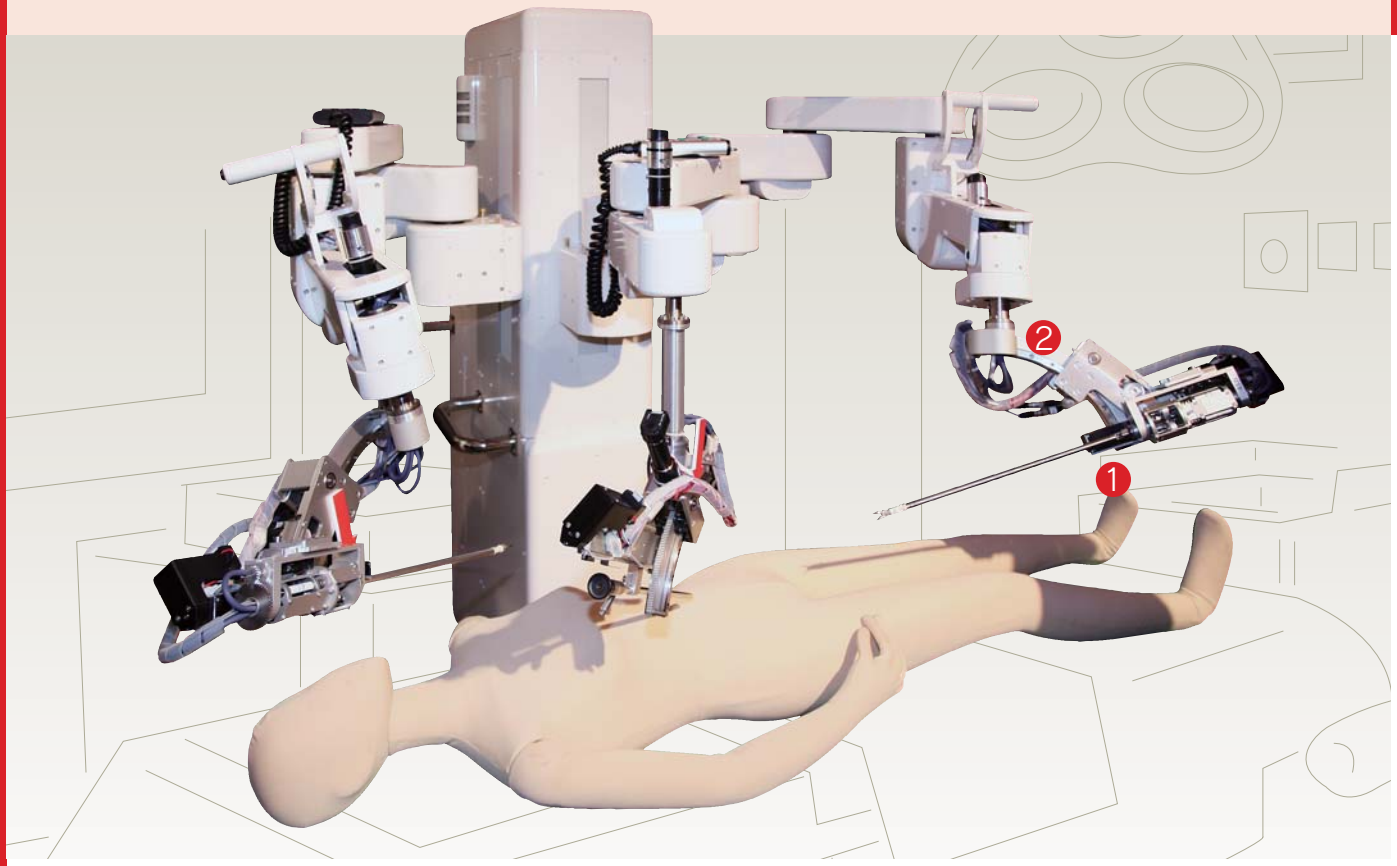
Robotic telesurgery: A dream comes true

Making cutting-edge medical technology available to more patients



❶Actuator (KR) ❷R Guide

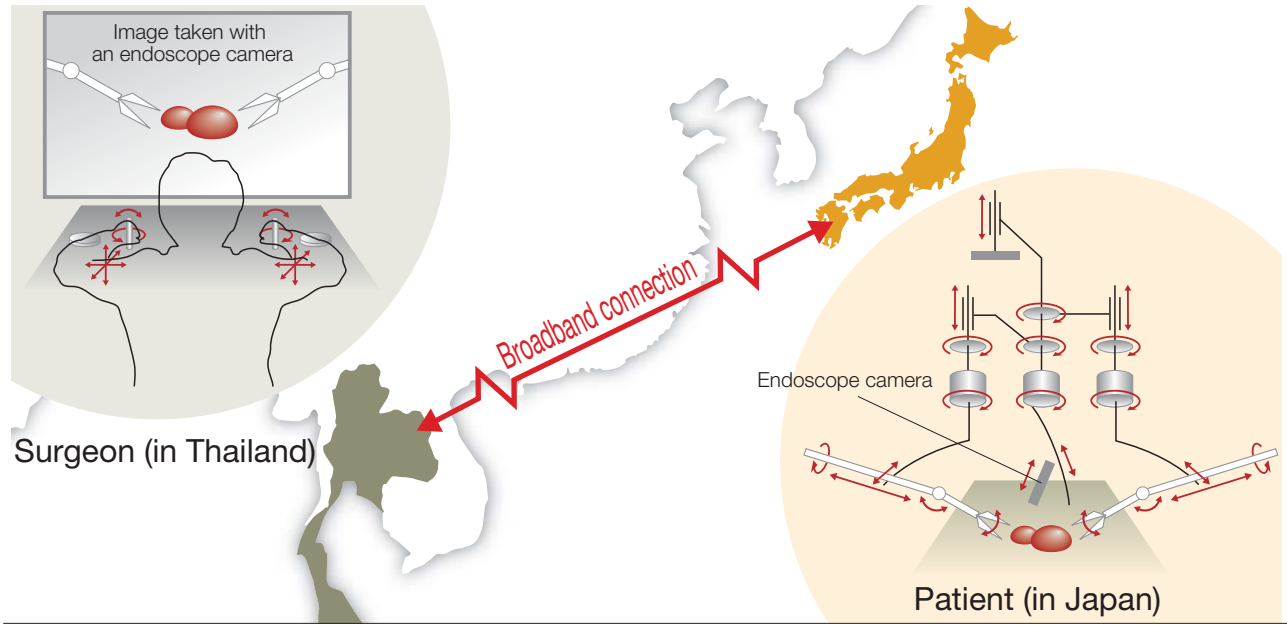
Have your operation performed by a highly skilled surgeon no matter where you are.

Aging population and declining birthrate, a shortage of physicians, and regional disparities in medical care—these are among the healthcare issues currently confronting Japan; they are in the news almost daily. One promising approach to resolving some of these issues is the use of medical robots. Among other efforts, research is progressing in the area of robotic telesurgery, which will enable a surgeon to operate on a patient who is not in the same location. While the physician operates the controls at his location, a robotic arm installed in the remote operating room moves in response to signals received over a broadband connection. The ability to have an operation performed by a highly skilled surgeon anywhere in the world is a dream come true and THK is putting its technology to excellent use in helping to develop telesurgery robots.

The development of medical robots has focused on several objectives: (1) enabling the physician to see behind or inside normally inaccessible internal organs and skeletal structures, (2) providing surgical access to confined spaces and the areas of organs that are difficult to reach by hand, and (3) making it possible to perform microsurgery and high-precision surgery. More recently, efforts have also been directed toward equipping sparsely populated areas with facilities for remote diagnosis and remote surgery, to provide patients in such areas with diagnostic and surgical services on a par with those available in hospitals equipped with state-of-the-art medical equipment.

A collaborative academic-industrial research and development project has been established with the aim of providing regions and countries that have substandard medical facilities with the same high level of health care enjoyed in wealthier countries. The project participants, including Tokyo University Professor Mamoru Mitsuishi and scholars from Kyushu University, are currently engaged in finding practical applications for telesurgery robots. The first robot designed to assist a surgical procedure—in this case, "minimally invasive laparoscopic surgery*"—was developed in 1999, and the second, an improved version of the first, appeared in 2007. In minimally invasive laparoscopic surgical robot, a laparoscope (endoscope) and forceps or an electric scalpel are inserted through small openings made in the abdomen; the doctor uses a surgical-assistant robot installed at the operating table to perform the surgery by remote control. Thus, a physician in a hospital in Japan, for example, can perform surgery on a patient in a hospital in Southeast Asia. To date, two successful remote-control operations have been performed: on two occasions doctors at Chulalongkorn University in Thailand have removed the gallbladder of a guinea pig located in Fukuoka, on the island of Kyushu. (See the illustration on the opposite page.)

* Minimally invasive laparoscopic surgery: A surgical procedure designed to be nonintrusive and to subject the patient to minimal trauma



Advances in medical care to create an affluent society

THK has participated in the development of telesurgery robots, designing and manufacturing the robot arms and the arm sections of the forceps. ❶Actuators and ❷R Guides, THK's flagship products, are used in various parts required to faithfully reproduce the movements of the surgeon and maintain patient safety during the procedure. The telesurgery robot project is undergoing further improvements with a view toward eventual practical applications. Other THK products and technologies have also been put to use in medical fields. One example is the repositioning robot, developed by Professors Ichiro Sakuma and Mamoru Mitsuishi of the University of Tokyo and others, which assists the movements of the physician during surgery.

Surgery to repair a femur fracture requires considerable physical strength to bring the bone into the proper position. The use of THK's rolling motion technology to move heavy objects using minimal force can reduce physical demands on the physician and can make it easier for women to work in the field of orthopedic surgery.

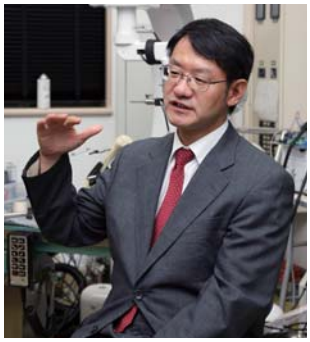
THK technology augments human physical strength. More uses for THK products are expected to be found in a variety of fields. As Japan continues to change demographically due to its aging population and declining birthrate, THK will make effective use of its technological capabilities to help create a truly affluent society.

Repositioning robot assisting a surgical procedure

Opening up great possibilities

My relationship with THK started when I was involved with intelligent machine tools* before taking up telesurgery robots. I had confidence in THK's considerable technical capabilities. Telesurgery robots, however, pose different challenges compared to machine tools. For instance, the requirements of reduced size and weight are different. Surgery is a race against time. Not only do the movements have to be more precise, but the robotic arm must react quickly and must be designed for quick installation and replacement. Another issue is cleaning and sterilization. THK took all of our demands very seriously. The telesurgery robot is a revolutionary system that not only reduces the patient's trauma but also lightens the burden on the surgeon. It offers many advantages, not the least of which will be helping to correct regional disparities in medical care and provide appropriate initial treatment in medical emergencies. I hope that THK will continue to engage in joint R&D with us, in the hope that we can put the telesurgery robot and its enormous potential to practical use.

* Intelligent machine tools: Machines equipped with the ability to analyze and make decisions



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