Neurologic outcomes in cardiac surgery patients

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Can Heart Surgery Change a Person's Personality?

—via e-mail

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**James L. Rudolph**, acting clinical chief of the division of aging at Brigham and Women's Hospital, provides an answer:

To date, no study has adequately examined whether heart surgery can change a person's personality, mainly because personality is difficult to define and measure. When recovering from heart surgery, some patients report trouble remembering, slower mental processing and difficulty focusing. Although this condition, often referred to as “pumphead,” is usually short-lived, one study of bypass patients has suggested that the associated cognitive changes might worsen over time. Related research, however, indicates it is unlikely that cardiac surgery significantly alters how the brain works.

*JAMIE CARROLL iStockphoto*
What is the incidence of neurological dysfunction after cardiac surgery?

- Stroke: 1-3%
- Delirium 13-73%
- Cognitive dysfunction: 15-75%
Neurocognitive dysfunction

Trail Making Test - Baseline

Trail Making Test - Deficit
Cognitive dysfunction

Cerebral injury and cardiac surgery: interaction between patient and environment

“Controlled Trauma”

OP environment

Systemic response

Inflammation
Thrombosis
Oxidative Stress
Neuroendocrine response
Endothelial activation

Variability in Incidence/degree of cerebral deficit

PHENOTYPE

Normal Outcome

Stroke

GENOTYPE

Patient

Gene A
Gene B
Gene C
Gene N

Comorbidity
Gender
Age

CPB and DHCA
Hypothermia

Anesthesia

Surgical Stress

Pharmacological intervention

Variability in Incidence/degree of cerebral deficit

Cognitive deficit

Gene C
Gene B
Gene A
Gene N
Project

RANDOMIZED, PROSPECTIVE CLINICAL STUDY AIMING TO ASSESS THE IMPACT OF CEREBRAL MONITORING GUIDED THERAPY ON CEREBRAL OUTCOMES AFTER CARDIAC SURGERY
Hypothesis

Does “cerebral monitoring guided” management improve postoperative neurological outcome?

(Stroke, cognitive function etc.)
Population

Cardiac surgery patients undergoing cardiopulmonary bypass with cardioplegic arrest (CABG, valves, CABG + valves)
Intervention

“Cerebral monitor” - guided management (versus blinded monitoring only)
Cerebral oximetry
Outcomes

- Neurocognitive testing
- Neurologic testing
- Metabolic profiling (cross-brain, using retrograde, transvenous jugular bulb catheter and arterial line)
  - Targeted mass spectrometry-based profiling to assess relation between the metabolite factors and cerebral outcomes after cardiac surgery.
  - Risk stratification of cardiac surgery patients and elucidation of novel biochemical pathways that mediate risk.
Protocol

- Maintain rSO2 values at or above 75% of the baseline
- Check patient’s head position
- Target CO2 was 40 mm Hg, target MAP >60 mm Hg
- Maintain cerebral perfusion pressure >50 mm Hg
- Target pump flow 2.5 L/m2/min
- If rSO2 persistent below treatment threshold: FiO2 was increased, pulsatile perfusion was initiated, or propofol 50–100 mg bolus was administered
- If Hct was below 20% red blood cell transfusion was administered
## Data collection timepoints

<table>
<thead>
<tr>
<th>BASELINE – pre anesthesia</th>
<th>INTRA-OP</th>
<th>POD 1</th>
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<tbody>
<tr>
<td>• Cerebral oxymetry</td>
<td>• Pre incision/CPB/post CBP</td>
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<tr>
<td>• Computer based (Neurocognitive)</td>
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<td>• Cerebral oxymetry</td>
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<td>• Psychometric (Neurocognitive)</td>
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<td>• Battery cognitive test (Neurocognitive)</td>
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<tr>
<td>• Neurologic tests</td>
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<td>• Arterial (Radial) vs. Venous (IJ)</td>
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TIMELINE FOR OUTCOME ASSESSMENT

- **Neurologic and neurocognitive testing**
- **Cerebral oximetry**
- **Metabolomic profiling (cross-brain)**

PERIOPERATIVE

- BASELINE
- PRE-INCISION
- CPB (x3)

POSTOPERATIVE

- Discharge
- 6 weeks