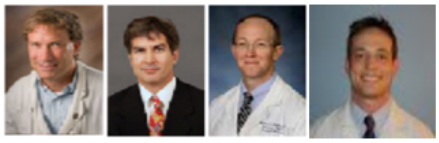
critical care perspectives in emergency medicine



The TOMAHAWK Study

Key Article

Desch S, et al. Angiography after Out-of-Hospital Cardiac Arrest without ST-segment Elevation. N Engl J Med. 2021. Published online August 29, 2021.

Background

- Despite advances in resuscitation, the prognosis for patients with OHCA remains poor.
- Even in patients who achieve ROSC, mortality is almost 70%.
- Acute coronary syndrome accounts for up to 60% of causes in patients who have a suspected cardiac etiology for their OHCA.
- In patients with an MI, early revascularization may preserve ventricular function and prevent downstream effects such as CHF or arrhythmias.
- The benefits of immediate cath and revascularization have been demonstrated for patients with OHCA and a STEMI on their post-resuscitation ECG. Unfortunately, this is a smaller cohort of patients.
- Coronary angiography is not without procedural risks. In addition, this may delay other critical interventions and identifying the etiology of OHCA.
- The majority of patients with ROSC from OHCA have a non-diagnostic ECG without evidence of ST-segment elevation.
- The COACT Trial evaluated a strategy of immediate cath vs. delayed cath in OHCA patients without ST-segment elevation and found no benefit to immediate cath. However, the COACT trial enrolled only patients with a shockable rhythm and had an overall low incidence of acute coronary thrombus at the time of cath.
- Evidence regarding the timing of cardiac cath in OHCA patients without ST-segment elevation for both shockable and nonshockable rhythms is still limited.

Objective

- To determine whether OHCA patients with ROSC but without ST-segment elevation benefit from immediate coronary angiography for treating or ruling out acute coronary events.

Study

- Investigator-initiated, randomized, multicenter, open-label trial
- Conducted in 31 centers in Germany and Denmark
- Patients
    - Included
        - At least 30 years of age
        - Resuscitated from OHCA of possible cardiac origin
        - Shockable or nonshockable rhythm
        - No ST-segment elevation on ECG
    - Excluded
        - STEMI

        - Severe hemodynamic or electrical instability
        - Non-cardiac cause
        - In-hospital cardiac arrest
        - Pregnancy
- Randomization – patients randomized 1:1 to either immediate coronary angiography or delayed coronary angiography
- Interventions
    - Immediate Coronary Angiography
        - Transferred to the cath lab as soon as possible after hospital admission
    - Delayed Coronary Angiography
        - First transferred to the ICU for further treatment and evaluation of the etiology of OHCA
        - Could proceed to cath after a minimum delay of 24 hours depending on the results of further testing and treatment
        - Cath within 24 hours in this group was permitted for:
            - Substantial increase in troponin
            - Electrical instability
            - Cardiogenic shock
            - New ST-segment elevation
    - Revascularization attempted in both groups if at least 1 major coronary artery had disease deemed clinically relevant by the operator
- Primary Outcome
    - 30-day all-cause mortality
- Secondary Outcomes
    - MI at 30 days
    - Severe neurologic deficit (CPC 3 to 5) at 30 days
    - ICU LOS
    - Rehospitalization within 30 days for CHF
    - Moderate or severe bleeding
    - Stroke
    - AKI leading to RRT
- Pre-specified Subgroups
    - Age (> 65 years and < 65 years)
    - TTM (yes or no)
    - Shockable vs. nonshockable
    - Time from OHCA to ROSC (< 15 min vs. > 15 min)

Results

- Total of 558 patients eligible for randomization; 554 ultimately included in the trial
    - Immediate Coronary Angiography: 281 patients
    - Delayed Coronary Angiography: 273 patients
- Patient characteristics well balanced
    - Median age 70 years
    - 30% were female
    - Median time from OHCA to ROSC was 15 min
    - 56% had a shockable rhythm
- Interventions

    - Immediate Coronary Angiography
        - Performed in 96% of patients
        - Median time from arrest to cath: 2.9 hrs
        - Prevalence of CAD was 61%
        - One or more coronary lesions considered responsible in 38%
        - Revascularization occurred in 40%
        - 78% received TTM
    - Delayed Coronary Angiography
        - Performed in 62% of patients
        - Median time from arrest to cath: 46.9 hours
        - Prevalence of CAD was 72%
        - One or more coronary lesions considered responsible in 40%
        - Revascularization occurred in 43%
        - 79% received TTM
- Primary Outcome (30-day all-cause mortality)
    - Immediate Coronary Angiography: 54%
    - Delayed Coronary Angiography: 46%
    - Hazard Ratio: 1.28
    - 95% CI 1.00 to 1.63
    - p=0.06
- Secondary Outcomes
    - No difference in MI at 30-days, severe neurologic deficit at 30-days, ICU LOS, rehospitalization for CHF at 30-days, need for RRT, CVA, or bleeding.
    - A composite outcome of all-cause mortality or severe neurologic deficit favored delayed coronary angiography

Limitations

- Open-label: physicians/ICU staff were aware of treatment allocation which may have influenced further treatment
- Excluded in-hospital cardiac arrest and those with ST-segment elevation, electrical, or hemodynamic instability
- 22 patients randomized to delayed coronary angiography got a cath under 24 hours despite no protocol indication

Take Home Points

- Among OHCA patients with ROSC and no evidence of ST-segment elevation on ECG there was no benefit to immediate coronary angiography compared with delayed angiography after ICU admission.