

## Comparison of Regional versus General Anesthesia on Perioperative Hemodynamic Stability in Elderly Patients

Stuti Kumari<sup>1</sup>, Mukesh Kumar<sup>2</sup>, Bijoy Kumar<sup>3</sup>

<sup>1</sup>Senior Resident, Department of Anesthesia, Nalanda Medical College & Hospital, Patna, Bihar, India

<sup>2</sup>Senior resident, Department of Anesthesia, Nalanda Medical College & Hospital, Patna, Bihar, India

<sup>3</sup>Professor, Department of Anesthesia, Nalanda Medical College & Hospital, Patna, Bihar, India

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Corresponding Author: Stuti Kumari

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### Abstract:

**Background:** Due to numerous comorbidities and decreased physiological reserve, elderly individuals having surgery are especially susceptible to perioperative hemodynamic instability. The decision between general and regional anesthetic may have an impact on cardiovascular stability.

**Objective:** To evaluate older patients undergoing regional anesthesia against general anesthesia in terms of perioperative hemodynamic stability.

**Methods:** 120 senior patients (>60 years old) who had elective procedures over a one-year period were included in this retrospective analysis. The patients were split into two groups: 60 in the regional anesthesia group and 60 in the general anesthesia group. Heart rate, mean arterial pressure (MAP), diastolic blood pressure (DBP), and systolic blood pressure (SBP) were among the hemodynamic parameters that were examined. Tachycardia and hypotension episodes were noted. The independent t-test and the chi-square test were used for statistical analysis. A significance level of  $p < 0.05$  was identified.

**Results:** Compared to 63.3% of patients under general anesthesia, 86.7% of patients under regional anesthetic showed hemodynamic stability ( $p = 0.006$ ). Compared to regional anesthesia (13.3%), hypotension was more common in the general anesthesia group (30%) ( $p = 0.028$ ).

**Conclusion:** In older patients, regional anesthesia offers superior perioperative hemodynamic stability than general anesthesia.

**Keywords:** General anesthesia, regional anesthesia, hemodynamic stability, Heart rate, mean arterial pressure (MAP).

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### Introduction

The worldwide rise in life expectancy has resulted in an increasing population of elderly individuals seeking surgical interventions. The aging process is linked to several physiological alterations, especially within the cardiovascular system, rendering older adults more vulnerable to perioperative hemodynamic instability. The alterations encompass poorer cardiac reserve, decreased arterial compliance, impaired autonomic regulation, and reduced baroreceptor sensitivity, all of which restrict the capacity of aged individuals to adapt to abrupt variations in blood pressure and heart rate [1].

The selection of anesthetic strategy is crucial for preserving cardiovascular stability during surgery in this at-risk population. General anesthesia is frequently linked to myocardial depression and peripheral vasodilation, potentially resulting in hypotension and compensatory tachycardia. The effects may be amplified in elderly people because

to their diminished physiological reserve and heightened sensitivity to anesthetic drugs. Moreover, the application of positive pressure ventilation during general anesthesia may further impair venous return and cardiac output.

Conversely, localized anesthetic methods, like spinal or epidural anesthesia, induce a regulated sympathetic blockade. When meticulously administered, regional anesthetic can yield sufficient analgesia while maintaining reasonably steady hemodynamic responses. While sympathetic inhibition may induce hypotension, it may frequently be anticipated and efficiently controlled with suitable hydration therapy and vasopressors. Furthermore, localized anesthetic circumvents airway manipulation and diminishes the surgical stress response, potentially enhancing hemodynamic stability [3].

Ensuring stable perioperative hemodynamics is essential in elderly patients to avert severe

consequences, including myocardial ischemia, cerebrovascular incidents, and acute renal injury. Even short instances of hypotension or considerable blood pressure fluctuations can result in negative consequences for this demographic. This retrospective study was conducted to assess and compare the perioperative hemodynamic stability of elderly patients receiving surgery with general versus regional anesthetic over one year. The results seek to enhance anesthetic management and elevate perioperative outcomes in the older demographic [4].

## Methods

**Study Design:** Retrospective observational study.

**Study Duration:** 1 year from January 2024 to December 2024.

## Sample Size

120 patients

- Regional anesthesia: 60
- General anesthesia: 60

**Study Population:** Patients aged  $\geq 60$  years undergoing elective surgery.

## Inclusion Criteria

- Age  $\geq 60$  years
- Elective surgery
- ASA Grade I–III

## Exclusion Criteria

- Emergency surgery
- Severe cardiac disease
- Uncontrolled hypertension
- Arrhythmias
- Shock

## Data Collected

From anesthesia records:

- Heart Rate
- Systolic Blood Pressure
- Diastolic Blood Pressure
- Mean Arterial Pressure
- Episodes of hypotension
- Episodes of tachycardia

**Statistical Analysis:** For continuous variables, the data were presented as mean  $\pm$  standard deviation (SD). A p value  $< 0.05$  was deemed statistically significant, and the independent t-test and chi-square test were employed for statistical comparison.

## Results

**Table 1: Demographic Characteristics**

Variable	Regional (n=60)	General (n=60)	p-value
Mean Age (years)	68.2 $\pm$ 6.4	69.1 $\pm$ 7.1	0.48
Male	34 (56.7%)	36 (60%)	0.71
Female	26 (43.3%)	24 (40%)	0.71
ASA II/III	42 (70%)	45 (75%)	0.53

**Table 2: Hemodynamic Parameters**

Parameter	Regional	General	p-value
Mean SBP (mmHg)	128 $\pm$ 12	118 $\pm$ 15	0.002
Mean DBP (mmHg)	78 $\pm$ 8	72 $\pm$ 9	0.001
Mean MAP (mmHg)	94 $\pm$ 7	87 $\pm$ 8	0.001
Mean HR (bpm)	76 $\pm$ 8	84 $\pm$ 10	0.003

**Table 3: Hemodynamic Events**

Event	Regional (n=60)	General (n=60)	p-value
Stable Hemodynamics	52 (86.7%)	38 (63.3%)	<b>0.006</b>
Hypotension	8 (13.3%)	18 (30%)	<b>0.028</b>
Tachycardia	6 (10%)	16 (26.7%)	<b>0.018</b>

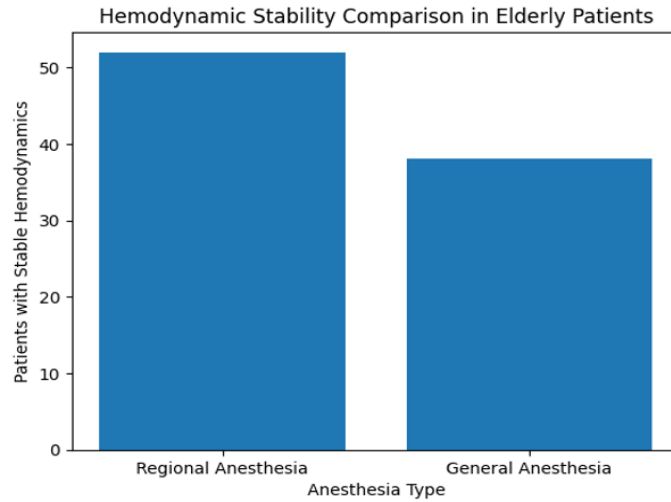


Figure 1: Hemodynamically stability comparison in elderly patients

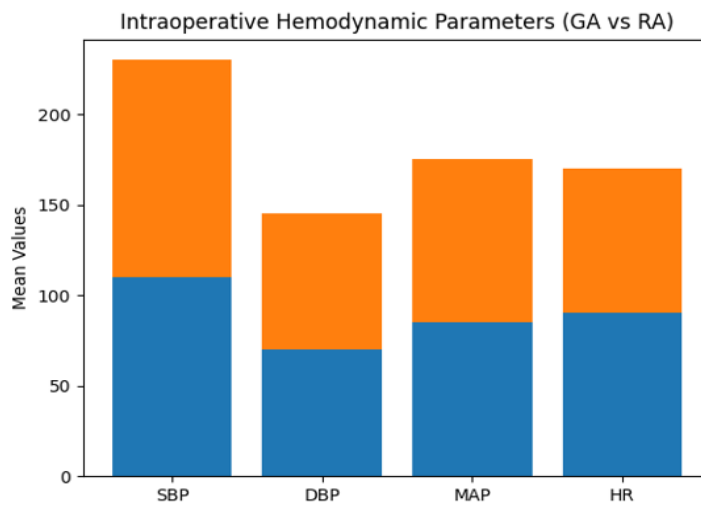


Figure 2: Intraoperative Hemodynamic parameters

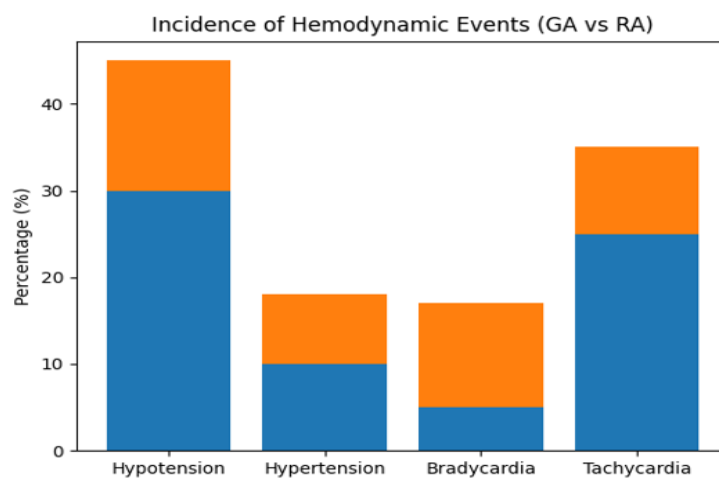
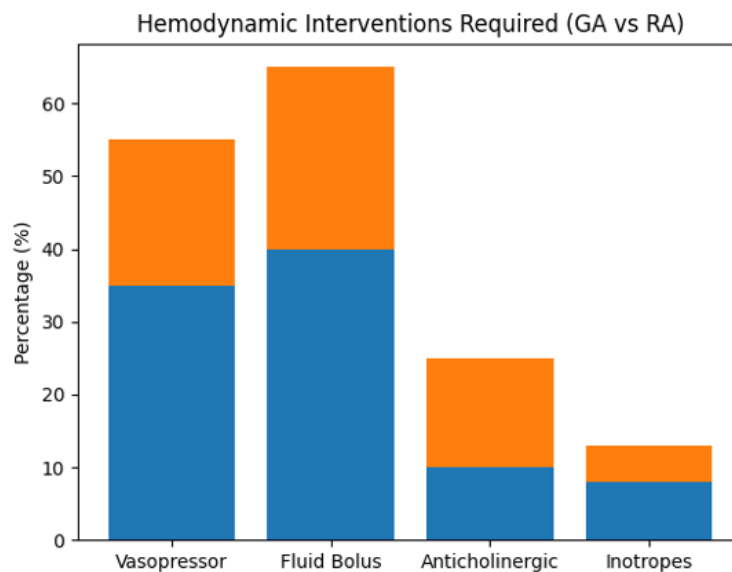


Figure 3: Incidence of Hemodynamic events



**Figure 4: Hemodynamic interventions required**

### Discussion

The present retrospective study compared the effects of general anesthesia (GA) and regional anesthesia (RA) on perioperative hemodynamic stability in elderly patients. The findings demonstrate significant differences between the two techniques, with regional anesthesia showing superior hemodynamic stability, fewer complications, and reduced need for interventions.

In terms of intraoperative hemodynamic parameters, patients in the RA group maintained higher mean systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) compared to those in the GA group, indicating better preservation of baseline cardiovascular function. Additionally, heart rate remained lower and more stable in the RA group, whereas patients under GA exhibited relatively higher heart rates, suggesting increased sympathetic fluctuations. These findings support the understanding that regional anesthesia avoids the myocardial depressant and vasodilatory effects associated with general anesthetic agents.

The incidence of hemodynamic events further highlights these differences. The GA group demonstrated a higher occurrence of hypotension and tachycardia, which may be attributed to anesthetic-induced vasodilation and myocardial depression [5]. In contrast, the RA group showed comparatively lower rates of these complications, although a slightly higher incidence of bradycardia was observed, likely due to sympathetic blockade. Despite this, the overall hemodynamic profile of RA remained more stable and predictable.

Importantly, 86.7% of patients in the RA group maintained stable hemodynamics, compared to only

63.3% in the GA group, reinforcing the superiority of regional techniques. Furthermore, the requirement for interventions such as vasopressors, fluid boluses, and inotropic support was greater in the GA group, indicating a higher degree of hemodynamic instability and need for active management.

These findings are consistent with previous studies reporting that regional anesthesia provides better cardiovascular control and is associated with improved perioperative stability in elderly patients [6,7]. The avoidance of airway manipulation and reduction in systemic drug effects further contribute to improved outcomes.

Overall, the results suggest that regional anesthesia is a safer and more effective option for maintaining hemodynamic stability in elderly patients undergoing surgery. However, careful monitoring and patient selection remain essential, particularly to manage potential bradycardia associated with regional techniques.

### Limitations:

- Retrospective design
- Single-center study
- Different types of surgery included

Despite these limitations, the study provides clinically relevant evidence supporting the use of regional anesthesia in elderly patients.

### Conclusion

In older patients, regional anesthesia offers noticeably greater perioperative hemodynamic stability than general anesthesia. Better blood pressure and heart rate control and fewer episodes of

tachycardia and hypotension were linked to regional anesthetic.

For older patients, regional anesthesia should be the preferred anesthetic method whenever possible in order to enhance perioperative cardiovascular stability.

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