

Marcos G. Lopez, MD, MS

Vanderbilt University Medical Center, Nashville, TN

The Effects of Perioperative Oxygenation on Endothelial Function

Abstract

Ischemia-reperfusion injury is blamed for kidney and brain injury following surgery. Reperfusion with hyper-oxygenated blood induces excess reactive oxygen species (ROS) production, and ROS cause oxidative damage, which we have linked to postoperative organ injury. ROS eliminate nitric oxide and cause endothelial dysfunction. Hyperoxia also causes endothelium-mediated vasoconstriction. The Effects of Perioperative Oxygenation on Endothelial Function Study (PI: Lopez) will test the hypotheses that normoxia during cardiac surgery improves endothelial function compared to hyperoxia (Aim 1) and that endothelial dysfunction correlates with intraoperative oxidative stress (Aim 2). This study is nested within the NIH-funded Risks of Oxygen during Cardiac Surgery (ROCS) trial (PI, co-mentor Billings) and will benefit from the subject recruitment, randomized oxygenation treatment, sampling, and outcomes assessment of the ROCS trial but contains specific measurements and analyses of endothelial function. In 80 patients Dr. Lopez will measure flow-mediated dilation, peripheral artery tonometry, plasminogen activator inhibitor-1, and E-selectin at baseline and ICU admission and will directly measure endothelium-dependent vasodilation in arterioles harvested from epicardial fat at the end of surgery in the lab of David Harrison, MD, a world-renowned vascular biologist. We will compare these data within oxygenation groups and to markers of oxidative stress. Dr. Lopez is a physician-scientist BH Robbins Scholar and has assembled a mentorship committee with the expertise and commitment to facilitate his long-term objective of performing mechanism-based translational research to reduce organ injury in surgical patients.