

MEDIA RELEASE

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ADVANCING PAEDIATRIC HEART CARE WITH GROUNDBREAKING SURGERIES

The Double Root Rotation, Double Switch Operation and Ross-Konno Procedure are the novel surgical procedures achieved at the national centre



Photo credit: National University Heart Centre, Singapore (NUHCS)

Four-year-old Nur Faathimah Assyifa' (middle) who underwent the Double Switch Operation, holding a 3D model of her heart, with (from left to right):

- *Assistant Professor Chen Ching Kit, Senior Consultant, Division of Paediatric Cardiology, Department of Paediatrics, Khoo Teck Puat – National University Children's Medical Institute, National University Hospital;*
- *Dr Senthil Kumar Subbian, Consultant, Division of Paediatric Cardiac Surgery, Department of Cardiac, Thoracic and Vascular Surgery (CTVS), National University Heart Centre, Singapore (NUHCS);*
- *Assistant Professor Winn Maung Maung Aye, Consultant, Division of Paediatric Cardiac Surgery, Department of CTVS, NUHCS; and*
- *Associate Professor Laszlo Kiraly, Head & Senior Consultant, Department of CTVS, NUHCS.*

SINGAPORE — From life-changing complex surgeries to heartwarming stories of resilience and recovery, the paediatric cardiac team at the National University Heart Centre, Singapore (NUHCS) has seen them all.

Congenital heart disease (CHD) is the most common birth defect globally, affecting numerous lives every year. More than half of patients with structural CHD will require cardiac surgery in their lifetime, with close to 70 per cent needing intervention within the first six months of life.

The multidisciplinary team at NUHCS performs about 100 to 150 interventions per year. This includes catheter-based and surgical procedures, reflecting NUHCS's role as a beacon of hope and a treatment centre of choice for complex CHD.

In 2022 and 2023, the paediatric cardiac surgery team at NUHCS, led by Associate Professor Laszlo Kiraly, successfully performed three different highly complex and novel congenital heart procedures: Double Root Rotation, Double Switch Operation, and the Ross-Konno Procedure.

Associate Professor Kiraly, Head and Senior Consultant, Department of Cardiac, Thoracic and Vascular Surgery, NUHCS, said, "These procedures not only represent significant advances in treating complex congenital heart defects but also offer crucial opportunities for survival and improved quality of life."

- **Double Root Rotation:** This complex surgery is performed when the great arteries are formed on opposite sides and the pathway is narrowed to one of them. The procedure switches the arterial roots back to their original positions and corrects the narrowed segment. As mostly native tissues are used in the correction, they allow natural growth and reduce the likelihood of reoperation.
- **Double Switch Operation:** The Double Switch Operation corrects a situation where the heart's internal segments, comprising the receiving chambers (atria), pumping chambers (ventricles) and vessels (arteries) arising from the heart, are incorrectly connected. Without treatment, the burden of pumping of blood around the body will strain the ventricles which are in the wrong position, leading to heart failure. To rectify the connections, two switches are necessary at the atrial and arterial levels.
- **Ross-Konno Procedure:** The Ross-Konno Procedure is a complex form of surgery to treat a diseased aortic valve. The aortic valve is an important heart valve that stands between the left ventricle (which pumps the blood to the entire body) and the aorta (the largest artery in the body). The procedure also addresses any narrowing in the outlet from the main pumping chamber. The diseased aortic valve is replaced with the patient's own pulmonary valve (a valve that manages the blood flow to the lungs). This is followed by replacement of the pulmonary valve conduit with a donor valve. The patient's own transplanted valve is a viable and growing "bioprosthesis". Therefore, optimal circulation can be restored without anticoagulation.

A comprehensive programme for congenital heart disease

These complex surgeries often require extensive pre-surgery planning and the NUHCS team has been integrating the latest innovations – including 3D modelling and

printing, mixed reality and augmented visualisation – in preparation for these operations. The team is also exploring the use of artificial intelligence and robotics, nanotechnology, bioprinting and bioengineering in the future.

The treatment of complex CHD cases is part of NUHCS's comprehensive programme for CHD, which includes a dedicated team of specialists and allied health professionals providing round-the-clock service for emergency and elective CHD treatment. These include comprehensive continuity-of-care (pre-operation, post-operation and follow-up), an Extra Corporeal Membrane Oxygenation (ECMO)/Extracorporeal Life Support (ELS) programme and treatment options for all ages from neonatal complex repairs to adult congenital cardiac care.

Through personalised care and advanced surgical interventions, NUHCS continues to lead in the treatment of paediatric cardiac conditions, striving for better outcomes and brighter futures for children.

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)
Associate Professor Laszlo Kiraly Head & Senior Consultant Department of Cardiac, Thoracic and Vascular Surgery (CTVS) National University Heart Centre, Singapore (NUHCS)	Laszlo Kiraly 副教授 主任兼高级顾问医生 心胸血管外科 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.

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>.