



**University  
of Glasgow** | Institute of Neuroscience  
& Psychology

## **Gender differences in the evolution of ischaemic injury. An MRI study.**

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## Introduction

- The risk of stroke in pre-menopausal women is lower than in men (Kannel and Thom, 1994).
- Female rodents experience less severe ischaemic injury compared to males (Murphy et al, 2004).
- Very little is known about the evolution of ischaemic injury during the acute time period immediately after stroke onset.

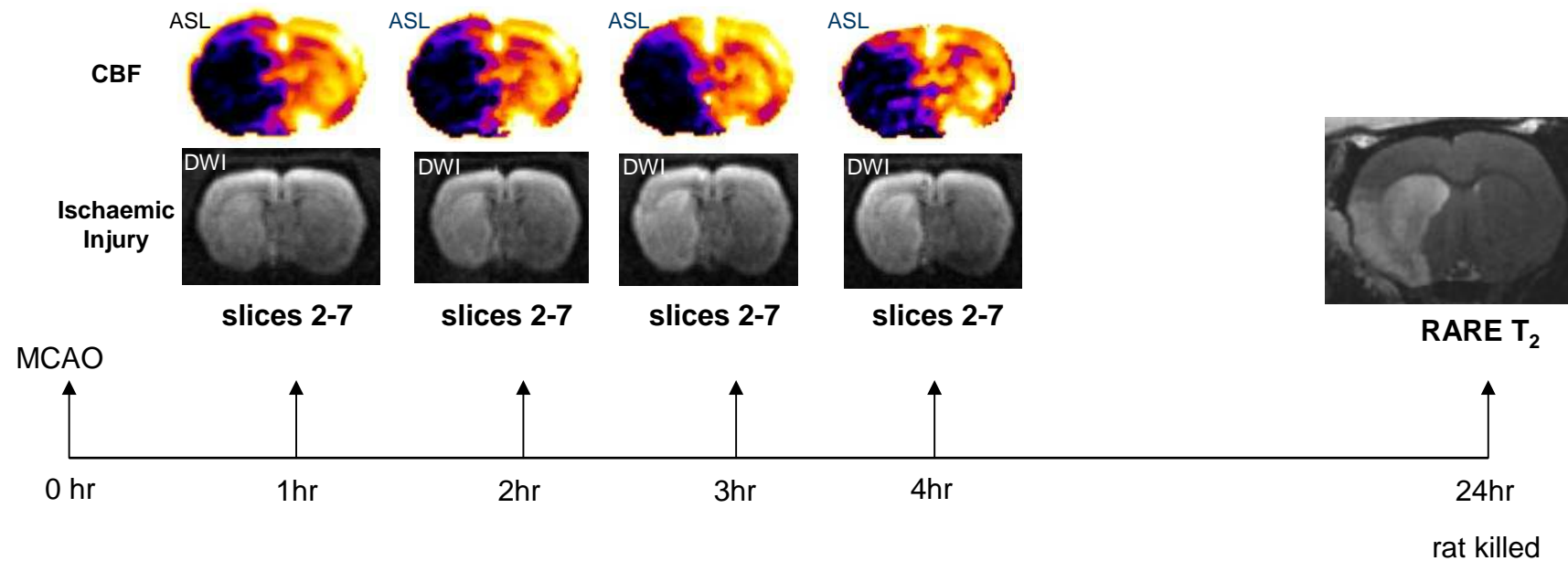
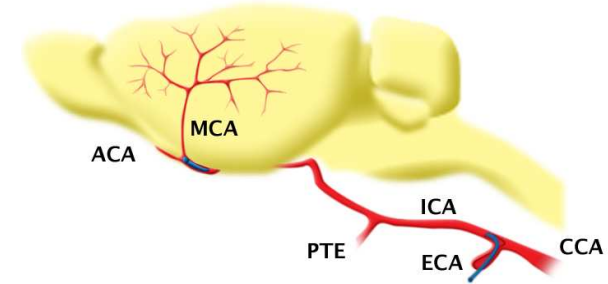
## Research aims

1. To compare the evolution of ischaemic injury during the acute stroke period between males and females.
2. To compare CBF within ischaemic core and presumed penumbra between males and females.

## Methods

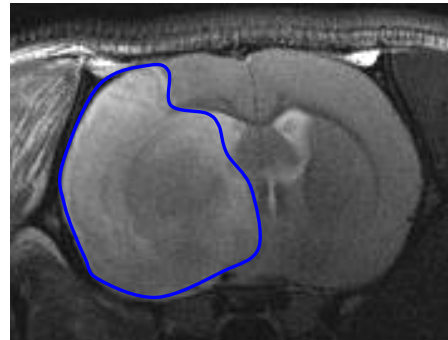
### Surgery

- Male (300-350g) and female (220-260g) Sprague-Dawley rats
- Anaesthetised with isoflurane
- Intubation and mechanical ventilation.
- Permanent focal cerebral ischaemia induced by middle cerebral artery occlusion (MCAO) using the intraluminal filament model.
- MABP monitored throughout and blood gas analysis performed.

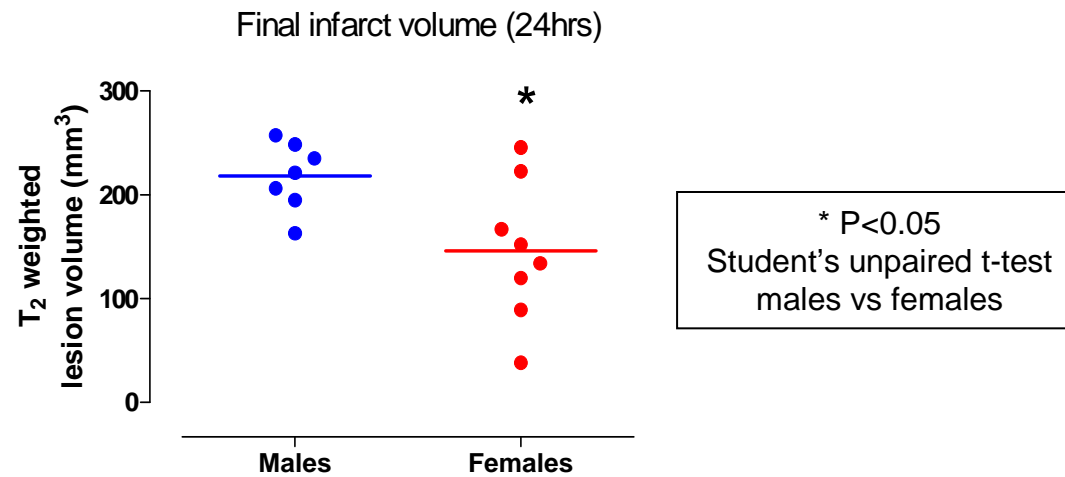
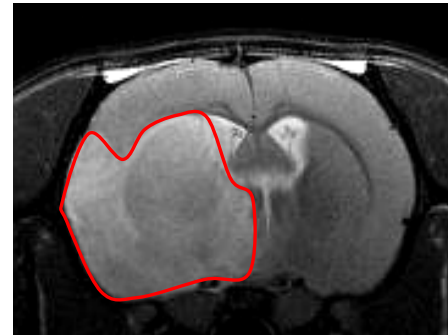


## Females exhibit a smaller infarct size

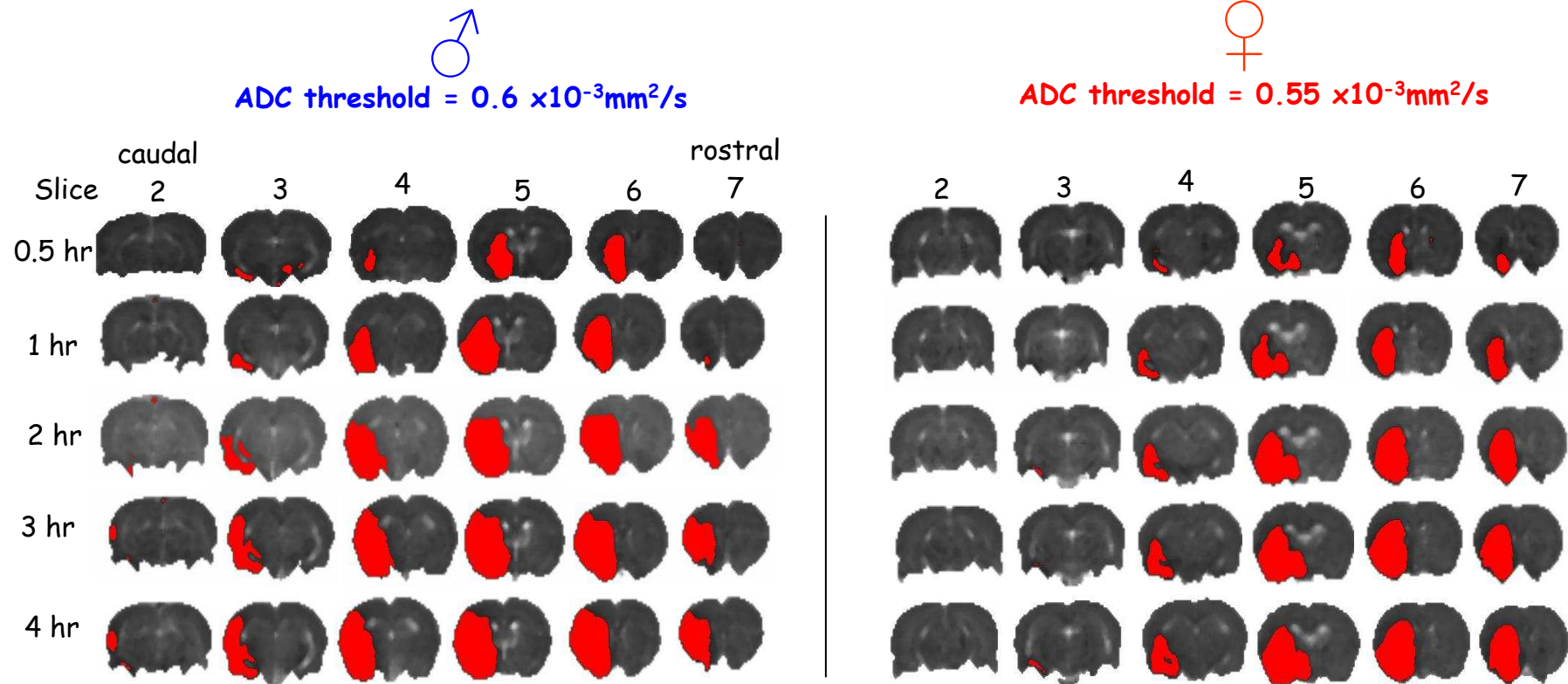
male



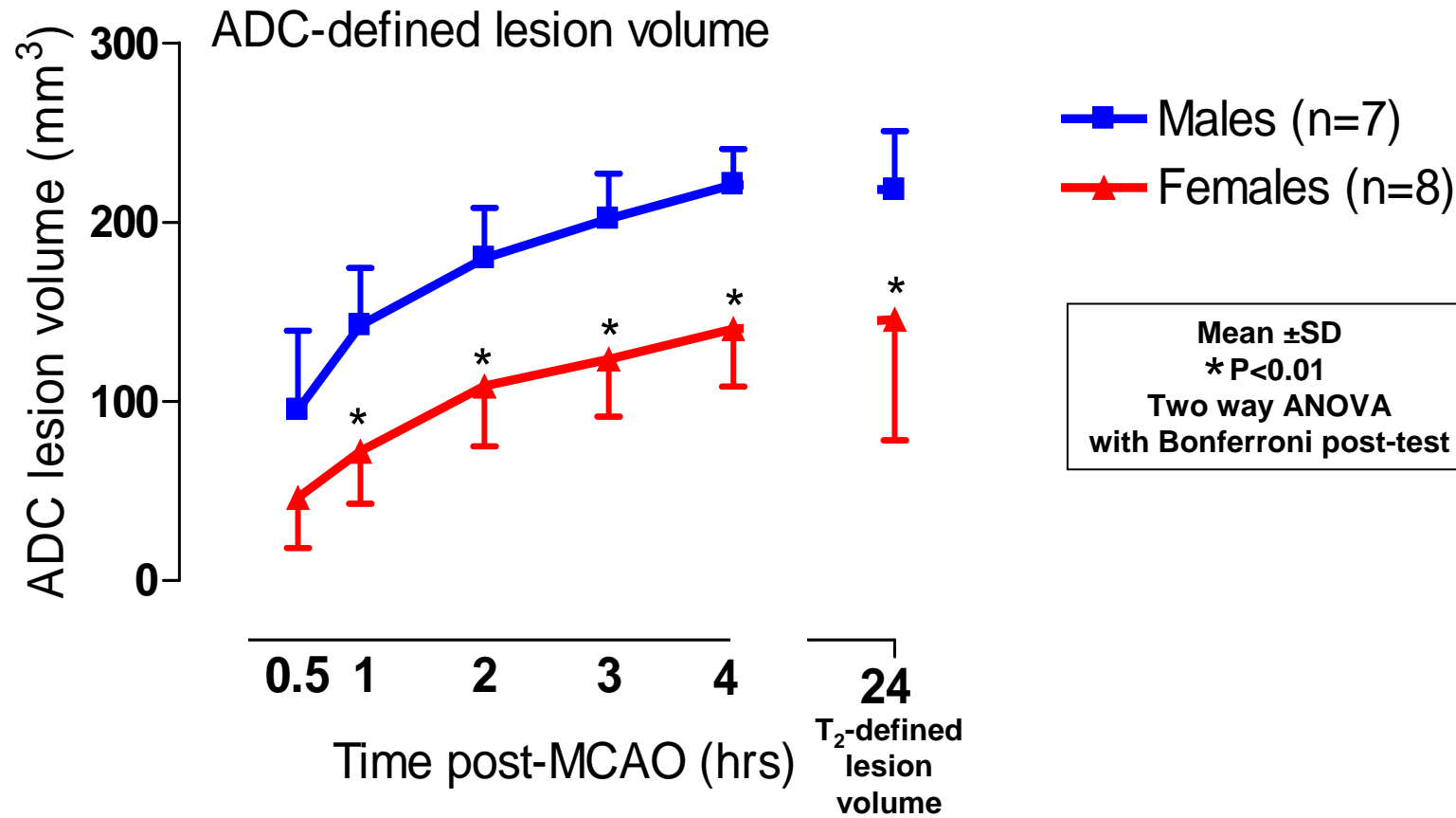
female



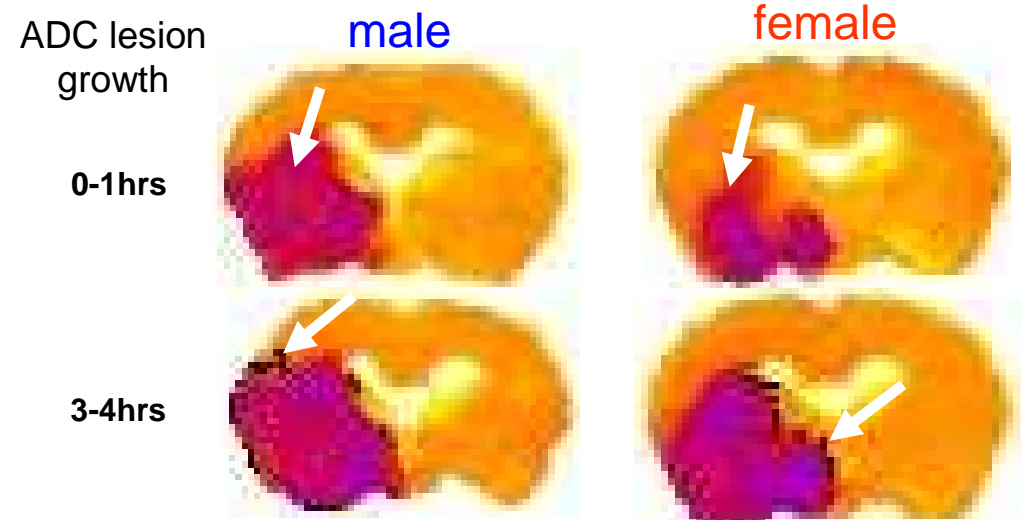
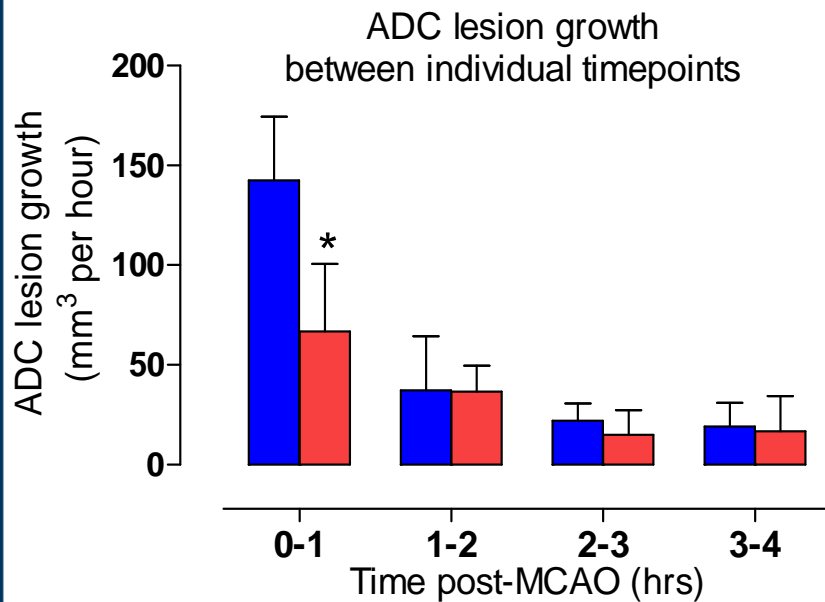
## Spatio-temporal progression of thresholded ADC lesion



Females exhibit a smaller ADC-defined lesion volume after stroke onset



## ADC lesion evolves differently in males and females during acute stroke



Mean  $\pm$ SD  
 \*  $P < 0.001$   
 Two way ANOVA  
 with Bonferroni post-test

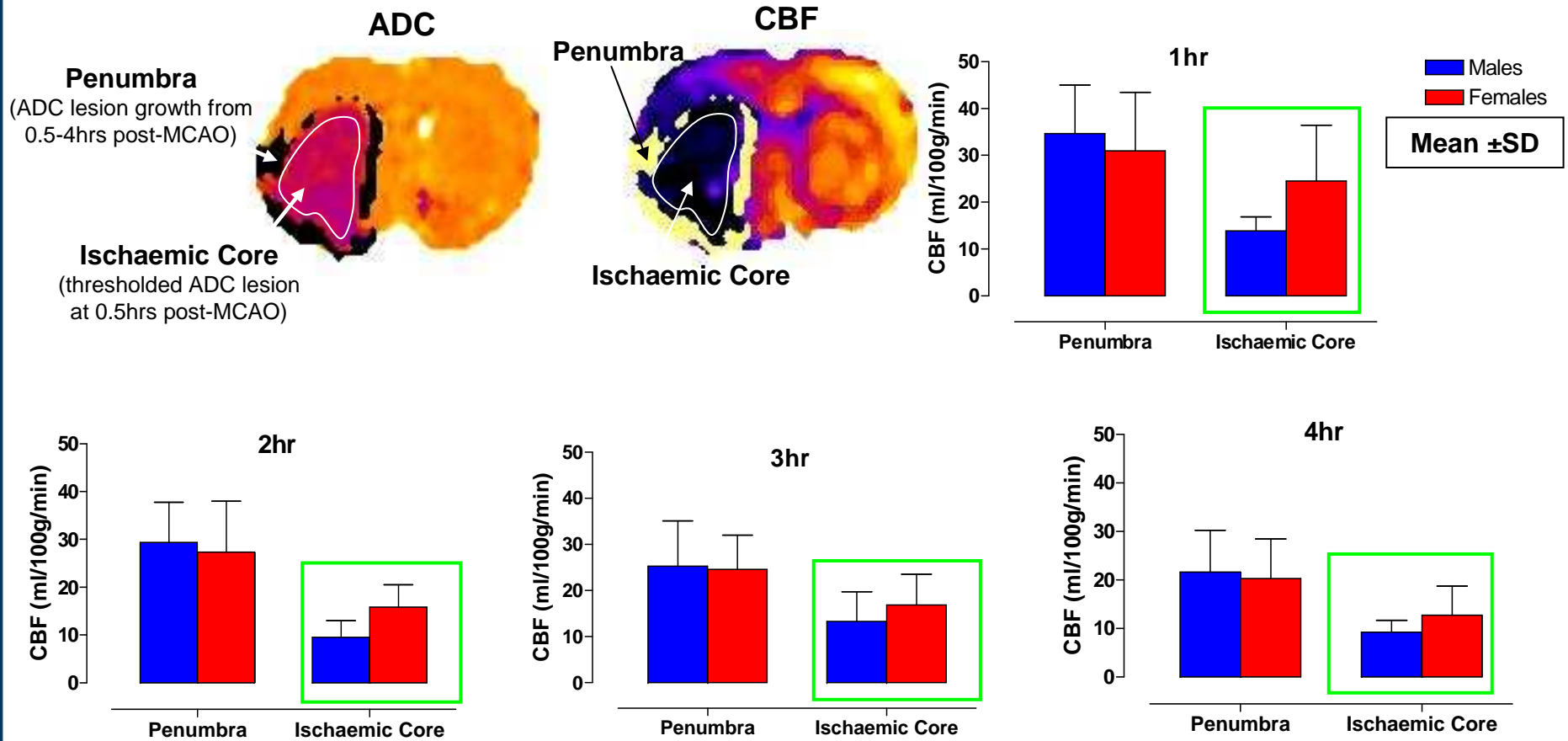


## Summary

- Final infarct size at 24hrs was smaller in females compared to males.
- ADC derived lesion volumes were significantly smaller in females and evolved slower within the first hour after stroke. Thereafter, the ADC lesion grew similarly between the sexes.

**Could differences in residual tissue perfusion account for the gender difference in ischaemic injury evolution and infarct size?**

## ROI analysis to measure CBF in ischaemic core and penumbra



## Histogram analysis of CBF



Slice 2

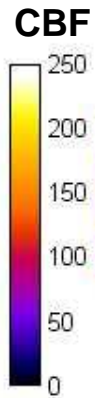
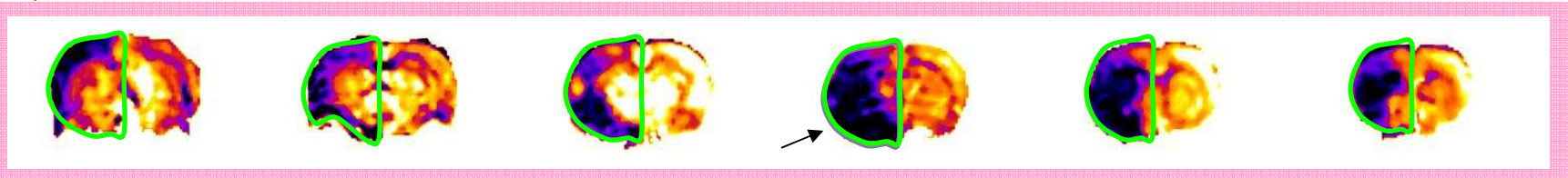
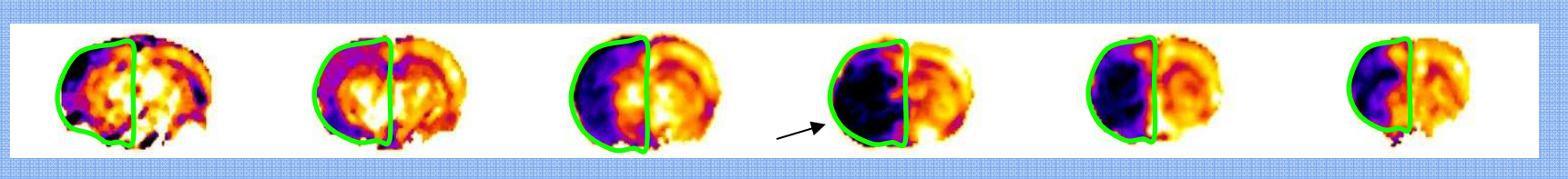
Slice 3

Slice 4

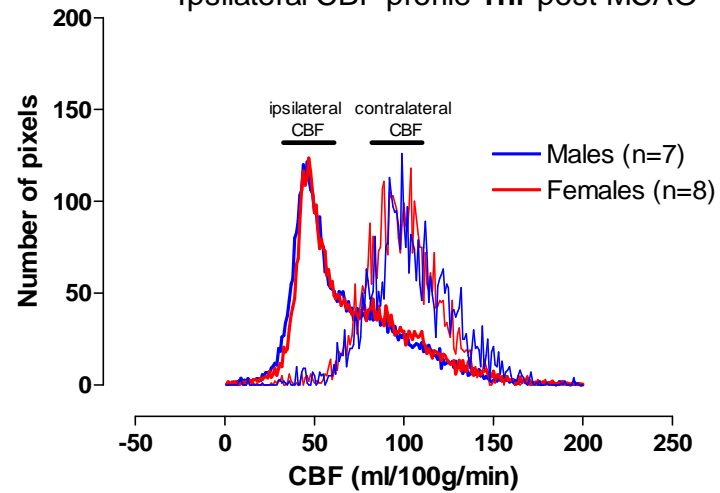
Slice 5

Slice 6

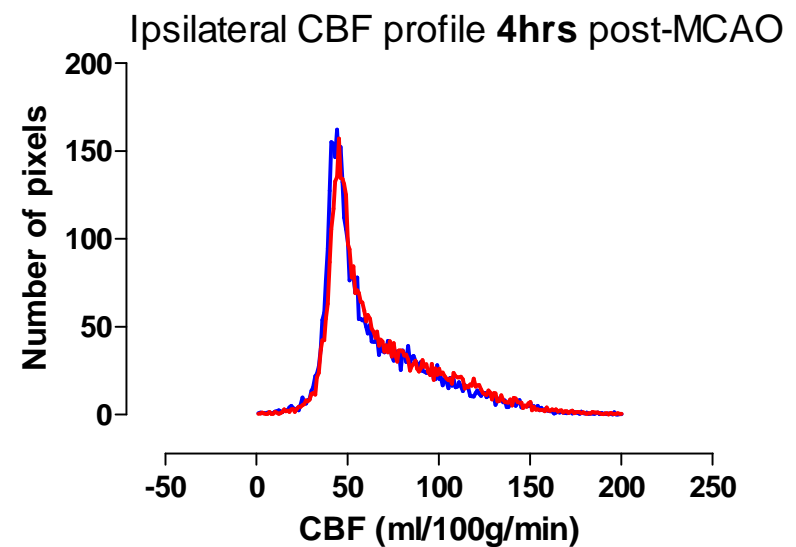
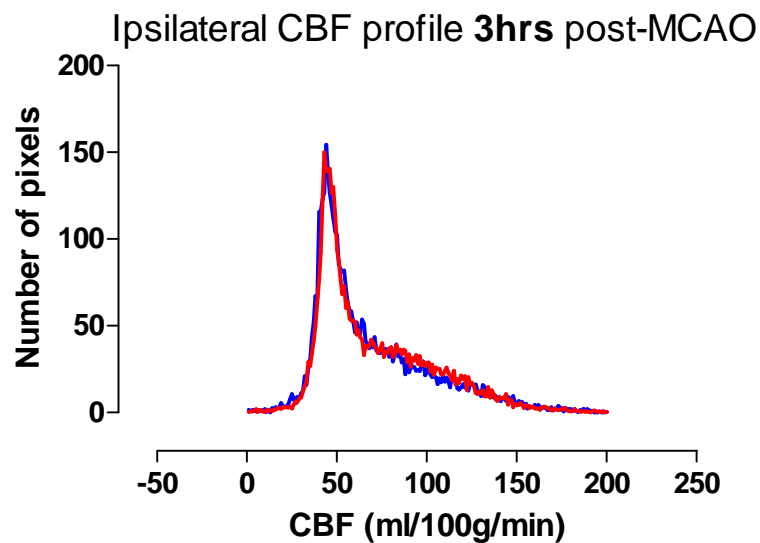
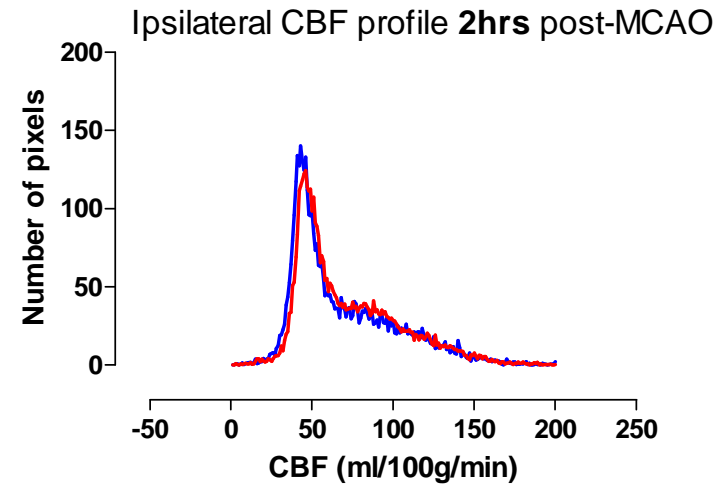
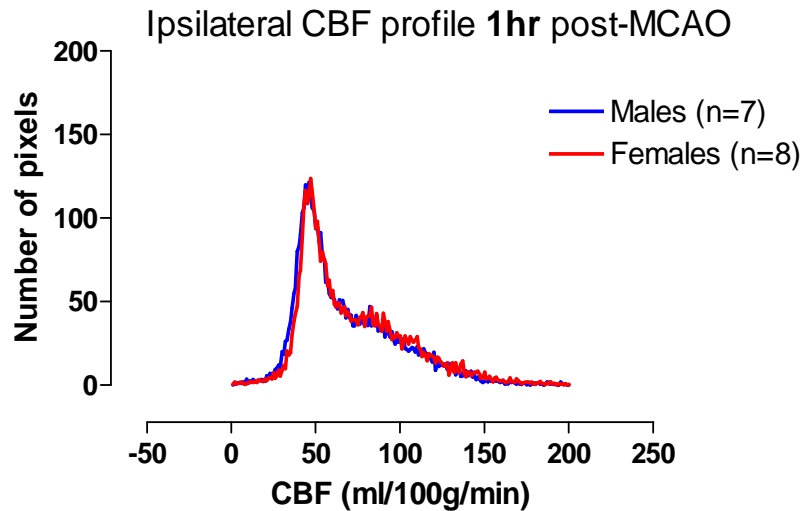
Slice 7



Ipsilateral CBF profile 1hr post-MCAO



## Ipsilateral CBF profiles at 1, 2, 3 and 4hrs post-MCAO



## Summary

- CBF is similar between the sexes using ROI analysis.
- Histogram analysis revealed ipsilateral CBF profiles in males and females were similar at all time points after stroke onset.

## Conclusions

- Whilst both sexes are exposed to the same ischaemic insult, the volume of ischaemic damage is smaller in females compared to males.
- CBF did not differ between males and females after stroke onset. Differences in tissue response to ischaemia rather than vascular mechanisms appear to account for the sex-specific responses during ischaemic stroke.

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