

SCA 8

ROUTINE CEREBRAL OXYGEN MONITORING FAILS TO IMPROVE NEUROLOGICAL OUTCOME IN CARDIAC SURGERY

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Introduction: Near-infrared spectroscopy has been used for monitoring of regional cerebral oxygen saturation (rSO₂). It is proposed that a decrease in rSO₂ during cardiac surgery is associated with an increase in cerebral complications. We calculated the rate of severe neurological sequelae, defined as transient ischemic attack (TIA) or permanent stroke, in 260 consecutive cardiac operations (control group) and in an additional 170 consecutive patients (study group) who were monitored with rSO₂ perioperatively.

Methods: The INVOS 4100 sensor (Somanetics Corp., Troy, MI) was applied bilaterally to the patient's forehead prior to induction of anesthesia. rSO₂ (lowest value of the two numbers: left and right side) was recorded at baseline, immediately prior to CPB, post separation from CPB, and at the end of the case. Also, individual nadirs of rSO₂ during the entire case were recorded, and the total duration of rSO₂ <50% was measured in each patient. No specific protocol was followed consistently to guide treatment of significant decreases in rSO₂ (index <50%, or a >25% decline from baseline). Frequently, however, responses to such declines included increasing PaCO₂, blood transfusion if the hemoglobin concentration was <8 gms/liter, or increasing pump flow. Any severe postoperative neurological complication during the hospital stay was recorded, as was in-hospital mortality, and time from surgery to discharge was calculated.

Results: The rSO₂ data are presented in Table I. The data did not indicate any significant differences in the rSO₂ pattern between those who suffered severe cerebral complications and those who did not. There were two permanent strokes and one TIA in the control group and two TIA's in the monitored group. This difference was not significant. In-hospital mortality rate and time from surgery to discharge also did not differ significantly (Table II).

Discussion: The addition of routine use of cerebral oxygen monitoring for cardiac surgery was not found to decrease the incidence of severe neurological complication, death, or days from surgery to discharge. Comparison of rSO₂ values in patients with and without postoperative neurological complication did not reveal any differences at four time points, nadir values, or duration of rSO₂ below 50%. Therefore, although there may be subtle or rare differences in neurological outcome not detected in this study, and therapeutic maneuvers may have reversed negative rSO₂ trends in some patients, we found no large benefit of routine cerebral oxygen monitoring to justify its significant cost.

Table I

Neuro comp	Baseline rSO ₂	On-CPB rSO ₂	Off-CPB rSO ₂	End rSO ₂	Nadir rSO ₂	Duration <50%, mins
No (n=168)	59 ± 7.7	56 ± 7.2	54 ± 6.6	56 ± 6.2	46 ± 11.7	0 (0-143) median (range)
Yes (n=2)	62 ± 11.2	58 ± 12.2	62 ± 11.2	62 ± 11.2	50 ± 10.9	0 (0-3)
Significance	NS	NS	NS	NS	NS	NS

rSO₂ index values (mean ± SD) in patients without and with neurological complication in the monitored group.

Table II

	Neurological complication	Mortality rate	Surgery to discharge (days)
Control group (n=260)	1.2%	4.1%	8.2 ± 7.3
Monitored group (n=170)	1.2%	4.1%	7.8 ± 8.1
Significance	NS	NS	NS

Outcomes in patients who were not monitored with rSO₂, and in patients who were monitored.