Dr Kevin Jang, radiation oncology registrar

Improving imaging analysis of metastatic brain tumours for personalised treatment strategies

Brain metastases are the most common type of brain tumour in adults, affecting up to 20% of patients with cancer. Aggressive treatment with high-dose radiotherapy improves survival with excellent local control. However, irradiated brain tissue can yield ambiguous imaging features, leading to significant treatment dilemmas during the follow-up period.

Research by Radiation Oncology Registrar and 2022 Avant Early Career Research Program grant recipient, Dr Kevin Jang, will explore using artificial intelligence to accurately distinguish radiation necrosis from recurrent brain metastases.

The study is being conducted at Dr Jang's current workplace, Nepean Cancer Care Centre.

"The aim of our research is to develop a radiomics-based machine learning model that can be applied to post-treatment imaging of patients with brain metastases to distinguish regions of tumour progression from radiation necrosis," Dr Jang explains.

Differentiating radiation necrosis from tumour progression is essential in the follow-up period, as management of these two entities differs substantially. An incorrect diagnosis of progressive disease prompting further surgery, re-irradiation or change in systemic therapy can lead to unnecessary morbidity. Whereas a delayed diagnosis of tumour recurrence may lead to worse patient outcomes, such as more extensive surgical resection.

"At present, no clear guideline exists for imaging patients with suspected radiation necrosis. Thus, a reliable and non-invasive method to distinguish tumour progression from radiation necrosis could help individualise treatment strategies and monitoring of therapeutic response," Dr Jang says.

Research builds on prior study's promising findings

Dr Jang's project builds on emerging techniques to quantify brain tumour features on MRI. Preliminary studies have shown that multiparametric radiomics may serve as a valuable tool in accurately differentiating true tumour progression from treatment-induced changes in the brain.

A team from five medical specialties will collaborate with the Faculty of Computer Science, University of Sydney, to translate the study's findings and integrate the radiomics analyses into the clinical workflow.

Avant funding enhances research quality

Receiving the Avant Early Career Research Program grant was validation for Dr Jang of the quality of his research.

"Knowing the calibre of research funded by Avant, I was excited to be supported by an organisation that prioritises the growth of young doctors," Dr Jang says. "Avant's support for junior clinicians exemplifies their commitment to improving the way medicine is practised in Australia. With the landscape of medical practice becoming increasingly complex, Avant provides young doctors a vision for the future."

Dr Jang will use the grant funds to acquire basic hardware and computational tools for the radiomics analyses, along with software for image processing and model development.

In 2023, he will commence five years of Radiation Oncology Advanced Training through the Royal Australian and New Zealand College of Radiologists, and undertake a PhD to further investigate the role of radiomics in cancer imaging.

"The resources gathered for this project will allow further radiomics research throughout my training. The opportunity to partake in collaborative research will shape my future commitment to bridging gaps in understanding and treatment of cancer," Dr Jang says. "My overarching goal is to extend our radiomics research into other tumour sites, developing reproducible imaging biomarkers for all cancer patients. Through this award, I aim to dedicate my career to precision cancer medicine."

Visit **avantdifference.org.au** for application information.

“Through this generous award, I intend to become an advocate for innovations that will shape the future of patient care in the field of radiation oncology.”

Dr Kevin Jang