

# Investigations of human kidneys pre-transplantation

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## Introduction:

*Ex-vivo* normothermic perfusion (EVNP) is a novel technique of kidney preservation. It is performed outside human body by circulating a red blood cell based solution through the kidney at normal body temperature. Normothermic perfusion of kidneys may improve surgical outcomes and open the door to use kidneys in transplantation, which were previously declined.

**The aim** of this study is to compare kidneys obtained from donors with brain death (DBD) and donors with circulatory death (DCD) using novel markers of inflammation and renal damage.

## Method:

Sixty human kidneys underwent 60 minutes of *Ex-vivo* normothermic perfusion (EVNP) at 37°C (Figure 1 and 2). Thirty five kidneys were from DCD donors and 25 from DBD donors. Von Willebrand Factor (vWF) and complement fragment C4d were measured in tissue during perfusion.

October 2012 – July 2013  
60 kidneys declined for transplantation

### Reasons for Decline

PMH (Past medical history)	15
Poor Flush	13
Donor Age	9
HMP (Hypothermic machine perfusion) Parameters	8
Technical/Anatomical	6
Histology	5
Prolonged CIT (Cold ischemic time)	4

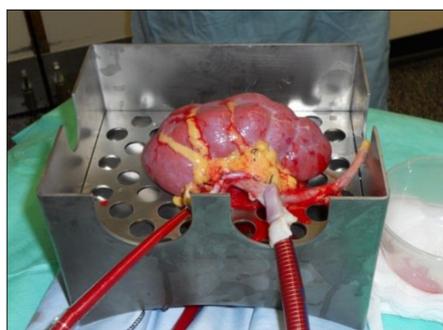


Figure 1. A picture of a kidney during EVNP

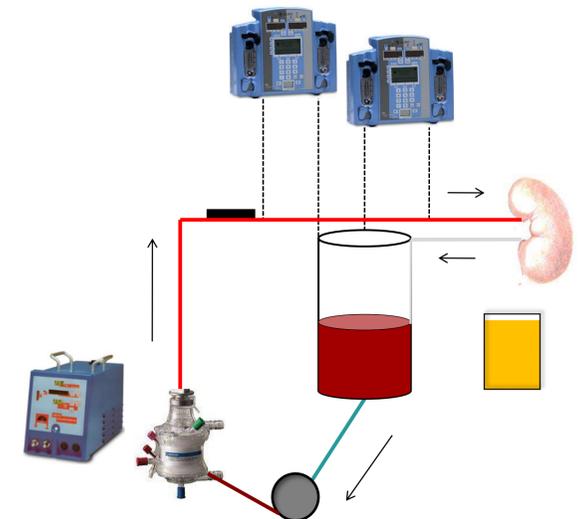


Figure 2. Schematic diagram of the ex-vivo normothermic perfusion (EVNP) system

Table 1. Reasons for decline for transplantation

## Results:

9.1% of DBD and 3% of DCD Kidneys showed mild histopathological score and no C4d deposition (Figure 3).

### C4d



### vWF

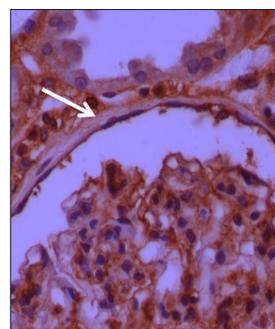


Figure 4. C4d (left) and vWF (right) positive staining in the renal biopsy

In terms of vWF, 4.5% of DBD and 3.4% of DCD kidneys showed mild histopathological score with no vWF reactivity. There were significantly more DBD kidneys (13.6%) that showed mild histopathological score and moderate vWF reactivity (Figure 6).

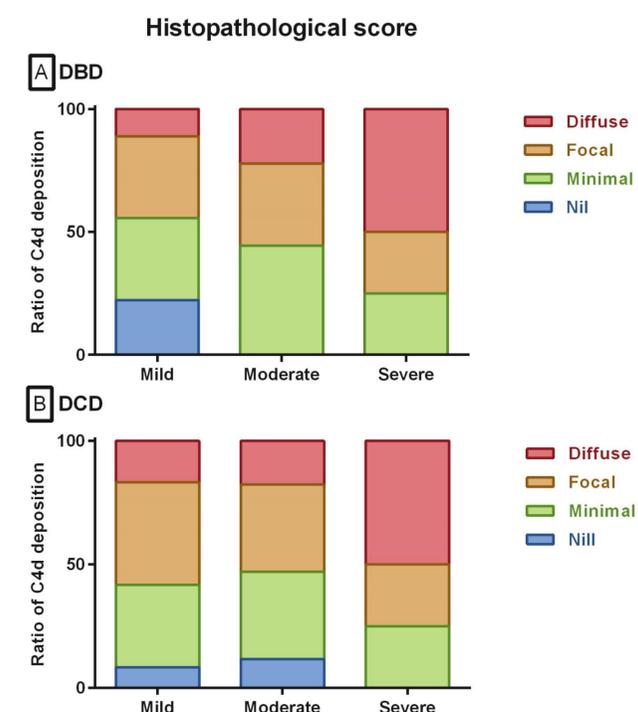


Figure 3. Semiquantitative analysis of C4d deposition in renal tubular epithelium plotted against histopathological damages in DBD (A) and DCD (B)

The pattern of the diffuse C4d deposition in DCD specimens (Figure 5) was significantly increased with higher renal impairment grades ( $r=0.88$ ;  $p=0.05$ ).

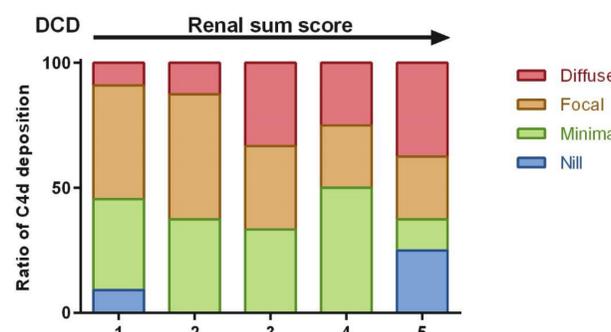


Figure 5. Semiquantitative analysis of C4d deposition in renal tubular epithelium blotted against sum score in DCD. The sum score is a cumulative score of renal blood flow; urinary output and visual score calculated from 1-5.

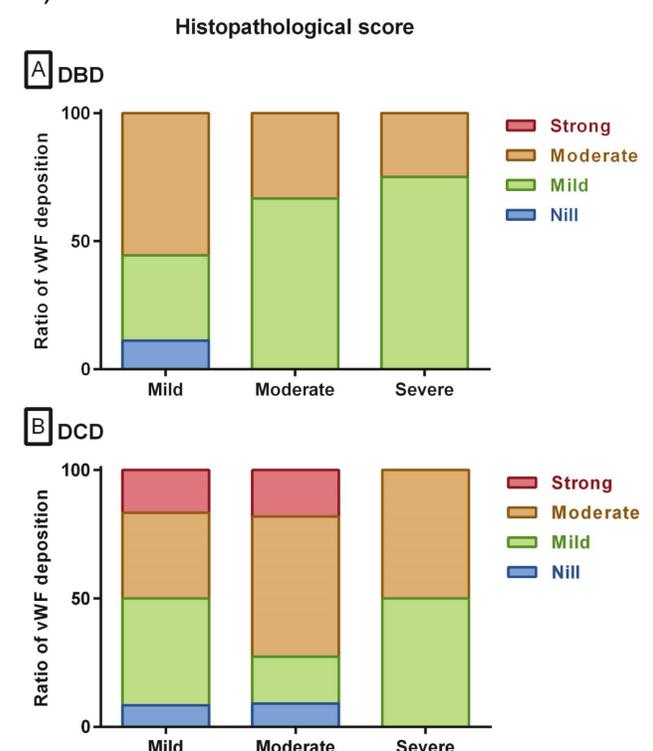


Figure 6. Semiquantitative analysis of vWF deposition in renal tubular epithelium plotted against histopathological damages in DBD (A) and DCD (B)

**Conclusion:** C4d staining of renal tubules did not differentiate between DBD and DCD kidneys. But vWF, the vascular endothelial marker, could be used as a predictor for the severity of renal damage in donor kidneys prior to transplant surgery. Furthermore, both DBD and DCD may be good sources of transplantable material.

## Acknowledgement:

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