Whether called SILS (single-incision laparoscopic surgery), LESS (laparoendoscopic single-site surgery), SPA (single-port access) surgery, or SAS (single-site access surgery), to name a few, these techniques have one thing in common—they are performed through a single site, usually the umbilicus.

Single-site surgery is capturing interest, and surgeons are asking to try the new equipment.

It remains to be seen whether the potential advantages outweigh the learning curve, length of operating time, and increased cost of new instruments developed for the technique. One possible outcome is improved instruments and approaches that could benefit another innovation—natural orifice transluminal endoscopic surgery (NOTES).

OR Manager asked experts involved with the single-incision technique to comment on its prospects.

Potential advantages

Minimal scarring and less incisional pain are potential advantages of the techniques because the working ports are placed through a single incision rather than 3 or 4 separate incisions. The umbilical incision is from 1.5 cm to 5 cm depending on the procedure and number of ports.

As yet, there are no published data that find that a single large umbilical incision has a superior cosmetic result or is less painful than 3 or 4 small incisions, says John R. Romanelli, MD, assistant professor of surgery at Tufts University School of Medicine, Springfield, Massachusetts. One of the first surgeons in the US to begin using the technique nearly 2 years ago, he has performed more than 30 single-incision laparoscopic cholecystectomies.

Dr Romanelli thinks the data will eventually show a cosmetic benefit but no difference in pain because the major discomfort from a laparoscopic procedure is from the pneumoperitoneum, which doesn’t change with this technique.

Barely invisible incision site

Kurt E. Roberts, MD, assistant professor of surgery at the Yale University School of Medicine, New Haven, Connecticut, sees the main advantage to be cosmetic. The incision inverts into the umbilicus as it heals, making it barely visible, notes Dr Roberts, who has performed 90 single-port cases (gallbladder, appendix, and umbilical hernia).

Postoperative incisional pain has been similar to that for a traditional laparoscopy in his patients.

Dr Roberts and his colleagues are participating in a 9-center study comparing complications, pain, quality of life, length of operating time, and cosmesis between the single-port and traditional 4-port technique.
A complex technique

Major disadvantages of the single-incision technique are technical complexity, a significant learning curve, and longer operating time. Introducing a camera and several instruments parallel to each other means decreased range of motion and clashing of instruments.

“These are hurdles that shouldn’t be ignored,” says Dr Romanelli. “Most surgeons do not feel comfortable crossing their hands to operate for the entire procedure, but that is what you have to do to perform this technique.”

After nearly 2 years, Dr Romanelli says he is approaching his operating times for regular laparoscopic cholecystectomies. But the times aren’t comparable because he does only the easy cases through the single incision.

Dr Roberts’s single-incision appendectomies and cholecystectomies take about 10 minutes longer than traditional laparoscopic procedures.

New ports and articulating instruments, especially the flexible-tipped laparoscope, have brought down the learning curve and shortened the procedures at Rex Hospital, notes Janet Ashley, RN, service coordinator for general, bariatric, and plastic surgery at Rex Hospital in Raleigh, North Carolina. Surgeons have been performing single-incision laparoscopic procedures there for more than a year and a half.

The downside is that the new instruments are single use, increasing the cost per case, and the cases have to be scheduled to make sure the flexible scope is available. The scope is sterilized using the Sterrad System.

Instrumentation

The new ports and articulating instruments for single-incision surgery range from $150 to $550. The equipment is all single use except for the robotically assisted single-incision laparoscopic system, which runs $170,000, notes Diane Robertson, director of ECRI Institute’s Health Technology Assessment Information Service. The flexible-tipped laparoscope runs $17,000.

There is no additional reimbursement for single-incision procedures, which are paid on the same basis as traditional laparoscopic procedures. The new instruments must receive Food and Drug Administration 510(k) clearance for marketing, according to Jim Keller, ECRI Institute’s vice president of technology evaluation and safety.

Flexible instruments coming to market are what will make a difference in this procedure, he says, because they will give surgeons more room to work without colliding with other instruments.

Competition for the robot?

Many of the new instruments for single-incision laparoscopy have been borrowed from robotic-assisted surgery, and a number of proposed single-incision procedures are now performed with robotic assistance.

“The question,” says Robertson, “is what will happen to robotic-assisted surgery if the single-incision technique takes off?”

Dr Roberts has a similar question: “If we can develop articulating instruments so a robot can use them to benefit minimally invasive surgery, why can’t we develop similar instruments surgeons can use with their hands?” He has been an advisor on design of the new instruments for Covidien.

A step to NOTES

Whether the single-incision surgery replaces robotic-assisted laparoscopy or is a step to NOTES remains to be determined.
Clockwise from top left:
The SILSTM Port Multiple Instrument Access Port from Covidien. Copyright © Covidien. Used with permission.
The Quadport™, a single-incision laparoscopic device from Olympus. Courtesy of Olympus.
The Olympus Triport™ for single-incision laparoscopic surgery. Courtesy of Olympus.

The incision for single-site surgery measures 1.5 cm to 5 cm.

Flexible instruments are coming to market. Courtesy of Olympus.
“If surgeons can do a cholecystectomy through a single incision in the abdomen, for example, they can do one through a single incision in the stomach or vagina. That is where this technique will ultimately progress,” says Dr Roberts.

Dr Romanelli agrees NOTES would be the preferred technique, adding that far more research and development are going on for NOTES than for single-incision laparoscopy.

“Single-incision laparoscopic surgery may die conceptually, but it may provide surgeons with articulating instruments that are better and more useful than straight standard laparoscopic instruments,” he says.

The NOTES technique may prove to be too difficult, but surgeons and gastroenterologists might get new endoscopes with 3 or 4 working channels that will allow endoluminal procedures to take off, he says.

New instrumentation is likely to allow physicians to perform procedures they are unable to do today. Patients will reap the benefits. ✪

—Judith M. Mathias, RN, MA

References


Single-incision lap procedures

Among procedures performed are:

- colon resection
- cholecystectomy
- bariatric lap banding and sleeve gastrectomy
- appendectomy
- nephrectomy
- pyeloplasty
- prostatectomy
- oophorectomy
- hysterectomy.
Single-incision lap devices

Devices cleared by the Food and Drug Administration as of November 30, 2009:

Advanced Surgical Concepts (Olympus)
• TriPort and QuadPort: Ports allow 3 or 4 instruments to be used simultaneously through a single incision.
• EndoEYE LS laparo-thoraco videoscope with deflectable-tip.
• HiQ LS curved instruments.
  —www.olympus-owi.com

Applied Medical
• GelPort: Flexible fulcrum allows surgeons to introduce up to 3 or 4 instruments, including the videoscope.
  —www.appliedmed.com/products

Covidien
• SILS Port: Has 4 openings: 1 for insufflation and 3 working ports.
• Articulating laparoscopic dissectors and graspers.
  —www.covidien.com

EndoControl
• ViKY XL System: Reusable single-port access system for robotic-assist laparoscopic surgery.
  —www.endocontrol-medical.com

Ethicon Endo-Surgery
• SSL Access System: Has 3 ports for insertion of instruments and laparoscope.
  —www.jnj.com

Novare Surgical Systems
• Real Hand System: Full range-of-motion hand-held laparoscopic instruments.
  —www.novaresurgical.com

PNavelSystems, Inc (recently acquired by Covidien)
• Uni-X single site laparoscopic system: Allows simultaneous use of 3 laparoscopic instruments.

Surgiquest
• AirSeal access port: Uses a pressure barrier rather than a mechanical barrier to maintain the pneumoperitoneum while allowing instruments to be passed through multiple ports.
  —www.surgiquest.com