National University Heart Centre Singapore

MEDIA RELEASE

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NUHCS ADVANCES AORTIC CARE WITH PERSONALISED PREVENTIVE TREATMENT USING 3D-PRINTED MODELS FOR PATIENTS AT HIGH RISK OF DEADLY HEART DISEASE

Custom-fitted aortic sleeve implant minimises risk of life-threatening rupture while providing long-term heart support

(From left to right) Adjunct Associate Professor Vitaly A Sorokin holding a 3D-printed model of Mr Long Foo Pieng's aorta; patient Mr Long Foo Pieng; and Adjunct Associate Professor Low Ting Ting holding an open-mesh aortic sleeve used in PEARS. Photo credit: NUHCS

SINGAPORE — A silent heart disease makes its presence known at the point of a devastating rupture to the aorta, the body's largest artery. The condition, known as an aortic aneurysm, leads to around 150,000 to 200,000 deaths each year worldwide with a staggering 80 per cent mortality rate if it results in a rupture.[1]

What if it is possible to stop this condition before it claims a life? This is where the **Personalised External Aortic Root Support (PEARS)** comes in as a promising procedure that aims to stop the aneurysm from growing and avoid an aortic rupture from happening at all.

[1] Cho, M.J., Lee, MR. & Park, JG. Aortic aneurysms: current pathogenesis and therapeutic targets. *Exp Mol Med* **55**, 2519–2530 (2023). https://doi.org/10.1038/s12276-023-01130-w

An aortic aneurysm is an enlargement of the aorta, formed when the wall of the aorta becomes weakened and begins to bulge outward. This can be due to many factors, including high blood pressure, genetic conditions and aortic valve issues. Often underdiagnosed or delayed in diagnosis, the bulge that continues to grow over time is at high risk of rupturing along the elastic wall, leading to rapid and life-threatening blood loss.

The National University Heart Centre, Singapore (NUHCS) sees approximately 300 patients a year in its specialised Aortic Centre. Last year, close to 30 patients had to undergo an emergency surgery due to an impending rupture.

PEARS is a proactive approach that reinforces a weakened aorta with a tailored, open-mesh support sleeve. Applied when a patient's aorta has only just increased in size or is mildly aneurysmal, the support sleeve acts as a protective "glove" around the vessel to prevent further expansion and significantly reduces the risk of a rupture.

A safer and personalised approach

This groundbreaking treatment was first performed at NUHCS in November 2024, and it is understood that it was also the first time PEARS was performed in Southeast Asia. Since then, five more patients from NUHCS have benefitted from the treatment. Without PEARS, these patients would be at risk of a larger aneurysm, at which a major surgery that involves stopping the heart to replace the entire aortic root may be needed to avoid a rupture.

"The open-mesh sleeve used to support the weakened aorta in PEARS is custom-shaped to a 3D-printed model of a patient's aorta from their CT scan. Due to the customised nature of this sleeve, it provides personalised long-term structural support to the heart vessel, which is crucial in stopping the aneurysm from growing larger," explained Adjunct Associate Professor Vitaly A Sorokin, Head and Senior Consultant, Division of Adult Cardiac Surgery, Department of Cardiac, Thoracic and Vascular Surgery (CTVS), NUHCS.

An aneurysm that does not grow in size greatly reduces the risk of a rupture. For patients with aortic aneurysms who are eligible for PEARS, the need for an aortic root replacement is also avoided. This not only reduces surgical risks and future complications, but also significantly shortens the surgical treatment time by half.

"PEARS represents a shift in aortic care, emphasising personalised prevention over a later intervention for patients. These patients can now experience life just like their peers without constantly worrying about their aortic health and the risk of a sudden rupture. The tremendous improvement in their quality of life cannot be discounted," said Adj A/Prof Sorokin.

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Chinese Glossary

National University Heart Centre, Singapore (NUHCS)	新加坡国立大学心脏中心 (国大心脏中心)
Personalised External Aortic Root Support (PEARS)	个性化的主动脉根部外部支持
Aortic aneurysm	主动脉瘤
Aortic rupture	主动脉破裂
Adjunct Associate Professor Vitaly A Sorokin Head and Senior Consultant Division of Adult Cardiac Surgery Department of Cardiac, Thoracic and Vascular Surgery (CTVS) National University Heart Centre, Singapore (NUHCS)	Vitaly A Sorokin 客座副教授 成人心脏外科 主任兼高级顾问医生 胸肺外科 国大心脏中心

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About the National University Heart Centre, Singapore (NUHCS)

The National University Heart Centre, Singapore (NUHCS) is an academic, national specialist centre under the National University Health System (NUHS). NUHCS brings together the resources, expertise and capabilities in the areas of Cardiology, Cardiothoracic and Vascular Surgery to better meet the needs of the growing number of patients with heart disease and raise the future generation of medical professionals.

As one of two national heart centres in Singapore for the treatment and management of complex cardiovascular diseases, NUHCS offers six core clinical programmes including Heart Failure & Cardiomyopathy, Structural Heart Disease, Acute Coronary Syndrome, Heart Rhythm, Congenital & Structural Heart Disease and Women's Heart Health. The centre has been awarded two institutional Peaks of Excellence for its Minimally-invasive Cardiothoracic Surgery and Aortic Centre Programme, and has been ranked top in Singapore for three consecutive years in 2022, 2023 and 2024 for the specialty of Cardiac Surgery in Newsweek's "World's Best Hospital" Award.

Comprising a team of internationally-recognised cardiologists and surgeons from the cardiothoracic and vascular specialties, NUHCS serves as a referral national centre for cardiothoracic and vascular conditions and provides a comprehensive approach to the treatment of these patients. The holistic patient-care approach is backed by leading translational research at the Cardiovascular Research Institute (CVRI) and Cardiovascular Metabolic Translational Program, all of which complements these advanced quaternary clinical services to deliver state-of-the-art treatment solutions to the most challenging heart, lung and circulatory diseases.

National University Heart Centre Singapore

NUHCS services span across four locations to serve the western and central locations in Singapore:

- NUHCS at National University Hospital (NUH), Kent Ridge - Main Operations
- NUHCS Heart Clinic @ Ng Teng Fong General Hospital (NTFGH)
- NUHCS Heart Clinic @ Jurong Medical Centre (JMC)
- NUHCS Heart Clinic @ Alexandra Hospital (AH)

For more information, visit: https://www.nuhcs.com.sg.