

EFFECTS OF HYPOXEMIA, NORMOXIA, AND MODERATE TO SEVERE HYPEROXEMIA ON BRAIN-LUNG CROSSTALK IN A FOCAL ISCHEMIC STROKE MODEL

Isadora Antunes Botelho; Giselle Carvalho de Sousa; Pedro Henrique Lima Conceição; Raquel Ferreira de Magalhães Sacramento; Maira Rezende Lima; Cynthia dos Santos Samary; Pedro Leme Silva; Patrícia Rieken Macedo Rocco;
Laboratório de Investigação Pulmonar UFRJ;
Autor principal: Isadora Antunes Botelho

Introduction: Patients with acute focal ischemic stroke (AIS) often require intensive care management, including mechanical ventilation and supplemental oxygen. Observational studies suggest a "U"-shaped relationship between PaO₂ levels and mortality in AIS, yet the mechanisms driving cerebral and pulmonary damage across different oxygen levels are not well understood. **Objective:** This study aimed to evaluate the extent of brain and lung injury following exposure to varying PaO₂ levels in an experimental model of focal AIS. **Methods:** Thirty-two male Wistar rats (CEUA 131/23) underwent focal AIS induced by thermocoagulation of pial blood vessels. After 24 hours, rats were randomly assigned to one of four groups (n=8 per group): normoxia (NORMO: PaO₂ = 80-120 mmHg), hypoxia (HYPO: PaO₂ < 80 mmHg), moderate hyperoxia (MOD: PaO₂ = 121-299 mmHg), or severe hyperoxia (SEV: PaO₂ ≥ 300 mmHg). Rats were ventilated for two hours with a positive end-expiratory pressure of 1 cmH₂O and tidal volume (VT) of 6 ml/kg. Lung function was assessed at INITIAL and FINAL of the experiment. Lungs and brains were gathered for histological analysis. **Results:** PaO₂ levels at FINAL were 95±15 mmHg in the NORMO group, 51±6 mmHg in the HYPO group, 184±52 mmHg in the MOD group, and 350±47 mmHg in the SEV group (p<0.001). Peak and plateau airway pressures increased over time across all groups (p<0.001), with no significant differences among groups. Diffuse alveolar damage (DAD) score was higher in MOD and SEV than NORMO groups (p=0.042, p=0.048; respectively). DAD score showed a positive and significative correlation with PaO₂ levels (r=0.48, p=0.005). In the brain, inflammatory infiltration in ischemic penumbra indicated blood-brain barrier dysfunction, according to PaO₂ levels. **Conclusion:** This study showed an association between lung structural changes and PaO₂ levels. In the brain, it was observed inflammatory infiltration in ischemic area according to PaO₂ levels.

Palavras-chave: Acute Focal Ischemic Stroke, Hyperoxemia, Hypoxemia, Mechanical Ventilation.