

Effects of Thermal Preconditioning on the Ischemia-Reperfusion Induced Acute Lung Injury in Minipigs

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Backgrounds: Lung ischemia-reperfusion (I/R) injury plays an important role in many clinical issues. Series of mechanism after ischemia-reperfusion has been uncovered after numerous related studies. Organ preconditioning (PC) is a process whereby a brief antecedent event, such as transient ischemia, oxidative stress, temperature change, or drug administration, bestows on an organ an early or delayed tolerance to further insults by the same or different stressors. In this study, we want to uncover the optimal thermal PC patterns which cause maximal early or delayed protective effect on the subsequent pulmonary ischemia-reperfusion, with the use of minipigs model.

Materials and Methods: Twenty-one 15-20 kgw minipigs are used and divided into three groups (seven control, seven ischemia-reperfusion and seven PC followed by ischemiareperfusion).

The PC was performed with the animals being anesthetized and, using a 40% moist air to ventilate their lungs for 15 minutes for 3 episodes, followed by I/R, which consists of 90 minutes of blocking the perfusion and ventilation of the left lung followed by 240 minutes of reperfusion. Control animals had a thoracotomy with hilar dissection only. Indicators of lung injury included hemodynamic and aerodynamic parameters, blood gas analysis, bronchoalveolar lavage fluid (BALF) cell analysis and protein concentration, histopathological (lung pathology, wet/dry (W/D) weight ratio, myeloperoxidase (MPO) assay), and molecular biological (TNF α assay, HSP70 expression by Western blot analysis).

Results: This model of lung ischemia-reperfusion induced significant lung injury with pulmonary hypertension, increased pulmonary vascular resistance, decreased pulmonary dynamic compliance and arterial hypoxemia, increased BALF total protein amount and neutrophil infiltration, tissue injury score and neutrophil infiltration, increased W/D ratio, MPO assay, TNF α assay and HSP70 expression. The thermal PC can attenuate the I/R related lung injury with most of these parameters improved significantly, including decreased TNF α assay and increased HSP70 expression.

Conclusions: The intratracheal thermal PC can effectively attenuate ischemia-reperfusion induced lung injury through various mechanisms, including the decreased TNF α assay and increased HSP70 expression.