CHRD 2024: Abstract Submission Form

Presenter Name
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Presenter Status
Masters Student

Role in the project
Write Abstract

Research Category
Basic Science

Title
Uncovering the Role of Lipids on One-Lung Ventilation During Lung Surgery in a Pediatric Porcine Animal Model

Background
Background: Lung surgery is performed in a pediatric setting to repair congenital abnormalities, trauma, and perform lung biopsy1. One-lung ventilation (OLV) facilitates surgical exposure of the affected lung and minimizes contamination of the healthy lung2. High levels of fraction of inspired oxygen (FiO2) – or hyperoxia – used to prevent hypoxemia during OLV can contribute to postoperative acute lung injury3,4. Using a pediatric surgical porcine model, our study aims to address the research gap in the impact of hyperoxia during OLV.

Objective
Hypothesis: We hypothesized that hyperoxia during OLV will increase oxidative phospholipid levels post-OLV due to oxidative stress and reactive oxygen species formation.

Methods
Methods: Ten three-month-old farm-bred pigs subjected to lung-protective ventilation (LPV) were assigned to either a hyperoxia (LPV-HO, n=5, FiO2=100%) or normoxia group (LPV-NO, n=5, FiO2≤50%). While another five pigs were exposed to injurious mechanical ventilation (IMV, n=5, FiO2≤50%). Plasma samples were collected before and after OLV to be analyzed using an LC-MS/MS lipidomic approach.

Results
Results: Our lipidomic analysis indicates a significant increase in lyzophosphatidylcholines, lysophosphatidylethanolamine, free fatty acids and phosphatidylserine in the hyperoxia group post-OLV (FC 2, p≤0.05). While in the IMV group, a significant increase in triglycerides, diacylglycerols, and linoleoyl carnitine was observed post-OLV (FC 2, p≤0.05). Based on the significant lipids in both groups, we were able to predict the top pathways associated with these changes. Interestingly, the “Inflammatory mediator regulation of TRP channels” pathway was among the top 3 enriched pathways in both groups (FDR 6.52E-06 and FDR 8.48E-11, respectively).

Conclusion
Conclusion: Lipids that significantly increased in our pediatric model of intraoperative hyperoxia are associated with regulation of inflammation, increased apoptosis, and exacerbation of oxidative stress5–8. These findings align with our lab’s data indicating increased pro-inflammatory cytokines in this porcine model. This approach allowed us to better understand the role of lipids in pediatric OLV surgery.

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