

# 5G Network Used in Demonstration of Remote Surgery

By Linda Carroll

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(Reuters Health) - In a proof of concept, an Italian surgeon successfully performed a delicate vocal cord procedure on a cadaver from 15 km away using robotic technology and a 5G network, according to a new report.

In the experiment, the surgeon had effective control of the surgical robot, forceps and laser, and was able to perform high-precision laser cordectomies on the cadaver's vocal cords as if he were in the room with the patient, researchers report in the *Annals of Internal Medicine*.

"The most important take home message from this study is that telesurgery is finally feasible at a large scale thanks to 5G, the new generation of mobile telecommunication networks," said study coauthor Leonardo Mattos, head of the biomedical Robotics Lab at Istituto Italiano di Tecnologia in Genoa.

"This way of performing surgery has been a dream for more than 20 years," Mattos said in an email. "In 2001, pioneers performed the first demonstration of long distance telesurgery and large excitement was created around it."

Due to the limited availability of surgical robots and the lack of fast reliable network connections, that feat was not repeated, Mattos said. "Now, the presence of surgical robots in operating rooms is becoming increasingly common and 5G is quickly becoming a reality worldwide, bringing ultra-fast, stable and reliable data transmission," he added.

Mattos sees numerous uses of the technology in the future.

"For example, the technology is expected to make possible collaborative telesurgery over very large distances, to revolutionize training and to make surgical expertise available at a global level, benefiting specially developing nations," Mattos said. "The current pandemic also highlights the benefit of telesurgery as a way to ensure the safe distancing between infected patients and the surgeon, thus contributing to safeguard the health of critical medical personnel."

For the experiment, an expert otorhinolaryngologist located at Vodafone Village (southwest of Milan) used a novel, teleoperated surgical robot system to operate on a cadaver at the anatomy laboratory of San Raffaele Hospital, which is approximately 15 km northeast of the city.

The surgeon's setup included a tablet device for laser position control, a haptic device to control the surgical forceps, and a 3-dimensional display for visualization of the surgical site, the study team notes. On the patient side, the setup included the CALM system for laser micromanipulation, a Panda robot (Franka Emika) to manipulate the surgical forceps, and a VITOM 3D exoscope (Karl Storz) for imaging the surgical site.

Measurements showed a mean round-trip time of approximately 40 milliseconds between devices that were both connected to the 5G Radio Access Network, the authors report. "After addition of the application layer, the mean 1-way latency for transmission of the full, 3-dimensional, high-definition video was  $102 \pm 9$  ms, with maximum delay below 140 ms. Maximum round-trip latency of approximately 280 ms did not cause deterioration in the teleoperation performance."

During the procedure, the surgeon first performed a ventriculotomy to expose the vocal cords and then did a type I cordectomy on the left vocal fold, followed by a type IV cordectomy on the right vocal fold.

In practice, Mattos said, with a live patient, most of the operating staff would be in the room with the patient, including the anesthesiologist, a nurse and an assistant surgeon. "This is because the patient has to be prepared for the surgery, the robot has to be set up for the procedure and patient safety must be ensured by the possibility of converting to a standard procedure in case something goes wrong with the robot."

The new paper "is exciting from a technological point of view," said Chris Carmody, senior vice president of enterprise

technology and services at UPMC in Pittsburgh. "It shows the possibilities of what can be done with a very fast robust network," Carmody said.

"They are showing what is possible," Carmody said. "It's a good first step. But I don't think you're going to see this happening tomorrow."

Before this type of surgery can become widespread, it needs to be tested and its safety proven, Carmody said.

It's likely that prior to remote surgeries becoming commonplace, other uses will come to the fore, such as sensors that keep track of people's health, Carmody said. That's likely to include real-time glucose sensors that can report a patient's blood sugar to the healthcare provider, which would enable the healthcare provider to send notifications of blood sugar gets into a dangerous zone, he added.

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