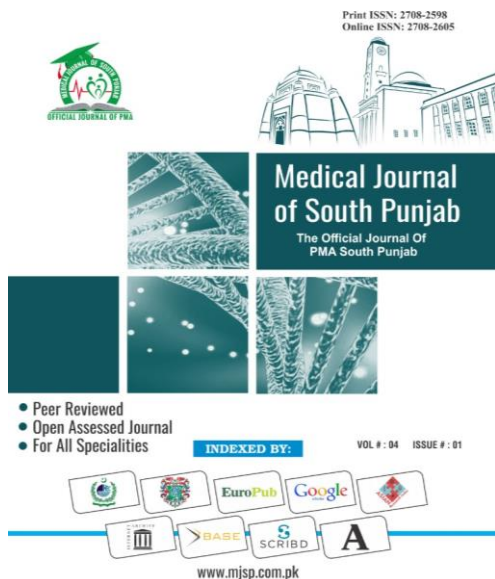


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Comparison of hemodynamic stability between propofol plus ketamine and etomidate in patients undergoing coronary artery bypass graft

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ABSTRACT

Objective: To compare the hemodynamic stability of Propofol plus Ketamine and Etomidate in patients undergoing coronary artery bypass graft.

Methods: This Randomized control trial was conducted in Dow University Hospital, Ojha Campus in the Department of Anesthesia from July 2019 to January 2020. Patients were assigned in group A Ketamine and Propofol combination and group B Etomidate alone. Hemodynamic parameters were measured before induction and after induction but before laryngoscope and finally after laryngoscopy. Data was collected on standard proforma.

Results: In this study 104 patients, who fulfilled the inclusion criteria were included and distributed into two group A and B. 34 (65.4%) and 32 (61.5%) patients were male and 18 (34.6%) and 20 (38.5%) patients with mean age of 57.3 ± 7.7 (44-70) years and 57.4 ± 8.7 (41-70) years in group A and B respectively. Hemodynamic stability was achieved in 4 (7.7%) patients and 15 (28.8%) patients in group A and B respectively.

Conclusion: It was concluded from the study that hemodynamic stability was high in etomidate group patients as compared to Propofol and Ketamine group patients.

Keywords: Anesthesia, CABG, Intubation, Hemodynamic, Surgery.

1. INTRODUCTION

During induction of anesthesia in cardiac surgery patients, maintaining hemodynamic stability is important, requiring careful management to balance myocardial oxygen demand and attenuate the stress response¹, while the use of laryngoscope and tracheal intubation for airway management may lead to undesired changes such as tachycardia, hypertension, or arrhythmia, necessitating vigilant monitoring and intervention to overcome these risks².

Studies comparing various induction agents such as etomidate, thiopental, propofol, and ketamine have demonstrated stable hemodynamic responses during laryngoscopy³. Each pharmacologic agent presents distinct advantages and disadvantages, indicating that there is no universally preferred choice for this purpose⁴.

Etomidate, often utilized as an anesthetic agent due to its minimal impact on cardiovascular function, is considered suitable for patients with compromised ventricular function⁵; however, studies suggest that its administration during anesthesia induction may result in postoperative vasopressor dependency and significantly adverse outcomes such as increased hospital stay, cardiovascular morbidity, and mortality^{6,7}.

Combining ketamine and propofol as anesthetic agents leverages the distinct properties of each drug effectively⁸. Ketamine, with its cardiac stimulatory effects, elevates blood pressure, heart rate, and cardiac output, while also providing sedation, bronchodilation, and sympathetic nervous system stimulation⁹. Propofol is an ultra-short-acting sedative-hypnotic agent with its beneficial characteristics of smooth induction and rapid recovery¹⁰.

Since the day of coronary artery bypass graft (CABG) surgery was introduced, hemodynamic stability remains a challenge for anesthetics during anesthesia especially in our region where no guidelines were available before, so we compare the hemodynamic stability between etomidate and combination of propofol and ketamine for induction of anesthesia in patients who are undergoing CABG surgery to fulfill the local reference gap. Our study will be local reference towards modern research in this field.

2. METHODOLOGY

This Randomized control trial was conducted in Dow University Hospital, Ojha Campus in the Department of Anesthesia from July 2019 to January 2020. First 52 patients meeting the inclusion criteria and were candidate of coronary artery bypass graft surgery were placed in group A and the next 52 patients were allocated to group B by lottery method. Ethical guidelines were strictly followed. The patients with age limit 40-70 years underwent coronary artery bypass graft had a physical status class 2 and class 3 of American Society of Anesthesiology (ASA). Known history of adrenal insufficiency, already on steroids for the past 5 months, allergic to egg and known allergies or contraindicated to propofol and ketamine were excluded. The sample size was 52 patients in each group. The sample size was calculated with WHO calculator with power of test 80% and confidence interval 95%, using statistics of previous study as 24.4% stability in ketamine + Propofol group and 5% in etomidate group [9]. Total sample size of study was 104.

Each patient received premedication of 0.03 mg/kg intravenous midazolam. After pre-medication, patients in group A received a combination of 1 mg/kg ketamine and 1 mg/kg propofol in two divided doses at the interval of 30 sec, whereas in group B patients received the

etomidate at 0.2 mg/kg in two divided doses at the interval of 30 sec.

After drug administration, each patient received the muscle relaxation with atracurium. With standard intubating dose, hemodynamic parameters were measured before induction and after induction but before laryngoscope and finally after laryngoscopy.

Statistical analysis was performed by using SPSS 27 for windows. Post-stratification chi-square test was applied. P-value ≤ 0.05 was taken as significant.

3. RESULTS

In current study 104 patients were included who fulfill the inclusion criteria of the study. Mean age was 57.3 ± 7.7 (44-70) years and 57.4 ± 8.7 (41-70) years in group A and B respectively. Mean heart rate was 87.2 ± 18.4 (72-100) beats/min and 81.3 ± 20.3 (69-95) beats/min in group A and B respectively. Mean SBP was 118.3 ± 13.5 (100-135) mmHg and 116.7 ± 14.7 (98-128) mmHg in group A and B respectively. Diastolic blood pressure (DBP (mmHg) was 71.5 ± 9.4 (64-86) mmHg and 70.3 ± 7.6 (68-84) mmHg in group A and B respectively. Mean arterial pressure (MAP (mmHg) was 89.6 ± 11.7 (73-101) mmHg and 84.3 ± 8.3 (70-95) mmHg in group A and B respectively.

Mean heart rate (beats/min) after induction before and after laryngoscope was 84.7 ± 15.3 (70-104) beats/min and 80.9 ± 12.5 (71-94) beats/min after induction before laryngoscope and 94.5 ± 19.4 (68-105) beats/min and 85.2 ± 16.8 (68-98) beats/min after induction after laryngoscope in group A and B respectively. Systolic blood pressure (SBP (mmHg) after induction before and after laryngoscope was 85.5 ± 12.8 (70-102) mmHg and 105.3 ± 11.4 (74-112) mmHg after induction before laryngoscope and 94.1 ± 11.7 (76-104) mmHg and 110.6 ± 10.5 (73-

116) mmHg after induction after laryngoscope in group A and B respectively.

Table: 1: Demographics and preoperative hemodynamics

Characteristics	Group A	Group B
Age	57.3 ± 7.7	57.4 ± 8.7
Heart Rate	87.2 ± 18.4	81.3 ± 20.4
SBP	118.3 ± 13.5	116.7 ± 14.7
DBP	71.5 ± 9.4	70.3 ± 7.6
MAP	89.6 ± 11.7	84.3 ± 8.3

Table-2: Descriptive statistics of heart rate after induction before and after laryngoscope

After Induction Before Laryngoscope		After Induction After Laryngoscope	
Group A	Group B	Group A	Group B
Heart Rate			
84.7 ± 15.3	80.9 ± 12.5	94.5 ± 19.4	85.2 ± 16.8
Systolic Blood Pressure (SBP)			
85.5 ± 12.8	105.3 ± 11.4	94.1 ± 11.7	110.6 ± 10.5
Diastolic Blood Pressure (DBP)			
61.3 ± 10.5	69.5 ± 8.7	66.7 ± 9.6	70.1 ± 8.3
Mean Arterial Pressure (MAP)			
71.5 ± 12.5	78.5 ± 9.4	78.7 ± 10.8	82.6 ± 8.7

Table-3: Hemodynamic stability among groups

Stability	Group A	Group B
Yes	4 (7.7%)	15 (28.8%)
No	48 (92.3%)	37 (71.2%)
P Value	0.005	

4. DISCUSSION

In group A 65.4% and 61.5% patients were male and in group B 34.6%

and 38.5% patients were female respectively. A similar study by Baradari et al¹¹ also reported the higher male prevalence affected with heart disease and undergoing CABG surgery. Researcher reported the 60% male in ketamine with propofol group and 68% male in etomidate group. Another similar study by Aghdaii et al¹² also reported the higher male prevalence 70% in ketamine with propofol group and 66% male in etomidate group.

In current study mean age of patients was 57.3 ± 7.7 (44-70) years and 57.4 ± 8.7 (41-70) years in group A and B respectively. A similar study by Baradari et al¹¹ also reported the mean age of 58.71 ± 9.2 years in ketamine with propofol group and 62.23 ± 6.3 years in etomidate group. Another similar study by Aghdaii et al¹² also reported the mean age of 57.36 ± 5.5 years in ketamine with propofol group and 57.16 ± 5.6 years in etomidate group.

In current study, rate of hemodynamic stability was high in group Etomidate group 28.8% patients as compared to group Ketamine with Propofol group 7.7% patients. Studies conducted by Shivanna S et al¹³ and Kaushal RP et al¹⁴ comparing the haemodynamic effects of propofol and etomidate as induction agents have concluded that etomidate provides superior haemodynamic stability compared to propofol.

Similarly Kabir et al¹⁵ and Singhal et al¹⁶ also reported that etomidate stands out as a unique induction agent due to its minimal haemodynamic effects and wide safety margins, making it a preferred choice in situations where maintaining stable blood pressure and cardiovascular function during induction is important.

In studies conducted by Aggarwal et al¹⁷ and Regmi et al¹⁸ concluded that patients who received etomidate exhibited minimal alterations in MAP and heart rate (HR) when compared to those who received

propofol ($p > 0.05$) from their baseline values. The propofol group experienced more pain upon injection, whereas the etomidate group showed increased myoclonus activity.

In their respective studies, Yousef et al¹⁹ and Ozgul et al²⁰ demonstrated that the combination of propofol and ketamine in different ratios led to superior haemodynamic stability and reduced adverse effects compared to using either agent alone for induction of anesthesia. Their findings underscored the synergistic benefits of combining these medications, highlighting the potential for improved patient outcomes and enhanced safety during anesthesia induction procedures.

5. CONCLUSION

Hemodynamic stability was high in etomidate group patients as compared to Propofol and Ketamine group patients undergoing coronary artery bypass graft surgery.

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