

# Robot-Aided Surgery Successful For Soft-Tissue Procedures



By Lila Abassi — May 5, 2016



Robot surgery via [shutterstock](#) [1]

Robot-assisted surgeries have been around for a while and the [da Vinci Surgical System](#) [2], which is the most widely-used process, was approved in 2000 by the Food and Drug Administration. There are many benefits to robotic procedures, which typically: include fewer post-surgical infections; cause less pain and blood loss; allow for quicker recovery; and produce smaller scars that are less noticeable over time.

In a recent paper, published in *Science Translational Medicine*, surgeons have demonstrated the capability of utilizing robotic surgery without using the surgeon's hands, during soft-tissue surgeries in living subjects, whereas previously they were used primarily in minimally-invasive procedures.

The da Vinci system, consisting of a camera arm and mechanical arms equipped with surgical instruments, is controlled by the surgeon from a computer console near the operating table. The console provides a magnified, HD three-dimensional view of the surgical site, and this process still depends entirely on the surgeon's manual capability.

At the Sheikh Zayed Institute for Pediatric Surgical Innovation at Children's National Health System, surgeons and scientists have developed an entirely autonomous robotic surgery which removes any necessity of the surgeon's hands. This system has promised to enhance efficacy, safety, while improving access to optimal surgical techniques.

"Our results demonstrate the potential for autonomous robots to improve the efficacy, consistency, functional outcome and accessibility of surgical techniques," according to Dr. [Peter C. Kim](#) [3], Vice President and Associate Surgeon-in-Chief at the Institute, located in Washington, DC. "The intent of this demonstration is not to replace surgeons, but to expand human capacity and capability through enhanced vision, dexterity and complementary machine intelligence for improved surgical

outcomes,” he added.

Previous attempts to perform surgeries without the surgeon were not feasible for a variety of reasons – but mainly due to technological limitations. Specifically, the authors cite a lack of adequate technology for visualization of target tissue during the operative procedure, and the absence of advanced software needed to allow for complex mechanical surgical maneuvering.

The scientists developed what they called the Smart Tissue Autonomous Robot (STAR) system comprised of a light-weight robotic arm equipped with laproscopic suturing tools. The STAR system used a three-dimensional and near-infrared fluorescent (NIRF) imaging technology programmed with a suturing algorithm.

In this trial, the researchers compared the work performed by the supervised autonomous system, manual laproscopy, and robotic-assisted systems (RAS). Based on quality outcomes with regard to suturing and leaking from the suture site (at the level of the intestine), they were able to gauge performance. They evaluated the consistency of suturing and the pressure at which there was observed leaking from the suture site (site of anastomosis), the number of mistakes, completion time, and reduction in the size of the intestinal lumen.

Based on their results scientists found a demonstrable superiority of supervised autonomous procedures to surgery performed by surgeons, or via RAS despite the unpredictability of the ever-changing surgical scene. The researchers were successfully able to program the human cognition and manual dexterity required to perform the surgical procedure.

“We chose the complex task of anastomosis as proof of concept because this soft tissue surgery is performed over one million times in the U.S. annually,” according to Dr. Kim.

This is very exciting, and it has real potential for robots to perform surgical techniques with improved efficacy and consistency in the near future.

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