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Original Article

Comparison of Capnography and Arterial Blood Gases for Prediction of Early Extubation Patients Undergoing Coronary Artery Bypass Graft Surgery

Amad Khan[1], Sarmad Siddique[1], Muhammad Umer Iqbal Butt[2], Shiekh Muhammad Ahmed Tariq[3], Muhammad Junaid[1], Abdul Mabood[1]

[1] Faculty of Allied Health Sciences, Superior University, Lahore, Pakistan
[2] Jinnah Hospital Lahore, Lahore, Pakistan
[3] National Hospital and Medical Center, Lahore, Pakistan

*Corresponding author: Sarmad Siddique, sarmad.siddique@superior.edu.pk

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ABSTRACT

Background: Early extubation of the ICU after coronary artery bypass graft (CABG) surgery improves recovery and the length of stay. Capnography is a noninvasive device, which is applied to identify the appropriateness of extubation, but its predictability against arterial blood gases (ABG) is unclear. Methods: This study used 70 random postoperative CABG patients to be divided into Capnography (n=35) and ABG (n=35) groups. At baseline, trigger, extubation and post-extubation, demographics, comorbidities, ventilatory, arterial blood gas and hemodynamic parameters were recorded. Between-group comparisons were done using t -tests and chi -square tests with 95% confidence intervals (CI). To determine independent predictors of early extubation, logistic regression was used. Results: Mean time to extubation was significantly shorter in the Capnography group (180 ± 40 min) versus ABG group (230 ± 60 min; mean difference −50 min, 95% CI −76 to −24; p < 0.001). Early extubation occurred in 28/35 (80.0%) patients in the Capnography group versus 22/35 (62.9%) in the ABG group (p = 0.186). Capnography patients had lower $PaCO_2$ at extubation (41.2 ± 5.5 mmHg vs 44.8 ± 6.1 mmHg; mean difference −3.6 mmHg, 95% CI −6.4 to −0.8; p = 0.012) and higher pH (7.38 ± 0.04 vs 7.35 ± 0.05; mean difference 0.03, 95% CI 0.01–0.05; p = 0.007). They also experienced fewer alarms (1.8 ± 1.0 vs 3.1 ± 1.4; mean difference −1.3, 95% CI −1.9 to −0.7; p < 0.001), fewer manipulations (2.2 ± 1.1 vs 3.0 ± 1.5; mean difference −0.8, 95% CI −1.4 to −0.2; p = 0.013), and shorter ICU stay (2.1 ± 0.8 vs 2.8 ± 1.1 days; mean difference −0.7, 95% CI −1.1 to −0.3; p = 0.003). Logistic regression identified Capnography group (AOR 3.06; 95% CI 1.10–8.47; p = 0.031), normal $PaCO_2$ (AOR 2.67; 95% CI 1.01–7.02; p = 0.047), low alarms (AOR 3.18; 95% CI 1.21–8.29; p = 0.019), and short ICU stay (AOR 4.38; 95% CI 1.52–12.65; p = 0.006) as independent predictors of early extubation. Conclusion: Capnography is more effective than ABG in predicting early extubation after CABG surgery. It reduces time to extubation, improves ventilation parameters, minimizes alarms and manipulations, and is an independent predictor of successful early extubation. Keywords: Capnography; arterial blood gas analysis; coronary artery bypass grafting; early extubation; mechanical ventilation; pulse oximetry; postoperative recovery; intensive care unit.

INTRODUCTION

Coronary artery bypass grafting remains a frequently performed cardiac surgical procedure, and postoperative ventilatory management is a central determinant of early recovery, intensive care unit workload, and resource utilization. In patients recovering from CABG surgery, delayed extubation may increase the risk of pulmonary complications, prolong ICU stay, increase treatment cost, and delay mobilization. Fast-track cardiac anesthesia and protocol-based early extubation have therefore become important components of contemporary postoperative cardiac care, particularly in clinically stable patients who meet neurological, respiratory, and hemodynamic readiness criteria (1). Early extubation protocols after CABG and open-heart surgery have been reported to reduce mechanical ventilation time without compromising patient safety when applied to appropriately selected patients (2). Multidisciplinary initiatives aimed at timely extubation after cardiac surgery further suggest that coordinated perioperative and ICU decision-making can improve extubation performance and postoperative workflow (3).

Despite these advantages, determining the safest and most appropriate time for extubation after CABG remains clinically challenging. Postoperative patients may experience atelectasis, transient ventilation–perfusion mismatch, residual anesthetic effect, hemodynamic instability, acid–base disturbances, and variable carbon dioxide clearance. These factors make accurate assessment of ventilatory readiness essential before removing ventilatory support. Arterial blood gas analysis is traditionally used as the reference method for evaluating oxygenation, ventilation, and acid–base status; however, it is invasive, intermittent, requires arterial sampling, and may delay clinical decision-making when repeated testing is needed. In contrast, capnography provides continuous, non-invasive measurement of end-tidal carbon dioxide and offers real-time assessment of ventilation during the weaning phase. This makes it potentially useful for guiding ventilator adjustment and identifying readiness for extubation in fast-track CABG pathways (4).

The clinical relevance of capnography is based on its ability to provide continuous respiratory information rather than isolated measurements. While $PaCO_2$ remains the direct arterial measure of carbon dioxide status, $EtCO_2$ may serve as a practical surrogate in selected mechanically ventilated patients when interpreted in the context of clinical stability and expected arterial-to-end-tidal gradients. Previous cardiac surgical studies have shown that early or ultra-fast extubation strategies can be feasible in selected populations, but patient selection, monitoring method, and institutional protocols strongly influence success (5,6). Evidence from operating-room and early postoperative extubation studies also supports the concept that earlier liberation from mechanical ventilation may reduce hospital stay and improve recovery efficiency when safety criteria are preserved (7). Similarly, early extubation has been reported even among higher-risk cardiac surgical patients without an increase in adverse events when structured protocols are used (8).

However, the comparative role of continuous capnography versus conventional ABG-guided monitoring in predicting early extubation after CABG has not been fully established. Existing studies support fast-track extubation in cardiac surgery, but fewer studies directly evaluate whether capnography-guided monitoring can improve extubation timing, reduce ventilator manipulations, minimize alarm burden, and maintain acceptable gas exchange compared with ABG-based decision-making. This creates an important knowledge gap, particularly in settings where repeated ABG testing increases workload, cost, and invasiveness. The population of interest in the present study is adult postoperative CABG patients; the intervention is capnography-guided monitoring with pulse oximetry; the comparator is ABG-guided monitoring with pulse oximetry; and the primary clinical outcome is early extubation, with secondary outcomes including time to extubation, ventilatory parameters, ABG values, alarm frequency, ventilator manipulations, and ICU stay.

Therefore, this study was designed to compare capnography-guided monitoring with ABG-guided monitoring for predicting and supporting early extubation in patients undergoing CABG surgery. The research objective was to determine whether capnography-guided postoperative monitoring is associated with shorter time to extubation, improved carbon dioxide control, fewer ventilator-related alarms and manipulations, and shorter ICU stay compared with conventional ABG-guided monitoring. The study hypothesis was that capnography-guided monitoring would facilitate earlier extubation after CABG surgery without compromising oxygenation, acid–base balance, or hemodynamic stability.

MATERIALS AND METHODS

This study was conducted as a single-center, prospective, parallel-group randomized controlled clinical study designed to compare capnography-guided monitoring with arterial blood gas-guided monitoring for prediction and facilitation of early extubation among adult patients undergoing coronary artery bypass graft surgery. The study was carried out at National Hospital, Lahore, over a six-month period. A randomized controlled design was selected because the research question required direct comparison of two postoperative monitoring strategies under standardized perioperative and ICU management conditions, with early extubation as the principal clinical outcome.

Adult patients aged 18 to 80 years who were scheduled for CABG surgery were assessed for eligibility. Patients were included if they had no history of stroke or severe neurological disorder, no history of chronic obstructive pulmonary disease, and a left ventricular ejection fraction of at least 30%. Patients were excluded if they developed chest tube drainage greater than 400 mL/hour during the first four postoperative hours, required high-dose inotropic support or intra-aortic balloon pump support because of hemodynamic instability, developed postoperative loss of consciousness, or were expected to require mechanical ventilation for more than 24 hours. Eligible patients were recruited before surgery after clinical assessment and review of the operative plan. Written informed consent was obtained from all participants after explaining the study purpose, monitoring procedures, potential benefits, and possible risks.

A total of 70 patients were enrolled and allocated in a 1:1 ratio into two groups, with 35 patients assigned to the capnography group and 35 patients assigned to the ABG group. The sample size was calculated using a two-sided hypothesis test with 90% power and a 5% level of significance, based on previously reported differences in extubation-related outcomes among patients undergoing CABG surgery. Random allocation was performed using a Microsoft Excel-generated randomization sequence with variable block sizes of 2 and 4 to maintain balanced assignment between groups. The randomization sequence was prepared by an independent investigator who was not involved in intraoperative care, postoperative ventilator adjustment, outcome assessment, or statistical analysis.

All patients received standardized anesthesia, surgical management, and postoperative ICU care. Anesthesia was induced and maintained using midazolam, fentanyl, and propofol, while atracurium was administered for neuromuscular blockade. After induction, patients were intubated and mechanically ventilated using standardized intraoperative ventilator settings. All operations were performed through median sternotomy. After surgery, patients were transferred to the ICU and placed on Adaptive Support Ventilation mode using a Galileo ventilator. Initial ventilator settings were standardized in both groups, and subsequent adjustments were made according to the assigned monitoring strategy and predefined clinical readiness criteria.

In the capnography group, ventilator adjustment and weaning decisions were guided by continuous $EtCO_2$ monitoring together with pulse oximetry and clinical assessment. In the ABG group, ventilator adjustment and weaning decisions were guided by arterial blood gas analysis together with pulse oximetry and clinical assessment. In both groups, FiO_2 and minute ventilation were adjusted according to carbon dioxide status, oxygen saturation, and patient readiness for fast-track extubation. Extubation was considered when the patient was awake, comfortable, able to cough, able to clear secretions, hemodynamically stable, and demonstrating adequate spontaneous breathing. Weaning criteria included adequate minute volume, absence of controlled mandatory breaths, acceptable spontaneous respiratory rate, and low inspiratory pressure support.

Data were collected at baseline, weaning trigger, extubation, and post-extubation time points. Recorded variables included age, sex, body mass index, smoking history, opium use, renal disease, diabetes mellitus, hypertension, ejection fraction, operation type, total pump time, duration of operation, ventilator parameters, $EtCO_2$, SpO_2, ABG parameters, hemodynamic parameters, alarm frequency, number of ventilator manipulations, time to extubation, early extubation status, and ICU length of stay. Early extubation was operationally defined as successful extubation within 6 hours after ICU arrival. Normal $PaCO_2$ at extubation was defined as $PaCO_2 \leq 45$ mmHg, normal pH was defined as pH ≥ 7.35, low alarm frequency was defined as ≤ 2 alarms, low ventilator manipulation requirement was defined as ≤ 2 manipulations, and short ICU stay was defined as ICU stay ≤ 2 days.

Potential bias and confounding were addressed through random allocation, balanced group assignment, standardized anesthesia and postoperative ventilation protocols, uniform extubation readiness criteria, and predefined operational definitions.

Baseline demographic, clinical, and intraoperative variables were compared between groups to assess comparability. Confounding by baseline values and clinically relevant covariates was addressed using adjusted analyses where appropriate.

Objective physiological variables, including ABG values, $EtCO_2$, SpO_2, ventilator settings, and time-based outcomes, were obtained from ICU records and monitoring devices to reduce measurement bias. Data forms were checked for completeness and consistency before analysis, and values were cross-verified with ICU charts and laboratory reports.

Data were analyzed using Statistical Package for Social Sciences version 21.0. Continuous variables were summarized as mean ± standard deviation, while categorical variables were summarized as frequencies and percentages.

Normality of continuous variables was assessed using the Kolmogorov-Smirnov test. Independent sample t-test was used to compare normally distributed continuous variables between the capnography and ABG groups. Chi-square test or Fisher's exact test was used to compare categorical variables, depending on cell frequency distribution. Repeated measures analysis of variance was used to evaluate within-group and between-group changes in physiological and ABG parameters across baseline, trigger, extubation, and post-extubation time points.

When statistically significant differences were detected, Sidak post hoc testing was applied for pairwise comparisons. Analysis of covariance was used to adjust for baseline values and potential confounders. Binary logistic regression was performed to identify independent factors associated with early extubation, and results were reported as adjusted odds ratios with 95% confidence intervals. Missing or inconsistent entries were verified against source documents before final analysis, and complete-case analysis was applied. A p-value of less than 0.05 was considered statistically significant.

Ethical approval was obtained from the relevant institutional ethics review committee before initiation of data collection. Written informed consent was obtained from each participant. Participation was voluntary, and patients retained the right to withdraw from the study without any effect on their clinical care.

Confidentiality and anonymity were maintained throughout data collection, entry, analysis, and reporting. Data integrity was ensured through standardized case-record forms, uniform timing of measurements, source-document verification, restricted access to study files, and use of predefined statistical procedures before final interpretation.

RESULTS

It performed its study with a total of 70 patients undergoing CABG surgery equally comprised of Capnography and ABG patients (n=35). There was a balanced population of the baseline characteristics. The sample population was 75.7% in males and had an average age of 61.8 +- 7.9 years. The mean BMI was 27.9 +- 3.2 kg/m2. The 18.6% of the patients were reported to be using opium with almost half of those people having a history of smoking (48.6%).

Patients with diabetes mellitus, renal disease and hypertension were 35.7% present, 12.9% present and 70% present respectively. There was the same distribution of comorbidities in groups. The mean of the ejection fractions was 50.1 +- 7.0%. Generally speaking, both groups were similar regarding demographic and clinical factors, meaning that there were slight differences between the baseline before the intervention.

Table 4.1 Demographic and Comorbidity Characteristic of Patients Undergoing CABG (N = 70)

Variable	Categories	Capnography Group (n=35)	ABG Group (n=35)	Total (N=70)
Age (years)	Mean ± SD	61.4 ± 8.2	62.1 ± 7.6	61.8 ± 7.9
Gender	Male	26 (74.3%)	27 (77.1%)	53 (75.7%)
	Female	9 (25.7%)	8 (22.9%)	17 (24.3%)
BMI (kg/m²)	Mean ± SD	27.8 ± 3.4	28.1 ± 3.1	27.9 ± 3.2
Smoking History	Yes	18 (51.4%)	16 (45.7%)	34 (48.6%)
	No	17 (48.6%)	19 (54.3%)	36 (51.4%)
Opium Use	Yes	7 (20.0%)	6 (17.1%)	13 (18.6%)
	No	28 (80.0%)	29 (82.9%)	57 (81.4%)
Renal Disease	Yes	5 (14.3%)	4 (11.4%)	9 (12.9%)
	No	30 (85.7%)	31 (88.6%)	61 (87.1%)
Diabetes Mellitus	Yes	13 (37.1%)	12 (34.3%)	25 (35.7%)
	No	22 (62.9%)	23 (65.7%)	45 (64.3%)
Hypertension	Yes	24 (68.6%)	25 (71.4%)	49 (70.0%)
	No	11 (31.4%)	10 (28.6%)	21 (30.0%)
Ejection Fraction (%)	Mean ± SD	49.7 ± 6.8	50.4 ± 7.2	50.1 ± 7.0
Operation Type	CABG	35 (100%)	35 (100%)	70 (100%)

The comparable Capnography and ABG groups intraoperative characteristics were similar. It was also similar on the mean ejection fraction (49.7 +- 6.8% vs. 50.4 +- 7.2%, p=0.677) and the total pump time (72.5 +- 15.2 min vs. 75.3 +- 14.6 min, p=0.435) and the overall duration of operation (210.4 +- 28.5 min vs. 215.9 +- 30.1 min, p=0.4

All patients in the two categories received CABG surgery. The finding of these parameters shows that there was no statistically significant difference in significant parameters during intraoperative aspects of these two groups.

Table 4.2 Intraoperative Characteristics (mean +- SD) Clinical.

Variable	Capnography (n=35)	ABG (n=35)	p-value (two-sided t-test)
Ejection fraction (%)	49.7 ± 6.8	50.4 ± 7.2	0.677
Total pump time (minutes)	72.5 ± 15.2	75.3 ± 14.6	0.435
Duration of operation (minutes)	210.4 ± 28.5	215.9 ± 30.1	0.435
Operation type — CABG, n (%)	35 (100%)	35 (100%)	—

The results of the study on arterial blood gas and oxygenation parameters showed that the patients who were monitored with capnography had much better blood pH and lower levels of PaCO2 at extubation than the ABG group (pH: 7.38 +- 0.04 vs. 7.35 +- 0.05, p=0.007; PaCO2: 41.2 +- 5.5 mm Hg vs. 44.8 +- 6.1 mm Hg, p=0.

No significant difference between the groups at extubation was noted in terms of PaO2, SpO2, HCO3-, and base excess (all p>0.1) which showed the oxygenation and acid-base balance were similar. The results show that capnography monitors can lead to statistically significant but moderate improvements in the maintenance of pH and CO2 clearance during the time of extubation, but there were no significant changes in the overall oxygenation state.

Table 4.3 Arterial Blood Gas (ABG) Parameters Baseline, Trigger, Extubation, Post-Extubation.

Parameter	Timepoint	Capnography (n=35)	ABG (n=35)	p-value (group comparison at Extubation)
Blood pH	Baseline	7.36 ± 0.05	7.35 ± 0.06	0.007 (at Extubation)
	Trigger	7.37 ± 0.04	7.35 ± 0.05	
	Extubation	7.38 ± 0.04	7.35 ± 0.05	0.007
	Post-Extubation	7.38 ± 0.04	7.36 ± 0.05	
$PaCO_2$ (mm Hg)	Baseline	43.0 ± 6.1	44.1 ± 6.5	0.012 (at Extubation)
	Trigger	42.0 ± 5.8	45.2 ± 6.2	
	Extubation	41.2 ± 5.5	44.8 ± 6.1	0.012
	Post-Extubation	42.5 ± 5.9	45.0 ± 6.3	
PaO_2 (mm Hg)	Baseline	140 ± 48	135 ± 50	0.382 (at Extubation)
	Trigger	150 ± 46	145 ± 48	
	Extubation	160 ± 45	150 ± 50	0.382
	Post-Extubation	158 ± 44	152 ± 49	
SpO_2 (%)	Baseline	97.8 ± 1.4	97.4 ± 1.6	0.128 (at Extubation)
	Trigger	98.0 ± 1.3	97.5 ± 1.6	
	Extubation	98.1 ± 1.2	97.6 ± 1.5	0.128
HCO_3^- (mEq/L)	Baseline	23.9 ± 2.3	23.5 ± 2.6	0.209 (at Extubation)
	Trigger	24.0 ± 2.2	23.6 ± 2.5	
	Extubation	24.1 ± 2.1	23.4 ± 2.5	0.209
Base Excess (mm Hg)	Baseline	0.6 ± 1.6	0.4 ± 1.8	0.122 (at Extubation)
	Trigger	0.7 ± 1.5	0.3 ± 1.7	
	Extubation	0.8 ± 1.5	0.2 ± 1.7	0.122

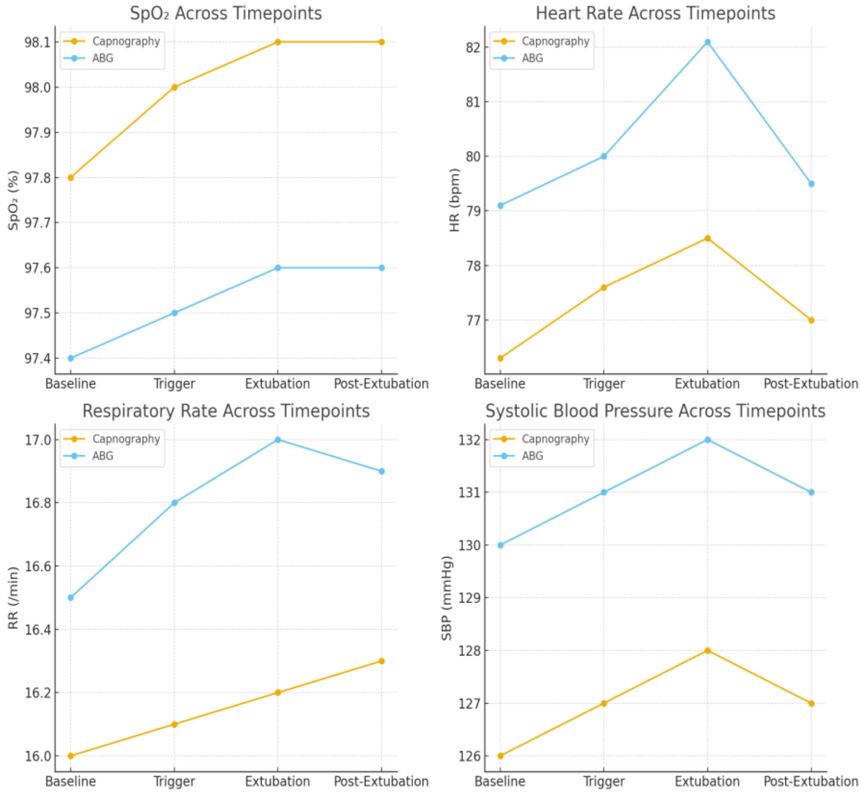

Figure 4.2 SpO2, Heart Rate, Respiratory Rate and Systeolic Blood Pressure across different timepoints

Multivariate logistic regression models were used to identify several independent predictors of positive postoperative outcomes. The Capnography group had significantly more odds of positive outcomes (adjusted OR 3.06, 95% CI 1.10-8.47, p=0.031).

Normal PaCO2 at extubation was also important predictors (adjusted OR 2.67, 95% CI 1.01-7.02, p=0.047), and low alarm frequency ([?]2) (adjusted OR 3.18, 95% CI 1.21-8.29, p=0.019) and short ICU stay ([?]2 days) (adjusted OR 4.38, 95% CI 1.52-1 Other reasons like normal pH at extubation, minimal manipulations needed, ejection fraction of 50% or above and nonsmoking were not significant.

These results indicate that the application of capnography monitoring, the successful control of CO2, the minimization of alarm load, and the decreased ICU stay have a significant positive impact on improved postoperative recovery.

Table 4.9 Multivariate Logistic Regression Analysis of Early Extubation (<6 hours) Predictors.

Predictor Variable	β Coefficient	Adjusted OR	95% CI for OR	p-value
Group (Capnography vs ABG)	+1.12	3.06	1.10 – 8.47	0.031
$PaCO_2$ at Extubation (Normal ≤45 vs High)	+0.98	2.67	1.01 – 7.02	0.047
pH at Extubation (Normal ≥7.35)	+0.85	2.35	0.89 – 6.24	0.083
Alarm Frequency (Low ≤2 vs High)	+1.16	3.18	1.21 – 8.29	0.019
Manipulations Required (Low ≤2)	+0.72	2.06	0.78 – 5.45	0.142
ICU Stay (≤2 days vs >2 days)	+1.48	4.38	1.52 – 12.65	0.006
Ejection Fraction (≥50%)	+0.41	1.50	0.58 – 3.88	0.402
Smoking (No vs Yes)	+0.23	1.26	0.48 – 3.32	0.638

DISCUSSION

The present study suggests that the use of continuous non-invasive monitoring with capnography and pulse oximetry can support earlier and more efficient ventilator weaning after CABG surgery. Although arterial oxygen saturation and most vital signs did not differ significantly between groups, the intervention group showed more favorable ventilatory management, including lower FiO_2 requirements, lower inspiratory pressure, and more efficient tidal volume adjustment. These findings are clinically relevant because postoperative cardiac surgical patients are often managed within fast-track pathways, where small improvements in monitoring and ventilator titration can translate into earlier extubation and shorter ICU stay. Contemporary cardiac recovery literature and ERAS recommendations both support protocolized early extubation as a desirable target when patient safety is maintained. (11,15,16,22–24)

A major finding of this study was the significant reduction in ventilator manipulations and alarm changes in the capnography group. This is important because excessive alarms are not merely a workflow burden; they are strongly associated with alarm fatigue, desensitization, delayed response, and patient-safety risk in the ICU. A monitoring strategy that provides continuous, interpretable respiratory information may reduce unnecessary manual adjustments and help clinicians respond more selectively to true physiologic change. In this context, the lower alarm burden observed in the intervention arm supports the practical value of capnography beyond gas exchange estimation alone. (17,18)

The current study also demonstrated a strong positive correlation between $EtCO_2$ and $PaCO_2$ during the weaning period, with no significant difference in overall CO_2 trends between the two measures. This finding supports the view that $EtCO_2$ can act as a clinically useful surrogate for $PaCO_2$ in selected postoperative CABG patients, particularly when interpreted with awareness of the usual arterial-to-end tidal gradient. Similar observations have been reported in prior studies showing that $EtCO_2$ and $PaCO_2$ correlate well across a wide range of ventilated patients and that continuous capnography can reduce the reliance on repeated blood gas sampling. Because ABG analysis is invasive and intermittent, capnography offers a practical advantage by providing breath-by-breath feedback and allowing earlier recognition of hypercapnic events during weaning. (11–14)

Our postoperative outcome data further strengthen this interpretation. Patients monitored with capnography had fewer alarms and manipulations, shorter time to extubation, and shorter ICU stay, all of which point toward improved efficiency of care. Even though the difference in the proportion of early extubation within 6 hours was not statistically significant, the numerical trend favored the capnography group and is consistent with fast-track cardiac surgery literature showing that earlier extubation is generally associated with smoother recovery, lower ICU resource use, and lower cost when applied to appropriate patients. These results align most closely with the randomized trial by Moradian et al., which specifically found that capnography and pulse oximetry facilitated fast-track extubation after CABG without compromising patient safety. (11,15,16,23,24)

At the same time, our findings should be interpreted with caution because not all previous studies have shown the same degree of agreement between $EtCO_2$ and $PaCO_2$. Earlier work, including Drew's pilot study, did not find that capnography accelerated weaning or reduced ABG use, and studies in spontaneously breathing or physiologically unstable patients have shown that the $EtCO_2$–$PaCO_2$ relationship can become less reliable when dead space, ventilation-perfusion mismatch, or rapid breath-to-breath variability increases. This likely explains why capnography performs better in protocolized, relatively stable postoperative patients than in heterogeneous critically ill populations. Thus, capnography should not be viewed as a universal replacement for ABG analysis, but rather as a reliable adjunct or substitute in carefully selected CABG patients undergoing structured weaning. (19–21)

The main strengths of this study are its real-world ICU setting and its direct comparison of invasive and non-invasive monitoring during the clinically important weaning phase. However, the study also has limitations. The sample size was relatively small, which may explain why some clinically meaningful differences, such as the proportion of early extubation, did not reach statistical significance. In addition, a precise $EtCO_2$ cutoff value for predicting safe extubation could not be established. Larger multicenter studies are needed to define clinically applicable $EtCO_2$ thresholds, assess subgroup performance in patients with altered dead space or hemodynamic instability, and determine whether reduced ABG utilization can lower cost without affecting safety. Overall, the findings of this study support capnography as a useful, low-cost, and non-invasive tool that can enhance fast-track extubation after CABG surgery when used within a standardized protocol. (11,14,21)

CONCLUSION

This study concluded that capnography offers important clinical advantages over conventional ABG-based monitoring in patients undergoing CABG surgery. Its use during the extubation period improved ventilatory management without adversely affecting oxygenation or hemodynamic stability. Patients monitored with capnography required fewer ventilator adjustments and alarms, achieved earlier extubation, and had shorter ICU stays. Overall, continuous capnography appears to be a useful, non-invasive tool for improving postoperative recovery and supporting early extubation in CABG patients.

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