

PRESS RELEASE

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Ng Teng Fong General Hospital introduces two new minimally invasive techniques to treat high-risk and life-threatening Pulmonary Embolism

Singapore, 13 January 2022 – A new multi-disciplinary team of doctors, known as the Pulmonary Embolism Response Team (PERT) has been formed to improve the treatment of Pulmonary Embolism (PE). Led by Dr Pipin Kojodjojo, Director of Cardiology at Ng Teng Fong General Hospital (NTFGH) and Senior Consultant, Cardiology and Cardiac Electrophysiology at the National University Heart Centre, Singapore, the team has brought about improved outcomes for PE patients and reduction of stay in the ICU. More recently, two new minimally invasive techniques for high risk, life-threatening cases of PE have been introduced to further improve patient care. To date, 13 patients have been treated with these minimally invasive procedures to rapidly eliminate acute and large blood clots within the lungs.

PE is the third leading cause of cardiovascular death in the world, after heart attack and stroke. It is potentially a life-threatening condition which requires immediate medical intervention, and mortality can be as high as 45 per cent of patients. If untreated, acute PE is associated with a significant mortality rate (as high as 30 per cent). Up to 10 per cent of acute PE patients die suddenly. Two of three patients who succumb to PE die within two hours after presentation¹. PE occurs when one or more blood clots block the supply of blood to the lungs – when accompanied by a sudden drop in blood pressure, it is also known as high-risk PE. The blood clot can form in the veins in the legs, pelvis or abdomen, and dislodge and travel in the blood stream to wedge in the arteries supplying blood to the lungs.

Besides traditional causes such as obesity, ageing, surgeries, cancer and immobility, recovered COVID-19 patients also have a higher risk of developing blood clots. PE is increasingly common and those infected with COVID-19, particularly in the first six months after infection, are at an increased risk of developing blood clots in their lungs. In a recent study², blood samples from 30 patients who had recovered from mild, moderate and severe COVID-19 were collected one month after their discharge from the hospital. All were found to have blood vessel damage which could trigger the formation of blood clots. The seriousness of the condition varies with the size of the blood clot, and its effect in obstructing blood circulation.

On 5 October 2021, Ms Michelle Yip, a 40-year-old insurance executive, was at work when she felt a sharp and tight chest pain, heavy palpitations as well as a further tightening of her calf (which had not alleviated despite a massage a few days earlier). She could not catch her breath and broke out in cold sweat. While her colleagues called for an ambulance, she briefly fainted and slumped in her seat. The medics woke her out of unconsciousness and quickly

¹ Linhart,A. Part 1, P129-138, 2013. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3718593/>

² Nanyang Technological University, the Agency for Science, Technology and Research's Singapore Immunology Network and the National Centre for Infectious Diseases. eLife, 23 March 2021. <https://elifesciences.org/articles/64909>

conveyed her to the emergency department at NTFGH as her heartbeat was racing and her blood pressure and oxygen levels were plunging.

Subsequent tests revealed that exceptionally large blood clots, which first developed in her legs, were obstructing blood flow into both lungs. As a result, her right heart chambers were grossly swollen and were at risk of failing. Michelle was diagnosed with high-risk PE and Deep Vein Thrombosis (DVT). She recounted her close brush with death, "I was shocked to learn that I almost had a cardiac arrest which could have been fatal. It is a mystery how I developed blood clots in my legs and lungs as I maintain a healthy lifestyle and have no underlying medical conditions."

Ultrasound-assisted thrombolysis

Conventionally, PE patients are treated with blood thinners and high-risk PE patients could remain in the ICU for at least one week to recover. Those at risk of a cardiac arrest can be given a large dose of the clot-busting medication or thrombolysis³ to break up the clot rapidly, but may develop bleeding complications in the brain. As Michelle had a high-risk PE with DVT and was possibly on the verge of a cardiac arrest, she opted for **an ultrasound-assisted catheter-directed thrombolysis** after discussing the options with Dr Jimmy Ong, Consultant Cardiologist and an intensive care physician at NTFGH.

This technique, which is new to Singapore healthcare and the first to be carried out in Southeast Asia, was conducted under local anaesthesia where two spaghetti-thin tubes (catheters) were inserted into a vein in her leg via X-ray guidance to deliver the clot-busting medication to the lungs; while high intensity ultrasound emitted from the catheters further broke up the blood clots. As a result, only 25 per cent of the usual dose was required, which greatly reduced the risk of bleeding complications. The thin catheters were inserted in under an hour, and Michelle's condition improved within 30 minutes to an hour. After six hours, the blood clots in the lungs dissolved and normalised blood flow through the lungs and returned her heart to its normal size.

By using this technique, Michelle achieved a swifter recovery with better outcomes in just six hours and was discharged the next day after. This technique also freed up critical ICU beds which are needed during the ongoing pandemic.

Suction Thrombectomy

Another new technique was administered on 48-year-old Mohamed Roslan Bin Dawood, a security officer who leads a healthy lifestyle. This was the first to be conducted in Asia. Roslan developed PE two years ago after a gall bladder surgery and was on blood-thinning medication for a year before he stopped due to bleeding complications.

On 21 November 2021, he became breathless while patrolling and visited the emergency department at NTFGH as it felt similar to his first PE incident. The tests confirmed that massive blood clots were obstructing blood flow into both lungs; his blood pressure dropped and his heart was under strain. He was treated with vacuum **suction thrombectomy** through a catheter to directly remove all the blood clots from the lungs without the use of any clot-busting medication and its associated risk of bleeding complications. Roslan recovered and was discharged three days later. He shared, "I was told that a cardiac arrest was imminent. While I was awake throughout the ordeal, the procedure was smooth, painless and it saved my life."

Said Dr Pipin who heads PERT, "We are racing against time for those with high-risk and life-threatening PE, including patients who have failed to respond to blood thinners or clot-busting

³ Injection of clot-busting drugs through an intravenous (IV) line or using a catheter.

drugs. These two minimally invasive methods are now the preferred first line of treatment as it enables us to remove the clots quickly to restore normal circulation and heart function, with as little complications as possible, to greatly benefit the patient. As importantly, it reduces the hospital stay and frees up ICU beds that are needed as we continue to manage the evolving pandemic.”

There is better recognition of PE in recent years and as a result, more cases have been diagnosed. There is also a rise in younger patients have PE despite having an active and healthy lifestyle. Some possible causes are:

- Underlying medical conditions including cancers, pregnancy, obesity and heart failure
- Smoking
- Surgery or injury to the hips or legs
- Recent COVID-19 infection
- Certain blood disorders which make the blood thick and likely to clot easier
- Prolonged periods of inactivity like hospital stay; recovery from surgery or sitting for a long time when travelling
- Medications such as birth control pills
- Enlarged veins in the legs (varicose veins)

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