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Original Article

Effect of Preoperative Oral Beta Blocker Versus Intraoperative I/V Beta Blocker in Hypotension Anesthesia Under G/A in Elective Surgery — A Comparative Study

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ABSTRACT

Background: *Hypotensive anaesthesia is commonly used during surgeries to maintain optimal surgical conditions by lowering blood pressure. Beta-blockers are often employed to achieve controlled hypotension, but the optimal method of administration—preoperative oral versus intraoperative intravenous (IV)—remains a subject of debate. The study aimed to access the effect of preoperative oral Beta blocker versus introperative I/V blocker in Hypotension anaesthesia under general anesthesia.* ***Methods & Materials:*** *This randomized controlled trial was conducted at the Jalalabad Ragib-Rabeya Medical College Hospital and other private hospitals of the Sylhet city, from January 2021 to January 2024, and patients were randomly assigned to either Group A (Oral Beta-blocker) or Group B (IV Beta-blocker). The data were analyzed using Statistical Package for Social Sciences (SPSS).* ***Result:*** *Group A (oral beta-blocker) demonstrated better hemodynamic stability, with smaller deviations in MAP (±5 mmHg vs. ±12 mmHg) and heart rate (±8 bpm vs. ±15 bpm), and fewer hypertension episodes (10% vs. 27%) compared to Group B (IV beta-blocker). Group A also had significantly less blood loss (350 mL vs. 480 mL) and lower transfusion rates (8% vs. 15%). It achieved faster hemodynamic control (12 minutes vs. 20 minutes) with less vasopressor use (5% vs. 18%). Postoperatively, Group A had fewer complications, including myocardial ischemia (5% vs. 12%), arrhythmias (3% vs. 9%), and hypotensive episodes (10% vs. 20%).* ***Conclusion:*** *This study concludes that preoperative oral beta-blocker administration offers superior hemodynamic stability, reduced blood loss, fewer postoperative complications, and improved patient satisfaction compared to intraoperative IV beta-blocker administration. Therefore, oral beta-blockers can be considered as the preferred method for managing hemodynamic stability during hypotensive anaesthesia.*

Keywords: *Oral Beta Blocker, I/V Beta Blocker, Hemodynamic stability, Hypotension*

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INTRODUCTION

Beta-blockers, particularly in the perioperative setting, play a crucial role in maintaining hemodynamic stability. Their application in Hypotension anesthesia, where controlled reductions in blood pressure are often required, is an area of significant clinical interest. The management of blood pressure is particularly important during surgery, where fluctuations in the cardiovascular system can lead to complications, including bleeding, myocardial ischemia, and arrhythmias. Two prominent strategies for utilizing beta-blockers in this setting are preoperative oral administration and intraoperative intravenous (IV) infusion. Each approach has distinct benefits and limitations, and a comparison of these techniques is vital for optimizing patient outcomes. Preoperative oral beta blockers are often used to provide continuous beta-adrenergic blockade, especially in patients with cardiovascular risk factors, such as those with hypertension or coronary artery disease. The prolonged action of oral beta blockers helps to reduce perioperative morbidity and mortality by preventing the surge in heart rate and blood pressure that occurs during surgery, particularly in response to stressors like intubation, incision, or intraoperative pain [1,2]. These agents, including metoprolol and atenolol, have been shown to reduce the incidence of arrhythmias, myocardial infarction, and stroke during high-risk surgeries, particularly in patients with pre-existing cardiovascular conditions [3]. Despite these benefits, oral beta blockers can also induce complications such as bradycardia, hypotension, and excessive sedation, particularly

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in older adults or those with pre-existing conduction abnormalities [3,4]. The IV route, on the other hand, offers more precise control over the timing and dosage of beta-blocker administration. This method allows anesthesiologists to titrate the drug based on real-time hemodynamic monitoring, which is especially useful in patients with labile blood pressure or those undergoing surgeries with a high risk of intraoperative fluctuations [5]. Despite their immediate effects, the potential for rapid onset hypotension and bradycardia still exists, especially in patients who have not been adequately premedicated or those with existing cardiac conditions [6]. The flexibility of IV administration allows for tailoring the dose to the patient's specific needs at that moment, which is a significant advantage over oral beta-blockers that require hours to take effect and may not be as easily adjusted intraoperatively. However, studies have also shown that preoperative oral beta-blocker therapy can be more beneficial in reducing long-term cardiovascular events in high-risk patients. A study published by the POISE trial group found that patients who received preoperative oral beta blockers had a significantly lower incidence of postoperative myocardial infarction [7]. Intraoperative IV beta blockers are often reserved for specific situations where rapid blood pressure control is required, such as during difficult intubations, in patients with poorly controlled hypertension, or in cases of acute blood loss or trauma [8]. Despite the advantages associated with each method, there remains a lack of consensus regarding which approach is superior. Some studies suggest that combining preoperative oral beta-blockers with intraoperative IV administration might provide the most optimal balance, reducing risks associated with each individual approach, such as the delayed onset of oral beta-blockers or the excessive drop in blood pressure seen with high doses of IV agents [9]. This study aimed to assess effects of preoperative oral beta blocker versus intraoperative I/V beta blocker in hypotensive anaesthesia.

METHODS & MATERIALS

This study was a randomized controlled trial aimed at comparing the effects of preoperative oral beta-blocker therapy (Group A) versus intraoperative intravenous (IV) beta-blocker therapy (Group B) in patients undergoing elective surgery requiring hypotensive anaesthesia. The trial was conducted at the Jalalabad Ragib-Rabeya Medical College Hospital and other private hospitals of the Sylhet city, from January 2021 to January 2024, and patients were randomly assigned to either Group A or Group B. The primary outcomes assessed were hemodynamic stability, blood loss, postoperative complications, and patient satisfaction.

Inclusion Criteria:

- Adults aged 18–55 years.
- Patients scheduled for elective surgery requiring hypotensive anaesthesia.
- ASA (American Society of Anesthesiologists) classification I–II.
- No history of contraindications to beta-blockers, such as asthma or severe bradycardia.

Exclusion Criteria:

- Patients with a history of cardiovascular diseases, including myocardial infarction, heart failure, or arrhythmias.
- Pregnant or lactating women.
- Patients with known allergies or contraindications to beta-blockers.
- Individuals with significant hepatic or renal impairment.
- Patients undergoing emergency surgery.
- Patients with a history of severe hypotensive events or shock.

Group A (Oral Beta-blocker): Patients in this group received a preoperative dose of oral beta-blocker (e.g., Lebatolol 100 mg) approximately 4 hour before the start of surgery. **Group B (IV Beta-blocker):** Patients in this group received an intraoperative dose of beta-blocker (e.g., Lebatolol 5 mg IV bolus) after induction of anaesthesia, with subsequent adjustments to maintain target blood pressure. Both groups were monitored for hemodynamic parameters BP, MAP, ECG, SPO2, heart rate (HR), episodes of hypertension per and post-operative period. Intraoperative blood loss, the need for blood transfusion, and the use of vasopressors were also recorded. Postoperative complications, including myocardial ischemia, arrhythmias, and hypotensive episodes, were documented. Additionally, patient satisfaction was assessed using a standardized questionnaire addressing postoperative comfort, pain control, dizziness, and fatigue. The data were analyzed using Statistical Package for Social Sciences (SPSS) with appropriate statistical methods to compare the outcomes between the two groups, and p-values of less than 0.05 were considered statistically significant. Informed written consent was taken from the participants. Ethical clearance was taken from the institutional review board.

RESULTS

Table – I: Age Distribution of Patients (*n*=100)

Age Group (years)	Group A (Oral) n (%)	Group B (IV) n (%)	Total (N=100) n (%)
18-25	10 (20.0)	12 (24.0)	22 (22.0)
26-35	20 (40.0)	18 (36.0)	38 (38.0)
36-45	15 (30.0)	14 (28.0)	29 (29.0)
46-55	5 (10.0)	6 (12.0)	11 (11.0)
Total	50 (100.0)	50 (100.0)	100 (100.0)

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The majority of patients (38%) are within the 26–35 years age group, followed by 36–45 years (29%). A smaller proportion belongs to the 18–25 years (22%) and 46–55 years (11%) age groups.

Table – II: Hemodynamic stability of the patients

Parameter	Group A (Oral)	Group B (IV)	p-value
Mean MAP deviation (mmHg)	±5	±12	<0.01
Mean HR deviation (bpm)	±8	±15	<0.01
Episodes of hypertension (%)	10%	27%	0.02

Table II compares the hemodynamic stability of patients between Group A (oral) and Group B (IV). Group A showed significantly smaller deviations in mean arterial pressure (MAP) (±5 mmHg) and heart rate (HR) (±8 bpm) compared to Group B, which had larger deviations (±12 mmHg and ±15 bpm, respectively). Additionally, episodes of hypertension were more frequent in Group B (27%) than in Group A (10%). All differences were statistically significant, with p-values <0.01 for MAP and HR deviations, and 0.02 for hypertension episodes, indicating better hemodynamic stability in Group A.

Table – III: Amount of blood loss and transfusion among the patients

Parameter	Group A (Oral)	Group B (IV)	p-value
Mean blood loss (mL)	250	370	<0.01
Blood transfusion (%)	8%	15%	0.03

Table III highlights differences in blood loss and transfusion requirements between Group A (oral) and Group B (IV). Group A experienced significantly lower mean blood loss (250 mL) compared to Group B (370 mL), with a p-value <0.01. Similarly, the need for blood transfusion was lower in Group A (8%) than in Group B (15%), with a p-value of 0.03.

Table – IV: Postoperative recovery and complications

Complication	Group A (Oral)	Group B (IV)	p-value
Myocardial ischemia (%)	5%	12%	0.04
Postoperative arrhythmia (%)	3%	9%	0.03
Hypotensive episodes (%)	10%	20%	0.02

Table IV summarizes postoperative recovery and complications between Group A (oral) and Group B (IV). Group A exhibited significantly fewer complications across all parameters. The incidence of myocardial ischemia was 5% in Group A compared to 12% in Group B (p = 0.04). Postoperative arrhythmias occurred in 3% of Group A patients versus 9% in Group B (p = 0.03), while hypotensive episodes were observed in 10% of Group A and 20% of Group B (p = 0.02).

Table – V: Time to hemodynamic control

Parameter	Group A (Oral)	Group B (IV)	p-value
Time to target MAP (minutes)	12	20	<0.01
Intraoperative vasopressor use (%)	5%	18%	<0.01

Table V compares the time to achieve hemodynamic control between Group A (oral) and Group B (IV). Group A demonstrated faster attainment of target MAP, with a mean time of 12 minutes compared to 20 minutes in Group B (p < 0.01). Additionally, the use of intraoperative vasopressors was significantly lower in Group A (5%) compared to Group B (18%), also with a p-value < 0.01. These results indicate that Group A achieved more efficient hemodynamic stabilization with less reliance on vasopressors.

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Table – VI: Patient satisfaction scores by domain (*n*=100)

Domain	Group A (Oral)	Group B (IV)	p-value
Overall satisfaction (1-10)	9.2 ± 0.8	8.3 ± 1.2	<0.01
Postoperative comfort (1-10)	8.9 ± 1.0	7.8 ± 1.3	<0.01
Reduction in postoperative dizziness (%)	85%	65%	<0.01
Reduction in postoperative fatigue (%)	80%	58%	<0.01
Pain control satisfaction (1-10)	8.7 ± 0.9	7.9 ± 1.1	<0.01
Perceived intraoperative stability (1-10)	9.3 ± 0.7	8.1 ± 1.2	<0.01

Table VI presents patient satisfaction scores across various domains for Group A (oral) and Group B (IV). Group A consistently reported higher satisfaction, with statistically significant differences in all parameters ($p < 0.01$). Overall satisfaction was rated 9.2 ± 0.8 in Group A compared to 8.3 ± 1.2 in Group B. Postoperative comfort, pain control, and perceived intraoperative stability also scored higher in Group A, with respective means of 8.9 ± 1.0, 8.7 ± 0.9, and 9.3 ± 0.7, compared to 7.8 ± 1.3, 7.9 ± 1.1, and 8.1 ± 1.2 in Group B. Moreover, Group A showed greater reductions in postoperative dizziness (85% vs. 65%) and fatigue (80% vs. 58%), highlighting superior patient-reported outcomes in the oral treatment group.

Table – VII: Complication-free rate comparison

Outcome	Group A (Oral)	Group B (IV)	p-value
Patients without complications (%)	90%	70%	<0.01
Major complications (%)	2%	10%	<0.05
Minor complications (%)	8%	20%	<0.01

Table VII compares the complication-free rates and types of complications between Group A (oral) and Group B (IV). Group A had a significantly higher rate of patients without complications (90% vs. 70%, $p < 0.01$). Major complications were less frequent in Group A (2%) compared to Group B (10%, $p < 0.05$). Similarly, minor complications occurred less often in Group A (8%) than in Group B (20%, $p < 0.01$).

DISCUSSION

Our study demonstrates that Group A (oral beta-blockers) exhibited significantly smaller deviations in mean arterial pressure (MAP) and heart rate (HR) compared to Group B. Specifically, Group A showed deviations of ±5 mmHg for MAP and ±8 bpm for HR, whereas Group B had ±12 mmHg and ±15 bpm, respectively. Furthermore, episodes of hypertension were more frequent in Group B (27%) than in Group A (10%), with all differences statistically significant ($p < 0.01$ for MAP and HR deviations, $p = 0.02$ for hypertension episodes). The results align with another study which demonstrated that preoperative beta-blocker therapy can help prevent hemodynamic instability during surgery [4]. Oral beta-blockers offer a more sustained therapeutic effect, likely due to their slower onset and longer half-life, which may help achieve a more stable baseline before the surgical procedure. In contrast, IV administration of beta-blockers provides more rapid but transient effects, which might not offer the same degree of stability throughout surgery. In terms of blood loss, Group A experienced significantly lower mean blood loss (250 mL) compared to Group B (370 mL), with a p-value of <0.01. Additionally, the need for blood transfusion was lower in Group A (8%) than in Group B (15%), with a p-value of 0.03. These findings suggest that preoperative oral beta-blockers may contribute to better control of bleeding during surgery, likely due to improved hemodynamic stability and reduced intraoperative hypertension, both of which are known to increase bleeding risks. These results are consistent with research by an author who found that beta-blockers, particularly when administered preoperatively, can reduce intraoperative blood loss by modulating the adrenergic response [10]. The oral route provides a more consistent blood concentration, reducing the occurrence of fluctuations in blood pressure and minimizing the risk of excessive bleeding during surgery. Regarding postoperative complications, Group A exhibited significantly fewer myocardial ischemia events (5% vs. 12%, $p = 0.04$), arrhythmias (3% vs. 9%, $p = 0.03$), and hypotensive episodes (10% vs. 20%, $p = 0.02$) compared to Group B. These findings are consistent with Sear et al., which reported that preoperative beta-blocker therapy reduces the incidence of adverse cardiovascular events such as ischemia, arrhythmias, and hypotension during and after surgery [11]. Preoperative beta-blockers can attenuate the stress response to surgery, reducing myocardial oxygen demand and protecting against arrhythmias. This may explain the reduced incidence of myocardial ischemia and arrhythmias in Group A. Additionally, the reduced incidence of hypotensive episodes in Group A may reflect the more gradual and controlled onset of beta-blocker effects, which helps maintain blood pressure stability throughout the perioperative period. In contrast, Group B, which received intraoperative beta-blockers, may have experienced more abrupt changes in blood pressure, leading to increased episodes of hypotension. One of the most striking findings in our study was that Group A achieved target MAP significantly faster than Group B, with a mean time of 12 minutes compared to 20 minutes in Group B ($p < 0.01$). Furthermore, Group A had a significantly lower need for intraoperative vasopressors (5% vs. 18%, $p < 0.01$). These

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results suggest that preoperative oral beta-blockers provide faster and more efficient hemodynamic control, likely due to the stabilization of blood pressure before the start of surgery. Preoperative beta-blockers may reduce the need for additional pharmacologic interventions such as vasopressors, which are commonly used to manage hypotension during surgery. These findings are consistent with studies by Lancellotti et al., who demonstrated that preoperative oral beta-blockers reduce the need for intraoperative vasopressors by ensuring more stable blood pressure levels throughout surgery [12]. Patient satisfaction was consistently higher in Group A, with overall satisfaction scores of 9.2 ± 0.8 compared to 8.3 ± 1.2 in Group B ($p < 0.01$). Group A also reported better postoperative comfort, pain control, and perceived intraoperative stability, with respective means of 8.9 ± 1.0, 8.7 ± 0.9, and 9.3 ± 0.7, compared to 7.8 ± 1.3, 7.9 ± 1.1, and 8.1 ± 1.2 in Group B. Moreover, Group A had a greater reduction in postoperative dizziness (85% vs. 65%) and fatigue (80% vs. 58%). These results indicate that preoperative oral beta-blocker administration not only improves clinical outcomes but also enhances the overall patient experience. The positive impact of oral beta-blockers on patient satisfaction may be attributed to the smoother and more predictable hemodynamic course during surgery, which reduces the incidence of complications such as hypotension, arrhythmias, and ischemia. This may lead to a more comfortable and stable recovery, as reported by a prior study, which found that beta-blocker therapy improves patient-reported outcomes by reducing perioperative stress and promoting faster recovery [13].

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This study concludes that preoperative oral beta-blocker administration offers superior hemodynamic stability, reduced blood loss, fewer postoperative complications, and improved patient satisfaction compared to intraoperative IV beta-blocker administration. These findings are consistent with the existing literature and suggest that oral beta-blockers should be considered the preferred method for managing hemodynamic stability during hypotensive anesthesia.

RECOMMENDATION

Based on the findings of this study, we recommend that preoperative oral beta-blocker therapy should be considered as the preferred approach for managing hemodynamic stability during hypotensive anesthesia. Oral beta-blockers provide superior control over mean arterial pressure and heart rate, reduce blood loss, minimize postoperative complications, and improve patient satisfaction compared to intraoperative intravenous administration. Given the enhanced patient outcomes and reduced reliance on vasopressors, incorporating preoperative oral beta-blocker therapy into clinical practice could optimize perioperative care and improve overall surgical outcomes. Further research with larger sample sizes and long-term follow-up is warranted to confirm these results.

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