Technology, Precision and Safety Meet
at the Institute for Robotic and Minimally Invasive Surgery at Northern Westchester Hospital
Northern Westchester Hospital established the Institute for Robotic and Minimally Invasive Surgery as robotics became viable surgical tools, purchasing a da Vinci S Surgical System about five years ago and a da Vinci Si last year. Initiated into robotic surgery by performing radical prostatectomies, Warren Bromberg, M.D., Chief of the Division of Urology and Co-Director of the Institute for Robotic and Minimally Invasive Surgery at Northern Westchester Hospital, recalls that once the technology proved beneficial, other disciplines — such as gynecology and general surgery — quickly adopted the robotic platform. Experiencing immediate benefits, the institute’s specialists have now completed more than 1,000 robot-assisted surgeries.

To ensure the most efficient use of the da Vinci system, Northern Westchester Hospital borrowed the model of its own orthopedics department, which successfully brought together orthopedic surgeons specializing in various areas, and began to consolidate disciplines using the robot into one overarching Institute for Robotic and Minimally Invasive Surgery.

“We realized that to maintain efficiency, keep an eye on cost, assure quality, and ensure certain standards of care for the increasing number of surgeons at the hospital and those who were interested in coming, we needed to roll this into a single program,” Dr. Bromberg says. “That way, we could incorporate everybody’s ideas, review them among a number of experts and make sure the program went the way we wanted it to.”

Why Not Standard Laparoscopy?

Dr. Bromberg recalls suggesting the use of the robotic platform to colleagues experienced in laparoscopy, who initially did not see the benefit. He remarks that after they tried it, they didn’t go back to laparoscopy.

“If the robot was simply a gimmick and my colleagues didn’t see the advantage, they wouldn’t embrace it like they have,” Dr. Bromberg says.

Aside from the innovative technology embodied in the da Vinci robotic
The da Vinci robot’s instrumentation is markedly different from its standard laparoscopic counterpart because of its wristed instrumentation — based on the human hand and fingers — that rotates 90°, meaning surgeons no longer have to participate in a laparoscopic soft-shoe to get the instrument into the necessary position.

Operating the instruments from the comfort of the system’s ergonomic console enables surgeons to perform advanced techniques with more precise movements and an increased range of motion. This proves especially important when operating near vital areas.

“When you operate with traditional laparoscopy, the end of the instrument where your hand is translates immediately to the same movement at the other end,” Dr. Bromberg says. “If you accidentally move your hand 2 inches, that means the other end moves 2 inches. The robotic platform offers a more controlled movement, so you’re much less likely to have extraneous sudden movement.”
textbooks,” says Jerald D. Wishner, M.D., FACS, FASCRS, Co-Director, Institute for Robotic and Minimally Invasive Surgery; Medical Director, Colorectal Surgery Program at Northern Westchester Hospital. “They see pictures in the textbooks where everything appears perfect, but when performing actual procedures, blood or fatty tissue is in the way, so it never looks like the artist’s rendition. The quality of the visuals and 3-D viewer and optical system in the robot has brought us closer to what it looks like in the books. I’m seeing things more clearly than I’ve seen laparoscopically or in open surgery. If that were the only advantage, it would be worth it.”

**Team Expertise in the Operating Room**

Although the da Vinci S and Si Surgical Systems are impressive technologies, neither would be effective if not for the expert hands manning the controls. Making quality the No. 1 priority, the institute has a rigorous training program that involves case observation, exercises on the da Vinci Si’s built-in skills simulator, animal labs, and proctoring and observation by experienced robotics surgeons.

Dr. Wishner explains the da Vinci Si’s skills simulator benefits surgeons the same way driving practice is good for people learning to drive — you never really know how things work until you have hands-on experience.

“I’m teaching my daughter how to drive now, and I’m witnessing these things I take for granted,” Dr. Wishner says. “She knows what a gas pedal is, but she doesn’t know what really happens when it’s forcefully pressed. When you first step on the brakes, it’s startling. It’s the same when using robotic instruments, so the simulator helps the surgeon be better prepared.

The skills simulator software allows surgeons to practice suturing, manipulating the platform’s instrumentation, or using features such as the camera zoom — all from the platform’s operating console. A metrics system included in the skills simulator allows surgeons to evaluate their skills and empirically track progress.

The Institute for Robotic and Minimally Invasive Surgery also mandates that everyone in the operating room during robotic surgery is properly credentialed and trained. As it is essential for providers to have experience in the modality, training protocols for surgeons and operating room staff were developed. Every member of the operating team must pass them before being involved in a robot-assisted procedure. According to Dr. Bromberg, fewer variations in the operating room processes account for better outcomes.

**Technological Updates**

The da Vinci Si Surgical System boasts surgical features that significantly expand the institute’s minimally invasive offerings and allow surgeons to more precisely operate around major blood vessels and access areas — such as the bottom of the pelvis for prostatectomy — that have traditionally been difficult to navigate with standard laparoscopic instrumentation.

Dr. Wishner, who uses the da Vinci Si for general and colorectal surgery, says the addition of a vessel sealer allows surgeons to more proficiently seal blood vessels vascularizing the colon and achieve hemostasis as part of colon resection procedures.

When performing partial nephrectomies, Dr. Bromberg uses the da Vinci Si’s fluorescence technology to illuminate the kidney’s vasculature. Surgeons removing a tumor from the kidney must ensure two
“Robotics offers an entirely new level of precision to general surgical procedures. It doesn’t always open the doors to new minimally invasive options we didn’t have before, but the degree of visualization and the precision of the instruments enable us to perform finer dissection around critical structures and complete tasks that, in the past, we may not have been able to do with traditional minimally invasive techniques.”

— Jerald D. Wishner, M.D., FACS, FASCRS, Co-Director, Institute for Robotic and Minimally Invasive Surgery; Medical Director, Colorectal Surgery Program at Northern Westchester Hospital

things, says Dr. Bromberg. First, surgeons must determine which part of the kidney the vasculature feeds. Second, the entire tumor needs to be removed. The robot’s fluorescence technology helps him achieve both objectives.

During surgery, an anesthesiologist injects dye into a vein, which illuminates under the camera’s near-infrared setting. This identifies circulatory paths and allows surgeons to clamp the desired artery. Because prolonged ischemia can cause kidney injury, identifying the necessary artery early helps prevent unnecessary damage, Dr. Bromberg says.

“If you’re working on the plumbing in your house, you turn the water off to the house, but then can’t use any of the other faucets,” Dr. Bromberg relates. “However, if you turn the water off to an individual faucet, you can use the rest of the plumbing. The kidney is no different.”

Fluorescence also helps surgeons identify the margins of a tumor, ensuring the most complete resection possible. Healthy tissues and diseased tissues pick up the dye differently, explains Dr. Bromberg. Healthy tissue picks up the dye much more efficiently, illuminating the tumor’s margins by its relative darkness.

Tumors on the kidney’s surface may be easily identified, but spotting tumors inside the kidney is more difficult.

“One of the most difficult situations is when there’s a tumor inside the kidney,” Dr. Bromberg says. “It’s like looking at the ground below and trying to locate an embedded rock.”

In these cases, Dr. Bromberg uses ultrasound technology in the form of an ultrasound wand introduced via one of the ports through which the robot’s arms pass into the patient. Placing the wand on the kidney provides Dr. Bromberg real-time operative ultrasound imaging of the inside of the kidney. The da Vinci Si’s computer produces screen-on-screen imaging, so the ultrasound image appears superimposed upon the camera’s video feed, allowing surgeons to locate the tumor, map the operative path and successfully remove it.

Nothing to Show for It

One feature of the da Vinci Si Surgical System sure to disappoint patients who like more than a hospital bill as proof of a major procedure is its capability for single incision laparoscopic surgery (SILS).

SILS was first approved for laparoscopic cholecystectomy, but was recently cleared by the United States Food and Drug Administration for benign hysterectomy and salpingo-oophorectomy. Many gallbladder problems are caused by gallstones, which do not naturally resolve and can only be managed temporarily by medications, according to the Society of American Gastrointestinal and Endoscopic Surgeons. Because surgical excision is the only proven method by which to relieve the pain, vomiting, indigestion and fever associated with these cholesterol and bile salt masses, gallbladder removal is performed on approximately 750,000 Americans each year, according to an article published online by the American College of Surgeons.

“As common as gallbladder surgery is, the ability to remove a gallbladder with no visible scar is a game changer for many people,” Dr. Wishner says. “All things being equal, if I told you, ‘You’re going to have the
same amount of pain, and go home and back to work within the same timeframe, and everything else will be the same,’ why not have an invisible incision?”

The laparoscopic cholecystectomy procedure that predates the da Vinci Si robotic platform was awkward and difficult for surgeons because the instrumentation introduced at the same angle limited surgical maneuverability.

“If you were working with your hands, you wouldn’t keep your hands in a straight splint,” Dr. Wishner says. “You wouldn’t try to eat dinner with your hands in casts because your wrists wouldn’t bend. You could achieve the tasks you wanted to achieve, but it would be clumsy and less precise. We’ve overcome that and gotten better.”

This linear model works contrarily to how the human body — and standard laparoscopy — is designed.

Physicians performing standard laparoscopy introduce instrumentation through four incisions. This way, the camera is situated so that instruments approach the target from the left and right, just as one’s hands come from the left and right periphery of his or her line of sight.

“When we do laparoscopy, we like to triangulate — to have our instruments come in on three different planes,” Dr. Wishner explains. “We make four incisions and introduce the instruments through a triangle. In single-site robot-assisted cholecystectomy, the instruments go through the same opening, but triangulation happens anyway because of the curved instruments.”

While laparoscopic cholecystectomy eschews this design, the da Vinci Si robotic platform’s SILS instrumentation provides surgeons a much freer range of motion and natural approach by designing instrumentation that achieves triangulation without the need for multiple incisions. Like scissors, the part of the instrument that enters the body on the left curves around and ends up on the right side of the target, and vice versa. The da Vinci Si’s computer displays the right-handed instrument coming from the right side of the view, even though it actually enters the patient from the left side.

If surgeons performing a laparoscopic procedure encounter more scar tissue from previous abdominal surgery, or the patient’s weight makes the procedure too difficult, they may choose to convert to an open procedure. Dr. Wishner explains that one key benefit provided by the da Vinci Si robotic platform is that these conversions occur much less frequently, enabling a safe procedure.

“The real advantage to the patient is this: Whenever we perform minimally invasive surgery, safety is the most important consideration,” Dr. Wishner says. “It’s nice to have small incisions, less pain, and go home right away, but safety is the most important thing. If at any time during the operation we feel that we cannot finish the procedure laparoscopically, we can convert to an open procedure. This isn’t a complication because we’re not hurting the patient. Our goal is to minimize the conversion rate, and the robot will allow this because of its improved visualization and wristed instruments. I’ve seen that already in my practice with colorectal and gallbladder patients.”

For more information about the Northern Westchester Hospital Institute for Robotic and Minimally Invasive Surgery, please visit www.nwhroboticsurgery.org.