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The Effect of Cross Clamp Time on the Post-Operative Ventilation and Inotropic Support in Post Coronary Artery Bypass Grafting Patients

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Abstract

Background: Ischemic heart disease is one of the major causes of death, disability and health care resource utilization worldwide. CABG is very effective at relieving angina and improving survival, which are the primary indications for the operation.

Aim of Study: To determine the effect of Aortic cross clamp time on postoperative ventilation and inotropic support in CABG surgery in patients underwent coronary artery bypass grafting for three vessels or more.

Patients and Methods: A comparative cross-sectional retrospective study that was conducted at department of cardiothoracic surgery, Ain Shams University Hospitals from 2021 to 2023 included 100 ischemic patients who are candidates for isolated on-pump CABG surgery.

Results: The comparison of additional postoperative outcomes between Group A and Group B reveals important findings regarding patient recovery and hospital course. Firstly, there were no cases of stroke in either group, suggesting that prolonged cross-clamp times did not increase the risk of this specific complication. However, significant differences were noted in the duration of ICU stay (p=0.001) and a trend towards longer hospital stays in Group A, although this difference did not reach statistical significance (p=0.134). Group A had a median ICU stay of 3.32 days compared to 2.01 days in Group B, indicating a prolonged need for intensive care management in patients with longer cross-clamp times. Despite these differences, there were no significant disparities in mortality between the groups, with the majority of patients surviving their hospitalization in both Group A (94.6%) and Group B (97.7%). These findings suggest that while prolonged cross-clamp times may lead to increased ICU stays, they do not necessarily impact mortality rates following CABG surgery. However, further investigation is warranted to explore the potential long-term implications of prolonged cross-clamp times on patient outcomes.

Conclusion: Our study highlights the significant impact of prolonged aortic cross-clamp times on various postoperative outcomes in patients undergoing isolated on-pump coronary artery bypass grafting (CABG) surgery. Patients with longer cross-clamp times experienced a higher duration of mechanical ventilation, increased requirement for inotropic support, and prolonged ICU stays compared to those with shorter cross-clamp times. Additionally, there was a trend towards longer hospital stays in the prolonged cross-clamp group, although mortality rates were comparable between the groups. These findings underscore the importance of minimizing ischemic times during CABG surgery to optimize postoperative recovery and reduce the need for intensive care interventions. Further research is needed to elucidate the long-term implications of prolonged cross-clamp times and to develop strategies aimed at improving surgical outcomes in this patient population.

Key Words: *Coronary artery bypass grafting – Cardiopulmonary bypass – Coronary heart disease.*

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Introduction

ISCHEMIC heart disease is one of the major causes of death, disability and health care resource utilization worldwide. CABG is very effective at relieving angina and improving survival, which are the primary indications for the operation **[1]**.

Coronary artery bypass grafting (CABG) is the definitive surgical treatment of the coronary artery disease and can be performed with a low incidence of morbidity and mortality **[2]**.

CABG is a technique that involves using an artery or vein from elsewhere in the body to bypass the blocked vessels, restoring adequate blood flow to the heart. The artery or vein is attached around

the blockage, so that there is a new pathway for oxygenated blood to reach the heart muscle [13].

Patients undergoing open heart surgery with prolong aortic clamp time is associated with adverse outcome. The effect of prolong ischemic time has also been observed in patients requiring coronary CABG with poor outcome in the early postoperative period [4].

A variety of myocardial protection techniques like use of blood or crystalloid based warm, tepid and cold cardioplegia solutions has been used during the period of aortic clamping in order to reduce ischemic insult to heart and return of adequate myocardial function in post-arrest period [5].

As with any type of surgery, CABG has risks in both short and long-term results. The risks of CABG include wound infection and bleeding, reactions to anaesthesia, fever, pain, stroke, heart attack, or even death [6].

Prolong clamp time with incomplete myocardial protection may cause irreversible myocardial damage leading to unfavourable outcome. Patients with preserved left ventricular function tolerate ischemic time better than those with impaired left ventricular function with increase morbidity and mortality seen in the later group [7].

Myocardial damage, secondary to prolong clamp time, results in release of myocardial enzymes and leads to number of adverse events in the perioperative period. It is further added that cardiopulmonary bypass (CPB) is directly linked to clamp time with increase in ischemic time leads to increase in CPB time [8].

Aim of the work:

The study aimed to determine the effect of Aortic cross clamp time on postoperative ventilation and inotropic support in CABG surgery in patients underwent coronary artery bypass grafting for three vessels or more.

Patients and Methods

Study design and duration:

A comparative cross-sectional retrospective study that was conducted at department of cardiothoracic surgery, Ain Shams University Hospitals from 2021 to 2023 included 100 ischemic patients who are candidates for isolated on-pump CABG surgery. They were divided in two groups:

- Group A: Consisted of patients who underwent Coronary artery bypass grafting (CABG) surgery with aortic cross clamp time more than 60 minutes.
- Group B: Included cases with aortic cross clamp time less than 60 minutes.

Inclusion criteria:

Isolated CABG. On cardiopulmonary bypass (CPB). Three grafts at least. Normal LV functions; Ejection Fraction >50%.

Exclusion criteria:

CABG with valvular surgery. CABG off pump. Redo CABG. Emergency CABG or patients on IABP. Ejection fraction <50%. COPD and other chronic lung diseases. Chronic Liver diseases or chronic kidney diseases. Bleeding tendency. Recent myocardial infarction. Morbid obesity.

Patient evaluation:

Preoperative Assessment: History-Taking from each patient including her/his age, history of Diabetes Mellitus (DM), hypertension (HTN), and functional status is assessed according to the New York Heart Association (NYHA) criteria (for heart failure symptoms) and the Canadian Cardiovascular Society (CCS) classification (for angina pectoris). Also history of smoking and symptoms suggestive of COPD (expectoration and chronic cough). Clinical Examination: full physical examination and a local cardio logical examination. Diagnostic and Imaging Studies. Laboratory Investigations: i. Complete blood picture (CBC) ii. Renal and liver function tests (urea, creatinine, creatinine clearance, ALT, AST, total and direct bilirubin, Prothrombin time and concentration, albumin. iii. Electrolytes (Na, K, Ca, Ph) iv. Lipid profile (TGs, HDL, LDL, cholesterol) Fasting and 2 hours' postprandial blood glucose level was included. Coronary angiography. 12-lead Electrocardiogram (ECG). Radiological Examination. Echocardiography (Echo). Chest X-ray (P-A view). Preoperative Counseling: A brief explanation of the steps of the surgery and postoperative ICU course with possible complications early and late postoperative was explained to the patients in the preoperative visit prior to surgery. Preoperative Preparation: A broad spectrum antibiotic (usually first generation cephalosporin) and an H2 receptor blocker was given before surgery.

All the patients have their chests, forearms and legs up to the level of the thighs shaved on the night if the surgery. Cleaning the body areas will be carried out after shaving by Bovidone iodine.

Intraoperative approach:

Incision: Routine median sternotomy. Harvesting of the conduits: Usually harvesting of Left internal mammary artery either pedicle or skeletonized, and the great saphenous vein. Other conduits that might be used: Right internal mammary artery and radial artery. Sustaining Cardiopulmonary Bypass: After administration of heparin and obtaining safe Activated clotting time, cannulation is performed: Central aortic arterial cannula, double staged venous cannula in the right atrium. Application of the aortic cross clamp. Cardioplegia: Cold blood K-based

cardioplegia (repeated every 35 minutes). Number of grafts: 3 grafts at least. The routine technique is the start with the distal anastomoses, ending by anastomosing the LIMA to the LAD, then removal of the aortic cross clamp. The proximal ends are anastomosed to the aorta on partial clamp. Coming of bypass and decannulation of the heart. Routine hemostasis and closure.

Postoperative assessment and complications:

Duration of Mechanical Ventilation: The average number of hours from the time the patient was transferred to the ICU to the time of his/her extubation.

The prolonged mechanical ventilation (PMV) was defined as cumulative duration of 24 hours or more of post-operative endotracheal intubation starting from transfer of the patient to cardiac i0ntensive care unit after completion of the procedure. Pulmonary Complications.

Hemodynamic stability. Drainage from chest tubes. Postoperative requirement of inotropic support. Length of ICU stay. Total Hospital Stay. Morbidity and Mortality.

Statistical analysis:

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 20. The qualitative data were presented as number and percentages while quantitative data were presented as mean, standard deviations and ranges when their distribution found parametric. The comparison between two groups with qualitative data were done by using Chi-square test and/or Fisher exact test was used instead of Chi-square test when the expected count in any cell was found less than 5. The comparison between two independent groups with quantitative data and parametric distribution was done by using Independent *t*-test. The comparison between two independent groups with quantitative data and non parametric distribution was done by using Mann- whitney test. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the *p*-value was considered significant as the following: $p>0.05$ = Non significant (NS). $p<0.05$ = Significant (S). $p<0.001$ = Highly significant (HS).

Results

Table (1): Comparison between studied groups regarding Age, Weight and Sex.

	Group A No. = 56	Group B No. = 44	Test value	*p*-value	Sig.
Age:					
Mean ± SD	56.88±8.84	59.66±6.34	–1.762•	0.081	NS
Range	30.23-84.79	36-69			
Weight:					
Mean ± SD	84.39±11.41	86.74±12.83	–0.968	0.336	NS
Range	60.51-105	55.53-116.55			
Sex:					
Female	8 (14.3%)	6 (13.6%)	0.019*	0.926	NS
Male	48 (85.7%)	38 (86.4%)			

p-value >0.05: Non significant (NS).
p-value <0.05: Significant (S).
p-value <0.01: Highly significant (HS).
*: Chi-square test.
• : Independent *t*-test.

Table (2): Comparison between studied groups regarding CCT.

CCT	Group A No. = 56	Group B No. = 44	Test value•	*p*-value	Sig.
Mean ± SD	75.52±10.50	50.74±2.60	15.285	0.000	HS
Range	62-126	46-58			

p-value >0.05: Non significant (NS).
p-value <0.05: Significant (S).
p-value <0.01: Highly significant (HS).
*: Chi-square test.
• : Independent *t*-test.

Table (3): Comparison between studied groups regarding Co morbidities.

Co morbidities	Group A		Group B		Test value	*p*-value	Sig.
	No.	%	No.	%			
DM:							
No	19	33.9	24	54.5	4.273	0.039	S
Yes	37	66.1	20	45.5			
HTN:							
No	12	21.4	8	18.2	0.162	0.687	NS
Yes	44	78.6	36	81.8			
Smoking:							
No	20	35.7	20	45.5	0.974	0.324	NS
Yes	36	64.3	24	54.5			
COPD:							
No	56	100.0	44	100.0	NA	NA	–

p-value >0.05: Non significant (NS). *: Chi-square test.
p-value <0.05: Significant (S). • : Independent *t*-test.
p-value <0.01: Highly significant (HS).

Table (4): Comparison between studied groups regarding NYHA.

NYHA	Group A		Group B		Test value	*p*-value	Sig.
	No.	%	No.	%			
I	52	92.9	20	45.5	32.359	0.000	HS
II	0	0.0	19	43.2			
III	0	7.1	5	11.4			

p-value >0.05: Non significant (NS). *: Chi-square test.
p-value <0.05: Significant (S). • : Independent *t*-test.
p-value <0.01: Highly significant (HS).

Table (5): Comparison between studied groups regarding EF, Duration of mechanical ventilation, Pulmonary complications, Duration of inotropic supports, Dose of inotropic supports and Chest tube drainage.

	Group A No. = 56	Group B No. = 44	Test value	*p*-value	Sig.
EF:					
Mean ± SD	59.19±5.53	58.87±3.36	0.337•	0.737	NS
Range	45.88-74.82	52-69			
Duration of mechanical ventilation:					
Median (IQR)	14.64 (11.41-17.71)	10.14 (6.02-48)	2.151 μ	0.034	S
Range	1.49-26.92	2.32-72.0			
Pulmonary complications:					
No	42 (75.0%)	40 (90.9%)	4.225*	0.061	NS
Yes	14 (25.0%)	4 (9.1%)			
Duration of inotropic supports:					
Median (IQR)	15.53 (13.02-17.38)	12.87 (0-16.52)	2.195 μ	0.031	S
Range	0-22.65	0-20.32			
Dose of inotropic supports:					
Median (IQR)	7.29 (5.48-8.59)	4.27 (0-5.81)	4.181 μ	0.000	HS
Range	0-11.92	0-9.15			
Chest tube drainage:					
Median (IQR)	139.76 (105.71-176.22)	112.94 (87.53-154.11)	0.801 μ	0.425	NS
Range	0-550	1.25-450			

p-value >0.05: Non significant (NS). *: Chi-square test.
p-value <0.05: Significant (S). • : Independent *t*-test.
p-value <0.01: Highly significant (HS).

Table (6): Comparison between studied groups regarding Patients required inotropic supports.

Patients required inotropic supports	Group A		Group B		Test value	*p*-value	Sig.
	No.	%	No.	%			
No	11	19.6	16	37.2	3.784	0.042	S
Yes	45	80.4	27	62.8			

p-value >0.05: Non significant (NS). *: Chi-square test.
p-value <0.05: Significant (S). • : Independent *t*-test.
p-value <0.01: Highly significant (HS).

Table (7): Comparison between studied groups regarding Stroke, ICU Duration, Hospital stay and Mortality.

	Group A No. = 56	Group B No. = 44	Test value	*p*-value	Sig.
Stroke:					
No	56 (100.0%)	44 (100.0%)	NA	NA	–
ICU Duration:					
Median (IQR)	3.32 (2.58-4.49)	2.01 (1.39-2.75)	3.412μ	0.001	HS
Range	1-7	-0.4 – 14			
Hospital stay:					
Mean ± SD	10.11±4.30	8.85±3.93	1.512•	0.134	NS
Range	1.09-21.68	5.15-30			
Mortality:					
No	53 (94.6%)	43 (97.7%)	0.610	0.435	NS
Yes	3 (5.4)	1 (2.3%)			

p-value >0.05: Non significant (NS). *: Chi-square test.
p-value <0.05: Significant (S). • : Independent *t*-test.
p-value <0.01: Highly significant (HS). μ: Mann- whitney test.

Discussion

Coronary Artery Bypass Grafting (CABG) surgery is a common procedure for treating coronary artery disease **[9]**. One crucial aspect of CABG surgery is the duration of aortic cross-clamping, which refers to the time during which the aorta is clamped to stop blood flow while the grafts are being attached to the coronary arteries. This period is essential for the surgical team to perform the intricate task of grafting **[10]**.

However, prolonged cross-clamp times have been associated with increased risk of adverse outcomes in postoperative patients. One area of concern is the impact on postoperative ventilation and the need for inotropic support, as prolonged cross-clamp times may lead to myocardial dysfunction and respiratory complications **[11]**.

Understanding the implications of cross-clamp time on postoperative ventilation and inotropic support is essential for optimizing patient outcomes in CABG surgery. Strategies to minimize cross-clamp time while ensuring adequate grafting and surgical precision are paramount **[12]**.

Furthermore, vigilant postoperative monitoring and early intervention in patients with prolonged cross-clamp times can help mitigate the risks of respiratory compromise and hemodynamic instability. By elucidating the relationship between cross-clamp time and postoperative outcomes, clinicians can tailor perioperative management strategies to

optimize patient care and enhance recovery following CABG surgery [13].

In our study, we aimed to investigate the effect of Aortic cross clamp time and its prolongation on postoperative inotropic support needs represented by its dose and duration, also the effect on the duration of mechanical ventilation, ICU stay and hospital stay.

The sample population of patients undergoing isolated on-pump CABG were divided into Group A (patients with aortic cross-clamp time >60 minutes) and Group B (patients with aortic cross-clamp time <60 minutes).

The demographic characteristics in both Group A (patients with aortic cross-clamp time >60 minutes) and Group B (patients with aortic cross-clamp time <60 minutes) undergoing isolated on-pump CABG are homogenous. With no statistically significant differences in age (p=0.081) or weight (p=0.336) between the two groups, there was also no significant difference in the distribution of sex (p=0.926). These findings suggest that baseline demographic factors were well-balanced between the groups, minimizing potential confounding effects on the study outcomes.

In the same line a comparative cross-sectional study conducted by Paracha and others [14]. Data from 100 patients undergoing CABG surgery were retrospectively gathered from the hospital database. Through non-random consecutive sampling, patients were categorized into two groups based on their aortic cross clamp time: Group A (n: 50) with aortic cross clamp time >60 minutes, and Group B (n: 50) with aortic cross clamp time <60 minutes. The study founded no statistically significant discrepancies between the groups in terms of gender distribution (p=0.80), indicating a similar male-to-female ratio. Additionally, the proportions of males and females in each group were comparable, with no significant difference noted (p=0.80). Similarly, there were no significant variations in mean age between Group A (56.40 years ± 8.70) and Group B (58.80 years ± 8.07), with a p-value of 0.15. Likewise, the mean BMI in Group A (26.30 kg/m^2 ± 3.75) and Group B (27.16 kg/m^2 ± 6.45) showed no significant difference, with a p-value of 0.41.

The current study compared the cross-clamp times (CCT) between Group A and Group B revealed a statistically significant difference (p=0.000), with Group A exhibiting a substantially longer mean CCT of 75.52±10.50 minutes compared to Group B's mean CCT of 50.74±2.60 minutes. This significant disparity underscores the effectiveness of the study's grouping strategy in delineating patients based on their aortic cross-clamp times. The findings align with our hypothesis, indicating that the duration of aortic cross-clamping indeed varies significantly between the two groups, thereby facilitating the investigation into its impact on postoperative outcomes. Such distinct CCT distributions lay a robust foundation for assessing the association between prolonged cross-clamp times and subsequent postoperative ventilation and inotropic support requirements, providing valuable insights into optimizing surgical techniques and patient management strategies in coronary artery bypass grafting procedures.

In accordance Paracha and others [14] revealed that the comparison of aortic clamp times between Group A (89.12±25.66 minutes) and Group B (48.74±9.33 minutes) revealed a significant disparity (p=0.000). Group A, characterized by longer clamp times, likely experienced more prolonged myocardial ischemia during surgery compared to Group B. This prolonged ischemic insult may lead to greater myocardial damage and compromise, potentially necessitating increased postoperative interventions such as prolonged mechanical ventilation and higher inotropic support.

The analysis of comorbidities in patients undergoing isolated on-pump CABG surgery revealed notable differences between Group A and Group B. Specifically, a statistically significant association was observed between diabetes mellitus (DM) and Group A (p=0.039), with 66.1% of patients in Group A having DM compared to 54.5% in Group B. This finding underscores the potential impact of DM on surgical outcomes, suggesting a higher prevalence in patients with prolonged cross-clamp times. However, no significant differences were noted in the prevalence of hypertension (HTN) or smoking between the groups, indicating a comparable distribution of these comorbidities.

In alignment with our study results Paracha and others [14] conducted a comparative cross-sectional study on 100 CABG patients, categorizing them into Group A (>60min clamp time) and Group B (<60min clamp time) via non-random consecutive sampling revealed that the prevalence of hypertension was 58% in Group A and 50% in Group B, with no significant difference noted (p=0.64). Additionally, there were 15 smokers (30%) in Group A and 16 smokers (32%) in Group B, showing no significant variation between the groups (p=0.83), in contrast with the current study there were 27 diabetic patients (54%) in Group A and 30 diabetic patients (60%) in Group B, with no statistically significant difference observed between the two groups (p=0.54).

In agreement with our study results Moh'd and his co-founders [15] showed that there were no significant differences observed in the prevalence of hypertension (36.5% vs. 41.9%), diabetes mellitus (16.9% vs. 16.6%), obesity (16.3% vs. 19.4%), or respiratory illness (7.9% vs. 5.9%) between patients with aortic cross-clamp times of <51min and ≥51min.

The comparison of postoperative outcomes between Group A and Group B provides important insights into the impact of cross-clamp duration on patient recovery. While there was no significant difference in left ventricular ejection fraction (EF) between the groups (p=0.737), significant differences were observed in the duration of mechanical ventilation (p=0.034) and duration of inotropic support (p=0.031). Group A exhibited a longer median duration of mechanical ventilation (14.64 vs. 10.14 hours) and duration of inotropic support (15.53 vs. 12.87 hours) compared to Group B, indicating a greater need for respiratory and hemodynamic support in patients with prolonged cross-clamp times. Additionally, the dose of inotropic support was significantly higher in Group A compared to Group B (p=0.000), suggesting a more pronounced hemodynamic compromise in patients with prolonged cross-clamp times. Although no significant differences were observed in the incidence of pulmonary complications (p=0.061) or chest tube drainage (p=0.425) between the groups, these findings highlight the potential impact of prolonged cross-clamp times on postoperative respiratory and hemodynamic stability, underscoring the importance of minimizing ischemic times during CABG surgery to optimize patient outcomes.

In the same line Cislaghi and others **[16]** assessed The relation between ACCT and ICULOS was investigated by several studies. Cislaghi et al. **[16]** investigated an audit of 5123 patients and concluded that longer ACCT was associated with a greater likelihood of prolonged post-operative mechanical ventilation and hospital stay.

In accordance Moh'd and others **[15]** indicated a significant correlation between the need for inotropic support in the ICU and longer aortic cross-clamp time (ACCT). Specifically, patients who required extended inotropic support in the ICU were significantly more likely to have had a longer than average (≥51min) ACCT compared to those who did not require inotropic support in the ICU (p<0.001).

In contrast Paracha and others **[14]** compared ventilation time between the two groups in the study yielded a p-value of 0.082, indicating a lack of statistical significance despite a numerical difference in mean ventilation duration. This suggests that factors beyond aortic cross-clamp time may influence ventilation time variability, founded a significant difference in ejection fraction (EF) percentages between the groups based on aortic cross-clamp times, highlighting the impact of this surgical parameter on cardiac function postoperatively. Group A, with longer clamp times, exhibited a higher percentage of patients with good LV function compared to Group B, indicating potential implications for patient outcomes and surgical decision-making.

The comparison of patients requiring inotropic support between Group A and Group B revealed a statistically significant difference (p=0.042). In Group A, 80.4% of patient's required inotropic support compared to 62.8% in Group B. This finding suggests a higher proportion of patients experiencing hemodynamic compromise requiring pharmacological intervention in the prolonged cross-clamp group. The significance of this difference underscores the potential impact of prolonged ischemic times during surgery on postoperative cardiac function and the need for aggressive hemodynamic management in these patients to optimize outcomes and prevent further complications.

In consistent with current study results Moh'd and others **[15]** demonstrated that required inotropic support between the two groups revealed a statistically significant difference (p<0.001). In the group with aortic cross-clamp time <51 minutes, the majority of patients (93.8%) did not require inotropic support, whereas in the group with aortic cross-clamp time ≥51 minutes, a substantial proportion (37.5%) of patients required inotropic support.

The comparison of additional postoperative outcomes between Group A and Group B reveals important findings regarding patient recovery and hospital course. Firstly, there were no cases of stroke in either group, suggesting that prolonged cross-clamp times did not increase the risk of this specific complication. However, significant differences were noted in the duration of ICU stay (p=0.001) and a trend towards longer hospital stays in Group A, although this difference did not reach statistical significance (p=0.134). Group A had a median ICU stay of 3.32 days compared to 2.01 days in Group B, indicating a prolonged need for intensive care management in patients with longer cross-clamp times. Despite these differences, there were no significant disparities in mortality between the groups, with the majority of patients surviving their hospitalization in both Group A (94.6%) and Group B (97.7%). These findings suggest that while prolonged cross-clamp times may lead to increased ICU stays, they do not necessarily impact mortality rates following CABG surgery. However, further investigation is warranted to explore the potential long-term implications of prolonged cross-clamp times on patient outcomes.

In accordance Ruggieri and his colleagues **[8]** founded that the prognostic significance of prolonged cross-clamp time (XCT) in coronary artery bypass grafting (CABG) surgery. Patients with XCT >75 minutes experienced a longer duration of ICU stay compared to those with XCT ≤75 minutes, indicating a potential association between prolonged XCT and postoperative recovery. This highlights the importance of monitoring and minimizing XCT duration during CABG procedures to optimize patient outcomes and resource utilization.

In the same Moh'd and others **[15]** compared ICU length of stay between two groups categorized

by aortic cross-clamp times (<51min vs. ≥51min) revealed a significant difference (p<0.001). Patients with aortic cross-clamp times ≥51min had a notably longer ICU length of stay compared to those with <51min clamp times.

In agreement with the current study Erkut & Ates, **[17]** established a direct and linear relationship between aortic cross-clamp time (ACCT) and post-operative troponin I levels in elective coronary artery bypass grafting (CABG) patients, advocating for a safety threshold of 50 minutes for ACCT in such procedures. This underscores the imperative of reducing ACCT to mitigate post-operative cardiac injury and enhance patient outcomes.

In contrast Paracha and others **[14]** compared ICU stay durations between the groups showed a lack of statistical significance (p=0.206), indicating that aortic cross-clamp time may not be the sole determinant of ICU stay duration. Despite numerical differences in means, other factors likely contribute to variations in ICU stay. hospital stay durations exhibited a significant difference (p=0.040), suggesting that longer aortic cross-clamp times correlate with shorter hospital stays. Further investigation is warranted to elucidate contributing factors and clinical implications comprehensively.

According to mortality Iino and others **[18]** reported that in 16,272 patients with aortic valve replacement, prolonged ACCT was independent predictor of post-operative morbidity and mortality. Al-Sarraf and others **[19]** demonstrated that in 3799 consecutive patients who had cardiac surgery that prolonged ACCT significantly correlates with major post-operative morbidity and mortality in both low- and high-risk patients, especially in those who had ACCT>90min. Shultz and others **[20]** studied the impact of longer ACC durations (more than 300min) on complex cardiac surgeries and found that cardiac procedures requiring extremely long ischemic times have significant early mortality and morbidity.

Several factors could explain these differences. Differences in study populations, sample sizes, and surgical techniques may contribute to varying results across studies. Additionally, the definition of prolonged ACCT and the thresholds used to categorize ACCT may differ between studies, leading to discrepancies in findings. Moreover, differences in the management of intraoperative and postoperative care, as well as variations in patient characteristics and comorbidities, could also influence outcomes and contribute to differences observed between studies.

Conclusion:

In conclusion, our study highlights the significant impact of prolonged aortic cross-clamp times on various postoperative outcomes in patients undergoing isolated on-pump coronary artery bypass grafting (CABG) surgery. Patients with longer cross-clamp times experienced a higher duration of mechanical ventilation, increased requirement for inotropic support, and prolonged ICU stays compared to those with shorter cross-clamp times. Additionally, there was a trend towards longer hospital stays in the prolonged cross-clamp group, although mortality rates were comparable between the groups. These findings underscore the importance of minimizing ischemic times during CABG surgery to optimize postoperative recovery and reduce the need for intensive care interventions. Further research is needed to elucidate the long-term implications of prolonged cross-clamp times and to develop strategies aimed at improving surgical outcomes in this patient population.

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تأثير وقت ربط المشبك الأبهرى على مدة استخدام التنفس الصناعى واستخدام الأدوية المقوية لعضلة القلب فى مرضى جراحات ترقيع الشرايين التاجية

يعد مرض القلب الإقفارى أحد الأسباب الرئيسية للوفاة والعجز واستخدام موارد الرعاية الصحية في جميع أنحاء العالم. تعتبر عملية تطعيم مجازة الشريان التاجى فعالة للغاية في تخفيف الذبحة الصدرية وتحسين فرص البقاء على قيد الحياة، وهى المؤشرات الأساسية للعملية.

لتحديد تأثير زمن المشبك الأبهري على التهوية بعد العملية الجراحية والدعم المؤثر فى التقلص العضلى في جراحة تطعيم مجازة الشريان التاجى فى المرضى الذين خضعوا لتطعيم مجازة الشريان التاجى لثلاث أوعية أو أكثر.

شملت دراسة استرجاعية مقطعية مقارنة تم إجراؤها فى قسم جراحة القلب والصدر بمستشفيات جامعة عين شمس فى الفترة من ٢٠٢١ إلى ٢٠٢٣، ١٠٠ مريض إقفارى مرشحين لإجراء جراحة ترقيع الشريان التاجى المعزولة على المضخة.

تكشف مقارنة النتائج الإضافية بعد العملية الجراحية بين المجموعة (أ) والمجموعة (ب) عن نتائج مهمة فيما يتعلق بتعافى المريض ودورة المستشفى. أولاً، لم تكن هناك حالات سكتة دماغية فى أى من المجموعتين، مما يشير إلى أن فترات المشبك المتقاطع الطويلة لم تزيد من خطر هذه المضاعفات المحددة. ومع ذلك، لوحظت اختلافات كبيرة فى مدة الإقامة في وحدة العناية المركزة (ع = ٠,٠٠١) واتجاه نحو الإقامة لفترة أطول في المستشفى في المجموعة (أ)، على الرغم من أن هذا الاختلاف لم يصل إلى دلالة إحصائية (ع = ٠,١٣٤). كان لدى المجموعة (أ) متوسط إقامة فى وحدة العناية المركزة يبلغ ٣,٣٢ يومًا مقارنة بـ ٢,٠١ يومًا فى المجموعة (ب)، مما يشير إلى الحاجة الطويلة لإدارة العناية المركزة لدى المرضى الذين يعانون من أوقات أطول للتشابك. على الرغم من هذه الاختلافات، لم تكن هناك فوارق كبيرة في معدل الوفيات بين المجموعتين، حيث نجا غالبية المرضى من دخولهم المستشفى فى كل من المجموعة (أ) (٩٤,٦٪) والمجموعة (ب) (٩٧,٧٪). تشير هذه النتائج إلى أنه على الرغم من أن فترات المشبك الطويلة قد تؤدى إلى زيادة الإقامة فى وحدة العناية المركزة، إلا أنها لا تؤثر بالضرورة على معدلات الوفيات بعد جراحة ترقيع الشريان التاجى. ومع ذلك، هناك ما يبرر إجراء مزيد من التحقيق لاستكشاف الآثار المحتملة على المدى الطويل لفترات طويلة عبر المشبك على نتائج المرضى.

تسلط دراستنا الضوء على التأثير الكبير لأوقات المشبك الأبهرى الطويلة على نتائج ما بعد الجراحة المختلفة لدى المرضى الذين يخضعون لجراحة تطعيم مجازة الشريان التاجى المعزولة على المضخة. شهد المرضى الذين يعانون من فترات أطول من المشبك المتقاطع مدة أعلى للتهوية الميكانيكية، وزيادة في الحاجة إلى دعم التقلص العضلى، وبقاء وحدة العناية المركزة لفترات طويلة مقارنة بأولئك الذين لديهم أوقات متقاطعة أقصر. بالإضافة إلى ذلك، كان هناك اتجاه نحو الإقامة لفترة أطول فى المستشفى فى مجموعة المشبك المتقاطع لفترات طويلة، على الرغم من أن معدلات الوفيات كانت قابلة للمقارنة بين المجموعتين. تؤكد هذه النتائج على أهمية تقليل أوقات نقص التروية أثناء جراحة تحويل مسار الشريان التاجى لتحسين التعافى بعد العملية الجراحية وتقليل الحاجة إلى تدخلات العناية المركزة. هناك حاجة إلى مزيد من البحث لتوضيح الآثار طويلة المدى لأوقات المشبك الطويلة ولتطوير استراتيجيات تهدف إلى تحسين النتائج الجراحية لدى هذه الفئة من المرضى.