

Singapore expertise pioneers quick and scarless surgery

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Patients with gastric tumours in their stomach will no longer have to suffer an eight-hour long surgery, but instead can look forward to a short day surgery which last a few minutes to an hour without the need for hospitalisation.

This new procedure – the world's first flexible endoscopy robotic [surgery](#) in the stomach – was successfully performed on patients suffering from gastric tumours in India.

The procedure was performed on a total of three patients, one patient per day from 1 to 3 July.

A flexible endoscope (small tube inserted in intestinal tracts) which had small robotic arms, was inserted through the patient's mouth to the stomach, while the surgeon monitored it on a computer screen. Using joystick and buttons to control the robotic arms, the surgeon then removed the cancerous [tumour](#) and the patient went home after the operation.

This groundbreaking technology was developed by Associate Professor Louis Phee, Head of the Division of Mechatronics and Design, School of Mechanical and Aerospace at Nanyang Technological University and Professor Ho Khek Yu Lawrence, Senior Consultant at the Department of Gastroenterology and Hepatology, National University Hospital, after six years of research.

This system, named MASTER (Master And Slave Transluminal Endoscopic Robot) is entirely designed and built from scratch in NTU.

Current robotic keyhole surgeries still require a small cut at the stomach area to enable a rigid robotic endoscope to enter and do the surgery. This new flexible robotic endoscope does not require any external incision, and enters through the mouth instead.

By controlling an external console, the surgeon is able to make the robot perform intricate surgical procedures. For the surgeries done in India, the robot is used to perform Endoscopic Submucosal Dissection (ESD): the delicate removal of a tumour embedded in the stomach wall without puncturing the latter.

Without this robotic system, a patient is likely to undergo open surgery to remove the tumour. As ESD is considered a very difficult procedure, the robot is easily modified to perform many other procedures within the digestive tract.

This novel procedure also opens up new possibilities for surgery: the robot is able to cut a small hole in the stomach wall to get access to other organs like the liver, kidney, and pancreas to perform intricate surgery. After the surgery is done, it slides back into the stomach, mends the hole in the stomach wall and exits out of the mouth again. It may come a time when a patient goes for surgery and all he or she needs do is open their mouth.

Apart from speeding up the operation process and leaving no scars, this robotic procedure is also significantly cheaper than normal surgery thanks to its precision, dexterity and manoeuvrability. The robotic arms, which is up to six millimeters in diameter, has the capacity to "feel" how hard or soft the delicate tissues of the stomach and intestines are, so doctors at the console can vary the pressure accordingly. The combined

diameter of both arms is up to 16 mm.

In future, it may be possible for such a surgical system to be controlled remotely from another part of the world.

To carry out the experiments on the device's effectiveness and efficiency, a multi centre experiment was decided as collaborators from Hong Kong and Germany have shown keen interests. Since the Asian Institute of Gastroenterology (AIG) was the first to get the relevant approvals for human trials and patients were easily available there, they were the first centre to carry out the operation.

AIG is one of Asia's largest outpatient centres doing therapeutic endoscopy, and has the credit of doing the most ERCP (Endoscopic retrograde cholangiopancreatography) procedures in the world.

In addition, Dr Nageshwar Reddy, chairman and chief gastroenterology at AIG, is one of the best gastroenterologists in the world and is known for his innovations. With the experimental operation carried out under his supervision, it would give the new surgical procedure a lot of credibility.

Dr R. Pradeep, the AIG surgeon who did the operations in India, was in Singapore last year to train on the prototype system for a week. AIG is a partner in performing the first operation and does not share the Intellectual Property with regards to this invention, which is patented.

The future plan will be to expand trials to other centres such as in Hong Kong and Germany. While relevant approvals have already been given to proceed with human trials in Singapore, patients with this particular ailment in Singapore are rare and are not easily found.

Provided by Nanyang Technological University

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