

## Original Article



# Study on Using Multimodal Analgesia in Postoperative Cardiac ICU

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### Abstract

**Background:** The cardiac operative procedure has a significant relationship with acute onset of pain. After cardiac surgery, pain has been managed with the help of opiate analgesics. **Objective:** To analyze the adverse effects of postoperative multimodal analgesia after cardiac surgery concerning the physical and specific biochemical parameters of undergoing surgery patients. **Materials & Methods:** It was a single-center, prospective study where patients were approached on the day before their cardiac surgery. A total of 120 post-cardiac operative surgery patients at Khwaja Yunus Ali Medical College Hospital, Sirajganj were included for this study purpose. **Results:** In first group, three types of analgesia were used in 60 patients and in second group, five types of analgesia were used in another 60 patients. About 76.7% were male and mean age was 45.73 ( $\pm$  11.3) years. Fentanyl was used for all patients followed by paracetamol (96.7%), diclofenac (83.3%), tramadol (16.7%), and pethidine (3.3%). Drug-induced nausea and vomiting were found in 76.7% and 66.7% patients respectively followed by drowsiness (36.7%) and vertigo (20.0%). **Conclusion:** In patients undergoing cardiac surgery, a multimodal regimen offered better analgesia. Furthermore, nausea and vomiting complaints were reduced significantly in the multimodal group.

**Key words:** Multimodal analgesia, Post-operative, Cardiac ICU

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### Introduction

The cardiac operative procedure has a significant relationship with acute onset of pain and a great proportion of these patients would develop chronic type of pain.<sup>1-3</sup> This pain is due to several factors like bone retraction, arterial harvesting, venous harvesting, pleural manipulation, insertion of the intra-thoracic tube, and other trauma/injury during the surgical procedure. After cardiac surgery pain has been maintained with the help of opiate analgesics because of their safe hemodynamic status and better role in sedation.<sup>3-8</sup> But, excessive use of high-dose analgesics causes different types of adverse effects like constipation, nausea, vomiting, mental instability even respiratory difficulties which prolong after surgery recovery and duration of staying in hospital.<sup>2-8</sup> Instead of this, the multimodal approach of analgesia improved patients' post-operative recovery and also decline the cost of this expensive operative mechanism.<sup>9</sup> There is a lot of

study present regarding user safety and drug efficacy of specific postoperative analgesia.<sup>1-11</sup> But there is a limitation of clinical data regarding user safety and drug efficacy of multimodal approach of postoperative analgesia in cardiac surgery.

The purpose of this study was to analyze the adverse effects of postoperative multimodal analgesia after cardiac surgery concerning the physical and specific biochemical parameters of undergoing surgery patients.

### Materials and Methods

It was a single-center, prospective study where patients were approached on the day before their cardiac surgery. A total of 120 patients (60 patients in two groups) undergoing a cardiac procedure at Khwaja Yunus Ali Medical College Hospital, Sirajganj, and all of them were enrolled for this study when they

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were under observation in the cardiac ICU. More than 18 years old patients undergoing any cardiac procedure and able to give informed written consent under accordance with the Helsinki 2 declaration were included for this study purpose. Patients with peripheral neuropathy, different types of neurological disease, psychiatric disorder, hypersensitive to study medication, narcotic and alcohol abuse, and pregnant women were not enrolled for this study. ICU stay for more than 5 days was also not enrolled because long ICU stay would hamper multimodal analgesic protocol. But in case of single-drug regimen, these exclusion criteria didn't include. A common anesthetic protocol was used. Arterial pressure (radial artery), heart rate, respiratory rate, arterial oxygen saturation status was monitored in the case of all patient. All of the patients were subsequently transferred anesthetized to the intensive care unit (ICU) for further stabilization and recovery. Serum creatinine levels, SGPT level, and serum bilirubin levels during hospitalization were recorded. All

statistical analyses were performed using SPSS statistical software v.26.0.

### Results

A total of 120 post-cardiac operative surgery patients (60 patients in two groups) were included for this study purpose. In the first group, in between 60 patients only three types of analgesia were used namely fentanyl, pethidine and morphine. In second group in between another 60 patients' multimodal analgesia (five types of analgesia) were used. Among 120 patients 76.7% (92) were male. The minimum age of the patient was 19 years and the maximum age was 66 years. Mean± Standard Deviation (SD) was 45.73 ± 11.255 years. Five drugs were used as analgesia in 60 patients (multimodal group). Fentanyl was used in case of all patient followed by paracetamol (58, 96.7%), diclofenac (50, 83.3%), tramadol (10, 16.7%), and pethidine (2, 3.3%).

**Table I:** Socio-demographic data including used analgesics and their adverse effects with biochemical parameters of patients (n=120)

Mode of Analgesia		Traits	Frequency (n)	Percentage (%)
<b>Gender</b>		Male	92	76.7
		Female	28	23.3
<b>Age</b>		Minimum: 19 years	Mean ± Standard Deviation	
		Maximum: 66 years	(SD) 45.73 ± 11.255 years	
<b>ICU stay</b>	Multimodal (n=60)	Minimum: 3 days	Mean ± Standard Deviation (SD) 4.03 ± 0.0809 days	
	Not Multimodal (n=60)	Maximum: 5 days		
		Minimum: 4 days		
	Maximum: 7 days			
<b>Pain Score</b>	Multimodal (n=60)	Minimum: 0	Mean ± Standard Deviation (SD) 1.80 ± 1.031	
	Not Multimodal (n=60)	Maximum: 3		
		Minimum: 1		
		Maximum: 2		
<b>Used Analgesic Drugs</b>	Multimodal (n=60)	Fentanyl (Yes)	60	100
		Pethidine (Yes)	2	3.3
		Tramadol (Yes)	10	16.7
		Diclofenac (Yes)	50	83.3
		Paracetamol (Yes)	58	96.7
	Not Multimodal (n=60)	Fentanyl (Yes)	60	100
		Pethidine (Yes)	48	80
		Morphine (Yes)	12	20.1
		Nausea (Yes)	26	43.3
		Vomiting (Yes)	12	20
		Drowsiness (Yes)	22	36.7
		Vertigo (Yes)	12	20
		Constipation (Yes)	8	13.3
		Pruritus (Yes)	2	3.3
<b>Adverse Effects</b>	Multimodal (n=60)	Urinary retention (Yes)	2	3.3
		AKI (Yes)	8	13.3
		Nausea (Yes)	46	76.7
		Vomiting (Yes)	40	66.7
		Drowsiness (Yes)	60	100
		Vertigo (Yes)	26	43.3
<b>Biochemical Parameters</b>	Not Multimodal (n=60)	Constipation (Yes)	24	40
		Serum Creatinine [median (min - max)]	81.47 µmol/l (42.96 - 155.00)	
		SGPT [median (min -max)]	31 U/L (10 -191)	
		Serum Bilirubin [median (min -max)]	16.03µmol/l (6.10 -35.20)	

\* First Group= Not Multimodal (Fentanyl, Pethidine and Morphine)  
 Second Group = Multimodal (Fentanyl, Paracetamol, Diclofenac, Tramadol and Pethidine)

In the first group, Fentanyl was used in the case of all patients followed by pethidine (48, 80%) and morphine (12, 20.1%).

The comprehensive information was collected from adverse-effect questionnaires. We observed in the second group drug-induced nausea and vomiting in 43.3% (26/60) and 20.0% (12/60) patients respectively. Drowsiness and vertigo related to medication were also observed in 36.7% (22/60) and 20.0% (12/60) patients respectively. Constipation and urinary retention were common in only 13.3% (8/60) and 3.3% (2/60) patients respectively. Acute kidney injury (AKI) and pruritus were found in 13.3% (8/60) and 3.3% (2/60) cases. (Table I)

**Table II:** Final preoperative diagnosis of the patient (n=120)

Preoperative Diagnosis	Frequency (n)	Percentage (%)
IHD with DVD with DM with HTN	28	23.3
AS (Severe & Calcific)	16	13.3
IHD (TVD)	16	13.3
ASD (2 Degree) with PH	8	6.7
MS (Severe) with PH with LA Thrombus	8	6.7
AS (Severe & Calcific) with MR (Grade II) with DM with HTN	4	3.3
AS (Severe) with Bicuspid Aortic Valve with Subclinical	4	3.3
ASD (2 Degree) with PH (Moderate)	4	3.3
IHD (DVD) with AS (Moderate t Severe)	4	3.3

In case of first group, drug-induced nausea and vomiting were found in 76.7% (46/60) and 66.7% (40/60) patients respectively. Drowsiness and vertigo related to medication were also observed in 100% (60/60) and 43.3% (26/60) patients respectively. Constipation was common in 40.0% (24/60) patients.

Serum creatinine levels, SGPT levels, and serum bilirubin levels were recorded in the case of the second group. Maximum postoperative creatinine levels data were presented as median (min-max) were 81.47  $\mu\text{mol/l}$  (42.96-155.00) followed by SGPT level 31 U/L (10-191) and serum bilirubin level 16.03  $\mu\text{mol/l}$  (6.10-35.20). All this information is shown in table I and the final preoperative diagnosis of the patient is shown in table II.

## Discussion

The present study is reflecting the effects of postoperative multimodal analgesia after cardiac surgery concerning the

physical and specific biochemical parameters of undergoing surgery patients. Results of this study show that patients had significantly lower 'average pain' scores during the postoperative period in ICU in the case of multimodal analgesia which is slightly higher in single-drug regimen. These findings are similar to findings in other surgical populations, which have shown better pain relief with a multimodal approach.<sup>4-12</sup> Not only as a pain reliever but also important as the consideration of adverse effects.<sup>9-13</sup> About half of the patients had extensive nausea and vomiting in the single-drug group. It has been considered an important finding of this study. Using NSAIDs instead of opiates after cardiac surgery has been demonstrated to significantly decline the incidence of nausea and vomiting.<sup>10-14</sup>

In this study, renal complications were not higher due to the use of multimodal drugs. But there was a trend towards a patient that the use of multimodal drugs causes increased serum creatinine levels postoperatively. However, in a review study, it was shown that NSAIDs were not associated with an increased risk of renal failure after cardiac surgery when administered at optimal 'renal' doses, within early postoperative settings, to patients at low-risk of renal dysfunction in whom NSAIDs were not contraindicated.<sup>15</sup> Our results support this decision but inspire physicians to assess postoperative creatinine levels regularly when on a multimodal regimen. This is the recent practice at the study place, where all patients postoperatively receive a multimodal analgesic regimen unless it is contraindicated.<sup>16</sup>

## Conclusion

In patients undergoing cardiac surgery, a multimodal regimen consisting of fentanyl, pethidine, morphine, tramadol, diclofenac, and paracetamol offered better analgesia. Furthermore, nausea and vomiting complaints were reduced significantly in the multimodal group. Although there was a non-significant increase in individual creatinine levels in the multimodal group, no safety issues regarding dialysis, MI, heart failure, stroke, GI bleeding sternal complications, and 30-day mortality were observed.

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