Research Grants 2026

Stroke | Radiomic analysis using photon-counting computer tomography and histopathologic correlation of acute stroke thrombi: A pathway to precision diagnostics

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Acute ischaemic stroke remains one of Australia's leading causes of death and long-term disability, with 23 Australians dying from stroke daily and thousands more living with persistent functional impairment. Current hyperacute management relies heavily on rapid multimodal neuroimaging – non-contrast CT, CT angiography and CT perfusion – to detect a vessel occlusion, exclude haemorrhage, and select patients for reperfusion therapies.

Despite major advances in imaging and treatment, a major unresolved gap is our knowledge of the biological heterogeneity of occlusive thrombi in vivo. Clots vary widely in red-blood-cell content, fibrin density, platelet organisation, calcification, and structural maturity. These properties influence thrombolysis responsiveness, mechanical thrombectomy success, clot fragmentation risk, and functional outcomes. Current CT imaging however, provides only coarse and indirect markers of clot composition, such as the hyperdense vessel sign which carry limited prognostic significance. Consequently, clinicians are often unable to tailor treatment to clot biology, and decision-making is constrained by diagnostic uncertainty. This is particularly important as emerging therapies in hyperacute stroke management (e.g. dornase, PI3K inhibitors, intra-arterial thrombolysis) require clearer understanding of clot-specific characteristics to guide their use.

This project aims to determine whether imaging features that can be extracted from a new form of CAT scan called photon-counting CT (PCCT) that will be available in The Royal Melbourne Hospital (RMH) emergency department from February 2026 can non-invasively predict the composition of a blood clot that is blocking an artery in the brain and causing stroke. The clots that are removed during stroke treatment will be examined under a microscope to determine the true composition compared to the CT-based prediction. PCCT provides much more detailed images than traditional CT.

Being able to identify what sort of clot is causing a stroke may enable personalised treatment selection. No study to date has correlated PCCT imaging features with blood clot microscopic features. The RMH treats >300 patients a year with thrombectomy and the availability of PCCT in the emergency department creates a unique opportunity to address this international research priority.

Grant $30,000

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