The Intersection of Endoluminal Surgery and NOTES

While Some Predict Divergence
Of Paths, Others See
Convergence as the Goal

BY TED BOSWORTH
SAN DIEGO—Nuances have been introduced into the debate about whether NOTES (natural orifice transluminal endoscopic surgery) is a threat to endoscopists. While conventional endoscopists fear being overshadowed by surgical laparoscopists adapting quickly to the technical demands of NOTES resections, at least one expert believes that new transluminal technologies, primarily guided by endoscopic ultrasound (EUS), will emerge as advanced therapies that will be delivered by endoscopists. As such, concurrent evolution of surgical laparoscopy and transluminal therapeutic endoscopy will occur over the next decade.

"I predict NOTES will evolve along two paths: Surgeons will employ NOTES to replace laparoscopic and transhiatal surgery, while NOTES for endoscopists will be a continuation of transluminal interventions guided by endoscopic ultrasound," said Kenneth F. Binmoeller, MD, director of interventional endoscopy at California Pacific Medical Center, San Francisco. Delivering the State-of-the-Art Lecture on endosurgery at the 2008 annual meeting of the American Society for Gastrointestinal Endoscopy (ASGE), held during Digestive Disease Week (DDW), Dr. Binmoeller envision both as separate domains with some overlap.

"In the future, patients may be offered two types of NOTES procedures," said Dr. Binmoeller, giving gallstone removal as an example; he referred to the surgeon's NOTES as "S-NOTES" and endoscopist's NOTES as "E-NOTES." Surgeons will offer patients cholecystectomy while endoscopists will offer a cholecystoenterostomy using an anastomotic stent."

This perspective was supported by the variety of new technology presented at the ASGE meeting, including a series of innovations described just prior to Dr. Binmoeller's lecture. Evaluating some of the advantages of the new technology, Dr. Binmoeller emphasized that endoscopy has come a long way "from its humble start as a simple visual tool for diagnosis." Although the biopsy channel long ago evolved to a working channel for a broad array of therapeutic applications, he suggested endoscopy could be summarized until recently by three Ps: prevention, palliation and the prohibitive-risk patient. Now, he said, therapeutic endoscopy has morphed into the four Rs: resection, restoration, reconfiguration and replacement.

"The most significant limitation of the endoscope has been that endoscopes only provide a single axis for instrumentation," Dr. Binmoeller said. Although various plicators have been developed to maneuver tissue for sewing or stapling, there is a stream of potential innovations that have potential to provide far more precise surgical procedures. Not least of these is simply using two scopes to allow better manipulation of the tissue, including pulling in two directions simultaneously, a feat that has been impossible with a single scope. However, several triangulating strategies are also being pursued to permit tissue to be maneuvered independently of the source of visualization.

One described just before Dr. Binmoeller's lecture involves placing metallic anchors in the tissue and then using magnetized needle knives to manipulate surgical tools for resection. Japanese researchers, led by Kazuki Sumiyama, MD, Jikei University School of Medicine, Tokyo, have so far confined studies to an animal model, but this approach has performed well. Indeed, the authors of the study characterized magnetic force-assisted endoscopic submucosal...
dissection as "technically feasible, safe and easy."

Another approach to endoscopic submucosal dissection, also developed by Japanese investigators and presented just before the lecture by Dr. Binmoeller, involves the use of a countertraction spring that is 2 mm in diameter and 2 cm long. The spring-loaded device is placed around a mucosal lesion, such as a gastric cancer, with enough tumor-free tissue to yield a minimum 5-mm margin. Traction is achieved by slipping the looped ends of the device to the lesion and to healthy mucosa. When the spring is released, the device lifts the target tissue. In a series of 10 cases presented by a team led by Nobuyuki Sakurazawa, MD, National Cancer Center Research Institute East, Chuｂa, Japan, negative resection margins were achieved in nine; in the 10th, submucosal invasion required additional surgery.

A water jet hybrid knife was another device in development that impressed Dr. Binmoeller for its potential role in expanding the domain of endoscopic submucosal dissection (ESD). The knife, which is designed to enable injection, dissection, and coagulation and injection all in one instrument, was called "the next evolutionary step" by Dr. Binmoeller, based on the favorable results produced in an animal model comparing the hybrid knife for ESD to conventional endoscopic mucosal resection. The study was presented by Horst Neuhauς, MD, chief of medicine, Evangelisches Krankenhaus at the University of Düsseldorf, in Germany. A major advantage of the hybrid knife over conventional endoscopic submucosal dissection is that there is no need to exchange tools for injection, cutting and coagulation.

Characterizing these and other innovations as "a great boon of new gadgetry and devices," Dr. Binmoeller also warned of "a harsh reality" in which many promising devices never reach the clinician because of intervening problems. One of the major barriers is the need for specialized training that can lead to slow adoption; this sets up the potential for a vicious circle in which device manufacturers are not encouraged to provide the support that would make the device viable from a commercial standpoint.

There is also a delicate balance for risk-to-benefit-to-cost ratios with devices that permit minimally invasive procedures. Although these procedures may accelerate recovery time, they often increase operating time and periods of anesthesia, particularly in the early part of the learning curve. Perhaps just as importantly, "there is often uncertain, poor or no reimbursement" for new technologies, according to Dr. Binmoeller, despite their potential to reduce costs for third-party payers once there are sufficient data to compare efficacy and safety to existing technologies.

Endoscopic endosurgery and NOTES are often seen as competing strategies, but Dr. Binmoeller suggested that each might improve the other, with endoscopists eventually performing a form of NOTES as more tools become available for resection and tissue approximation through the endoscope. Whether the option is S-NOTES by a surgeon or E-NOTES by an endoscopist, "the patient is going to benefit from the remarkable advances," Dr. Binmoeller said.

Asked for his comment on Dr. Binmoeller's predictions, Michael L. Kochman, MD, co-director of gastrointestinal oncology, Hospital of the University of Pennsylvania, Philadelphia, called them "helpful." However, Dr. Kochman, a co-chairman of the DDW scientific session where Dr. Binmoeller spoke, was not convinced that the evolution will necessarily take place along the separate pathways that Dr. Binmoeller described.

"I find that the division into E-NOTES and S-NOTES is not in keeping with the NOSCAR [Natural Orifice Surgery Consortium for Assessment and Research] premise that there
are intersecting and complementary skill sets that advanced interventionalists must possess, whether they are trained primarily as surgeons or gastroenterologists," Dr. Kochman observed.

"Nonetheless, a clear appreciation of luminal and extraluminal anatomy and pathology along with advanced endoscopic techniques is necessary to accomplish the procedures," he added. "The main obstacles to adoption are noted by Dr. Binmoeller. Uncertain risk-benefit ratios and potential reimbursement difficulties are likely to delay NOTES, but clearly the mindset and evolution of techniques and technologies are diffusing into daily practice."

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