Ex Vivo Lung Perfusion

Commonly used acronym: *EVLP*

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Organisation

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SCOPE OF THE METHOD

The Method relates to	Human health
The Method is situated in	Translational - Applied Research
Type of method	In vitro - Ex vivo
Species from which cells/tissues/organs are derived	Domestic Pig
Type of cells/tissues/organs	Pulmonary grafts / Lung

DESCRIPTION

Method keywords

ex vivo lung perfusion
pulmonary physiology
ischemia-reperfusion injury
mechanical ventilation

Scientific area keywords

Lung transplantation
organ preservation
organ assessment
organ resuscitation
organ donation
ARDS
lung injury

Method description

Ex vivo lung perfusion (EVLP) is a form of isolated lung perfusion in normothermic conditions and can be achieved with a pump-driven perfusion machine that recirculates a preservation solution through the vasculature of the lung in addition to mechanical ventilation. EVLP is based on a physiological concept using vascular resistance, airway pressure and oxygenation to assess lung function. This technology was initially developed to evaluate pulmonary donor grafts prior to transplantation and was successfully introduced in clinical practice in 2001 by *Steen et al*. Conversion rates of reassessment of questionable grafts can range up to 87%. In addition, there is also growing evidence that EVLP could serve as a potential dynamic preservation strategy in contrast to the current cold static preservation with inflated lungs. This might even potentially extend the out-of-body time and minimize ischemic injury. It is still not clear what the optimal time interval is to perform EVLP and this can range from a short assessment (with cold storage before and/or after EVLP) to a full replacement of the cold preservation time. Several groups have reported excellent outcomes on transplanted lungs of (initially rejected) donor's lungs after EVLP. Some centers reported even superior early and late outcomes regarding lung function, infection and freedom of rejection, while other trials were inconclusive. Finally, this technology can also serve as a platform to actively resuscitate or recondition lungs while metabolically active. Up to date, this approach is still mainly experimental.

Lab equipment

Centrifugal pump ;
Oxygenator ;
Flow probe ;
Organ chamber ;
Ventilator ;
Tubing ;
Heater system ;
Clinical monitoring equipment (intensive care).

Method status

Published in peer reviewed journal

PROS, CONS & FUTURE POTENTIAL

Advantages

The added value of this technology to the RE-Place project is the potential to study ischemia-reperfusion injury without actively transplanting the graft into another recipient animal. This approach allows the dramatic reduction in the number of animals used for transplantation research since it can serve as a surrogate for *in vivo* reperfusion. All physiological parameters can be monitored and selective biochemical and cellular assessment is possible. Separate approach to the left or right lungs allows internal control setup without using additional animals.

Challenges

Absence of the thoracic cavity surrounding the organs ;
This potentially limits the physiological impact of negative thoracic pressures.

Modifications

Perfusion characteristics can be modified to a pulsatile setting ;
Perfusate can be modified to resemble blood or even contain whole blood.

Future & Other applications

This technology can serve for active resuscitation of lungs in a transplant setting. This EVLP setup can be used to serve as an organ chamber in the field of organ regeneration studies at a large animal scale / human scale.

REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

References

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