Innovations in surgery

NOTES: A new way of performing surgery using natural body orifices

Removing the gallbladder through the vagina. Performing an appendectomy through the mouth. Doing an abdominal exploration through the rectum. It is a startling concept, but physicians are exploring new ways to perform surgery using the body’s natural openings.

Many questions remain, but researchers believe the approach holds promise of a faster recovery with less pain and no visible scars.

Natural orifice transluminal endoscopic surgery (NOTES) refers to the scar-free method of accessing the abdominal cavity through a natural opening using endoscopic visualization.

“Abdominal surgery through a natural orifice is the culmination of the progression of the minimally invasive technique to smaller and fewer incisions,” Marc Bessler, MD, told OR Manager. He led the team who performed the first NOTES transvaginal cholecystectomy, performed in March in a 66-year-old woman at Columbia University Medical Center, New York City.

There are many types of scar-free surgery, such as removing brain tumors through the nose, but NOTES specifically refers to intra-abdominal surgery through the wall of an abdominal organ, says Dr Bessler, who is the director of laparoscopic surgery and assistant professor of surgery at Columbia University College of Physicians and Surgeons.

In the March case, the incision to enter the peritoneal cavity was made at the roof of the vaginal vault behind the cervix. A flexible endoscope was inserted with 2 channels for instrument insertion. As with laparoscopic surgery, the abdomen was expanded by insufflating carbon dioxide gas.

The operation took about 3 hours, twice as long as the usual laparoscopic procedure, but it was the first such operation on a human, and the time should decrease with practice, says Dr Bessler. Also, because it was the first time, he and his team had minimal assistance from laparoscopic instruments. In the future, he hopes to perform the procedure without any external incisions.

“We inserted a laparoscope into the abdomen to make sure we entered the peritoneal cavity safely. Until we get the technique well worked out, we’re not going to take risks by doing it blindly,” he says.

Jacques Marescaux, MD, and his team at the University Hospital in Strasbourg, France, successfully performed the world’s first transvaginal cholecystectomy without abdominal incisions in a 30-year-old woman in April.

New instrumentation

Key to operating through natural body openings is a new stable surgical device (USGI, San Clemente, California) that supports and guides the flexible endoscope and instruments to the organ. Without the stabilizing device, the endoscope is unstable in the abdominal cavity.

Dr Bessler describes the device as “an overtube that will stiffen once you get it in position to hold the scope up or move it right or left.” Normally, the tip of the flexible endoscope can only be moved right and left, but the new device allows movement of the shaft of the scope. As in laparoscopic surgery, physicians watch their progress on video screens.

Two issues with performing a NOTES transvaginal cholecystectomy are the 2-dimensional view of the flexible scopes and the change in the way the gallbladder is
retracted that might increase the risk of injury to the bile duct.

The scope is cleaned, disinfected, and then gas sterilized.

Dr Bessler says he believes future technology and instruments will allow a 3-dimensional view through a scope and better retraction of the gallbladder structures away from the common bile duct. In the March case, he used laparoscopic instruments to retract the gallbladder.

Whether there will be more injury to the common bile duct with NOTES is unknown, but he assumes the rate of injury will not change.

**Who and where?**

The NOTES procedures will require the cooperation of both gastroenterologists and surgeons.

“The team approach brings the best of both specialties together,” says Dr Bessler. Gastroenterologists have more experience with flexible endoscopic procedures, whereas general surgeons have more experience dissecting tissue and better understanding of the anatomy of the gallbladder and other organs.

Dr Bessler believes the interdisciplinary borders will fall, and eventually there will be one specialty—gastrointestinal (GI) physicians, which might comprise surgeons, GI physicians, and GI interventionalists. This is similar to cardiology, which now includes cardiologists and interventional cardiologists. Ultimately, he hopes GI physicians will be trained in one field that is organ/system specific, not approach specific.

He also believes lines between GI suites and OR suites will blur, becoming more similar in anesthesia staffing and aseptic practice.

He does not think these procedures will be done in a regular GI lab, “because we’re operating in a sterile cavity as opposed to inside the GI tract. One is going to have to adapt to the other,” he says.

For now, NOTES procedures will be performed under general anesthesia. Someday, it might be possible to perform these procedures under local anesthesia if an insufflating gas is found that doesn’t irritate the abdominal cavity and a way is found to manipulate the organs that minimizes pain.

Many NOTES procedures will be performed on an outpatient basis.

“We may be more cautious in the beginning as with any new procedure or technology. But ultimately, the goal is to have no pain and minimal recovery. I don’t think we’re going to be keeping patients overnight for gallbladder and other operations,” he says. Exceptions would be patients having a kidney or part of the pancreas removed, who would be kept overnight because of the risk of postoperative bleeding, not because of the NOTES approach.

For their first human procedure, Dr Bessler and his team used 2 scrub nurses, 1 for the surgeon and 1 for the gastroenterologist, and 1 circulating nurse.

“This technique will require a fair bit of help in the beginning,” he says, “but as it becomes more routine, less will be needed.”

He does not anticipate a problem with reimbursement for NOTES, though there would be a problem if insurers consider the procedure as endoscopy instead of surgery.
Risk of infection

Conducting surgery through the vagina does not pose a greater infection risk than performing a procedure through the abdominal wall, says Dr Bessler. Both can be prepped with povidone-iodine or other prep solutions. It is a different story with the mouth or the rectum, however.

He and other researchers are developing ways to prep the stomach and colon. “Though the stomach is already relatively sterile because of the acids, the rectum is not,” he notes. In general, opening the stomach or colon does not cause complications. The complications arise when the opening doesn’t heal and continuously leaks nonsterile or acidic contents into the peritoneal cavity.

He does not see the small amounts of contamination that occur from opening the stomach or colon as a significant factor, adding that giving antibiotics before the surgery and irrigation will probably be enough to address that.

On the other hand, continuous leakage of stomach or colon contents into the peritoneal cavity is a significant issue and is not completely solved. This is why Dr Bessler began performing NOTES through the vagina.

In 2004, surgeons in India went through the stomach to remove an appendix. Because of concern about leakage, they kept the patient NPO for 5 days with a nasogastric tube in the stomach to keep it empty while it healed on its own, similar to treatment for a perforated ulcer.

“Presently, operating through the stomach is not something we’d be comfortable with in the United States,” says Dr Bessler.

He points out that infection is an inherent risk of an appendectomy, and the patient could become infected whether the incision is made through the skin or in the stomach. In fact, he says, there may be advantages to not having an abdominal incision because the subcutaneous fat and muscle are not as resistant to infection as the peritoneal cavity.

Patient selection

Currently, Dr Bessler is selecting patients who do not have a history of pelvic surgery or multiple abdominal operations so there will not be scar tissue. But he expects fewer exclusions as physicians gain experience.

“The fact that we are looking at 3 potential sites in women and at least 2 in men, or maybe 3 because some are considering using the urethra, means we will find some way of getting access to the abdomen even if there’s been other surgery.

“We will always have the back-ups of laparoscopic and open surgery in an era when NOTES is being widely applied—I don’t think NOTES will be used 100% of the time,” he says.

Every abdominal organ can be approached using NOTES, he says, noting that he and his colleagues have experimented extensively on every organ in animals.

NOTES procedures will be experimental for about 2 to 3 years as research studies are completed. But Dr Bessler thinks transvaginal procedures will be more widely applied in about a year. Transgastric and transcolon procedures will take longer—probably 3 years or more.

A new organization called NOSCAR, for Natural Orifice Surgery Consortium for Assessment and Research (www.noscar.org), has been formed to address this emerging technique for minimally invasive surgery and its new technology. 
—Judith M. Mathias, RN, MA

References


