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Adding On to Abdominal Surgery

Robots and interactive imaging technology are set to transform minimally invasive procedures.



Yu Kwan Lee, Cleveland Clinic

ON THE MOVE Jihad Kaouk, MD, says single-incision robotic surgery can turn inpatient-only procedures into outpatient options.

In performing the world's first single-port robotic surgery, Jihad Kaouk, MD, removed a patient's prostate and kidney through a single umbilical incision. The patient left the hospital that same day, missing not only a couple organs, but also the pain and abdominal incisions that accompany a radical prostatectomy.

"The [robotic arm] turned a surgery that typically requires an overnight stay into an outpatient procedure," says Dr. Kaouk, a professor of surgery and director of the Center for Robotic and Image Guided Surgery in the Glickman Urologic and Kidney Institute at the Cleveland Clinic in Ohio, one of the first U.S. prostate programs to perform robotic radical prostatectomy. "Robotic single-incision surgery results in less post-op pain, which we can manage without opioids."

Operating through a single incision isn't the only clinical benefit of operating with robotic assistance, says Dr. Kaouk. He's able to maneuver the robot's arms outside of the extraperitoneal cavity, which lets him avoid the bowel and prevent an ileus, a common side effect of radical prostatectomies.

For now, the FDA has approved the single-incision robot used in Cleveland Clinic's radical prostatectomies for only urologic surgeries, but there are plans to expand its application to ENT and colorectal procedures in the near future.

Single-incision robotic surgery shouldn't be seen as a tool to replicate what surgeons have done with multi-arm robotic surgery, says Dr. Kaouk. But, he points out, the technology provides a blueprint for exploring procedures that aren't effectively accomplished with multi-port robots and will lead to more surgeries being done on an outpatient basis.

Dr. Kaouk is excited about the potential of single-incision robotic surgery. "It affords us the opportunity to make minimally invasive surgery even more minimally invasive," he says.

Fast forward



Florida Hospital Tampa

INCREASED ACCESS Robotic surgery continues to evolve, and market competition could make the technology more available to a greater number of facilities.

Sharona Ross, MD, FACS, Professor of Surgery at the University of Central Florida (UCF), Director of Minimally Invasive Surgery and Surgical Endoscopy at Advent Health TAMPA, is a big fan of the da Vinci robot, which has monopolized the surgical robotic market for more than a decade. After using the da Vinci for big, complex procedures like pancreaticoduodenectomies (Whipples), distal pancreatectomies and esophagectomies, Dr. Ross set her sights on less complicated procedures normally handled on an outpatient basis.

"I have 2 fellows who needed to get accustomed to using the robot, so inguinal hernia repairs seemed like a natural place for them to get that time in," says Dr. Ross.

Before Florida Hospital Tampa added the da Vinci, Dr. Ross performed the hernia procedures laparoscopically using mesh and tacks, which sometimes led to unexpected nerve pain in patients. With the robot, Dr. Ross can perform procedures in about a quarter of the time and without tacks.

"I use a pro-grip mash that sticks, and my patients never have any nerve pain," she says. "It's so easy, I feel like my kids can do this operation."

Dr. Ross sits at the robot's controls for virtually all types of hernia procedures, from ventral and hiatal to inguinal and abdominal-wall repairs.

If the increased use of robot-assisted surgery is dominating the present, what's the future of abdominal surgery hold? Within the next 3 to 5 years, you can expect augmented or virtual reality and other high-tech imaging technologies to become commonplace. Cleveland Clinic is at the forefront of this movement.

Surgeons there recently used augmented reality for the ablation of a liver tumor. Rather than working off 2D images on a flat-panel screen, they used the technology to project and layer holographic images on top of their real-world view of the patient's actual anatomy.

"People refer to interactive technology as 'augmented reality,' but I prefer the term 'mixed reality,'" says Rafael Grossmann, MD, FACS, a healthcare futurist and practicing surgeon in Bangor, Maine. "You're superimposing the augmented reality over real images and having them interact. This technology is going to explode soon and cause a real change in how we do surgery."

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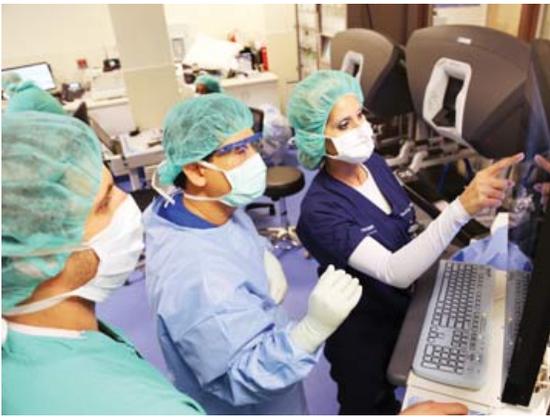
— Sharona Ross, MD, FACS

He expects mixed reality technology to have a significant impact on abdominal procedures, from ablating lesions on the liver to draining fluid from a cavity or abscess to performing percutaneous biopsies.

Dr. Ross also sees robotic imaging technology playing a pivotal role in abdominal surgery. For example, she points out the da Vinci platform has added image segmentation capabilities that augment the vision, decision-making and physical abilities of the surgeon. The technology turns 2D CT or MRI images into 3D images, and a software algorithm lets the surgeon manipulate the 3D images in real time from inside the robot's control console.

This version of the robot would "basically turn your physicians into super-human surgeons," says Dr. Ross.

More than marketing?



Florida Hospital Tampa

SURGEON CHAMPION Sharona Ross, MD, FACS (right), touts the benefits of robotic-assisted hernia surgery.

Most surgeons can perform basic abdominal procedures without the robot, points out Dr. Grossmann. But he does acknowledge that more abdominal procedures will be done with robotic assistance.

"This will be the year of the robotic explosion," says Dr. Grossmann. "In the UK, Germany and even the U.S., we're seeing new surgical robotic platforms that are challenging the monopoly in the market and that will lead to cheaper, more versatile options. I think there's a push from industry, from facility administrators and from patients to do everything robotically."

There's no denying the marketing power of being able to say your facility has a robot — the technology might set you apart from the competition in patients' eyes. But cost is still a common barrier to widespread adoption of the technology, and understandably so. Many surgical leaders can't look past the minimal \$2 million upfront cost and \$100,000 annual maintenance fees.

Experts hope market competition — several companies are in the process of launching platforms to take on the da Vinci — will make the technology more affordable in the near future.

Dr. Ross agrees that overall use of robotic platforms will continue to increase, but she isn't certain that competition in the marketplace will drive down the cost of the technology to make platforms more affordable for smaller facilities with tight budgets, at least not anytime soon. She does point out that many financing options are available for purchasing the robot.

"Companies have gotten smarter about offering several different financing programs from which facilities can choose," says Dr. Ross. "You no longer have to pay for everything upfront."

Even if there's no way your facility can invest in a robotic platform, there are ways to take advantage of a robotic-like performance with "tableside" platforms that were created to provide some of the same benefits as the full-scale robots, but without the seven-figure price tag.

There's even a \$500 device that slips over the surgeon's wrist and translates his movements to the tip of an integrated laparoscopic instrument, allowing the surgeon to perform procedures with robotic-like dexterity and precision.



Rafael Grossmann, MD, FACS

NEW LOOK Healthcare futurists such as Rafael Grossmann, MD, FACS, predict a surge in the use of augmented reality.

Of course, as with any new technology that promises significant cost savings, you'll want to proceed cautiously. "When I hear about less-costly or less-capable systems, I always think about whether it will be worthwhile in the long term," says Dr. Ross.

Also keep in mind that technology is just another tool in the surgeon's toolkit. "I always tell my students: A good surgeon knows how to operate, a better surgeon knows when to operate and the best surgeon knows when not to operate," says Dr. Grossmann. "This same concept applies to technology."

Dr. Ross agrees. "Look," she says, "I can perform single-incision laparoscopically to take out a gallbladder through a 1.25 cm incision in the umbilicus where I leave no scar, but the way the robot is marketed will no doubt make patients believe it's the better option for them." **OSM**

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