

Those who had Covid-19 may be at risk of getting blood clots: Study

Cheryl Tan

People who have recovered from Covid-19, regardless of the severity of their disease, may be at risk of developing blood clots due to an over-active immune system, according to a study by local scientists.

Blood clots, especially in arteries that are linked to vital organs, can increase a person's risk of heart attack, stroke or organ failure.

Blood samples from 30 patients who had recovered from mild, moderate and severe Covid-19 were collected a month after their discharge from hospital.

All were found to have blood vessel damage, possibly arising from a lingering immune response, which could trigger the formation of blood clots.

Around half of the patients had pre-existing cardiovascular risks such as diabetes and hypertension, which put them at higher risk of blood clotting, said Assistant Professor Christine Cheung from Nanyang Technological University's (NTU) Lee Kong Chian School of Medicine yesterday.

Speaking at a virtual media briefing, she noted that these patients also had more pronounced blood vessel dysfunction compared with those who had no cardiovascular risks.

The team led by Prof Cheung comprised researchers from NTU, the Agency for Science, Technology and Research's (A*Star) Singapore Immunology Network, and the National Centre for Infectious Diseases (NCID). Their study was published in the scientific journal *eLife* on March 23.

Prof Cheung's colleague, research assistant Florence Chioh,

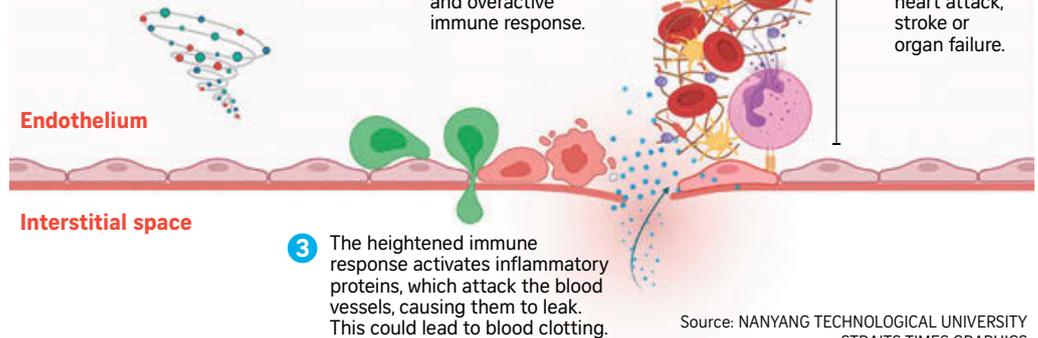
Danger for recovered patients

Bloodstream

1 When someone gets Covid-19, his body produces inflammatory proteins to activate an immune response against pathogens.

2 Killer T cells in excessive numbers post-recovery indicate a persistent and overactive immune response.

4 Blood clots that form in major arteries could cause a heart attack, stroke or organ failure.



Endothelium

Interstitial space

3 The heightened immune response activates inflammatory proteins, which attack the blood vessels, causing them to leak. This could lead to blood clotting.

Source: NANYANG TECHNOLOGICAL UNIVERSITY STRAITS TIMES GRAPHICS

who is the first author of the study, said the Sars-CoV-2 virus may attack the linings of blood vessels, causing inflammation and damage, resulting in leakage and triggering blood clotting.

But the researchers discovered that even after the patients had recovered, they continued to have high levels of inflammatory proteins called cytokines – which are produced to activate an immune response against pathogens.

They also had an unusually high number of immune cells known as T cells, suggesting that their immune response was still activated even after the virus was gone.

The heightened immune response could trigger the cytokines to attack the blood vessels, increasing the risk of blood clot formation.

They are now looking to include

more patients in the study, by recruiting those who are at least six months into their recovery from the initial infection.

This will help the team to better understand the long-haul effects of Covid-19.

In another study led by Dr Eugene Fan, a consultant at Tan Tock Seng Hospital's Department of Haematology, it was found that four patients who had recovered from asymptomatic Covid-19 infection had suffered from arterial thrombosis, or blood clotting in the arteries, weeks after their recovery.

Two of them had a stroke, one had a heart attack, and the other had acute limb ischaemia, which refers to a significant decrease in blood flow to the limb.

One of the four patients had dia-

betes, while the rest did not have any cardiovascular risk factors which would predispose them to the risk of blood clotting.

The findings were published in the *Journal of Thrombosis and Thrombolysis* last November.

Dr Fan said: "This could be a result of several mechanisms, one of which is increased platelet activation, where blood platelets are more sticky post-infection, and can lead to blood clot formation. Another is the chronic inflammation of the blood vessel lining – known as endotheliitis."

He noted that NCID recommends the use of anti-coagulants in severely or critically ill Covid-19 patients, or those with a higher risk of developing thrombosis.

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