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Special REPORT

Therapeutic Endoscopy: Evolution of Use and Utility In Surgical Procedures

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Modern endoscopy began in the 1960s, with the introduction of the fiber-optic endoscope, a breakthrough that turned gastrointestinal (GI) endoscopy into a comparatively safe diagnostic procedure for the first time.[1] Since then, the structure of the flexible endoscope has remained fundamentally the same, while devices and add-ons have been developed to expand its ability.[1] What has changed, and is still changing, according to the surgeons who are advanced flexible endoscopists interviewed for this special report, is use of the flexible endoscope as an instrument for therapeutic intervention.

Therapeutic Endoscopy in Surgery

For 6 decades, surgeons and gastroenterologists have been pushing the boundaries of what can be accomplished with an endoscope. Surgeons have contributed to the development of key procedures in therapeutic endoscopy, including endoscopic submucosal dissection, endoscopic mucosal resection (EMR), endoscopic suturing, endoscopic retrograde cholangiopancreatography (ERCP), colonoscopy, and polypectomy.[1] The development of additional technology and techniques, such as peroral endoscopic myotomy (POEM) and endoscopic pyloromyotomy, have advanced the utility of endoscopy beyond evaluation alone and into effective treatment (Figure 1).[2,3] With each new intervention, the practice of endoscopy has shifted further into the traditional domain of the surgeon.

Endoscopy now is a widely accepted option for the surveillance and/or treatment of achalasia, Barrett's esophagus, GI bleeding, and some neoplasms and surgical complications, and is used to inject tumors and place stents.[1,4,5] Until recently, therapeutic endoscopy was an uncommon specialized skill set among surgeons; however, that appears set to change, according to Eric M. Pauli, MD, an associate professor of surgery and the director of endoscopic surgery at Penn State Health Milton S. Hershey Medical Center in Hershey, Pennsylvania.

Dr Pauli identified several factors that are driving surgeon participation in therapeutic endoscopy: technological and knowledge

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advancements that have expanded the breadth of procedures that can be performed; a boost in the numbers of endoscopic procedures, including therapeutic endoscopic procedures, performed in minimally invasive surgery (MIS) or advanced gastroenterology fellowships and surgical residencies; and growing acceptance that therapeutic endoscopy belongs on the spectrum of MIS procedures.

Dr Pauli described the current state of therapeutic endoscopy as "both revolution and evolution: revolution for some surgeons and, for others, it's a period of evolution.

"For surgeons who have always been performing therapeutic endoscopy as part of their practice, what they are seeing is an evolution—a natural progression of disease states, ideas, and therapies that people have been talking about for decades. But for surgeons who haven't been doing therapeutic endoscopy, there appears to be a revolution happening, traced back to NOTES (natural orifice transluminal endoscopic surgery). NOTES renewed interest in therapeutic endoscopy because surgeons wanted to perform MIS with more advanced procedures, done with smaller tools and equipment."[6]

Therapeutic endoscopy has supplanted many surgical procedures over the past 3 decades, said Jeffrey M. Marks, MD, FACS, FASGE, professor of surgery and director of surgical endoscopy at University Hospitals in Cleveland, Ohio. As the list of current endoscopic therapies continues to grow, surgeons' opinions on endoscopy are beginning to change, he said.

"Four decades ago, surgeons didn't really find much of a home with flexible endoscopy because it really didn't have a lot of potential for intervention," Dr Marks said. "But now, I think surgeons are starting to realize that many things that we do require a skill set in flexible endoscopy in order to do procedures as well as to manage the complications of the procedure."

Advantages of Therapeutic Endoscopy

Michael B. Ujiki, MD, FACS, the vice chair of surgery for innovation and program development, Louis W. Biegler Chair of Surgery, and chief of gastrointestinal surgery at NorthShore University HealthSystem in Evanston, Illinois, calls flexible endoscopy "an essential tool for surgeons" (Figure 2). Surgeons who are proficient in flexible endoscopy, in addition to laparoscopic and open surgery, can assess a patient's condition and wants, and decide with the patient the best approach to treatment. "When you have a tool box and you have multiple tools in that tool box—and you're trained to use all of them—you are going to use whichever tool does the best job for that particular situation," he said.

When appropriate, therapeutic endoscopy offers measurable advantages over surgery for patients and health care systems, Dr Ujiki said. Patients recover faster and can avoid an extended length of stay (LOS) in the hospital that would be typical following surgery.[7,8] He used the example of esophagectomy for Barrett's esophagus, a surgical procedure that may require an LOS of 7 to 10 days, is associated with multiple complications, and may impair a patient's long-term quality of life.[9,10] In comparison, endoscopic ablation or EMR, performed in appropriate patients, may enable a patient to return home the same day of treatment and avoid the lifelong difficulties that can arise from removal of the esophagus.[11]

"If we can do something with the endoscope or therapeutic endoscopy that we otherwise would need an incision for, and we're able to perform the same sort of operation endoscopically, it affords great advantage for patient recovery," Dr Ujiki said. "There are basically dozens of procedures now that we can do with the endoscope that we used to have to do with incisions. And so, it has evolved quite significantly a bit over the last few years."

Figure 1. Endoscopic division of the circular muscle fibers of the esophagus during POEM.

POEM, peroral endoscopic myotomy

Image courtesy of Eric M. Pauli, MD, FACS, FASGE.

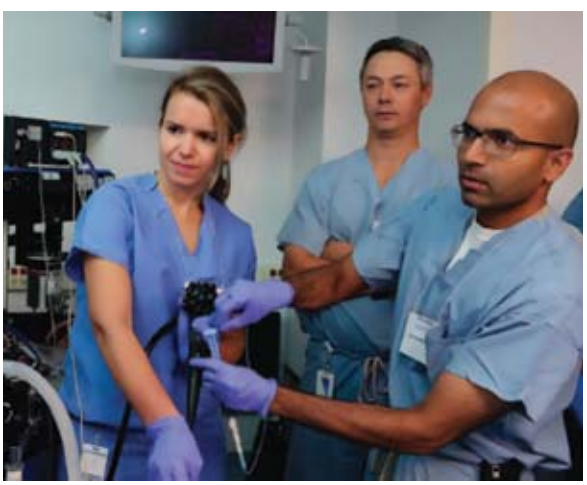

Figure 2. Michael B. Ujiki, MD (center) teaches endoscopy techniques in the simulation setting at NorthShore University HealthSystem Grainger Center for Simulation and Innovation in Evanston, Illinois.

Image courtesy of Michael B. Ujiki, MD, FACS.

Eleanor C. Fung, MD, a clinical assistant professor in the Department of Surgery at Jacobs School of Medicine and Biomedical Sciences at the University at Buffalo–The State University of New York in Buffalo, New York, said surgeons can draw from both their endoscopic and surgical skills in caring for patients and this combination provides advantages for the patient.

"It's a bit of a different mentality because we can fuse the worlds of surgery and endoscopy together," Dr Fung said. "If you're only in the surgery world, you'll keep persisting operatively. If you're only in the endoscopy world, you'll keep persisting endoscopically. Whereas for surgeons who do both, we can actually combine all the technologies together so that it's not one or the other. We can use everything to our advantage."

Endoscopy now accounts for 30% to 40% of her practice, although that figure varies depending on referrals from week to week. Three years after she started practice, she receives many referrals because she is known as a surgical endoscopist. "A lot of what I do is unexpected because it's a variable practice where I can try a different approach. It's not one set way to do something. I think that's where there's a real benefit; you have a different mindset in terms of how to attack things," Dr Fung said.

The measure of success for an endoscopic procedure is not always that a patient avoids surgery, Dr Pauli said. For some patients, endoscopic therapy can help improve or manage symptoms enough to carry patients through to a surgical procedure in better condition. "I think that's where some of the genius in these therapeutic procedures lies. While the failure rate may be higher for some of these procedures than with a definitive surgery, the morbidity of endoscopy is so much less. It's certainly worth attempting," Dr Pauli said.

Changing Management of Surgical Complications

Surgeons who perform advanced endoscopy said many surgical complications, notably postprocedural bleeds, increasingly are being addressed endoscopically. Most bleeding episodes that occur after foregut reconstructions or colorectal procedures, with some exceptions in the small bowel, occur within the reach of an endoscope, according to Dr Pauli. Consequently, many endoscopists have changed their algorithm for the treatment of bleeds, relying on endoscopy not just as a first-line, but also a second-line approach to bleeding, he said.

"If I scope somebody and they have a rebleed, I'm going to go back. I know that in the event of a rebleed, I can change my algorithm a bit," he said. "Instead of using a through-the-scope clip, I can switch to an over-the-scope clip or use an endoscopic sewing machine or something that's more complex than I did the first time around." Sprays and powders designed to stop bleeding both immediately until other measures can be used for bleeding control or to provide permanent hemostasis also have been introduced, and have shown a benefit in the GI setting.[12] "Having a variety of tools at your disposal means that you can ascend that treatment algorithm as you feel necessary," Dr. Pauli said.

Surgical endoscopists strongly recommend that surgeons use an endoscope in the operating room (OR) more frequently to prevent complications. For instance, during a gastric bypass or sleeve gastrectomy, a surgeon can and should use an endoscope to check the integrity of anastomoses. "That is a very important aspect of a successful surgery with low complications. If there's a bleeding anastomosis that isn't recognized in the OR, that likely will turn into a return to the operating room in the first 24 hours," Dr Ujiki said.

Endoscopic Training for Surgeons

In 2018, for the first time, all general surgery residents applying for certification by the American Board of Surgery were required to complete the board's Flexible Endoscopy Curriculum and pass the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) Fundamentals of Endoscopic Surgery examination.[13] In surgical fellowships, too, endoscopy is taking on greater significance, now accounting for a greater proportion of fellows' time and procedures in MIS fellowships, Dr Pauli said.

These 2 trends reflect an evolution in the recognition of flexible endoscopy as a core skill for general surgeons. It is believed this training will lead to increased utilization of endoscopy in practice. A 2018 study of 58 participants in the SAGES flexible endoscopy course for fellows showed the training resulted in long-term practice changes, with participating fellows maintaining confidence to perform the majority of taught endoscopic procedures 6 months later. Fellows reported no major barriers to implementing endoscopy in practice.[14]

"I think this is how therapeutic endoscopy among surgeons begins to move very rapidly and grow very quickly. As more surgeons are trained and data continues to come out showing better outcomes, you will find more surgeons seeking out training, and they will want to add endoscopy to their armamentarium to treat patients," Dr Ujiki said.

Surgical endoscopists stress the need for surgeons in practice to undergo additional training before adopting new endoscopic techniques. Training options, such as mini-fellowships and single- and multiple-day courses, are available through SAGES, the American College of Surgeons, and the American Society for Gastrointestinal Endoscopy (ASGE). These courses are not equivalent to residency or clinical training in endoscopy, but they can provide valuable exposure, Dr Marks said. "In combination with practice in animal laboratories and endoscopic simulation, these courses will be able to help surgeons gain the skill sets to take on some of these newer procedures."

For practicing surgeons who do not use flexible endoscopy or advanced flexible endoscopy, Dr Marks encouraged them to stay abreast of new tools and interventions in endoscopy. "We're going to lose our importance when it comes to managing diseases if we aren't right at the forefront with these new tools," he said.

Putting Therapeutic Endoscopy Into Surgical Practice

A practical consideration for surgeons looking to perform more therapeutic endoscopy is the challenge of establishing a viable practice. A 2008 survey of 1,075 general surgeons showed the proportion of clinicians performing endoscopic procedures was inversely correlated with the number of gastroenterologists available to patients in the survey area.[15] Many surgeons view therapeutic endoscopy as the subject of a turf war between gastroenterologists and surgeons, with physicians on both sides concerned about potential consequences for referrals, reimbursements, and collegiality. Surgeons who practice therapeutic endoscopy challenge that

stereotype, finding that surgeons and gastroenterologists often work collaboratively in this growing field to the benefit of patients.

The ideal therapeutic endoscopy practice involves a partnership between gastroenterologists and surgeons, and should be built based on local considerations, Dr Marks said. In some places, gastroenterology and surgery interact seamlessly, as shown by comanagement of patients and sharing of endoscopy suites. In other places, specialists perform in individual silos, a model that is often less successful because there is no shared learning between the 2 specialties, Dr. Pauli said. On a national level, 2 subspecialties—therapeutic endoscopy and MIS—are becoming more intertwined. This interaction ought to be reflected at a local level, Dr Fung said.

"I work in a setting where my colleagues are mainly gastroenterologists. I'm one of the few surgeons who do a lot of advanced endoscopy in my area," Dr Fung said. "It should never be considered a competition. We all have our different roles. People working together and fusing our training and skill sets is the best way to go."

Current Challenges

Experts point to multiple barriers that continue to hamper therapeutic endoscopy. Currently, many procedures are not reimbursed by insurance or are reimbursed at a low level.[16] A knowledge gap persists about what endoscopy can accomplish safely, an oversight that leads to some patients being referred for more invasive surgery when endoscopy would suffice, Dr Ujiki said. Training in advanced therapeutic endoscopy continues to be limited to a minority of surgeons.

But the most significant challenges may be technological: The endoscope device has not evolved significantly in the past 6 decades. The endoscopist is constrained to a small biopsy channel, an endoscope of fixed length, and an inability to triangulate.[1] "Our limitations of endoscopy now are based on this coaxial process whereby when we move our hand, we move our eyes or when we move our eyes, we move our hands," Dr Marks said. A redesign that would separate the eyes from the hands, mimicking the traditional surgical process, could lessen the learning curve and open up the ability for more surgeons to perform complex endoscopic procedures. Advances, such as the development of the flexible endoscopic robotic platform, may provide additional benefit to surgeons. "[In] the same way that robotics has become a large component of MIS, we have the same hopes that flexible robotic platforms would allow us to do intraluminal surgery inside the GI tract better than with the flexible endoscope," Dr Marks said.

Conclusion

When current challenges are overcome, advanced endoscopists believe the technology will be used in more, and more complex, procedures including full-thickness resection of GI tract lesions, more organ-sparing procedures, and management of gallbladder disease.

As noted by the expert clinicians interviewed for this special report, as surgeons have more effect on the endoscopy field, use of the technique may become commonplace for these complex procedures and ones like them. With the development of new endoscopic tools and techniques—such as POEM—robotic equipment, and hemostatic clips and powders, the aim is for these techniques to become safer and more effective. "When laparoscopy was introduced, it revolutionized surgery," Dr Ujiki said. "Endoscopy is the next step where we'll continue to see improved recovery for patients."

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