MASTER CLASS

Robotic Sacrocolpopexy

BY CHARLES E. MILLER, M.D.

This is the third installment of the Master Class in Gynecologic Surgery dedicated to robotic surgery.

Whether the procedure is called robotic sacrocolpopexy or robotic-assisted laparoscopic sacrocolpopexy, Dr. Anthony Visco's excellent description will help the reader understand how the robot and the laparoscope can be used to modify the standard treatment for vaginal vault prolapse—the abdominal sacrocolpopexy—into a minimally invasive gynecologic procedure that can be incorporated into one's practice.

As Dr. Visco points out, the robotic procedure involves an obligatory learning curve and a need for practiced, efficient teamwork. However, as the surgeon and staff gain experience, robotic sacrocolpopexy can lead to outcomes similar to those of abdominal sacrocolpopexy, but with less blood loss and quicker recovery time.

Dr. Visco is director of the division of urogynecology and reconstructive pelvic surgery; director of gynecologic robotic surgery; and vice chair of the department of obstetrics and gynecology at Duke University Medical Center in Durham, N.C. Dr. Visco has authored or coauthored nearly 50 peer-reviewed articles on, or related to, urogynecology.

In 2007, Dr. Visco performed a live robotic sacrocolpopexy in Madrid for an international conference on pelvic floor disorders, and a second live robotic sacrocolpopexy for the AAGL's 2007 annual meeting. ■

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Advantages of Open Sacrocolpopexy With Decreased Morbidity

Abdominal sacrocolpopexy, developed at Duke University in Durham, N.C., by Dr. W. Allen Addison, Dr. M. Chrystie Timmons, and colleagues nearly a half century ago and traditionally performed through a laparotomy incision, is considered by many to be the gold standard procedure for vaginal vault prolapse.

Some surgeons perform the procedure laparoscopically in an effort to decrease morbidity and recovery time, with some success. Overall, however, a laparoscopic approach has not been widely adopted because of the complex suturing and dissection involved, and the subsequently significant learning curve.

Robotic sacrocolpopexy is a new addition to our armamentarium and is an exciting option for me and other surgeons because it combines the advantages of open sacrocolpopexy with the decreased morbidity of laparoscopy.

A robotic approach to the tried-and-true abdominal sacrocolpopexy takes full advantage of all that robotic surgery offers. Instrument articulation, three-dimensional vision, tremor reduction, and improved ergonomics for the surgeon all make managing the mesh and intracorporeal suturing—as well as dissecting in the rectovaginal and presacral spaces—so much easier than would be the case with a standard laparoscopic approach.

Overall, sacrocolpopexy performed with the da Vinci surgical system—the only Food and Drug Administration–approved robotic device for use in gynecologic surgery—offers better access to the pelvis, compared with both the open and laparoscopic approaches.

We can truly replicate what we do in an open approach, but with less postoperative pain, less blood loss and scarring, and faster recovery. Robotic sacrocolpopexy can also be combined with total or supracervical hysterectomy for uterine prolapse.

Outcomes data are emerging. At the American Urogynecologic Society annual meeting last month, we presented our initial short-term data comparing robotic with traditional abdominal sacrocolpopexy for the treatment of both uterine and vaginal vault prolapse.

Postoperatively, based on a 6-week POPQ (Pelvic Organ Prolapse Quantification) examination, there was a similar degree of pelvic organ support in the 73 patients who underwent robotic surgery and the 105 patients who underwent traditional surgery. The length of hospital stay was significantly shorter with the robotic approach (1.3 days vs. 2.7 days), and estimated blood loss was significantly lower (103 mL vs. 255 mL).

The operative time for the colpopexy and all other procedures, including hysterectomy and slings, was significantly longer in the robotic group (328 vs. 225 minutes). This time is expected to decrease, however, as all members of the surgical team, including fellows, residents, and surgical staff, progress through the learning curve.

BY ANTHONY VISCO, M.D.

Patient Selection and Positioning

I now offer the procedure to any patient to whom I would recommend a sacrocolpopexy. In the initial stages of adopting a robotic approach, however, it makes sense to be more selective and to perform relatively straightforward surgeries. This means starting with patients who are relatively thin (with body mass indices less than 30 kg/m^2), younger than age 60, and without any history of intra-abdominal or pelvic surgery.

Initial patients should also have a reasonably sized uterus (if present) and few comorbidities. Pulmonary morbidity (emphysema or chronic obstructive pulmonary disease, for instance) is a relative contraindication, especially for initial cases, because these patients may not tolerate the Trendelenburg position, which is required for the surgery.

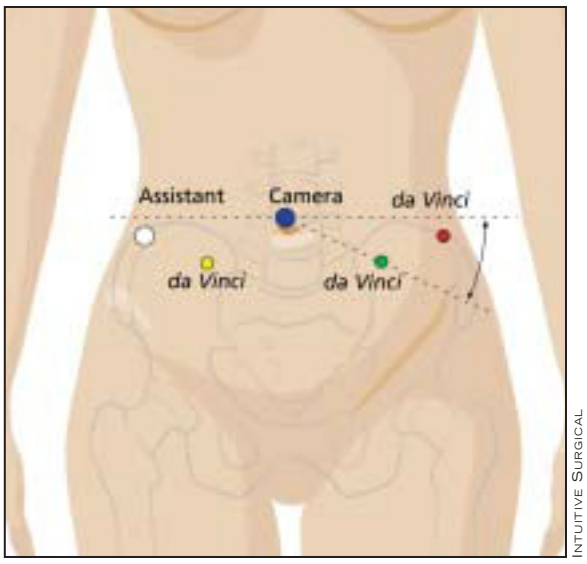
In addition, although robotic sacrocolpopexy can be used for uterine prolapse, I recommend starting with patients who have vaginal vault prolapse so that the surgeon can focus on a single robotic procedure. As their experience grows, surgeons can easily perform a combined robotic hysterectomy with sacrocolpopexy for the treatment of uterine prolapse. I primarily perform a supracervical hysterectomy in combination with a sacrocolpopexy in an attempt to reduce the risk of mesh erosion.

When the patient is positioned at the start of the surgery, her arms and shoulders and all "pressure points" should be well padded with foam, but I do not find a need for shoulder pads. I typically use an extra-large vacuum bean bag to keep the patient firmly in place while she is in the moderate to steep Trendelenburg position, but the use of a gel pad placed between the patient and the bed is an alternative approach to keep the patient from sliding cephalad during the surgery.

Port Placement, Setup, and Preparation

For robotic sacrocolpopexy, five trocar sites are used with a four-arm robotic system: three for operative robotic arms, one for the camera, and one to be used as the assistant's port for suction and irrigation, assistance with traction/countertraction, and the introduction of suture and mesh. (The bedside assistant is also helpful for instrument swaps, during uterine morcellation, and for any trocar depth repositioning that is necessary.)

Initially, we tried several different port locations. We have found that a "W-like" configuration for our port placement works well. We place the camera trocar at the umbilicus to accommodate the endoscope and the camera arm. This represents the middle of our "W."



INTUITIVE SURGICAL

Port placement: A "W-like" configuration for port placement works well. This configuration reduces any competition between the two left robotic arms.

We then place two robotic ports at the two inferior apices of the "W." The lateral ends of the "W" are each located about 2 cm inferior to the level of the umbilicus. The right lateral port is the assistant's port, which is used to introduce mesh, suture, and the like. The left lateral port is for the third robotic operative arm and is particularly helpful in moving the sigmoid laterally to expose the sacrum.

Using this configuration, we have reduced any competition between the two left robotic arms while we operate either in the pelvis or at the sacrum.

Some surgeons place the camera port higher (above the umbilicus), but I do not care for this placement because it can partially impede the view over the sacral promontory. (Placement of the camera port above the umbilicus is necessary for enlarged uteri, however.) After initial entry, a 0-degree scope should be used to place the other ports.

It is important to maintain at least 10 cm between robotic ports, and at least 6 cm between the robotic port and the assistant's port to reduce external collision of the robotic instrument arms.

Before docking the robotic arms of the patientside cart and placing the various EndoWrist instruments, I laparoscopically remove any small-bowel adhesions or other abdominal wall adhesions. This way, I have the tactile sensation that robotics does not provide. I then retract the sigmoid and move the small bowel out of the pelvis to expose the sacrum and the sacral promontory.

At this point and still prior to docking, it is also important to identify the ureters, the sacral promontory, the midline with the sigmoid retracted, the middle sacral vessels, and the iliac vessels. The left common iliac vessels, particularly the vein, can occasionally be identified crossing very close to the sacral promontory.

The operating table should be lowered and the patientside cart should be positioned as high as possible to clear the patient's legs, and then—after all overhead lights and equipment are moved to the side—the cart can be rolled into position between the patient's legs and aligned in a straight line with the camera arm and umbilical camera port. Docking can then be easily accomplished.

Open communication with the anesthe-

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siology team is important. Robotic sacrocolpopexy is associated with significantly less blood loss (typically less than 25 mL) and less insensible loss than is open sacrocolpopexy. Therefore intravenous fluids should generally be limited to a liter or less.

Surgical Steps

If the patient has uterine prolapse, this can be addressed first with a supracervical or total hysterectomy. I prefer supracervical hysterectomies, assuming that the patient's Pap smears have been normal, in an attempt to reduce the risk of mesh erosion. After the hysterectomy, I place the uterus along the left lateral gutter for morcellation at the end of the procedure and after the system is undocked.

With either type of hysterectomy, the use of a colpotomy ring—either a KOH cup or a VCARE device—works nicely. We find this helpful in manipulating the uterus and defining the cervical-vaginal junction, even during supracervical hysterectomies, because it helps in the dissection of the bladder flap.

After the bladder flap is dissected off the anterior vaginal wall (close to the anterior vaginal wall to avoid cystotomy and to identify the avascular plane), the rectovaginal septum is developed. Approximately 6-8 cm of anterior vaginal wall are exposed.

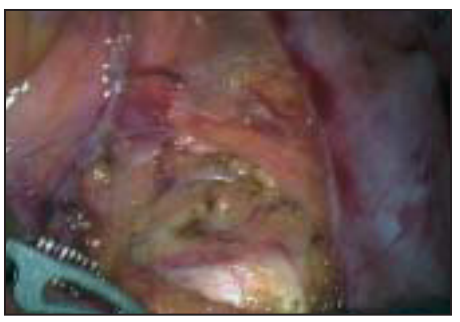
The placement of round, 31- to 33-mm EEA (end-to-end anastomosis) sizers in the vagina to manipulate the vaginal apex helps with the bladder flap dissection, which can be challenging in patients who have had a previous cesarean section, hysterectomy, or vaginal reconstructive procedure—especially those performed with vaginally placed mesh. Occasionally, the bladder is found densely adherent over the apex of the vagina and adherent to the proximal posterior vaginal wall.

I frequently have an additional, smaller (29-mm) sizer placed in the rectum to help clearly identify the rectovaginal septum and facilitate the dissection.

During the rectovaginal dissection, the vaginal EEA sizer should be oriented anteriorly to better expose the posterior vaginal wall. Between 6 cm and 10 cm of the posterior vaginal wall should be dissected, while the camera is kept at midline and oriented to the horizon.

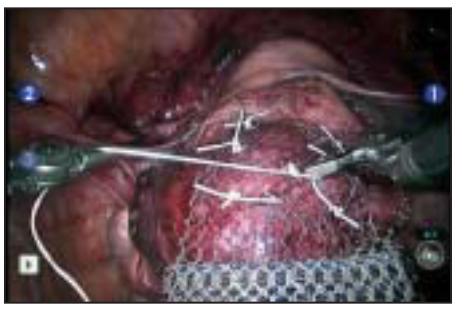
At this point, I frequently switch to a 30-degree down scope to develop the presacral space. This enables me to see over the sacral promontory and enhances my view. Depending on the configuration of the sacrum, it is possible to complete the surgery with a 0-degree scope. However, the view of the presacral space is generally significantly improved with the 30-degree down scope.

The sigmoid is retracted laterally by the third operative arm, and the peritoneum is lifted up, or tented, over the sacrum in the midline to avoid injury to a vessel. Our goal is to identify the anterior longitudinal ligament, and this area can be fairly vascular. Once the anterior longitudinal ligament is identified, the presacral peritoneal dissection can be extended inferiorly to the vagina.

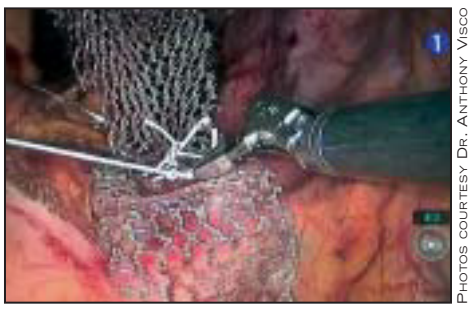


Presacral dissection: The presacral space is generally best viewed with a 30-degree down scope.

I use a Y-shaped polypropylene mesh (AMS) and introduce it, trimmed to the appropriate width and length, in the proper anatomical orientation. I place the distal and lateral sutures on the anterior vaginal wall first, and then place several (four to eight) additional sutures to secure the mesh to the anterior vaginal wall. To suture, I use a Mega needle driver in the left hand and a SutureCut needle driver in the right. The SutureCut needle driver is similar to the Mega needle driver, but it also has a cutting mechanism that provides enhanced autonomy to the console surgeon and makes suturing more efficient overall.



Anterior suturing: A Mega needle driver and SutureCut needle driver are used for anterior vaginal wall suturing.



PHOTOS COURTESY DR. ANTHONY VISCO

Mesh to sacrum: The first and most inferior of the three sacral sutures is placed with a sliding knot.

Using the third operative robotic arm, I then roll the sacral end of the mesh and lift it anteriorly, which allows the posterior mesh to drape nicely over the posterior vaginal wall. The longer posterior mesh can then be easily sutured to the posterior wall of the vagina. For the posterior vaginal-wall mesh attachment, I usually start at the vaginal apex and work my way inferiorly. Throughout the surgery, I use permanent sutures of CV-2 Gore-Tex.

I then adjust the mesh tension, ensuring that it will be attached to the sacrum without undue tension and with equal distribution of support to the anterior and posterior of the vagina. Once this is determined, the excess mesh is trimmed.

I typically place three sacral sutures to secure the mesh to the sacrum. I place the inferiormost suture first, using a slip (or sliding) knot. This is a one-way knot that allows the mesh to be easily attached to the sacrum without the need for an assistant to hold the mesh against the sacrum while the suturing and knot tying are completed. Two additional sacral sutures are then placed superiorly to allow for adequate visualization of the sacrum during the suturing, and the excess mesh is trimmed.

The mesh should then be retroperitonealized to reduce the risk of small-bowel obstruction. The closure of the peritoneum is facilitated by the extension of the initial peritoneal incision from the sacrum inferiorly in the midline through the cul-de-sac and along the posterior vaginal wall at the time of sacral dissection. An enterocele repair can be accomplished as closure over the mesh obliterates the cul de sac. The peritoneum is closed with a running, locking, braided, absorbable suture.

I typically perform cystoscopy at the end of the procedure to confirm bilateral ureteral patency using intravenous indigo carmine.

Fortunately, presacral bleeding is rare. However, if presacral hemorrhage does occur, it is important to remain calm and remember that pressure can be applied with most available robotic instruments. (For example, even scissors work well if the wrist of the instrument is used.) If the bleeding does not respond to pressure, a bipolar forceps can be used, depending on the location and source of the bleeding. If bleeding continues, then FloSeal—a thrombin matrix that will usually and very effectively stop the bleeding—can be considered.

If the clinical situation warrants additional procedures, such as a posterior repair or a suburethral sling for urinary incontinence, these can easily be performed after the robot is undocked. If necessary, we perform uterine morcellation after undocking the robot.

Our typical patient at Duke has an overnight stay in our 23-hour observation unit and requires minimal oral pain medication.

Dr. Visco is a consultant for Intuitive Surgical Inc. ■

Preventable Surgical Errors Cost $1.5 Billion, AHRQ Reports

BY ALICIA AULT
Associate Editor, Practice Trends

Preventable surgical errors are likely costing insurers $1.5 billion or more a year, according to a new study by the Agency for Healthcare Research and Quality.

The report is a fuller accounting of the true cost of potentially preventable errors than had been previously published, according to the authors, William E. Encinosa, Ph.D., and Fred J. Hellinger, Ph.D., both with AHRQ's Center for Delivery, Organization, and Markets.

They looked at the comprehensive, per-episode cost of medical errors, including payments to hospitals for the initial admission and readmission; and payments for physicians, for outpatient services, and for prescription drugs. All cost data were included for 90 days after surgical admission. The authors drew their analysis from the 2001-2002 MarketScan Commercial Claims and Encounter Database, which covers 5.6 million enrollees in private, employer-sponsored plans (Health Serv. Res. [doi: 10.1111/j.1475-6773.2008.00882.x]).

"Most papers that estimate the cost of medical errors only examine the initial hospitalization in which the medical error occurred," they wrote. But, they added, "We find that the death rate increases by 50% over 90 days once the patient leaves the hospital."

Postdischarge costs also are often higher than those for the initial admission, they noted. For infections, the excess payments during a 90-day episode were 28% higher.

By looking at an entire episode of care over 90 days, the researchers make a strong argument in favor of spending money on quality, Dr. Darrell A. Campbell, professor of surgery at the University of Michigan, Ann Arbor, said in an interview. "Complications and adverse events are expensive, and if you can avoid them, not only does quality go up, but costs go down."

The case-control study examined 14 potentially preventable adverse medical events, defined by AHRQ as patient safety indicators.

A total of 161,004 adult, nonelderly, major surgeries was analyzed; 2.6% (4,140) of cases had at least one of the 14 preventable events, and 5.6% of those cases had additional errors.

Acute respiratory failure was the most common preventable event, which occurred in 0.9% (1,392) of all surgeries. That also was the most expensive event, at $106,000 per instance, and patients who had respiratory failure also had the highest death rate, at about 12% over the 90-day period tracked.

For all patients who had at least one preventable event, the 90-day death rate was higher at 6%, compared with 0.6% for patients who did not have a preventable event. The 90-day readmission rate was 15% for patients with a preventable event, compared with 5.5% for those without.

A total of 23% of patients who experienced potentially preventable events was readmitted, compared with 10% of those without an event. Not surprisingly, overall costs were higher for those patients with events. The 90-day cost for a surgery that included a potentially preventable event was $66,800, compared with $18,200 for a procedure that did not involve such an event.

Lengths of stay were longer, as well, at 22 days for patients with events, compared with 5 days for those without.

By extrapolating the results to the entire population of insured nonelderly adults in the United States, the authors report that 11% of 90-day postdischarge deaths and 2% of 90-day readmissions are due to the 14 potentially preventable adverse events, and 2% ($1.5 billion) of all 90-day expenses after surgery.

This estimate might be conservative, because there are many costs that could be incurred outside of the 14 preventable errors observed, noted Dr. Campbell. ■