



Conservative or Liberal Oxygen after Cardiac Arrest?

Key Article

- *Conservative Oxygen for Unresponsive Patients after Cardiac Arrest. The LOGICAL Investigators and the Australian and New Zealand Intensive Care Society Clinical Trials Group. N Engl J Med. 2026; 395:571-81.*

Background

- Brain damage and death from ischemic encephalopathy is common after cardiac arrest.
- Brain injury can result from both oxygen deprivation during the arrest and from the reperfusion injury after ROSC.
- Animal studies and limited observational studies suggest that high oxygen exposure after ROSC may result in neuronal death.
- As such, it is hypothesized that limiting oxygen exposure (conservative oxygen) may attenuate reperfusion injury and improve outcomes.
- At present, analyses from 2 trials in patients with cardiac arrest in the ICU suggested a benefit with conservative oxygen therapy. In contrast, a trial of cardiac arrest patients in Denmark showed no difference in outcomes between conservative and liberal oxygen strategies (the BOX trial).
- Given the mixed results in the current literature, the Low Oxygen Intervention for Cardiac Arrest Injury Limitation (LOGICAL) trial was performed...

Objective

- To test the hypothesis that conservative oxygen therapy improves survival with favorable functional outcome at 180 days compared with liberal oxygen therapy in adult patients following cardiac arrest admitted to the ICU and suspected to have ischemic encephalopathy.

Methods

- Investigator-initiated, open-label, parallel-group, assessor-blinded, RCT
- 53 ICUs in Australia, New Zealand, and Ireland
- Patients - Included
 - Adults greater than 18 years of age
 - Receiving mechanical ventilation in the ICU after cardiac arrest
 - Suspected to have ischemic encephalopathy (unable to follow verbal commands)
- Patients – Excluded
 - Death deemed to be imminent and inevitable
 - Patients in whom enrollment was not considered in their best interest
- Randomization
 - Enrollment was required within the first 12 hours from meeting eligibility
 - 1:1 to Conservative Oxygen Therapy or Liberal Oxygen Therapy
 - In both groups, the acceptable lower limit for SpO₂ was 90%
 - Conservative Oxygen Therapy Group

- FiO2 was decreased to 0.21 and supplemental O2 was DC'd in patients who had been extubated if the SpO2 was > 90%
 - Upper limit of SpO2 set to 95%
 - Liberal Oxygen Therapy Group
 - No specific measures limiting the upper SpO2, but the minimum FiO2 permitted during mechanical ventilation was 0.3
 - Other treatments were at the discretion of the treating clinician (though reducing PEEP to meet oxygen targets was discouraged)
- Primary Outcome
 - Favorable functional outcome measured with the Extended Glasgow Outcome Scale (GOS-E) at 180 days
- Secondary Outcomes
 - All-cause and cause-specific mortality at day 180
 - Duration of survival to final follow up
 - Quality of life at day 180
 - Duration of mechanical ventilation
 - ICU and hospital LOS
 - Discharge to home
- Prespecified subgroups
 - Location of cardiac arrest (OHCA vs. IHCA)
 - Initial rhythm
 - Cause of cardiac arrest (medical, trauma, etc.)

Results

- 1,840 patients were enrolled
 - Conservative Oxygen Therapy Group: 882 patients
 - Liberal Oxygen Therapy Group: 958 patients
- Baseline characteristics
 - Similar in the two groups
 - Mean age: 60 years
 - Men: 71%, Women: 29%
 - OHCA: 74%
 - Witnessed: 79%
 - Bystander CPR: 78%
 - Shockable rhythm: 51%
 - Median time from ROSC to randomization: 7 hours

- Interventions

Table 2. Metrics of Oxygen Exposure.*				
Variable	Conservative Oxygen (N=873)	Liberal Oxygen (N=948)	Between-Group Difference†	Relative Risk (95% CI)‡
Measures of exposure to high arterial oxygen				
Median percentage of hours per patient with SpO ₂ ≥97% (IQR)	21.2 (8.9 to 43.8)	53.0 (29.5 to 75.1)	-31.9 (-35.6 to -28.1)	
Median no. of hours per patient with SpO ₂ ≥97% (IQR)	16 (5 to 34)	37 (16 to 70)	-21.0 (-23.5 to -18.5)	
At least one Pao ₂ recording >100 mm Hg — no. (%)	504 (57.7)	743 (78.4)		0.74 (0.68 to 0.80)
Measures of exposure to low arterial oxygen				
Median percentage of hours per patient with SpO ₂ <88% (IQR)	0 (0 to 1.19)	0 (0 to 0.58)	0 (0 to 0)	
Median no. of hours per patient with SpO ₂ <88% (IQR)	0 (0 to 1)	0 (0 to 1)	0 (0 to 0)	
At least one Pao ₂ recording <60 mm Hg — no. (%)	379 (43.4)	261 (27.5)		1.57 (1.39 to 1.78)
Measures of time spent breathing ambient air				
Median percentage of hours per patient with FiO ₂ =0.21 (IQR)	38.8 (6.8 to 76.1)	0.0 (0 to 4.9)	38.9 (32.5 to 45.2)	
Median no. of hours per patient with FiO ₂ =0.21 (IQR)	23 (5 to 56)	0 (0 to 4)	23.0 (17.9 to 28.1)	

- Protocol Deviations

- Conservative Oxygen Therapy Group: 26.3% (failure to reduce the FiO₂ when the SpO₂ was 95% or higher and the FiO₂ was more than 0.21)
- Liberal Oxygen Therapy Group: 8.4% (an FiO₂ less than 0.3 used during mechanical ventilation)

- Primary Outcome

- Conservative Oxygen Therapy Group: 38.2%
- Liberal Oxygen Therapy Group: 39.7%
- CI: 0.87 to 1.09; p=0.65

- Secondary Outcomes

- No differences between the groups in any of the secondary outcomes

- Safety Outcomes

- No adverse events were reported

Limitations Identified by Authors

- Clinicians and staff aware of patient assignments
- More patients assigned to the Liberal Oxygen Therapy Group
- Significant number of protocol deviations in the Conservative Oxygen Therapy Group
- The between group separation in daily oxygen exposure was modest at best
- Median time from ROSC to randomization was 7 hours - a bit long compared with other studies; time from randomization to initiation of oxygen therapy intervention not reported
- Conducted in Australia, New Zealand, and Ireland – generalizability?

Take Home Point

- Conservative oxygen therapy did not improve functional outcome at 180 days in adult ICU patients who remained unresponsive after a cardiac arrest.