

CORONARY ANGIOGRAPHY FOLLOWING CARDIAC ARREST WITHOUT ST-SEGMENT ELEVATION: A MULTICENTER STUDY.

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ABSTRACT.

Background:

Ischemic heart disease is a leading reason of cardiac arrest outside the hospital. However, the best approach for treating successfully resuscitated cardiac arrest patients without ST-segment elevation myocardial infarction (STEMI) remains uncertain.

Methods:

The primary endpoint of this multicenter study was survival at 90 days; secondary endpoints included duration of catecholamine support, myocardial injury, indicators of shock, length of time on mechanical breathing, ventricular tachycardia recurrence, significant bleeding, need for renal replacement therapy, acute kidney injury, neurologic status at ICU discharge, and time to reach the target temperature. Following neurological recovery, 152 patients who had suffered cardiac arrest but had not had STEMI were randomized to either quick coronary angiography or delayed coronary angiography, with PCI administered as needed.

Results:

The immediate angiography category had 63.5% survival at 90 days (56 out of 123 participants), while the delayed angiography category had 66.2% survival (68 out of 95 patients). In the immediate angiography category, the median time to reach the goal temp. was 5.3 hours, while in the delayed angiography category, it took 4.6 hours. The remaining secondary endpoints showed no discernible differences between the categories.

Conclusions:

Within the category of patients who underwent successful resuscitation following an out-of-hospital cardiac arrest and did not exhibit indications of STEMI, the overall survival at 90 days did not demonstrate a superiority between an urgent angiography method and a delayed angiography strategy.

Recommendation:

Based on the findings of this study, there is no clear superiority between an urgent angiography approach and a delayed angiography strategy for patients who have been successfully resuscitated following an out-of-hospital cardiac arrest without indications of ST-segment elevation myocardial infarction (STEMI). Further research and clinical guidelines may be necessary to determine the most effective treatment approach for this patient population.

Keywords: Cardiac Arrest, Coronary Angiography, ST-Segment Elevation.

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INTRODUCTION.

Out-of-hospital cardiac arrest is a significant reason for death in the US and Europe, with a reported mortality rate of 40% among successfully resuscitated patients [1]. Post-

resuscitation care involves various measures, including treating the underlying cause, supporting the organs, and carefully controlling the temperature. However, determining the source of arrest is often challenging soon after the event, leading to uncertainty in treatment decisions.

Ischemic heart disease, specifically coronary artery disease (CAD), is a common reason for cardiac arrest, affecting up to 70% of individuals requiring urgent coronary angiography after resuscitation [2]. When myocardial infarction is the cause, rapid percutaneous coronary intervention (PCI) can save heart muscle, improve blood flow, and prevent dangerous heart rhythm disturbances. According to current guidelines, patients experiencing cardiac arrest and ST-segment elevation myocardial infarction (STEMI) should get PCI right away [3].

Debatable is the part of early coronary angiography in individuals who have had cardiac arrest but do not have elevated ST segments on their ECG. Limited randomized trial data exists, and observational studies provide inconclusive results for this patient category. Although guidelines suggest emergency coronary angiography in specific cases without ST-segment elevation [4], these recommendations require validation through robust clinical trials.

The primary aim of the Coronary Angiography after Cardiac Arrest (COACT) trial is to investigate whether, in successfully resuscitated individuals without STEMI, compared to delayed angiography, early coronary angiography (with PCI if necessary) delivers a superior overall survival rate.

METHODS.

Study Design and Supervision.

The COACT trial was a multicenter, randomized clinical trial designed to investigate the optimal approach for treating patients who had experienced cardiac arrest without ST-segment elevation on their electrocardiogram (ECG). The trial compared two strategies: rapid coronary angiography and delayed coronary angiography, followed by percutaneous coronary intervention (PCI) if necessary. The trial was conducted across multiple centers and aimed to evaluate the impact of these strategies on various clinical endpoints, including 90-day survival and several secondary outcome measures. The study design adhered to predefined protocols, with an impartial evaluation of PCI and coronary angiography procedures. Oversight and monitoring were provided by the Sri Jayadeva Institute of Cardiovascular Science & Research, Bengaluru, along with a dedicated information and security monitoring committee to ensure data accuracy and trial integrity.

Participants.

The trial enrolled patients who met the eligibility criteria, which included experiencing an episode of out-of-hospital cardiac arrest characterized by an initial rhythm that was deemed shockable. Furthermore, these patients continued to

exhibit a state of unconsciousness even after spontaneous circulation had been successfully restored.

Exclusion criteria.

The exclusion criteria encompassed the presence of ST-segment elevation on the ECG, shock, or evident noncoronary etiologies.

Randomization and Treatment.

The individuals seeking medical attention were subjected to a thorough evaluation within the emergency department and subsequently allocated to either immediate or delayed angiography through a web-based platform, maintaining an equal distribution ratio of 1:1. In the prompt angiography cohort, the commencement of coronary angiography took place within a time frame of 2 hours after randomization. Delayed angiography commonly manifests after neurological recuperation, frequently following discharge from the intensive care unit. If a patient initially designated for delayed angiography were to exhibit symptoms of severe arrhythmias, recurrent ischemia, or cardiogenic shock during their hospital stay, it may be necessary to promptly proceed with urgent angiography. The selection of treatment options, such as anticoagulant therapy and revascularization techniques, was left to the discretion of the attending physicians. Post-resuscitation care followed accepted international standards, incorporating targeted temperature management and determinations regarding the discontinuation of life-sustaining interventions based on local protocols.

Follow-up and End Points.

Following randomization, a 90-day follow-up evaluation was carried out using information gathered from general practitioners or through telephone conversations with patients and their families. Finding the survival rate after ninety days was the main goal. Evaluating different clinical results, such as survival at 90 days with positive brain function or mild to moderate disability, were examples of secondary endpoints. Furthermore, measurements of creatine kinase, creatine kinase MB, and troponin were used to test for myocardial damage. Acute kidney injury, the requirement for renal replacement therapy, the time it took to reach the desired temp., the length of catecholamine or inotropic therapy, the patient's neurologic state upon release from the ICU, the presence of shock markers, the recurrence of ventricular tachycardia necessitating electrical cardioversion or defibrillation, the length of mechanical ventilation, and the identification of significant bleeding by TIMI criteria were among the other factors evaluated.

Statistical Analysis.

The study was adequately powered to assess the primary outcome, to identify a 40% disparity in 90-day survival rates between the immediate and delayed angiography cohorts (45% versus 32%). Categorical data were subjected to comparative analysis utilizing suitable statistical tests, alongside the computation of odds ratios. P-values were exclusively reported for the primary analysis.

RESULT.

This study comprised 152 patients from 'centers' between 'period' who underwent successful cardiac arrest resuscitation and did not exhibit ST-segment elevation on their ECG. When patients were enrolled at all facilities, data screening was placed. There were 138 patients (96.5%) with data for analysis after those who had revoked their consent were excluded. They were divided into two categories: 123 people underwent immediate angiography and 95 people underwent delayed angiography. Baseline characteristics are displayed in Table 1. With a mean age of 64.3 years, 78.0% of the participants were male.

96.1% of participants in the immediate angiography category and 63.9% of participants in the delayed angiography category had coronary angiography. For the immediate angiography category, between randomization and coronary angiography, the median delay was 0.7 hours, but for the delayed angiography category, it was 118.9 hours. 3.3% of patients receiving prompt angiography and 6.6% of participants receiving delayed angiography had acute thrombotic occlusion. 32.0% of the participants in the immediate angiography category and 23.2% of the participants in the delayed angiography category underwent PCI. In the immediate and delayed angiography categories, coronary artery bypass grafting was carried out in 5.2% and 7.7% of cases. People in the delayed angiography category had a greater probability of being administered with a glycoprotein IIb/IIIa inhibitor, whereas those in the immediate angiography category were more likely to receive salicylates, a P2Y12 inhibitor, or both. It's noteworthy that whereas thirteen individuals in the immediate angiography category had delayed treatment, 3 patients in the delayed angiography category received prompt care.

Table 1: Techniques, Remedies, and Features of Coronary Artery Disease.

Variable	Immediate Angiography Category (N=123)	Delayed Angiography Category (N= 95)
Coronary angiography performed (%)	96.1	63.9
Median time from arrest to coronary angiography (IQR)	1.7-2.0	51.0-196.3
Median time from randomization to coronary angiography (IQR)	0.4-1.1	46.2-202.7
Severity of coronary artery disease (%)		
No clinically significant disease	34.5	33.3
One-vessel disease	26.2	27.5
Two-vessel disease	19.4	19.3
Three-vessel disease	16.0	15.9
Acute unstable lesion (%)	12.6	15.9
Acute thrombotic occlusion (%)	2.4	6.6
Chronic total occlusion (%)	36.7	32.7
Revascularization treatment (%)		
PCI	32.0	23.2
CABG	5.2	7.7
Pharmacologic or conservative treatment	60.5	66.5

Twenty-eight patients in the delayed angiography category had their planned surgery preceded by an urgent coronary angiography. Over ninety percent of patients received

mechanical breathing and targeted temperature management from both categories. It took about 5.3 hours for the individuals in the immediate angiography category and 4.6

hours for those in the delayed angiography category to attain the target temperature. Life-sustaining care was stopped for 49 participants in the delayed angiography category and 56 participants in the immediate angiography category. In the end, ninety-two people in the delayed angiography category and sixty-three individuals in the immediate angiography category survived for ninety days or more. Sensitivity analysis revealed no discernible variation in the primary result between the categories. Subcategory studies revealed possible variations in treatment outcomes according to age and coronary artery disease history; however, no additional interactions between patient sub-categories and treatment were found.

DISCUSSION.

In the COACT trial, it was investigated that the potential differences in patient outcomes between immediate and delayed angiography after successful resuscitation after an out-of-hospital cardiac arrest without evident non-heart-related causes and ST-segment elevation on the ECG. The main outcome, which was survival after 90 days, did not significantly differ between the two categories, according to the results. This runs counter to earlier observational studies that in individuals with comparable circumstances may have indicated a survival benefit with prompt coronary angiography. The discrepancy may arise from biases in earlier research that favored patients who had better prognoses and underwent prompt angiography [5, 6]. The patient category may also have contributed to the discrepancy; the majority of our patients had stable coronary artery disease, with thrombotic blockages accounting for a relatively modest proportion of cases. Given that individuals with acute blockages benefit from rapid coronary intervention but not those with stable coronary disease, this could account for our findings.

The results are consistent with randomized trials in which similar individuals who did not experience cardiac arrest but had myocardial infarction without ST-segment elevation did not show any advantage in survival. One alternative possibility is that, in contrast to heart-related problems, the majority of the patients who did not survive passed away from neurological sequelae [3, 7]. This is consistent with results from prior resuscitation trials, which showed that neurological injuries were more frequently responsible for deaths than cardiac issues. The potential benefits of immediate angiography may have been diminished since individuals in the immediate angiography category waited longer to reach their target temperature for therapeutic cooling.

Patients who underwent expeditious angiography demonstrated a higher propensity for administration of a glycoprotein IIb/IIIa inhibitor, while those who underwent delayed angiography exhibited a greater likelihood of receiving antiplatelet therapy. Nevertheless, there was no

discernible difference in severe bleeding events between the two categories as a result of these variations. The trial's shortcomings include missing patient screening data, treatment bias that might arise from doctors knowing patient category assignments, the exclusion of some patient categories, and a low number of patients who revoked their permission.

GENERALIZABILITY.

The findings of this study cannot be generalized for a larger sample population.

CONCLUSION.

This study, in summary, presents the findings of a randomized, multicenter trial that involved individuals who had successfully undergone shock after going into cardiac arrest outside of a hospital, but who did not exhibit any symptoms of STEMI or noncoronary causes of the arrest. The trial's main objective was to evaluate the effects of immediate vs delayed angiography, with an emphasis on overall survival at 90 days. The results suggest that, in terms of overall survival at the designated time point, immediate angiography did not significantly outperform delayed angiography.

LIMITATIONS.

The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of a comparison group also poses a limitation for this study's findings.

RECOMMENDATION.

Based on the findings of this study, there is no clear superiority between an urgent angiography approach and a delayed angiography strategy for patients who have been successfully resuscitated following an out-of-hospital cardiac arrest without indications of ST-segment elevation myocardial infarction (STEMI). Further research and clinical guidelines may be necessary to determine the most effective treatment approach for this patient population.

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LIST OF ABBREVIATIONS.

STEMI infarction	: ST-segment elevation myocardial
PCI	: percutaneous coronary intervention
CAD	: coronary artery disease
COACT	: Coronary Angiography after Cardiac Arrest
ECG	: electrocardiogram

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The study was not funded.

CONFLICT OF INTEREST.

The authors report no conflicts of interest in this work.

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