



Novel Imaging Technologies In Acute and Chronic Kidney Injury Models

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15% of inpatients



40% children on PICU



Long term morbidity



£1.44-£1.45 Billion, per year



Models of injury

- Nephrotoxicity models

- Cisplatin
- Adriamycin
- Folic Acid
- Warfarin
- Gentamycin

- Surgical models

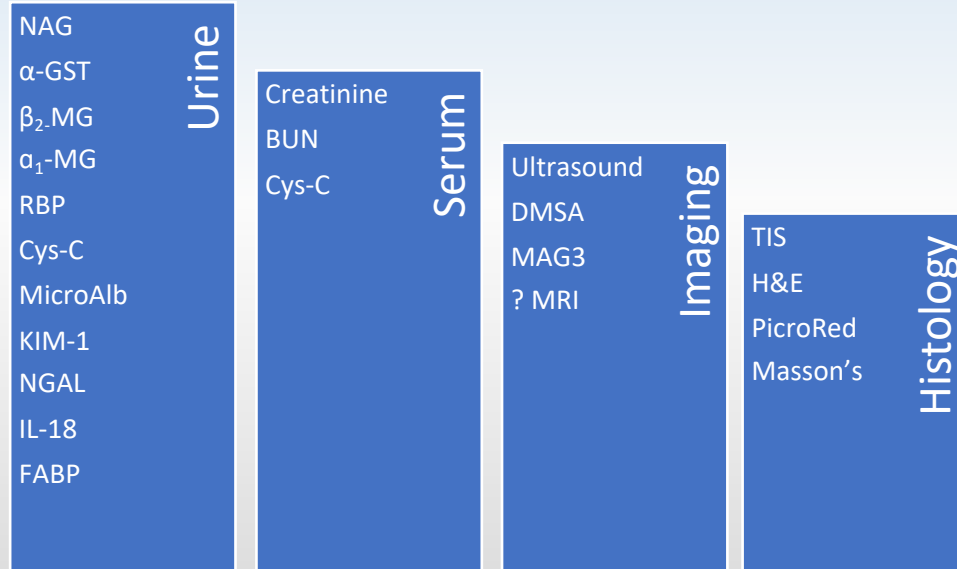
- Ischaemia Reperfusion Injury
- 5/6 nephrectomy
- Ureteric Obstruction

- Systemic models

- Sepsis
- Diabetic nephropathy
- Rhabdomyolysis (Glycerol)

Ischaemia Reperfusion Injury

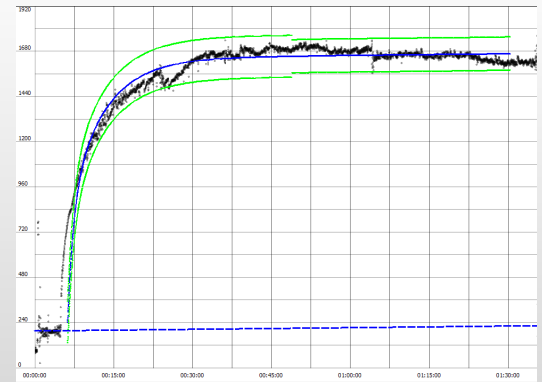
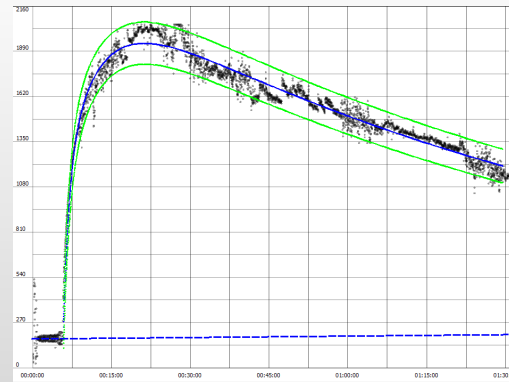
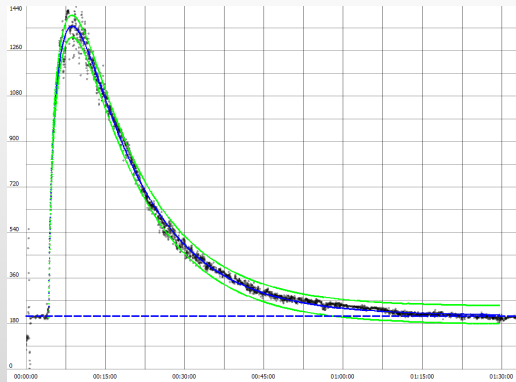
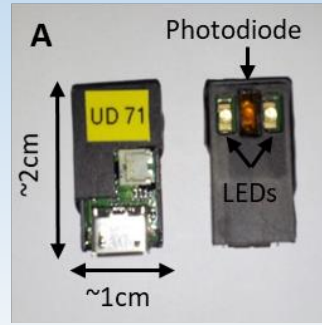
Monitoring Disease Progression



Transcutaneous FITC-Sinistrin Clearance

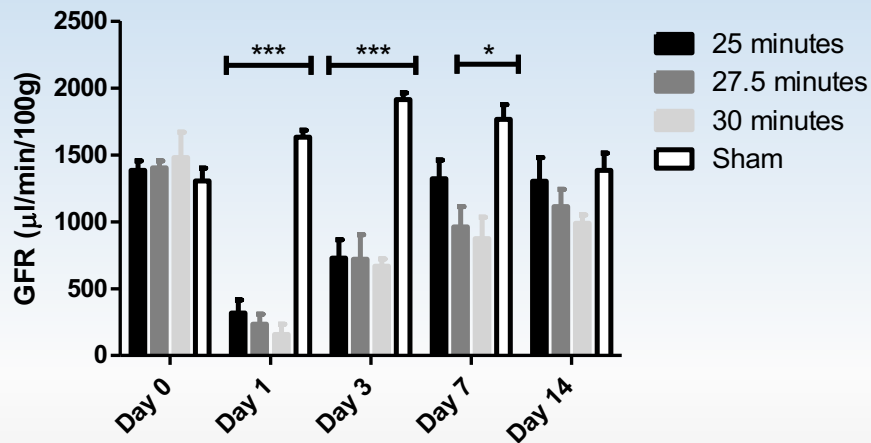
**Multi-spectral
optoacoustic
tomography (MSOT)
Clearance of IRDye800
CW**

FITC-Sinistrin Clearance

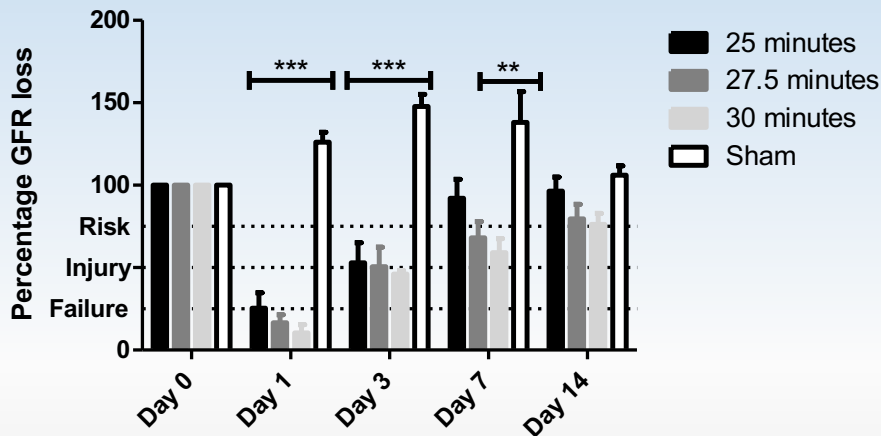


Bilateral Ischaemia Reperfusion Injury

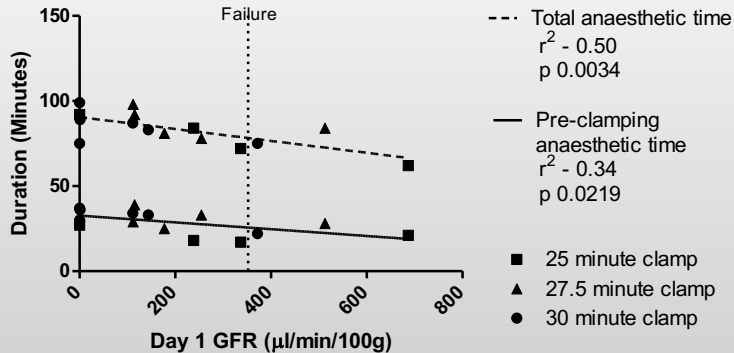
GFR of all surviving animals



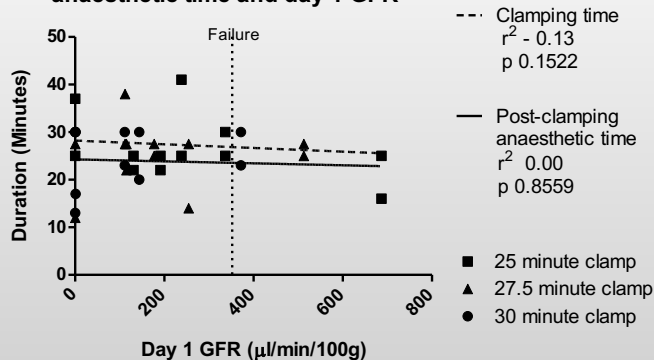
RIFLE classification of GFR reduction



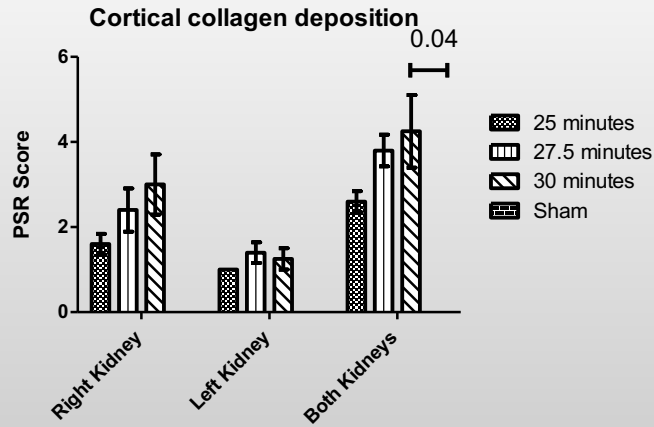
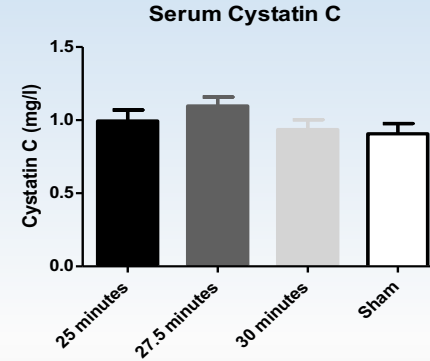
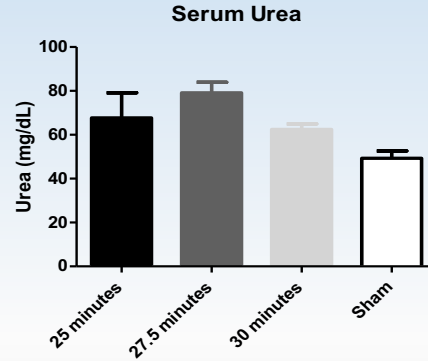
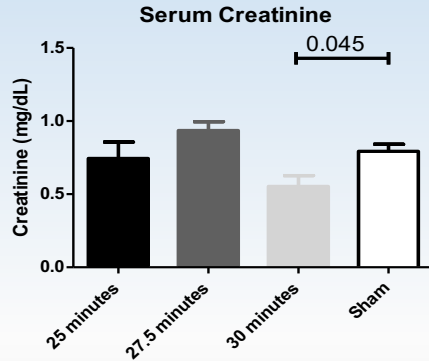
Correlation between anaesthetic duration, pre-clamping anaesthetic time and day 1 GFR



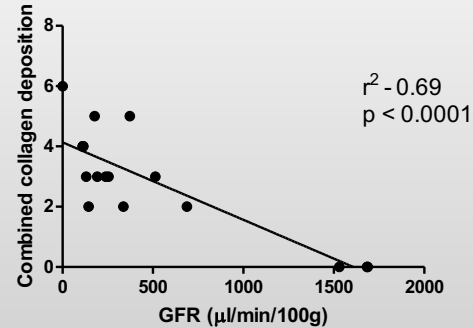
Correlation between clamping time, post clamping anaesthetic time and day 1 GFR



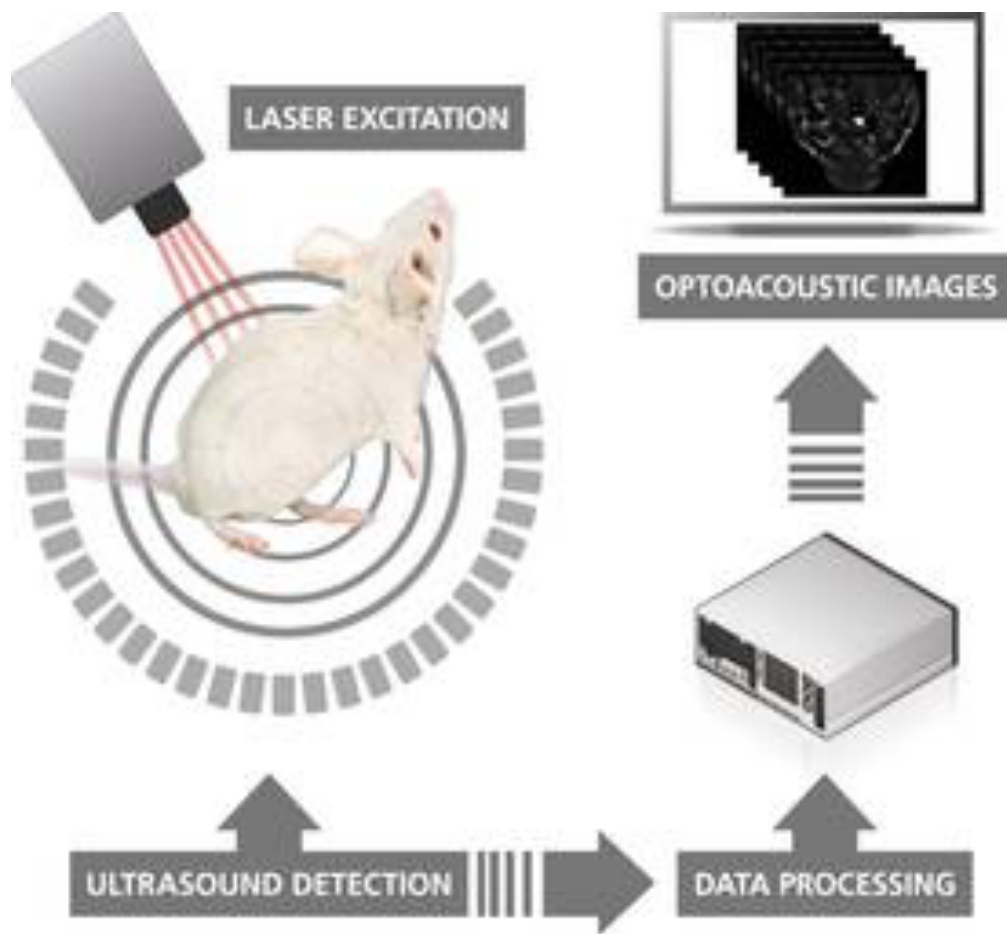
Day 14 after Bilateral IRI



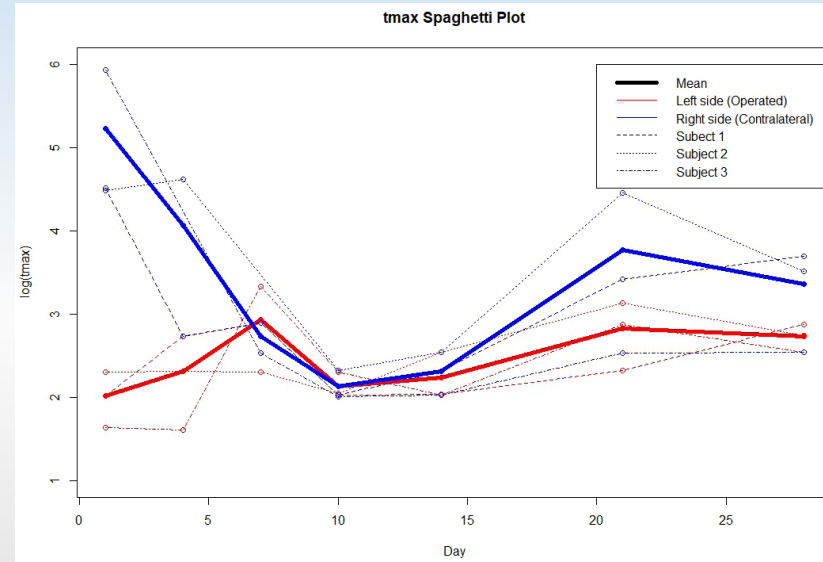
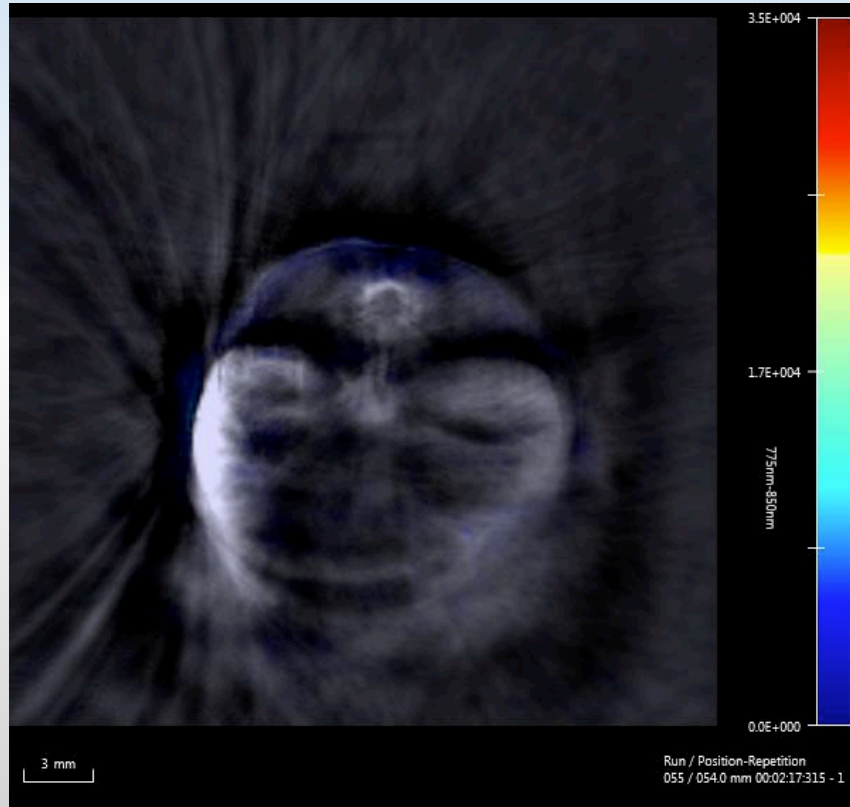
Relationship between acute injury and development of cortical collagen deposition



MSOT

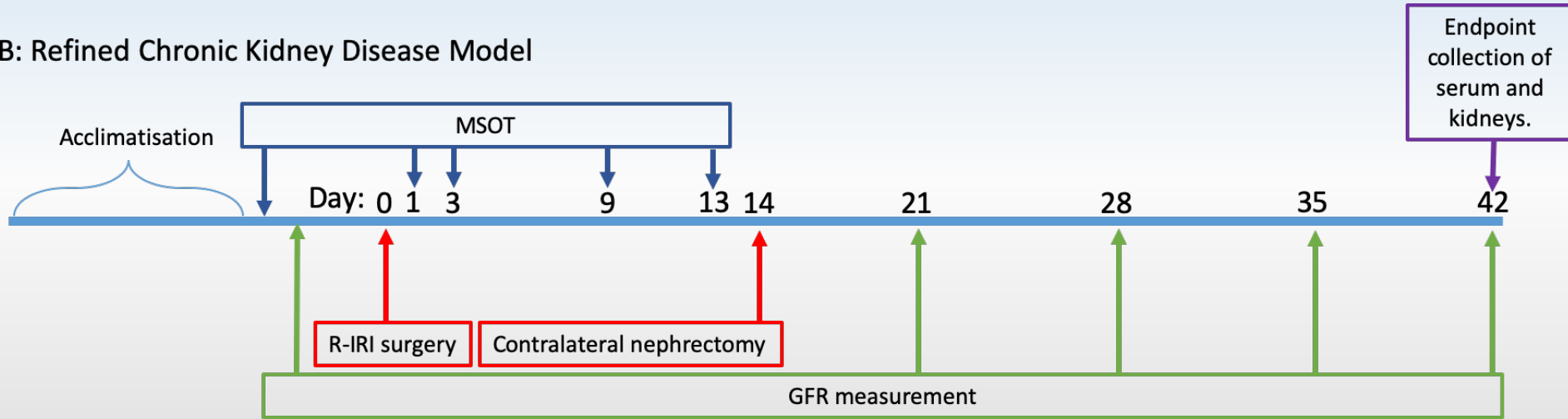


Unilateral Ischaemia Reperfusion Injury

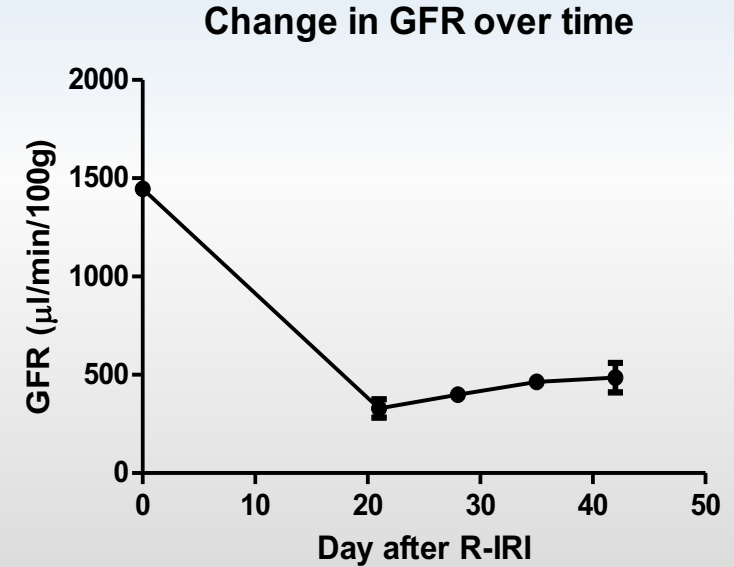
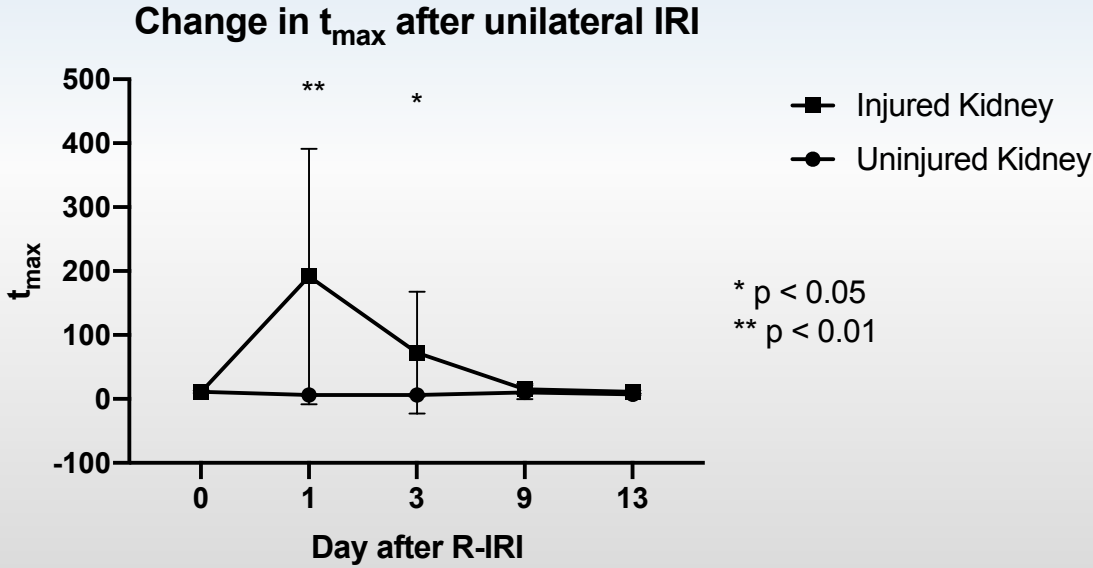


IRI Chronic Kidney Disease Model

B: Refined Chronic Kidney Disease Model

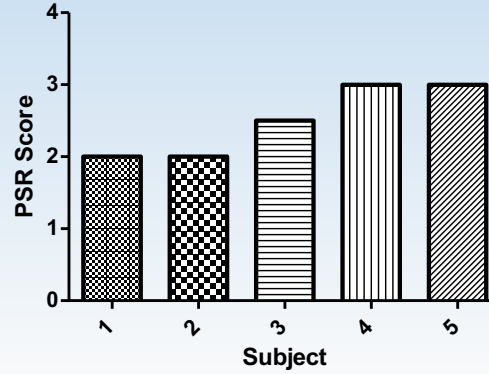


Refined Unilateral Ischaemia Reperfusion Injury

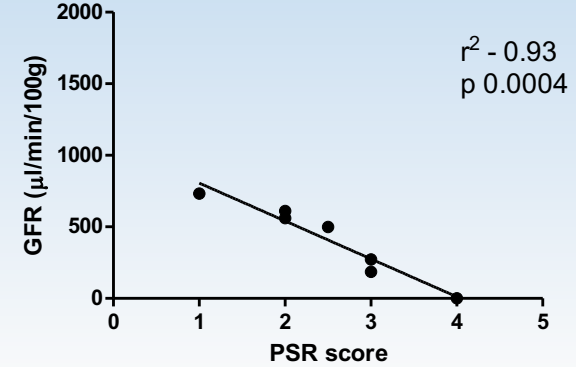


Refined Unilateral Ischaemia Reperfusion Injury

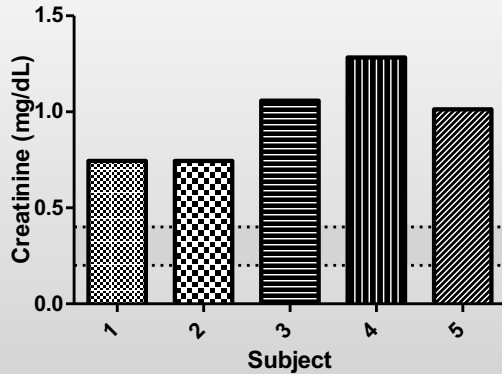
PSR score



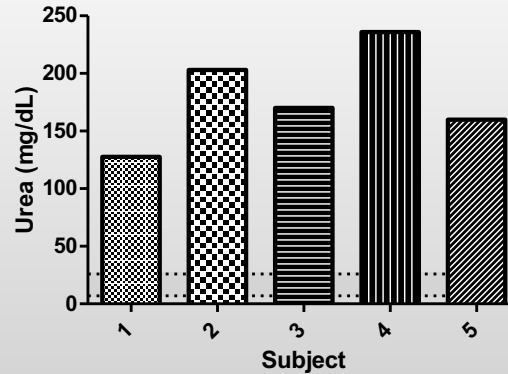
Comparison of PSR score and GFR in CKD models



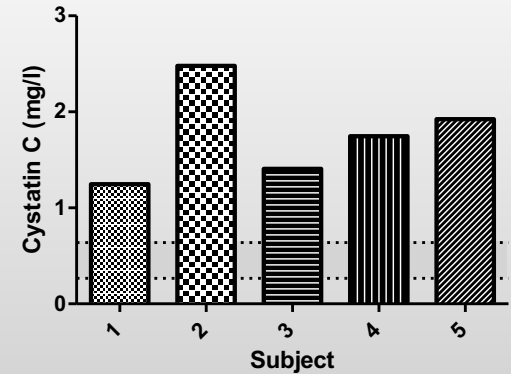
Creatinine



Urea



Cystatin C



Take Home Messages

- The use of non-invasive monitoring can
 - enable better **refinement** of a kidney injury model
 - **reduce** the numbers of subjects required for efficacy studies
 - Has the potential to improve knowledge about mechanisms of injury
- The future
 - Efficacy studies
 - Alternative dyes for MSOT
 - ? Translation to humans



Thanks to

Prof P Murray
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