced by stress in abdominal surgery. The cost of propranolol is generally low and it is used orally. It has been demonstrated that â-adrenoceptor blocker, in therapeutic doses, causes only modest reduction in cardiac output while decreasing the incidence of arrhythmia and myocardial ischaemia after laryngoscopy and intubation. It was recommended that its administration to be continued until the day of surgery [10, 11].

MATERIALS AND METHODS

A prospective observation study was carried out at the Dept. of Anesthesia, 250 Bedded General Hospital, Noakhali, Bangladesh from January to December 2021. Ninety (90) patients of ASA physical status admitted in hospitals for abdominal diseases had undergone operation of an average duration of 30 to 60 minutes under general anesthesia were selected for the study. Both male and female patients within age group 18-65 years were included. The anaesthetic procedures were explained and reassured to each patient after arrival of patient in operation theatre and intravenous access was secured. The patient and the investigator were blinded regarding the groups. Monitoring of heart rate and blood pressure were started. Pre-oxygenation was done for 3 minutes. Oxygen saturation was monitored from the beginning. All the patients were induced with thiopentone sodium (4-5 mg/kg) and fentanyl 1 μgm/kg. During the procedure ventilation of lung was assisted or controlled with 100% oxygen. Heart rate and automated non-invasive arterial blood pressure were recorded before intubation, just after intubation, at 10 minutes interval during the operative procedure and after extubation, using a DatexOhmeda (Helsinki, Finland) monitor. Rate pressure product (RPP) values were taken as derived values from multiplication of heart and systolic arterial blood pressure. Data collected in a pre-designed data collection sheet were compiled on a master chart. All data are plotted on sigma plot and all results are expressed as mean±SD. Data were analyzed by students unpaired‘t’ test and considered significant if $p<0.05$.

RESULTS

In our study both groups were homogenous as regard to age, weight, height and ASA physical status. The duration of surgery was also statistically matched with each other. The effect of placebo and propranolol on heart rate, systolic arterial pressure and rate pressure product at immediately after intubations and during pre-operative period showed significant difference than that of base line values (Table-1). Table-2 shows that the baseline values of heart rate of the two groups were similar. Base line systolic arterial pressures (SAP) were also similar. But it was significantly different within groups. Heart rate was significantly higher in placebo group (Group A) immediately after intubation and at 5, 15, 30, 60 minutes of per-operative period compared to the propranolol group (Group B). Table-3 shows that the baseline values of systolic arterial pressure (SAP) of the two groups were similar. But it was significantly different between groups. Systolic arterial pressure (SAP) values were found to be significantly higher in placebo Group. Immediately after intubations and at 5, 15, 30, 60 minutes of per-operative period compared to the propranolol group.

Table 1: Age, weight and height of the study subjects (N=90)

Variables	Group A		Group B		P value
	Mean	SD	Men	SD	
Age (yrs)	32.2	9.4	34.3	9.1	0.261
Weight (kg)	51.2	5.9	50.6	6.2	0.541
Height (cm)	154.4	3.4	155.2	4.7	0.431

Table 2: Changes in preoperative Heart Rate (bpm) during upper abdominal surgery (N=90)

	Heart rate at time after intubations				
Groups	Group A		Group B		P value
	Mean	SD	Mean	SD	
Baseline	77	6	75	4	0.021
0 min	110	8	78	6	<0.0001
5 min	101	9	74	7	<0.0001
15 min	96	9	70	6	<0.0001
30 min	89	7	68	6	<0.0001
60 min	82	11	67	6	0.003
Post-operative	112	7	76	6	<0.0001

Table 3: Changes in preoperative systolic arterial pressure (mmHg) during upper abdominal surgery (N=90)

	Heart rate at time after intubations				
Groups	Group A		Group B		P value
	Mean	SD	Mean	SD	
Baseline	116	7	115	7	0.401
0 min	129	6	117	7	<0.0001
5 min	124	6	112	10	<0.0001
15 min	120	7	114	9	0.00002
30 min	118	7	113	8	0.0006
60 min	82	11	111	2	0.0092
Post-operative	126	5	117	8	<0.0001

DISCUSSION

Our study anaesthetic stages consist of sleep, analgesia and muscle relaxation, which could now be produced by separate and several medications. Increased hypothalamic activity is accompanied by an increased traffic in sympathetic efferent tracts resulting in adrenergic responses in 1970 [1, 2]. In cardio-vascular system stress response activates sympathetic nervous system, which increases myocardial oxygen demand by increasing heart rate and arterial blood pressure [12]. The goal of adequate anaesthesia is to keep the patient throughout the operative procedure "stress free". In our study both groups were homogenous as regard to age, weight, height and ASA physical status. The duration of surgery was also statistically matched with each other. The effect of placebo and propranolol on heart rate, systolic arterial pressure and rate pressure product at immediately after intubations and during pre-operative period showed significant difference than that of base line values (Table-1).). Table-2 shows that the baseline values of heart rate of the two groups were similar. Base line systolic arterial pressures (SAP) were also similar. But it was significantly different within groups. Several agents and regimens have been devised to control this stress induced haemodynamic response including alpha-blocker, droperidol [13], lignocaine [14], low dose opioid [10], and cervical extradural blockade [11]. Propranolol has been shown to exert an alleviating effect in anxiety in addition to beta-blockade. Furthermore it is generally of low cost and there is convenience about its dosing and routes of administration. The result of this trial demonstrate that in patients who are not at risk for coronary artery disease and who are undergoing non cardiac surgery, stress induced haemodynamic response can be substantially reduced by premeditation with low dose oral propranolol. In pre-operative period heart rate of Group A is (77.32± 5.82) and remains slightly higher than the Group B (75.02±4.24) but after surgical incision, heart rate rises sharply (110.10±8.25) in group A where group-B heart rate (77.6±6.37) remains close to pre-operative value. Throughout the operative period result shows a significant value irrespective of heart rate, systolic arterial pressure and simultaneously rate pressure product. Pine et al., found that a concentration of propranolol of 100 ng/ml produce complete receptor blockade, whereas 8 ng/ml produce a 50% blockade [15]. In our study, we are not able to measure serum concentration of propranolol but it can be shown from the performed study that 10 mg bid oral dose can maintain much more than 8 ng/ml plasma level which is

sufficient to produce therapeutic blockade. In our study the heart rate was significantly higher in placebo group (Group A) immediately after intubation and at 5, 15, 30, 60 minutes of per-operative period compared to the propranolol group (Group B). In our study table-3 shows that the baseline values of systolic arterial pressure (SAP) of the two groups were similar. But it was significantly different between groups. Systolic arterial pressure (SAP) values were found to be significantly higher in placebo Group. Immediately after intubations and at 5, 15, 30, 60 minutes of per-operative period compared to the propranolol group. At the same time Johnson et al., showed that maximum improvement in angina pectoris occurs at 64 % to 98 % beta blockade [16]. There is the rationale for using low dose propranolol pre-medication for the prevention of perioperative risk of myocardial ischaemia. Studies conducted over the past decade have established the association between chances of preoperative myocardial ischaemia is more in untreated patients than those who gets some of any sympatholytic agents. The study, we performed here, have demonstrated an association between perioperative ischaemia and an elevated heart rate and have suggested that mitigation of this heart rate response may reduce the incidence or severity of ischaemia.

CONCLUSION

It is concluded that oral pre medication with low dose propranolol could attenuate the heart rate response and limit the development of ischaemia, might substantially reduce long-term cardiac complications. From this study it may be assumed oral pre-medication with low dose propranolol significantly attenuates stress induced haemodynamic changes in upper abdominal surgery.

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