



# Liver Transplantation in an ECMO Supported DCD Swine Model

T. ISSAC (The STARS 2009); H. (OMICHI) LU, MD, PhD; Z. (Jeff) SUN; J. ARENAS, MD. (Mentor, The STARS 2009)

Surgical Transplantation Research, Department of Surgery, UT Southwestern Medical Center at Dallas, Dallas, Texas, USA

## Introduction

Liver transplantation (LTx) has been widely accepted as the only cure for end-stage liver disease. A major limitation to clinical LTx remains an insufficient donor organ supply. Marginal donors, specifically donors after cardiac death (DCD), represent the largest pool of potential organ donors. The use of DCD livers, however, has been limited due to the organ sensitivity to warm ischemia, and higher risks of developing severe graft complications such as biliary strictures and primary graft nonfunction. Widespread utilization of DCD liver would mostly benefit from developing unique techniques for DCD liver procurement.

Extracorporeal membrane oxygenation (ECMO) is a technique used to temporarily support heart and/or lung functions using mechanical devices. ECMO support via veno-arterial access has the advantage of higher flow rate and pulsatile perfusion, and has been demonstrated to be associated with normal flow rates to abdominal organs including the liver during normothermic reperfusion. Initiation of ECMO after declaration of death in DCD could provide prompt reperfusion of abdominal organs with warm oxygenated blood, and will decrease the period and extent of warm ischemia prior to cold flushing. Moreover, efficient abdominal organ reperfusion with oxygenated blood via ECMO could be setup rapidly prior to DCD liver procurement by an experienced ECMO team.

Swine have considerable anatomic similarity to humans and its basic physiologic and biochemical profiles closely resemble human values. Swine have similar sedentary lifestyle patterns to most humans and develop cardiac, renal and hepatic pathology. Biomedical findings revealed from swine studies have the potential to easily be translated to the applications in humans.

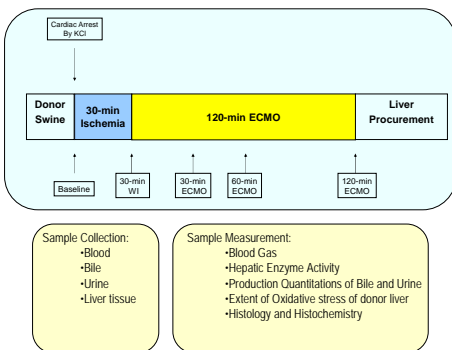
The overall goal of this project is to investigate how ECMO support DCD technique can promote graft viability of swine DCD liver.

## Hypothesis

Prior to the organ preservation and transplantation, initiation of oxygenated blood perfusion via ECMO is able to

- resuscitate DCD livers from warm ischemia injury
- restore hepatic functions

## Experimental Design



## Results

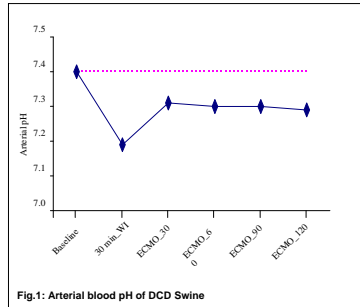


Fig.1: Arterial blood pH of DCD Swine

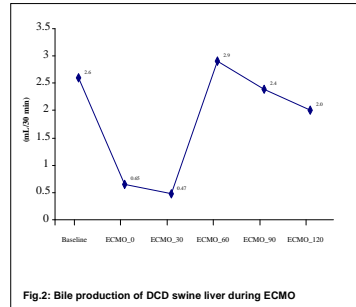


Fig.2: Bile production of DCD swine liver during ECMO

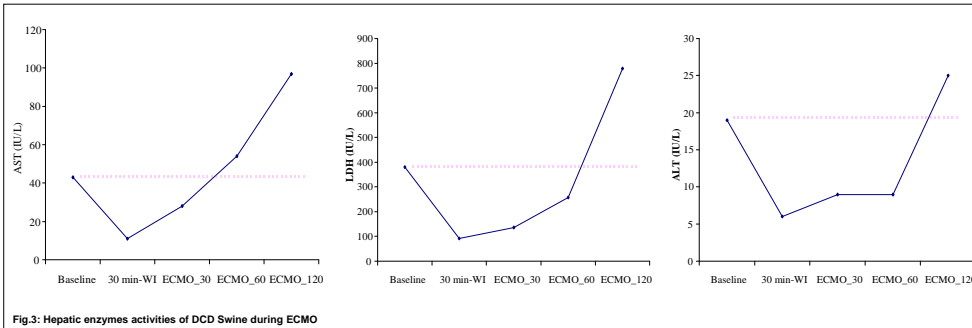


Fig.3: Hepatic enzymes activities of DCD Swine during ECMO

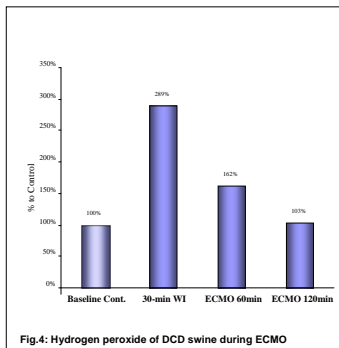


Fig.4: Hydrogen peroxide of DCD swine during ECMO

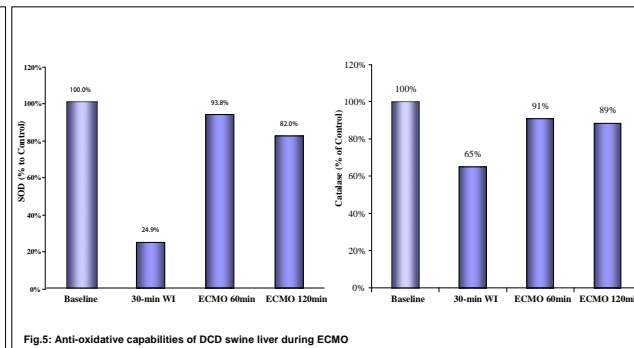


Fig.5: Anti-oxidative capabilities of DCD swine liver during ECMO

## Results (cont.)

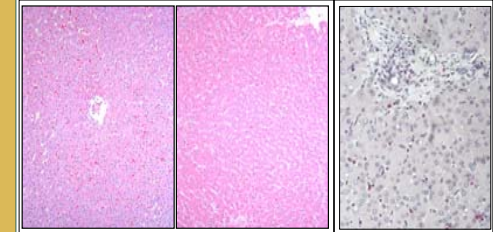


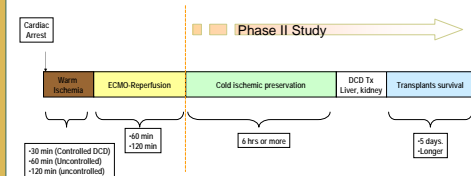
Fig.6: DCD swine liver before and after ECMO (HE, x200)

Fig.7: Neutrophil infiltration

## (Pre) Conclusions

- ECMO perfusion support provides oxygenated warm blood reperfusion to DCD donor systemically
- The liver function of DCD donor is able to be restored by ECMO support from 30-minutes of warm ischemic injury
- The recovery of DCD liver function reaches maximum after 60-minutes of ECMO perfusion support
- The function recovery of ECMO-supported DCD liver is associated with the recovery of the hepatic anti-oxidative capabilities

## Future Directions



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