CHRD 2024: Abstract Submission Form

Presenter Name
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Presenter Status
Undergraduate Students

Role in the project
Analyze Data
Write Abstract

Research Category
Basic Science

Title
Inflammatory Effects of One-Lung Ventilation and Lung Protective Ventilation Strategies in a Porcine Animal Model

Background
Over 100,000 patients undergo lung surgery annually, the primary curative treatment for lung cancer, one of the leading causes of cancer-related deaths worldwide. During lung surgery, one-lung ventilation (OLV) deflates the operated lung while ventilating the healthy lung. Lung protective ventilation (LPV) strategies have been established to minimize ventilation-induced lung injury in adults. However, these strategies have not been deeply explored in pediatric patients, and similar benefits are presumed. Therefore, we generated a porcine animal model subjected to LPV and injurious mechanical ventilation (IMV) to assess the risks of complications post-OLV.

Objective
We hypothesize that there will be significantly higher levels of pro-inflammatory biomarkers post-OLV versus pre-OLV levels in the IMV-group compared to LPV-group.

Methods
Three-month-old farm-bred pigs, a pediatric animal model, were used and randomly assigned to LPV(n=5) and IMV(n=5) groups. Bronchoalveolar lavage fluid(BALF) and arterial plasma were collected pre- and post-OLV to capture the local and systemic inflammatory markers using the Discovery Assay panel. Thirteen cytokine were analyzed from these specimens using Metaoboanalyst6.0.

Results
We observed through heatmaps and unsupervised principal component analysis similarities in the inflammatory profiles, locally and systemically, between the LPV pre- and LPV post- groups. However, there was a distinct cluster separation between the IMV pre- and post-OLV groups locally, without any changes systemically. Next, the volcano plots identified significantly lower levels of IL-4 locally ($p<0.05$,FC 2.0), without significant systemic changes in the LPV group post-OLV compared to pre-OLV. However, we observed higher levels of IL-1α, IL-1β, IL-6, and IL-8 locally, and IL-6, systemically, in the IMV group post-OLV compared to pre-OLV levels ($p<0.05$,FC 2.0).

Conclusion
These findings suggest there is greater local and systemic inflammation associated with IMV compared to LPV. Furthermore, these cytokines may represent potential pathways to target for therapies to reduce inflammation and pulmonary complications after one-lung ventilation surgery in children and adults.

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