The distal middle cerebral artery occlusion (dMCAo) mouse model has been used in the field of preclinical stroke research to study brain injury and dynamics of post-stroke recovery. MRI is advantageous in that it allows excellent visualization and volume quantification of brain tissue abnormalities following brain trauma such as ischemic stroke, it is non-invasive, non-destructive, and sensitive to brain tissue changes at macroscopic, mesoscopic and microscopic levels, and it allows the whole brain coverage. In this study we performed whole brain, ex vivo, multi-modal MRI characterization of the dMCAo mouse model of stroke at 24h. We used T2-weighted and multi-shell diffusion scans for quantitative and qualitative analysis of stroke induced brain damage.

**Methods**

**Study Design**

<table>
<thead>
<tr>
<th>Exp Group</th>
<th>N (30)</th>
<th>Stimuli</th>
<th>N (30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>12 (6♀)</td>
<td>T2-w Diffusion</td>
<td>8 (4♀)</td>
</tr>
<tr>
<td>Sham</td>
<td>12 (6♀)</td>
<td>GFAP</td>
<td>8 (4♀)</td>
</tr>
<tr>
<td>Naive</td>
<td>6 (3♀)</td>
<td>Iba-1</td>
<td>8 (4♀)</td>
</tr>
</tbody>
</table>

- **T2-w Diffusion:** Cresyl Violet, GFAP, Iba-1
- **GFAP:** Astrocytes, Microglia
- **Iba-1:** [Days]

**MRI Modality**
- T2 structural
- T2w (T2 weighted)

**Duration**
- 33min

**Matrix**
- 131x100/105/100μm
- 240x89/120

**Sequence:** T2w, T2*w, T2* weighted, T2* weighted, 240x89/120, 131x100/105/100μm

**Key parameters**
- 0.6T, 12 segments, T23, T25, T29, T23, T25, T29
- i.e.: 1.5T, b=0±500mm2, volume: 4 phase-encoding
- b=0±500mm2, volume: 4 phase-encoding

**Animals:** Thirty 6-month-old wildtype C57BL/6J mice were randomised into 3 experimental groups (naïve, sham and stroke)

**Surgery:** Stroke was induced in the left hemisphere, using permanent distal Middle Cerebral Artery occlusion (dMCAo) via electro-cauterisation (sham group underwent the same surgical procedure, but without dMCAo occlusion, and naïve group did not undergo any surgery)

**Quantitative MRI Data Analysis**

- **Volume**
  - T2w
  - T2w

**Lesion Analysis**

- **Comparison of Lesion Appearance between Histology and MRI**

**Results**

- **Infarct Volume Analysis**

**Behavioural Analysis**

- **Grip Strength**
  - Normalised over body weight of naïve, sham and stroke mice 24h post-surgery (grey)

**Conclusions**

- Whole brain, 3-dimensional MRI used in this study has allowed us to visualize, identify and quantify not only the stroke lesion but also stroke impact on the rest of the brain. Tissue staining completed so far has allowed us to better understand the cellular nature of these MRI findings. Additional tissue staining analyses are ongoing.
- Portrayal and detailed characterization of brain injury 24h post-stroke in the dMCAo model using whole brain multi-modal MRI and tissue staining, as done in the current study, will be of value to the field.

**References**


**Acknowledgements**

The project was funded by WIN Seed Grant. Special thanks to Claire Park for her assistance with the tissue staining.