

COMPARISON OF EFFICACY BETWEEN DEXMEDETOMIDINE AND PROPOFOL AFTER CORONARY ARTERY BYPASS GRAFT SURGERY

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(Received, 17th January 2024, Revised 10th May 2024, Published 22nd May 2024)

Abstract: Postoperative management following coronary artery bypass graft (CABG) surgery is crucial for patient outcomes. Sedation plays a key role in recovery, with dexmedetomidine and propofol being commonly used agents. Evaluating the efficacy of these sedatives can help optimise postoperative care. **Objective:** To compare the effectiveness of dexmedetomidine and propofol in terms of pulmonary complications, mean mechanical ventilation time, and postoperative ICU and hospital stay in patients undergoing CABG surgery. **Methods:** A randomised controlled trial was conducted from October 1, 2023, to December 31, 2023, at a tertiary care hospital. Eighty patients scheduled for CABG surgery were randomised into two groups: Group A received dexmedetomidine, and Group B received propofol. Outcomes were assessed by measuring the incidence of pulmonary complications, mean mechanical ventilation time, length of postoperative ICU stay, and total hospital stay. Statistical analysis was performed using appropriate tests to compare the outcomes between the two groups, with significance set at $P < 0.05$. **Results:** Pulmonary complications occurred in 5% of patients in Group A, significantly lower than the 20% observed in Group B ($P = 0.04$). Group A's mean mechanical ventilation time was 17.03 ± 3.46 hours, considerably shorter than Group B's 23.20 ± 5.55 hours ($P = 0.0001$). Group A's average postoperative ICU stay was 62.53 ± 15.10 hours, notably less than the 71.10 ± 14.06 hours for Group B ($P = 0.01$). Additionally, the mean hospital stay in Group A was 20.60 ± 1.99 days, significantly shorter than the 21.85 ± 3.11 days in Group B ($P = 0.03$). **Conclusion:** Dexmedetomidine demonstrates superior efficacy to propofol for patients undergoing CABG surgery, as evidenced by reduced pulmonary complications, shorter mechanical ventilation duration, and decreased postoperative ICU and hospital stays.

Keywords: Coronary Artery Bypass, Dexmedetomidine, Hospital Stay, Intensive Care Units, Mechanical Ventilation, Postoperative Complications, Propofol, Randomized Controlled Trial, Sedation, Treatment Outcome

Introduction

An ideal intraoperative anaesthetic agent during cardiac surgery should facilitate patient recovery and mitigate adverse outcomes such as pulmonary problems and prolonged mechanical lung ventilation, including extended stays in the intensive care unit (ICU) (1, 2). Extended utilisation of mechanical ventilation and prolonged stay in the ICU is linked to elevated risks of both morbidity and mortality after heart surgery (3, 4). Utilising anaesthetic procedures and agents during surgery to expedite the process of weaning from artificial lung ventilation and facilitate the patient's recovery is crucial for implementing fast-track cardiac anaesthesia. This practice is becoming more widely accepted (5). Dexmedetomidine (DEX) is currently highly regarded as a sedative due to numerous recent articles highlighting its practical application in cardiac surgery, demonstrating its capacity to maintain hemodynamic stability during the perioperative period. Dexmedetomidine is a potent and specific α_2 -adrenoceptor agonist with a brief action duration. It possesses sedative, analgesic, anxiolytic, opioid-sparing, and anesthetic-sparing qualities (6). Dexmedetomidine has a limited effect on respiratory depression, enhances oxygenation and lung compliance,

and decreases postoperative pulmonary problems (7, 8). DEX also mitigates perioperative stress and inflammatory and immunological response, resulting in a remarkable postoperative recovery (9). Administration of DEX during surgery and as a sedative after surgery has been found to decrease the duration of mechanical ventilation, improve survival rates after 30 days, shorten the length of stay in the intensive care unit and hospital, and reduce the incidence of postoperative complications such as pulmonary complications, delirium, and acute kidney injury (10, 11). Multiple studies have shown that the administration of DEX can effectively maintain stable blood flow during cardiac surgery. (12-14)

To make an informed decision regarding dexmedetomidine and propofol during postoperative sedation within the ICU after CABG surgery, it is essential to have a thorough knowledge of their pharmacological characteristics, possible advantages, and related risks. This comparison offers guidance on enhancing postoperative care by determining the most appropriate sedative medication for patients following CABG surgery, considering their requirements. As critical care progresses, conducting a detailed examination of these sedatives can help enhance

clinical practices and patient outcomes throughout the difficult post-CABG period.

Methodology

This study was conducted in the cardiothoracic anaesthesia department of Rehman Medical Institute, Peshawar, from 01-10-2023 to 31-12-2023. Before starting the study, the hospital's ethics board approval was taken. Participants provided written informed consent after having in-depth conversations regarding the survey. A non-probability consecutive sampling strategy was utilised to choose individuals with ASA statuses III and IV who were scheduled for CABG heart surgery and were between the ages of 40 and 60 years. Both genders were included in this sample. Patients with severe systemic problems, such as respiratory diseases, abnormal liver function, psychological disorders, left ventricular ejection fraction less than 30%, blood pressure systolic less than 90 mmHg, and heart rates less than 70 beats per minute, were excluded.

Eighty patients were included in the randomised experiment, split into two groups by lottery, with forty patients each. The induction protocol for Group A comprised a 10-minute infusion of dexmedetomidine at a rate of 0.2–0.6 micrograms/kg/hour after a 10-minute bolus of dexmedetomidine (1 microgram/kg) diluted in 100 ml normal saline. Patients in Group B received fentanyl (4-5 micrograms/kg) and propofol (1-2.5 mg/kg) during induction, and isoflurane was utilised to maintain anaesthesia. After the injection of muscle relaxant cisatracurium (0.15–0.2 mg/kg, patients were manually ventilated for 3 minutes, and tracheal intubation was performed. Isoflurane was administered to both groups in a manner consistent with up to one Minimum Alveolar Concentration (MAC). The patients were kept on standard

mechanical Ventilation with intermittent positive pressure ventilation, using a tidal volume of 6–8 ml/kg.

Both groups were evaluated for postoperative pulmonary problems, which include the duration of mechanical ventilation, postoperative ICU stay, and hospital stay.

Data was analysed using SPSS version 23. Independent samples of the T-test and Chi Square tests were applied to compare the outcomes in both groups. P value was kept at < 0.05 as significant.

Results

The mean age in group A was 49.87±6.27 years, while 51.53±5.76 years in group B. Gender-wise distribution revealed that the frequency of male patients in group A was 25 (62.5%) while females were 15 (37.5%). In group B, male patients were 27 (67.5%), and females were 13 (32.5%). Diabetic patients in group A were 10 (25%), while 12 (30%) were in group B. In group A, 14

(35%) patients were hypertensive, while 11 (27.5%) were hypertensive in group B. The demographics between both groups did not reveal any notable difference.

We assessed the efficacy regarding pulmonary complications, mean mechanical ventilation time, postoperative ICU, and hospital stay. In group A patients, only 2 (5%) patients developed pulmonary complications, while 8 (20%) patients in group B developed pulmonary complications (P = 0.04). The mean duration of mechanical ventilation in group A was 17.03±3.46 hours, while 23.20±5.55 hours in group B (P = 0.0001). The mean ICU stay postoperative in group A was 62.53±15.10 hours, while 71.10±14.06 hours in group B (P = 0.01). The mean duration of hospital stay in group A was 20.60±1.99 days, while 21.85±3.11 days in group B (P = 0.03).

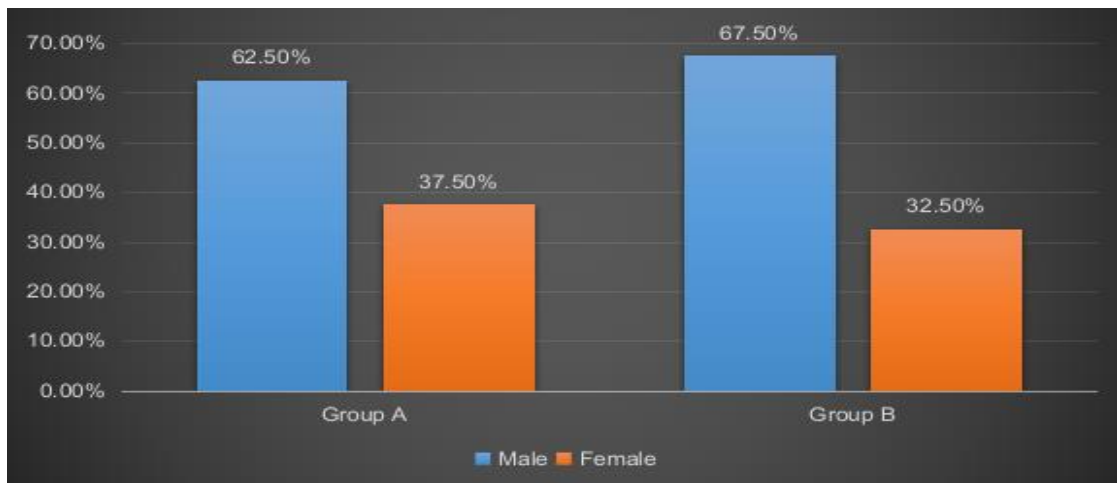


Figure 1 Gender distribution

Table 1 Comparison of pulmonary complications between both groups

Groups	Pulmonary complications		Total	P-value
	Yes	No		
Group A (Dexmedetomidine)	2	38	40	0.04
	5.0%	95.0%	100.0%	
Group B (Propofol)	8	32	40	
	20.0%	80.0%	100.0%	
Total	10	70	80	
	12.5%	87.5%	100.0%	

[Citation: Bangash, R., Ahmad, I., Naz, U., Islam, M.U., Zeb, A., Shah, N.A., Shabir, A., Sajjad, M.W., (2024). Comparison of efficacy between dexmedetomidine and propofol after coronary artery bypass graft surgery *Biol. Clin. Sci. Res. J.*, 2024: 849. doi: <https://doi.org/10.54112/bcsrj.v2024i1.849>]

Table 2 Comparison of postoperative factors between both groups

Postoperative factors	Groups	N	Mean	Std. aviation	P-value
Duration of mechanical ventilation (Hours)	Group A (Dexmedetomidine)	40	17.03	3.468	0.0001
	Group B (Propofol)	40	23.20	5.553	
ICU stay postoperative (Hours)	Group A (Dexmedetomidine)	40	62.53	15.108	0.01
	Group B (Propofol)	40	71.10	14.069	
Hospital stay (Days)	Group A (Dexmedetomidine)	40	20.60	1.997	0.03
	Group B (Propofol)	40	21.85	3.118	

Discussion

CABG surgery is an intricate technique that often necessitates efficient perioperative treatment to guarantee the best possible results. The selection of anaesthetic drugs is essential in determining patient recuperation and postoperative problems. Dexmedetomidine and propofol have been popular options for anaesthesia in CABG surgery in recent years. (15)

Dexmedetomidine, a particular α 2-adrenergic agonist, possesses distinctive pharmacological characteristics that render it a compelling option for CABG operation. This substance's sedative, analgesic, and anxiolytic properties have been extensively studied, resulting in a well-balanced anaesthetic profile. The perioperative situation benefits greatly from Dexmedetomidine's capacity to regulate sympathetic output without inducing respiratory depression. Propofol, a commonly employed intravenous anaesthetic, is renowned for its swift initiation and cessation of effects. Nevertheless, the disadvantages of this approach, including the possibility of low blood pressure, decreased breathing, and reduced heart function, give rise to concerns when considering CABG operation. The necessity for meticulous titration and surveillance may restrict its effectiveness, particularly in high-risk patients.(16)

An essential factor to consider during CABG surgery is preserving hemodynamic stability. The sympatholytic properties of dexmedetomidine lead to regulated and stable hemodynamics, hence decreasing the occurrence of perioperative hypertension and tachycardia. On the other hand, propofol can cause low blood pressure, which may negatively affect the blood flow to the heart muscle during the crucial stages of CABG operation. The distinctive capacity of dexmedetomidine to diminish the stress response and decrease the release of catecholamines may provide myocardial protection during CABG surgery. This can improve heart function maintenance and reduce heart damage during surgery. Although propofol is efficient in inducing anaesthesia, it does not possess the unique cardioprotective mechanisms of dexmedetomidine.(17)

CABG surgery has the potential for postoperative delirium and cognitive impairment. Dexmedetomidine's neuroprotective qualities, along with its capacity to induce a sleep-like state, may potentially lead to a lower occurrence of postoperative delirium compared to propofol. Patients who receive dexmedetomidine may undergo a more gradual recovery from anaesthesia, leading to enhanced cognitive results.(18)

We conducted our study on 80 patients randomised in two equal groups. Group A received DEX, while Group B received propofol. The demographics between both groups

did not show notable differences in age, gender, diabetes, and hypertensive status.

We observed notable differences between both groups in terms of pulmonary complications. The DEX group showed a lower number of pulmonary complications compared to propofol; a study that reported lower complications in the DEX group compared to the propofol group attested to our findings.(11)

The mean mechanical ventilation time, postop ICU stay, and hospital stay were notably lower in the DEX group than in the propofol group. These findings align with a study that reported lower mechanical ventilation time, postop ICU stay, and hospital stay, which was notably lower in the DEX group than in the propofol group.(19)

Conclusion

Our study concludes that dexmedetomidine showed better efficacy in lower pulmonary complications, mechanical ventilation duration, postoperative ICU, and hospital stay than propofol after coronary artery bypass graft surgery.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department concerned. (IRBCE/RMCP-141 dated 10-10-21)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

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Revisiting Critically

MUJAHID UL ISLAM (Professor & Consultant) & AURANG ZEB (Professor & HOD)

[Citation: Bangash, R., Ahmad, I., Naz, U., Islam, M.U., Zeb, A., Shah, N.A., Shabir, A., Sajjad, M.W., (2024). Comparison of efficacy between dexmedetomidine and propofol after coronary artery bypass graft surgery *Biol. Clin. Sci. Res. J.*, 2024: 849. doi: <https://doi.org/10.54112/bcsrj.v2024i1.849>]

Data Analysis

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Concept & Design of Study

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