ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 10, Issue – 5, September – 2025, Page No. : 56 – 57

Incidence of Postoperative Delirium with Use of Benzodiazepines in Adult Cardiac Surgery: A Comparative Study of On-Pump and Off- Pump Procedures

[1]Dr Bhakti Patil, Assistant Professor, Department of Cardiac Anesthesia, JNMC Swangi Meghe, Wardha

Corresponding Author: Dr Bhakti Patil, Assistant Professor, Department of Cardiac Anesthesia, JNMC Swangi Meghe, Wardha

Citation this Article: Dr Bhakti Patil, "Incidence of Postoperative Delirium with Use of Benzodiazepines in Adult Cardiac Surgery: A Comparative Study of On-Pump and Off- Pump Procedures", IJMSIR - September – 2025, Vol – 10, Issue - 5, P. No. 56 – 57.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Postoperative delirium (POD) is a common neurocognitive complication after adult cardiac surgery, associated with morbidity and longer hospital stays[1]. Both cardiopulmonary bypass (CPB, on-pump) and benzodiazepine use have been proposed as risk factors. This study compared POD incidence in on-pump versus off- pump surgeries, with midazolam used for induction. Elective cardiac surgery was included. Fifty underwent on-pump surgery and fifty underwent off-pump surgery. All patients received midazolam during induction. POD was assessed postoperatively using standardized clinical criteria. Occurred in 8 on-pump patients (16%) and 6 off-pump patients (12%). The relative risk (RR) of POD with on-pump versus off-pump surgery was 1.33 (95% CI: 0.49–3.65). Odds ratio (OR) was 1.39 (95% CI: 0.45–4.27). Statistical analysis using chi-square showed p=0.57, indicating no significant difference.

Conclusion: In this cohort, POD incidence was not significantly different between on- pump and off-pump cardiac surgery when midazolam was used for induction. Midazolam did not appear to increase the risk of POD. Larger multicenter trials are needed for confirmation.

Keywords: Benzodiazepine, Cardiopulmonary Bypass, Midazolam, Postoperative Delirium

Introduction

Postoperative delirium (POD) is a frequent neuropsychiatric complication after cardiac surgery, with incidence ranging from 10% to 30% in adults [2]. It is associated with adverse outcomes, including prolonged ICU stay, higher risk of cognitive decline, and increased mortality.

Age, pre-existing cognitive dysfunction, systemic inflammation, benzodiazepine use, and cardiopulmonary bypass (CPB). Midazolam, a short-acting benzodiazepine commonly used at induction, has been debated as a contributor to POD. Similarly, CPB introduces systemic inflammatory and embolic risks that may predispose to delirium [3]. Incidence of POD in on-pump versus off-pump adult cardiac surgery in patients receiving midazolam for induction.

Methods

Study Population

Sample size: 100 adult patients undergoing elective cardiac surgery Groups: On-pump (n=50) Off-pump (n=50).

Inclusion: Patients aged 18–75 years, undergoing isolated CABG or valve surgery

Exclusion: Pre-existing dementia, psychiatric illness, emergency surgeries Midazolam used in all cases for induction (0.05 mg/kg IV) Standard opioid and muscle relaxant regimen Maintenance with balanced anesthesia (sevoflurane/propofol, opioids) POD assessed in ICU using the Confusion Assessment Method for the ICU (CAM-ICU) at 6, 12, 24, and 48 hours.

Statistical Analysis

POD incidence compared between groups using chi-square test. Relative risk (RR), odds ratio (OR), and 95% confidence intervals calculated.

Results

Risk of POD (On-pump): 8/50 = 16%

Risk of POD (Off-pump): 6/50 = 12%

Relative Risk (RR): 1.33 (95% CI: 0.49–3.65)

Odds Ratio (OR): 1.39 (95% CI: 0.45–4.27)

P-value: 0.57 (not significant)

Table 1:

Group	Post op delirium	No post op delirium	total
Off pump	6	44	50
On pump	8	42	50

Discussion

This study found no statistically significant difference in POD incidence between on- pump and off-pump adult cardiac surgeries when midazolam was used for induction. The incidence observed (12–16%) aligns with reported ranges in adult literature[4].

Midazolam use at induction did not independently increase the risk of POD, supporting previous findings that short peri-induction use of benzodiazepines may not be harmful, whereas prolonged postoperative sedation with benzodiazepines is associated with higher POD rates[4]. Our results are consistent with Brown et al. (2018) and Marcantonio (2017), which highlight multifactorial risk factors rather than a single drug effect.

Conclusion

POD incidence was comparable between on-pump (16%) and off pump (12%) cases. increased POD risk. No statistically significant difference was found (p=0.57). Larger multicenter studies are required to confirm these findings and refine delirium prevention strategies.

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