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Timing and outcomes after coronary angiography following out of hospital cardiac arrest without signs of ST segment elevation myocardial infarction

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Abstract---Less than 10% of individuals who experience out-of-hospital cardiac arrest survive to be discharged from the hospital, making it 1 of leading causes of mortality globally. Less than 40% of individuals with returned of spontaneous circulation who are hospitalised survive. One of the pillars of care for postcardiac arrests is determining & treatment of underlying reason for arrest. this can entail delay in cause-directed treatment if the cause is not always immediately evident. Adults most frequently develop OHCA due to cardiac disease, among which abrupt coronary occlusion is prevalent in aetiology. Early coronary angiography & revascularization are related to increased survival in this cohort because significant fraction of studied cases with ST-segment elevation on initial electrocardiogram after ROSC have acute coronary blockage. Numerous recommendations urge immediate angiography following OHCA with ST elevation following ROSC. incidence of acute coronary occlusion has been significantly lower in individuals without ST elevation after ROSC, & advantages of early angiography have been less certain in these studied cases. percentage of people who experience OHCA without ST elevation is substantially higher & includes people who experience cardiac arrest due to non-cardiac reasons such pulmonary embolism, hypoxia, & drunkenness.

Keywords---timing, outcomes, coronary angiography, cardiac arrest, ST segment, elevation myocardial infarction.

Introduction

Less than 10% of individuals who experience out-of-hospital cardiac arrest survive to be discharged from the hospital, making it 1 of leading causes of mortality globally. Less than 40% of individuals with returned of spontaneous circulation who are hospitalised survive. One of the pillars of care for postcardiac arrests is determining & treatment of underlying reason for arrest. this can entail delay in cause-directed treatment if the cause is not always immediately evident (1).

Adults most frequently develop OHCA due to cardiac disease, among which abrupt coronary occlusion is prevalent in aetiology. Early coronary angiography & revascularization are related to increased survival in this cohort because significant fraction of studied cases with ST-segment elevation on initial electrocardiogram after ROSC have acute coronary blockage. Numerous recommendations urge immediate angiography following OHCA with ST elevation following ROSC. incidence of acute coronary occlusion has been significantly lower in individuals without ST elevation after ROSC, & advantages of early angiography have been less certain in these studied cases. percentage of people who experience OHCA without ST elevation is substantially higher & includes people who experience cardiac arrest due to non-cardiac reasons such pulmonary embolism, hypoxia, & drunkenness (2).

Observational studies have suggested that individuals without ST elevation post ROSC can benefit from early angiography despite more heterogeneous sample that includes studied cases without coronary blockage, albeit findings depend on relatively low certainty of evidence. A recent systematic review summarised some of recent randomised controlled trials that investigated advantages of early coronary angiography in individuals without ST elevation on ECG following ROSC. This review did not include 2 more recent RCTs, but it did include post hoc observational data & RCTs. It also did not evaluate reliability of summarised evidence from those studies. To compare safety & effectiveness of early versus delayed angiography in studied cases without ST elevation after ROSC, this study's goal had been to conduct updated systematic review & meta-analysis of RCTs (3).

heterogeneous population included in this group without ST elevation post ROSC could because of lack of benefit of early angiography following OHCA. detection & subsequent revascularization of acute coronary blockage are benefits of early angiography that are hypothesised. Nevertheless, approximately fifteen to forty percent of trials included in this study show that studied cases without ST elevation following OHCA frequently do not have acute coronary occlusion. On the other hand, seventy– ninety percent of studied cases who experience ST elevation after OHCA have acute coronary occlusion. Early angiography probably won't help studied cases who have other types of cardiac arrest, & it might even make it harder to find & treat noncardiac reasons for arrest. Trials considered in this meta-analysis excluded individuals with clear or assumed noncardiac reasons for cardiac arrest to choose those most likely to benefit from early angiography. Early angiography, despite this enrichment method, was not proven to be helpful (4).

Findings of this analysis agree with those of earlier meta-analysis of RCTs addressing same question (19), which excluded most recent RCTs. By incorporating Coronary Angiography in studied cases Without ST-segment Elevation Following OHCA study (n = sixty-six) & Emergency versus Delayed Coronary Angiogram in Survivors of OHCA Without ST-Segment Elevation trial (n = 279), that had not been comprised in prior review (18,20), We have increased the precision of our findings, which could lead to more solid conclusions. Utilizing GRADE approach to evaluate certainty in estimates of impact & excluding 2 studies that were comprised in previously published meta-analyses nonetheless had been deemed ineligible for this meta-analysis are additional incremental improvements of this review compared to previous meta-analyses on subject. 1 of 2 studies that were left out had been post hoc observational analysis of targeted temperature management RCT, in which treating clinician made decision on when to perform angiogram rather than randomising process. 2nd trial had been RCT comparing accelerated transfer to specialised postcardiac arrest centre for early angiography against transfer to closest geographic center, in which treating clinician had sole discretion over whether to perform angiography in this group (5).

It is concerning that fourteen out of eighteen studied cases in control group underwent angiography, with median delay of 132 minutes between arrest and angiogram, compared to median delay of one hundred minutes in early angiography group. Given that this research compares early angiography in specialised cardiac arrest centre to early angiography at geographically closest hospital to arrest, which does not reflect our comparator of interest, we made decision to exclude it (6).

While it has been still conceivable that some subgroups of studied cases without ST elevation would benefit from early angiography, we regrettably lacked the trial-level data necessary to carry out several of the preplanned subgroup analyses. Comparison of early angiography with delayed or no angiography in sizable ongoing RCTs should help to define these subgroups of interest & provide more clarity more precisely to better guide treatment decisions. early angiography technique can be beneficial for OHCA studied cases who have clinical history of prior chest pain, non-ST elevation ECG alterations, echocardiographic results showing new regional wall motion abnormalities, & high troponin levels. Noncomatose studied cases, who have better prognosis than comatose studied cases & who will be evaluated in future DISCO-NO-COMA trial, are another OHCA cohort that has not been included in any of published RCTs. Early angiography can prevent progressive myocardial injury that causes rearrest in noncomatose population, whereas in comatose studied cases, who frequently pass away from neurologic injury or discontinuation of life-supporting treatments because of expected poor prognosis, & whose prognosis cannot change with coronary revascularization (7).

Since Coronary Angiography after Cardiac Arrest without ST-Segment Elevation without ST-Segment Elevation trial outcomes were released in 2019, most worldwide guidelines about cardiopulmonary resuscitation have deemphasized importance of early angiography after OHCA in studied cases without ST elevation during ROSC. most current RCT outcomes, nevertheless, weren't yet available

when those guidelines had been being created. To balance potential benefits, harms, values, preferences, & costs when developing clinical recommendations for angiography strategies for studied cases after OHCA without ST elevation, this systematic review & meta-analysis will provide more specificity & stronger conclusions (8).

1 of main reasons for death worldwide is out-of-hospital cardiac arrest(OHCA). Based on estimates, there have been about 395,000 adults who get OHCA each year in United States, and with six to ten percent survival rate, there are about 350,000 fatalities annually. general prognosis is still quite bad despite ongoing improvements in postarrest treatment & resuscitation technology. rate of survival until discharge with good neurologic function ranges from 0.8 percent to twenty percent, with significant regional heterogeneity, even between studied cases who recover return of spontaneous circulation & have been admitted to hospital. Up to seventy percent of studied cases with OHCA had their coronary artery disease diagnosed after ROSC (9).

Therefore, it is recommended that all studied cases ought to be given the option of urgent coronary angiography & percutaneous coronary intervention after OHCA. All successfully revived studied cases with OHCA who have ST-segment elevation on prearrest or postarrest electrocardiograms & estimated reasonable neurologic prognosis are strongly advised to undergo emergency CAG, according to current recommendations. However, because studies on this subject have varied designs & outcomes, it is less obvious if quick CAG in studied cases without STE on post- ROSC ECGs will be beneficial. As result, it can be difficult to provide recommendations on whether & when to perform CAG on these studied cases. Despite this, this topic is nonetheless crucial because these studied cases frequently require complex decisions & high resource usage (10).

Between hardest studied cases for critical care & interventional cardiologists to treat are those who have OHCA without shockable rhythm & without STE on post-ROSC ECGs. With few alternatives, early CAG & PCI are long accepted as therapies that lead to better results. Recent RCTs & meta-analyses, nevertheless, debunk these presumptions & show that routine early CAG technique has identical short- & long- term effects to delayed or selective CAG strategy & is not advantageous (11).

Finding studied cases with OHCA who will ever benefit from CAG in coming decade will be problem for critical care team. strategy should consider likelihood that acute coronary lesion caused studied case's OHCA as well as studied case's neurologic, cardiac, & systemic conditions at time of presentation. multidisciplinary team should also be involved to closely coordinate which interventions are most likely to be beneficial to studied case (12).

Even in individuals lacking ST-segment elevation on post-resuscitation ECG, acute coronary syndrome has been frequent reason for out-of-hospital cardiac arrest (OHCA). Clinical outcomes for studied cases who have been revived are poor, with short-term mortality rates above fifty percent and an increased risk of survivorship-related long- term neurological disability. studied cases with treatable acute coronary pathology might profit from early coronary angiography.

These advantages could include smaller infarct size, as well as avoidance of cardiac failure, hemodynamic worsening, or malignant arrhythmias. On other hand, early coronary angiography may be linked to procedural issues & delay in ultimate diagnosis & subsequent therapy for OHCA causes other than ACS (13).

Prior recommendations have called for early coronary angiography in OHCA studied cases with suspected cardiac causes but without ST-segment elevation. After publication of COACT research, 1st significant RCT in this area, which found no variations among early & delayed/selective approach with respect to all-cause mortality or other endpoints, anticipated potential benefit has come under increased scrutiny. COACT, on the other hand, exclusively accepted individuals with shockable arrest rhythms. This meta-analysis now offers strong evidence that delayed & selective coronary angiography has been reasonable approach in hemodynamically stable studied cases that allows for thorough evaluation of studied cases such as assessment of neurological prognosis, along with PEARL & TOMAHAWK, both of which included OHCA studied cases with nonshockable rhythms (23.5percent & fifty one percent, respectively). To consider results of COACT study, recent update to European guidelines already revised advice from consideration of early CAG to consideration of delayed/selective strategy (level of recommendation class IIa, level of evidence B). These suggestions could be improved by PEARL, TOMAHAWK, & appropriate meta-analyses (14).

Possible causes of nonsuperiority of early invasive approach contain: (1) Only around one-third of studied cases participating in included trials had acute culprit coronary lesions. Although no significant harm had been shown in this meta-analysis with respect to bleeding or essential for renal replacement therapy, studied cases without acute coronary trigger of OHCA do not benefit from coronary catheterization & might suffer harm because of periprocedural problems like bleeding, stroke, contrast nephropathy, & others. Further research is required to determine whether individuals benefit from early revascularization even when they have manageable acute coronary lesion (2) Diagnosis & therapy may be delayed in individuals with OHCA reasons other than ACS, which could have severe impact on prognosis (3) In OHCA studied cases, tragic neurological rather than cardiac results frequently account for majority of deaths (15).

Notably, mortality varied significantly among big studies TOMAHAWK & COACT. This is likely due to COACT trial's requirement that studied cases have shockable rhythm to participate, which is linked to increased survival in OHCA. There had been no differences in incidence of bleeding or need for renal replacement therapy among treatment arms, therefore there had been no safety issues with early invasive strategy regarding these objectives. This COACT research found decreased incidence of acute renal failure requiring renal replacement therapy. Once more, this might be because studied cases with shockable arrest rhythms were included. Given that trials had been carried out in various healthcare systems, different cause could be variances in indication for undertaking renal replacement therapy. Because serious bleeding was defined differently in each study, these findings ought to be evaluated with care (16).

Comparable major conclusions were reached by various meta-analyses addressing timing of CAG in OHCA survivors. But these also included randomised, retrospective, & observational trials. Now, analysis presents information that is solely based on randomised data. subject of present analysis is addressed by number of ongoing RCTs, including studies that involve both comatose & non-comatose OHCA survivors (DISCO & COUPE) as well as non-comatose studied cases only (DISCO- noCOMA). Yet, despite consistency of reported RCT findings & current meta-analysis, early coronary angiography is not advised for individuals with OHCA who do not have ST-segment elevation (17).

References

1. Lemkes, J. S., Janssens, G. N., van der Hoeven, N. W., Jewbali, L. S., Dubois, E. A., Meuwissen, M., et al. (2019). Coronary angiography after cardiac arrest without ST-segment elevation. *New England Journal of Medicine*, 380(15), 1397- 1407.
2. Lemkes, J. S., Janssens, G. N., van der Hoeven, N. W., Jewbali, L. S., Dubois, E. A., Meuwissen, M. M., et al. (2020). Coronary angiography after cardiac arrest without ST segment elevation: one-year outcomes of the COACT randomized clinical trial. *JAMA cardiology*, 5(12), 1358-1365.
3. Choi, K. H., Dai, N., Li, Y., Kim, J., Shin, D., Lee, S. H., et al. (2021). Functional coronary angiography-derived index of microcirculatory resistance in patients with ST-segment elevation myocardial infarction. *Cardiovascular Interventions*, 14(15), 1670-1684.
4. Spoormans, E. M., Lemkes, J. S., Janssens, G. N., Van Der Hoeven, N. W., Bonnes, J. L., van Royen, N. (2020). The role of coronary angiography in out-of-hospital cardiac arrest patients in the absence of ST-segment elevation: A literature review. *Netherlands Heart Journal*, 28(Suppl 1), 108-114.
5. Viana-Tejedor, A., Andrea-Riba, R., Scardino, C., Ariza-Solé, A., Bañeras, J., García-García, C., et al. (2022). Coronary angiography in patients without ST-segment elevation following out-of-hospital cardiac arrest. *Revista Española de Cardiología (English Edition)*.
6. Thiele, H., Desch, S., Freund, A. (2022). Out-of-hospital cardiac arrest without ST-segment elevation: an alternative focus on priorities?. *European Heart Journal*.
7. Spoormans, E. M., Lemkes, J. S., Janssens, G. N., van der Hoeven, N. W., Jewbali, L. S., Dubois, E. A., et al. (2021). Sex differences in patients with out- of-hospital cardiac arrest without ST-segment elevation: A COACT trial substudy. *Resuscitation*, 158, 14-22.
8. Lemkes, J. S., Spoormans, E. M., Demirkiran, A., Leutscher, S., Janssens, G. N., van der Hoeven, N. W., et al. (2021). The effect of immediate coronary angiography after cardiac arrest without ST-segment elevation on left ventricular function. A sub-study of the COACT randomised trial. *Resuscitation*, 164, 93- 100.
9. Spoormans, E. M., Lemkes, J. S., Janssens, G. N., Sultana, O., van der Hoeven, N. W., Jewbali, L. S., et al. (2022). Ischaemic electrocardiogram patterns and its association with survival in out-of-hospital cardiac arrest patients without ST-segment elevation myocardial infarction: a COACT trials' post-hoc subgroup analysis. *European Heart Journal: Acute Cardiovascular*

- Care, 11(7), 535-543.
10. Arslan, F., Bongartz, L., Ten Berg, J. M., Jukema, J. W., Appelman, Y., Liem, A. H., et al. (2018). 2017 ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: comments from the Dutch ACS working group. *Netherlands Heart Journal*, 26, 417-421.
 11. Chu, C. H., Shih, H. M., Yu, S. H., Chang, S. S., Sie, J. S., Huang, F. W., et al. (2022). Risk factors for sudden cardiac arrest in patients with ST-segment elevation myocardial infarction: a retrospective cohort study. *BMC Emergency Medicine*, 22(1), 169.
 12. Kern, K. B., Radsel, P., Jentzer, J. C., Seder, D. B., Lee, K. S., Lotun, K., et al. (2020). Randomized pilot clinical trial of early coronary angiography versus no early coronary angiography after cardiac arrest without ST-segment elevation: the PEARL study. *Circulation*, 142(21), 2002-2012.
 13. Malta Hansen, C., Wang, T. Y., Chen, A. Y., Chiswell, K., Bhatt, D. L., Enriquez, J. R., et al. (2018). Contemporary patterns of early coronary angiography use in patients with non-ST-segment elevation myocardial infarction in the United States: insights from the National Cardiovascular Data Registry Acute Coronary Treatment and Intervention Outcomes Network Registry. *JACC: Cardiovascular Interventions*, 11(4), 369-380.
 14. Bascom, K. E., Dziodzio, J., Vasaiwala, S., Mooney, M., Patel, N., McPherson, J., et al. (2018). Derivation and validation of the CREST model for very early prediction of circulatory etiology death in patients without ST-segment-elevation myocardial infarction after cardiac arrest. *Circulation*, 137(3), 273-282.
 15. Lee, S. H., Lee, S. R., Rhee, K. S., Chae, J. K., Kim, W. H. (2019). Usefulness of myocardial longitudinal strain in prediction of heart failure in patients with successfully reperfused anterior wall ST-segment elevation myocardial infarction. *Korean Circulation Journal*, 49(10), 960-972.
 16. Fisher, M. B., Messerli, A., Wayne Jr, T. F. (2018). Characteristics, management, and results of out-of-hospital cardiac arrest (OHCA) with or without ST-segment elevation myocardial infarction (STEMI). *Angiology*, 69(3), 189-191.
 17. Song, H., Kim, H. J., Park, K. N., Kim, S. H., Kim, W. Y., Lee, B. K., et al. (2021). Which out-of-hospital cardiac arrest patients without ST-segment elevation benefit from early coronary angiography? Results from the Korean hypothermia network prospective registry. *Journal of Clinical Medicine*, 10(3), 439.