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Room Area P

Risk of Post-Op Complications below Different Cerebral Oxygenation Thresholds during Aortic Surgery

Gregory W. Fischer, M.D., Hung-Mo Lin, Ph.D., Gabriele DiLuozzo, M.D., Randall B. Griepp, M.D., David L. Reich, M.D.

Anesthesiology, Mount Sinai School of Medicine, New York, New York

Introduction: Currently only limited information exists exploring the relationship between brain oxygenation levels during aortic surgery and post-operative outcomes (1). The FORE-SIGHT® (CAS Medical Systems, Branford CT USA) cerebral oximeter measures absolute cerebral tissue oxygen saturation (SctO₂) values. We hypothesized that a relationship exists between decreased intraoperative SctO₂ values and post-operative complications following aortic surgery.

Methods: With IRB approval and informed consent, patients undergoing elective thoracic aortic surgery with deep hypothermic circulatory arrest (DHCA) were monitored intraoperatively using the FORE-SIGHT. Two sensors were placed on the subject's forehead bilaterally with SctO₂ values recorded every 2 seconds starting after induction of anesthesia until the end of surgery. SctO₂ minutes spent beneath the absolute threshold of 55, 60, & 65% were computed for left & right sensors whereas the sensor that recorded the longest time under a given threshold was entered into the analysis. Complications were categorized as "major" (death, stroke, depressed LV function, respiratory failure, sepsis, delirium, renal failure, GI complications, or severe volume overload) and "minor" (atrial fibrillation, minor volume overload, phlebitis, or none). Exact logistic regression analysis was used to model the relationship between exposure time of SctO₂ beneath 55, 60, and 65%, respectively and the risk for developing a major complication.

Results: Demographics: 30 subjects; Gender 22M/8F; Race 25W/1AA/3HS/1IN; Post-induction SctO₂ was 70.6% (SD 5.1). The result shows a significant association (P=0.034, 0.004, & 0.009) between exposure time beneath SctO₂ thresholds of 55, 60, and 65%, respectively. Figure 1 shows the odds ratios for increment of exposure time under each SctO₂ threshold. An odds ratio of 1.5 or 50% increase in odds for the development of complications corresponds to 9.3, 16.2, and 33.8 minutes increase of exposure time below SctO₂ thresholds of 55, 60, and 65%. An odds ratio of 2.0 or 100% increase in odds for complications corresponds to 15.9, 27.2, and 57.8 minutes increase in exposure time beneath SctO₂ thresholds of 55, 60, and 65%. It appears for every SctO₂ threshold decrease of 5%, the increment exposure time for a given odds ratio decreases by approximately a factor of two for SctO₂ thresholds 55 to 65%.

Discussion: Despite the low number of subjects enrolled in this study, decreased SctO₂ values and prolonged DHCA times were found to be associated with major complications. The results also demonstrate that absolute cerebral oximetry thresholds are not a function of SctO₂ alone, but both SctO₂ and time exposure spent below a given threshold.

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1) Reich et al, Eur J Cardiothorac Surg. 2004 Mar;25(3):401-6.[figure1]

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Figure 1

Figure 1: Logistic Odds Ratio: Time below SctO2 threshold and Post-Op Complications



