Original Article

HAEMODYNAMIC CHANGES BEFORE AORTIC CANNULATION IN CABG SURGERY UNDER PROPOFOL-FENTANYL ANAESTHESIA: COMPARISON WITH OXYGEN- NITROUS- HALOTHANE TECHNIQUE

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ABSTRACT:

Patients undergoing CABG surgery have abnormal cardiovascular physiology and are commonly associated with multivessels disease, have compromised ventricular function and are often associated with other co morbid conditions. Aim of the study was to compare the peroperative hemodynamic effect in CABG surgery before aortic cannulation of two anesthetic techniques, e.g. TIVA (propofol-fentanyl) vs conventional (N_20-halothane). 40 patients scheduled for CABG surgery were allocated in double blind, randomized study. Patients were divided into two groups. In group A patients were maintained anaesthesia with TIVA (Propofol-fentanyl) technique and in group B patients conventional (N_20-halothane) technique. Hemodynamic parameters were taken at different stages in peroperative period upto the time of aortic cannulation. Hemodynamic supports were manipulated in a systematic approach. Hemodynamic status was evaluated and compared on the basis of support requirements between the groups. No significant changes of all the hemodynamic parameters were observed at induction, intubation, skin incision, sternotomy and then in maintenance phase (mean of 15 minutes interval) upto aortic cannulation in both groups.

INTRODUCTION

Anaesthesia for the patients with ischaemic heart disease has been the subject of innumerable research and review articles, beginning with an initial review of anaesthesia for myocardial revascularization[1] and recently, an extensive commentary on the epidemiology, outcome, and effects of anaesthetic agents and monitoring on care of the patient with coronary artery disease (CAD). Patients undergoing CABG surgery have abnormal cardiovascular physiology and are commonly associated with multivessels disease, have compromised ventricular function and are often associated with other co morbid conditions. The anaesthesiologist's traditional approach to anaesthesia for CABG in myocardial protection has emphasized the maintenance of haemodynamic stability (avo.ding hypotension, hypertension, and tachycardia) and the optimization of oxygen-carrying capacity (avoiding hypoxia and anemia), thus preserving the delicate balance between myocardial oxygen supply and demand.

Volatile agents or opioids, which group is better as maintenance technique and has better control over haemodynamic parameters - has been a matter of debate since the beginning of cardiac anaesthesia. Volatile agents have both some advantages and disadvantages. All the inhalational anaesthetic agents produce dose I elated negative ionotropic effect. Both halothane and N_20 have been demonstrated to depress LV contractile function[2] though this effects of N_20 is compensated to a lesser extent by its stimulation of sympathetic nervous

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system. Halothane depresses ionotropic action or ventricular performance more than those of other volatiles in animal and human studies[3,4]. Moreover, the negative inotropic and chronotropic effects are greater in patients with poor cardiac function[5-8]. Halothane and other volatiles are capable of producing vasodilatation and reduction of tiler load through direct relaxant effect on arterial smooth muscle[9] and effects on sympathetic system by decreasing preganglionic and postganglionic activity[10] and decreasing release of noradrenaline from postganglionic nerves[11]. All volatiles have negative chronotropic effect mediated through inhibitory effects on SA node. baroreceptor reflex and autonomic activity, but N_20 increase the heart rate by sympathetic stimulation. Another problem with halothane is its ability to sensitize the heart to the arrythmogenic effect of adrenaline[12], which is commonly used in cardiac anaesthesia as an ionotropic support. These are the causes why early techniques employing predominantly high concentration of halothane presented significant challenges and both surgical and anaesthetic mortality and morbidity rate were very high.

On the other hand, inhalational agents have got some advantages. Halothane decreases myocardial oxygen demand (MVO_2) and interestingly the drop in MVO_2 is associated with an appropriate decrease in coronary flow[13-14]. It also decreases platelet thrombus generation in the coronary eirculation[15]. It has also got some coronary, vasodilator effect. Besides, halothane produces good amnesia, less post operative respiratory depression than opioids but they cause post operative nausea, vomiting. Another claim against volatiles that they- are declared as a green house gas[16]. They are polluting not only operation theatre environment but also destroying the ozone layer and thus participating in global warming process.

Because of above mentioned problems, the use of high concentration of volatiles (specially halothane) in cardiac anesthesia had started reducing worldwide and opioids took its place. The utility of opioids in cardiac anaesthesia goes beyond providing potent analgesia. They help promote haemodynamic stability both in the presence and in the absence of noxious stimuli. The cardiac action of opioids and in particular, the negative effects on myocardial contractile mechanism are significantly less than those of many other intravenous and inhalational anacsthetics.

This study is aimed at determining the qualitative aspects as well as to compare haemodynamic status of these two tchniques before aortic cannulation in CABG surgery.

AIMS AND OBJECTIVES

i. To find out whether any significant haemodynamic changes produced by TIVA (propofol-fentanyl) and conventional (halothane-N_20) anaesthetic technique in CABG surgery and to obtain a better anaesthetic technique.

ii. To create awareness among the cardiac anasesthesiologists regarding which is better anaesthetic technique in CABG surgery.

MATERIALS AND METHODS

Subjects

This randomized, prospective clinical study was carried out in the Department of Anasesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. Forty (40) patients, scheduled for coronary artery bypass grafting surgery were included in this study. They were divided into two groups (Group A and Group B) of twenty patients each and were randomly selected by card sampling method. Patients of group A were maintained anaesthesia with propofol-fentanyl (TIVA) and patients of group B were maintained with oxygen-nitrous-halothane (conventional).

Inclusiopn Criteria:

i. ASA and NYHA grading II of either sex (Appendix I&II).

ii. Age: 40-70 yrs.

iii. .Ejection fraction: 45% - 60%.

Exclusion criteria:

i. Patients refusal

ii. Patients with left main vessel disease.

ii. More than three vessels disease

iv. Uncontrolled hypertension

v. Prolonged history of uncontrolled diabetes Mellitus

METHODS (ANESTHETIC TECHNIQUE)

After all normal procedure up to ventilation patients of group A (TIVA) were maintained with oxygen and air 30% -50%), propofol infusion (2-6mg/kg/hr) and fentanyl infusion 0.5-1.25,µg/kg/h by infusion pump

and vecuronium 0.04mg/kg at 40 min interval. N_20 and halothane were not used. Patients of group B (conventional) were maintained with oxygen (30%-50%), N_20 (50%-70%) and halothane (.5 - 1%).Vecuronium .04µg/kg was given 40 min. interval. Fentanyl .5-lmg/kg was also given at 30min interval as incremental dose.

Heart Rate, Arterial blood Pressure (Systolic, Diastolic and Mean) Rate pressure product (RPP), central venous pressure (CVP) were taken after arterial cannulation and internal jugular venous (IJV) cannulation. Those measurements were considered as base line parameters.

Subsequently data were taken at induction, at intubation, at the time of skin incision, at the time of sternotomy, and then every 15 min. interval up to the time of aortic canulation.

Results and observation

Comparison of mean age, body weight, height, ejection fraction (%) and body surface are between TIVA and conventional group are shown in Table I. there were no significant difference among TIVA and conventional group.

Table I

Comparison of mean age, body weight, height, ejection fraction (%) and body surface are between TIVA and conventional group.

Variables	TIVA Mean ±SEM	Conventional Mean ± SEM
Age	57.7 ± 1.9	55.1 ± 1.9
Body weight	63.0 ± 1.1	59.0 ± 2.1
Height	159.8± 1,4	159.1 ± 1.7
Ejection Fraction	55.3 ± 1.1	55.7 ± 1.3
Bodysurfacearea area ararea	1.7± .02	1.6 ± .03

The mean difference of all baseline haemodynamic parameters were statistically insignificant ($p>0.05$) in unpaired t-test (Table II). There was no significant change in ST segment and no arrhythmia was found from ECG a tracing ST in airy patient of both group.

Table II

Mean baseline value of Haemodynamic parameters in TIVA and conventional group

Parameters	TIVA Mean ± SEM	Conventional Mean ± SEM
BP (Systolic)	132.4 ± 3.8	126.1 ±2.8
BP (Diastolic)	82.7 ± 2.0	82.3 ±1.8
Mean BP	99.3 ±2.4	96.9±2.0
Heart rate (BPM) Heart	78.6±1.6	81.3 ±1,9
RPP	10396.5 ± 465.5	10298.5 ± 402.0
CVP	8.9±0.2	9.5 ± 0.2

The mean difference of all haemodynamic parameters at induction were statistically insignificant ($p>0.05$) in unpaired t-test except RPP, which was significant ($p<0.05$) (Table III). There was no significant change in ST, segment and no arrhythmia was found from ECG tracing in any patient of both group.

Table III

Mean value of Haemodynamic parameters in TIVA and conventional group at induction

Parameters	TIVA Mean ±SEM	Conventional Mean ± SEM
BP (Systolic)	93.7 ±21	98.5 ± 1.3
BP(Diastolic)	66.5±2.5	64.4±1.5
Mean BP	75.6±23	75.7 ±1.3
Heart rate (bpm)	76.2 ±1.9	80.3 ±1.3
RPP	7123.±262.7	7917.1 ±190.7
CVP	8.7±0.2	9.3 ± 0.2

The mean difference of all haemodynamic parameters after 3 minutes intubation were statistically significant ($p<0.05$) in unpaired t-test except heart rate and RPP, which were insignificant ($p>0.05$) (Table IV). There was no significant change in ST segment and no arrhythmia was found from ECG tracing in any patient of both group.

Table IV

Mean value of Haeniodynamic parameters in TIVA and conventional group 3 minutes after intubatiou

Parameters	TIVA Mean ± SEM	Conventional Mean ± SEM
BP (Systolic)	120.8± 1.9	130.2-+2.1
BP(Diastolic)	81.7± 1.6	86.6±1.0
Mean BP	94.7±6.7	101.1±5,7
Heartrate (bpm)	81.3±2.6	80.0±1.5
RPP	9900. ±1945.26	10419.4±11944.
CVP	8.5±0.4	9.4±03

The mean difference of all haemodynamic parameters during skin incision were statistically significant ($p<0.05$) ii) unpaired t-test except heart rate and RPP, which was insignificant ($p>0.05$) (Table V). There was no significant change in ST segment and no arrhythmia was found from ECG tracing in any patient of both group.

Table V

Mean value of Haemodynamic parameters in TIVA and conventional group at skin incision

Parameters	TIVA Mean ± SEM	Conventional Mean ± SEM
BP (Systolic)	123.3± 1.9	131.2+1.9
BP(Diastolic)	82.5± L4	86.2 ±LO,
Mean BP	96.1±1.3	101.2 ±1.1
Heart rate (bpm)	81.8±2.3	80.2 ±1.5
RPP	10149.3±446.5	10524.9 ±264.1
CVP	8.2±0.3	9.7+0.2

The mean difference of all haemodynamic parameters during sternotomy were statistically significant ($p<0.05$) in unpaired t-test except heart rate and RPP, which were insignificant ($p>0.05$) (Table VI). There was no significant change in ST segment and no arrhythmia was found from ECG tracing in any patient of both group.

Table VI

Mean value of Haemodynamic parameters in TIVA and conventional group at the time of sternotomy

Parameters	TIVA Mean ± SEM	Conventional Mean ± SEM
BP (Systolic)	124.6+ 1.6	130.0± 1.7
BP(Diastolic)	81-9-+ 1.5	86.3±1.1
Mean BP	96.1 ±1.2	100.9±1.2
Heart rate (bPm)	82.1 ±2.7	80.7±2.2
RPP	10259.9±420.2	10471.2±321.8
CVP	8.4±0.3	9.2±0.2

Table VII

Mean value of Haemodynamic parameters in TIVA and conventional group during maintenance (upto initiation of aortic cannulation).

Parameters	TIVA Mean ± SEM	Conventional Mean ± SEM
BP (Systolic)	119.9± 2.0	115.0± 2.8
BP(Diastolic)	79.4± 2.2	76.6±2.1
Mean BP	92.9±1.9	89.4±2.2
Heart rate (bpm)_Heart	75.7±2.7	77.0±23
RPP	9121.9±415.5	88323±321.4
CVP	8.8±0.2	9.1± 0.3

The mean difference of all average haemodynamic parameters result during maintenance (upto initiation of aortic cannulation) were statistically insignificant ($p>0.05$) in unpaired t-test (Table VII). There was no significant change in ST segment and no arrhythmia was found from ECG tracing in any patient of both group , expect one patient in conventional group, who showed premature ventricular ectopics in ECG tracing which was treated with lignocainee.

DISCUSSION

In the present study the mean difference of all baseline haemodynamic parameters were statistically insignificant ($p>0.05$) in unpaired t-test. At induction the mean (±SEM) RPP was 7123.3±262.7 and 7917.1±190.7 in TIVA and conventional group respectively and the mean

difference was significantly ($p>0.05$) higher in conventional group compared to TIVA group. Other variables were statistically insignificant ($p>0.05$) at induction.

After 3 minutes intubation the mean (±SEM) systolic BP was 120.8±1.9 mmHg in TIVA group and 130.2±2.1 mmHg in conventional group. Similarly, the mean (±SEM) diastolic BP was 81.7±1.6 mmHg in TIVA group and 86.6±1.0 mmHg in conventional group. The mean(±SEM) BP was 94.7±6.7 mmHg in TIVA group and 101. 1+5.7 mmHg in conventional group. The mean(±SEM) CVP was 8.5±0.4 in TIVA group and 9.4±0.3 in conventional group. There was no significant change in ST segment and no arrhythmia was found from ECG tracing in any patient of both group. The mean difference of all haemodynamic parameters after 3 minutes intubation were significantly ($p<0.05$) higher in conventional group compared to TIVA group but heart rate and RPP were insignificant ($p>0.05$). Similar result were found during skin incision and sternotomy.

There was no significant change in the present study in ST segment and no arrhythmia was found from ECG tracing in any patient of both group except one patient in conventional group, who showed premature ventricular ectopics in ECG tracing which was treated with lignocaine. The mean difference of all average haemodynamic parameters result during maintenance (upto initiation of aortic cannulation) were statistically insignificant ($p>0.05$).

Regarding the haemodynamic parameters Hall RI et al. (1991) found a larger reduction in systolic blood pressure in propofol-sufentanil (156±22 to 104±20 mmHg Vs conventional group (152±26 to 124±24; $p<0.05$)[17].No statistical difference were detected at any other variables of haemodynamic parameters, which closely agrees with the present study where the mean systolic blood pressure was 132.4±3.8 mmHg and 93.7±2.1 mmHg at induction. Similarly Pagnin A et al._(1992) observed similar pattern of change after induction, intubatiun, skin incision and sternotomy except for a greater decrease in systolic BP, thus support the present study[18].

CONCLUSION

On the basis of present randomized prospective comparative clinical study it can be concluded that from the hemodynamic point of view there is no significant difference between propofol-fentanyl (TIVA) anaesthetic technique and nitrous-halothane (conventional) anaesthetic technique.

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