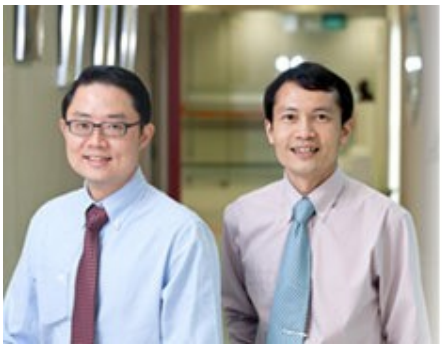
2012 PSTA WINNER CITATIONS

PRESIDENT'S TECHNOLOGY AWARDS 2012



(from left to right)
Associate Professor Louis Phee
School of Mechanical & Aerospace
EngineeringNanyang Technological University

Professor Lawrence Ho Khek Yu
Department of Gastroenterology & Hepatology
National University of Singapore

"For the development of a novel flexible endoscopic robotic system that enables intricate surgical procedures to be performed without the need for external incisions"

Mechanical engineering research scientist Associate Professor Louis Phee and clinician scientist Professor Ho Khek Yu joined hands to successfully drive a paradigm shift in the field of surgery and endoscopy - to move from 'keyhole' to 'no hole' surgery.

With their novel invention, the Master and Slave Transluminal Endoscopic Robot (MASTER), the duo is incorporating cutting edge robotics technologies and innovative engineering technologies to push the frontier of endoscopic surgery for the benefit of both patients and clinicians. Their vision is for surgical procedures involving organs in the peritoneal cavity (e.g. liver, pancreas, gall bladder) to be performed using robotic devices like MASTER, entering through natural orifices, without the need of making an external incision. This is particularly pertinent as the future for gastrointestinal cancer is early detection and complete endoscopic resection of the early lesions, and the future of surgery for the aging population is minimally invasive surgery.

MASTER is highly accurate, reliable and easy to use. The tube-like robot snakes its way through natural openings (e.g. mouth, anus) to reach tumours inside the digestive tract. Two miniature robotic arms from the end of the device are carefully controlled by the surgeon, who could be stationed a distance away from the patient. Using these dexterous arms, the surgeon would safely cut away the tumour. For added safety, haptics technology has been implemented to enable the doctor to 'feel' the tissue as the robotic arms perform the surgical procedure.

Using the first prototype of MASTER, the team successfully performed first-in-man trials in India and Hong Kong in 2011. The cancer tumors in the stomach of all five patients were removed effortlessly by MASTER. The patients experienced less pain and faster recovery. In addition, no scars were left behind as the surgical procedures were performed without the need for an external incision.

As the trials were novel procedures, the team was rapidly recognised as world leaders in robotic endoscopy, and they were widely covered by local and international media including Reuters, BBC and National Geographic. To push the technology all the way to commercialisation, the team incorporated EndoMaster Pte Ltd in late 2011. They have successfully filed for US patents on this device. In addition, they have proceeded with the national phase filling of a patent in USA, Japan, China, Europe and Singapore since late 2011.

Since 2004, the team has contributed substantially to high impact engineering and medical publications, and made numerous presentations on this project. In recognition of their cutting-edge invention, their robotic paper was featured as the top article in the official newspaper of the American Gastroenterology Association (AGA), which is the world's premier gastroenterology association. Their robot image was selected for the cover of the Clinical Gastroenterology & Hepatology, the official journal of the AGA. The accompanying video-abstract was also broadcasted on Youtube to all journal readers.

For the development of a novel flexible endoscopic robotic system that enables intricate surgical procedures to be performed without the need for external incisions, Associate Professor Louis Phee and Professor Ho Khek Yu are awarded the 2012 President’s Technology Award.