



Dr Mina Kang, Resident Medical Officer at Westmead Hospital

## Investigating the vascular origins of reticulate eruptions

As one of the 2021 Avant Doctor in Training Research Scholarship recipients, Dr Mina Kang, a resident Medical Officer at Westmead Hospital in NSW, is passionate about an area of dermatology that is commonly under-researched.

Known as reticulate eruptions, these skin conditions commonly manifest due to an underlying subdermal vascular plexus pathology and can be a significant burden on patients, potentially signalling the progression of other diseases.

Dr Kang is currently completing a Master of Science at the University of New South Wales and conducting clinical research at the Applied Medical Research Centre at St Vincent's Hospital.

"Reticulate eruptions are currently broadly grouped under the general umbrella term of net-like eruptions and the treatment remains largely the same for all sub-types. It's an area that is poorly understood," Dr Kang explains. "The classification, clinical manifestations, and terminology surrounding reticulate eruptions are confusing and conflicting."

The term 'reticulate' describes the patterns on the skin which may be net-like, branched or star-like. Despite current assumptions, there is no concrete evidence that reticulate eruptions have a vascular origin.

"A lack of understanding of the underlying vascular anatomy, particularly the pathophysiological relationship between reticulate eruptions and their vascular anatomy, has contributed to a dearth of research in this area. The existing treatment modalities are mostly ineffective and even when a good response is observed, the exact mechanism of action is unclear," she says.

"A clear understanding of the pathophysiologic mechanism behind the manifestations of reticulate eruptions is necessary to differentiate between the types of reticulate eruptions and improve the treatment approach for the underlying disease," Dr Kang says.

### 'Never done before' measurements

The research will be conducted at the Sydney Skin and Vein Clinic and compare the subdermal venous networks on the limbs in healthy controls versus patients with reticulate eruptions.

Non-invasive imaging techniques using infrared imaging, ultrasound, and long wave ultraviolet light will be used to identify the structure of the subdermal venous networks in the study participants. Smart Sensor 3D function enables three-dimensional augmented reality reconstruction of the images, using the linear ultrasound probe and analysis of the morphology of the subdermal reticulate venous network.

The study will analyse the difference in variables in the subdermal venous network such as vessel calibre, depth, flow velocity and morphology, using improved imaging technology. The Superb Micro-vascular Imaging function will be used, which has expanded the range of visible blood flow to allow low-velocity microvascular flow to be visualised.

"Such concise measurements of the cutaneous microvasculature have never been done before," Dr Kang says. "Based on our extensive literature search since we conducted our pilot study, improved US imaging technologies that enable three-dimensional augmented reality imaging of the reticular venous network have been developed."

"We aim to apply this technology to the limbs to better delineate the anatomy of the reticular venous network of the limbs where reticulate eruptions are common," Dr Kang explains.

### Early signs of other diseases

The burden of reticulate eruptions can vary from mild cosmetic disfigurement in transient vasospastic subtypes, to debilitating recurrent ulcerations resulting in infections and even amputations.

Reticulate eruptions are often one of the preliminary signs before more progressive diseases develop such as vessel inflammation and occlusion. Deeper understanding of the different characteristics between the subtypes of reticulate eruptions can facilitate early disease detection.

## Importance of planning

Dr Kang emphasises the importance of planning and advises other emerging researchers to have a detailed outline of the aim of their research.

"Ninety-nine percent planning and 1% execution' – that's one of the most valuable research philosophies that my supervisor has taught me," Dr Kang says.

"Clear methodology, including data management plans and statistical analysis is key to ensuring that your research is successful and stress-free."

The study is currently recruiting 60 participants and the preliminary results are expected in June 2022.

In the future, Dr Kang plans to continue her clinical career in dermatology and undertake a PhD, where she can amplify the impact and power of the study's preliminary findings.



Being able to exercise flexibility in terms of time commitments and scheduling of patients for recruitment has been key. Without the financial support from Avant to free me from other work commitments, this would have been very stressful."

