

FORE-SIGHT®: First to Detect Cerebral Malperfusion During Peripheral Bypass

Jonathan D. Leff, M.D. - Chief of Cardiothoracic Anesthesiology, Director of Cardiothoracic Anesthesia Fellowship and Associate Professor of Clinical Anesthesiology, Montefiore Medical Center, Bronx, NY

The use of cerebral oximetry to detect potentially devastating cerebral desaturation is well established. We describe a case in which the FORE-SIGHT (CAS Medical Systems, Inc., Branford, CT) cerebral oximeter was the first monitor to detect dangerous cerebral hypoxia during peripheral bypass. A 45 year-old female with a history of hypertension and morbid obesity (BMI of 41) had undergone multiple neck surgeries including thyroidectomy and a healed tracheostomy. Her otolaryngologist determined that her tracheal stenosis had worsened. Previous attempts to secure her airway with tracheostomy were unsuccessful secondary to distorted neck anatomy and difficult positioning because of dyspnea while supine. Fiberoptic bronchoscopy revealed tracheal narrowing that precluded general anesthesia with endotracheal intubation. Consensus was that femoral bypass would provide the safest approach for tracheostomy. In the operating room, the cardiothoracic surgeon secured a femoral venous and an arterial cannula via cut-down. The patient was monitored with standard ASA

monitors, an arterial catheter, and the FORE-SIGHT cerebral oximeter. After induction of general anesthesia, a perfusionist initiated peripheral bypass with appropriate arterial flow and a mean arterial pressure of 80mmHg. The arterial oxygen saturation (SaO₂) registered 100% on the bypass machine. Three minutes after initiation of bypass, the cerebral oximeter precipitously dropped from the initial value of 72 to 30 on both the left and right cerebral channels (Figure 1). The team immediately verified the cannulation sites and pump flows. Approximately 2 minutes after cerebral desaturation appeared, the left digital pulse oximeter revealed desaturation from 100% to 50%. Face mask ventilation with 100% oxygen was initiated and both cerebral saturation and SpO₂ returned to acceptable values. The tracheostomy was successfully completed using face mask ventilation without the use of peripheral bypass.

This case highlights a potential complication that may occur during peripheral bypass. During femoral artery and vein cannulation, the upper

body and cerebral circulation undergo retrograde perfusion. If the drainage through the venous femoral line is inadequate and cardiac output is high, antegrade (deoxygenated) flow competes with retrograde (oxygenated) flow. The perfusionist was measuring SaO₂ at a lower extremity cannulation site and was unaware that arterial desaturation was occurring in the upper body. The FORE-SIGHT monitor allowed for rapid detection of this problem, providing time for the team to troubleshoot the situation and to take appropriate action, avoiding a serious, permanent injury from unrecognized cerebral hypoxia. The cerebral oximeter was the first monitor to detect an abnormality in cerebral oxygenation and should be used in every case where cerebral perfusion is potentially compromised. Our patient underwent this high-risk procedure and recovered without neurologic deficit. In our practice, we believe that near infrared spectroscopy often provides the earliest indication of cerebral hypoperfusion and allows us to initiate analysis and intervention in a timely manner.

