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The Early Days of Laparoscopy for Metabolic and Obesity Surgery

From 'Voodoo' to Today's Best Weapon Against Obesity and Metabolic Syndrome, Laparoscopic Surgery Hits Stride in Past Decade

By Victoria Stern

Alan Wittgrove, MD, FACS, became intrigued by laparoscopy during his surgical residency at San Diego Naval Hospital in the late 1970s. Jerry Ragland, MD, a staff surgeon at the hospital, felt that operating with scopes would be the future of general surgery. His prediction turned out to be correct.

In the early 1990s, after laparoscopic cholecystectomy had gained a foothold in the United States, surgeons began investigating minimally invasive approaches for a range of procedures. At the time, Dr. Wittgrove was exploring ways to reduce the high rate of incisional hernia complications (16%) associated with open gastric bypass, a procedure initially described in the late 1960s by surgeons Edward Mason, MD, and Chikashi Ito, MD (*Surg Clin North Am* 1967;47:1345-1351).

During Dr. Wittgrove's travels to Belgium to learn laparoscopic Nissen fundoplication, he realized that he could turn an open gastric bypass into a laparoscopic technique. Upon his return to California in 1992, Dr. Wittgrove and G. Wesley Clark, MD, co-directors of a private practice bariatric surgery program in San Diego, began investigating ways to mimic the open procedure laparoscopically in the animal lab. The duo teamed up with Ethicon EndoSurgery to help develop new stapling technology. Once the circular stapler was approved, the surgeons had everything in place. In 1993, they performed the first laparoscopic Roux-en-Y gastric bypass in a patient.

Next, Drs. Wittgrove and Clark reported a case series of five laparoscopic Roux-en-Y gastric bypasses (*Obes Surg* 1994;4:353-357). They hand-selected patients with body mass indexes (BMIs) between 35 and 40 kg/m^2 to ensure the best possible outcomes, given the early stage of the technique. The procedure was free for the patients: The anesthesiologist didn't bill, Ethicon EndoSurgery donated equipment and follow-up was free.

"Bariatric surgery was still a bit of voodoo in early 1990s," said Dr. Wittgrove. "We were very attuned to the fact that this procedure might be controversial, so it was important for us to keep track of our patients' data to refute any malicious attacks."

Initially, Drs. Wittgrove and Clark were training surgeons at their primary facility but hospital administration became concerned that the facility might run into legal troubles if a patient had complications. The surgeons then began holding courses with a company named Vista, and later partnered with the American Society for Metabolic and Bariatric Surgery (ASMBS), then the ASBS, to run a laparoscopic gastric bypass program, in which they trained a select group of bariatric surgeons with laparoscopic experience to perform their technique on human cadavers.

During this time, the procedure began to spread, mostly among surgeons in private practice, and some surgeons, including Michel Gagner, MD, Philip Schauer, MD and James Ken Champion, MD, FACS, started bariatric programs and courses to help train surgeons throughout the United States.

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Over the next few years, Drs. Wittgrove and Clark reported outcomes on a growing series of patients. By 1996, they had completed a series of 100 laparoscopic Roux-en-Y gastric bypasses (*Obes Surg* 1996;6:500-504), and by 2000, the series had grown to 500 patients (*Obes Surg* 2000;10:233-239). In this later series, the authors found that the average percent excess body weight loss at five years was 75%, and the procedure appeared to be safe, with few complications and no mortalities. Additionally, 96% of preoperative comorbidities, including gastroesophageal reflux disease, sleep apnea and diabetes had resolved after surgery.

But even before Drs. Wittgrove and Clark had performed a laparoscopic gastric bypass, Belgian general surgeon Guy-Bernard Cadière, MD, PhD, had done the first adjustable gastric banding procedure laparoscopically in 1992 (*Br J Surg* 1994;81:1524). However, Dr. Cadière had used a Kuzmak adjustable silicon gastric band, designed for open procedures, so credit for the first laparoscopic adjustable gastric banding procedure initially went to Belgian surgeon Mitiku Belachew, MD, who did the procedure with a lap band on Sept. 1, 1993 (*World J Surg* 1998;22:955-963). This lap band had been modified from the Kuzmak adjustable silicon gastric band for laparoscopic applications. Subsequently, Dr. Cadière performed the procedure with the lap band one week later (*J Celio Chir* 1994;10:27-31).

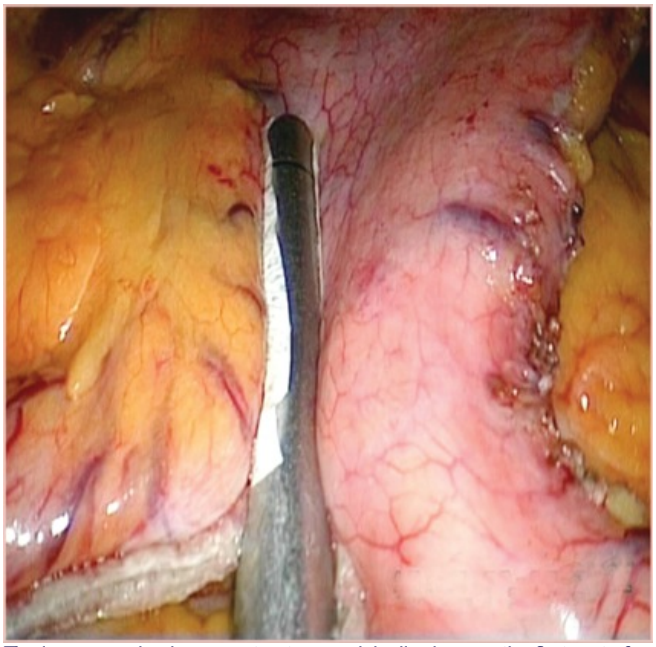
Duodenal Switch and Sleeve Gastrectomy

Intrigued by the possibility of more minimally invasive approaches to bariatric surgery, Dr. Gagner established a laparoscopic program at the University of Montreal, Hotel-Dieu, where he was assistant professor of surgery. Despite experiencing staunch resistance from the chief of surgery there, Dr. Gagner set up a pig lab at Hotel-Dieu in July 1990, and for the next five years worked on various laparoscopic techniques, including adrenalectomy, pancreatectomy and Roux-en-Y gastric bypass (*Surg Laparosc Endosc* 1997;7:294-297).

Eventually, however, the administrative roadblocks proved too intrusive, and Dr. Gagner relocated to the Cleveland Clinic in summer 1995 where he established the Minimally Invasive Surgery Center, and in early 1996, initiated a course on laparoscopic gastric bypass.

Two years later, Dr. Gagner moved to the Icahn Medical School at Mount Sinai in New York City, and took on the role of chief of laparoscopy, starting a minimally invasive surgery program that later became one of the biggest in the United States. After hearing about the success of an emerging open bariatric procedure—a biliopancreatic diversion with a duodenal switch—Dr. Gagner wondered whether he could perform the procedure laparoscopically.

In spring 1999, Dr. Gagner, along with clinical fellow Gregg Jossart, MD, FACS, and surgical resident John de Csepel, MD, FACS, performed laparoscopic biliopancreatic diversion with a duodenal switch on six 50-kg pigs, restricting food intake with a sleeve gastrectomy and achieving malabsorption with Roux-en-Y (*J Laparoendosc Adv Surg Tech A* 2001;11:79-83). On July 2, 1999, Dr. Gagner performed the first laparoscopic duodenal switch in a severely obese patient with a BMI greater than 60 kg/m^2.



The laparoscopic sleeve gastrectomy, originally done as the first part of a duodenal switch, was shown to produce good results as a stand-alone operation.

Image courtesy of Michel Gagner, MD.

“This was a very difficult patient, and soon we conducted a series using this technique on 40 morbidly obese patients,” Dr. Gagner said. “After presenting our results at the 2000 ASBS meeting, people took notice. We showed that gastric bypass was not the only bariatric surgery we could do laparoscopically.”

In the 40-patient series, patients showed significant excess weight loss of 46% after six months and 58% after nine months (*Obes Surg* 2000;10:514-523). However, Dr. Gagner also found high rates of complications, including one anastomotic leak, four staple-line hemorrhages and one mortality.

“In my introspection, I realized that the problems were a result of performing this surgery on such severely obese patients,” Dr. Gagner said. “If such patients have a leak or infection, they are at high risk for severe complications.”

A solution soon emerged. One day, Dr. Gagner was performing a duodenal switch on a morbidly obese patient. The surgical team had begun the sleeve gastrectomy, but because the patient was severely obese, the anesthesiologist was finding it difficult to maintain hemodynamics. The team finished the sleeve gastrectomy and stopped the operation.

“At that moment, we had done the first isolated sleeve gastrectomy,” Dr. Gagner said.

The patient lost more than 100 pounds after undergoing the sleeve gastrectomy. Dr. Gagner realized that they could reduce the rate of complications associated with laparoscopic duodenal switch by dividing the procedure into two parts, initially performing a sleeve gastrectomy and then performing the duodenal switch months later, after the patient had lost weight.

Dr. Gagner began conducting a series of sleeve gastrectomies in these high-risk patients, which he followed up with duodenal switches months later. He soon realized that some patients did so well after the sleeve gastrectomy that they did not require the second part of the operation.

However, after presenting results of a small series of laparoscopic sleeve gastrectomies at several meetings, the paper was rejected by *Surgical Endoscopy* because, according to the editors, the follow-up time was too limited.

“It can be difficult to get publication on first concept, which infuriates me,” Dr. Gagner said. “Insurance companies in the United States were refusing duodenal switch so we started doing laparoscopic gastric bypass instead as the second part of the procedure,” added Dr. Gagner, noting that the results of a two-phase sleeve gastrectomy and gastric bypass procedure were published earlier with co-authors Alfons Pomp, MD, FACS, and William B. Inabnet, MD (*Obes Surg* 2003;13:861-864).

Dr. Gagner also began courses on sleeve gastrectomy in New York every six to 12 months, and interest grew exponentially.

“During the first course, about 25 to 30 people came, but then the audience started doubling in subsequent courses,” Dr. Gagner recalled.

Michael McMahon, MD, a general surgeon from the University of Leeds, United Kingdom, for example, was also an early pioneer of sleeve gastrectomy, developed from the concept of *Magenstrasse and Mill* in 2000. The procedure also started to take off abroad in France, Belgium, Austria and Germany.

“This was the beginning of sleeve gastrectomy, which is fast becoming one of the most popular bariatric operations worldwide,” Dr. Gagner said.

Rise of Laparoscopy

When laparoscopic techniques for bariatric surgery were introduced, critics complained the operations were unsafe and associated with high morbidity compared with the open approach.

Although a proponent of the laparoscopic approach, Ninh Nguyen, MD, chief of gastrointestinal surgery at UC Irvine Medical Center, in California, recognized safety issues in the early days of the procedure. “I reviewed my initial experience of laparoscopic gastric bypass and found that it took 75 cases to overcome the steep learning curve,” he said.

The criticism prompted Dr. Nguyen to conduct a randomized trial comparing open versus laparoscopic gastric bypass. He and his colleagues found a significant benefit for the laparoscopic approach, including less postoperative pain, lower rate of wound-related complications and a quicker recovery (*J Am Coll Surg* 2001;192:469-476).

Over the years, an emphasis on surgical education and fellowship training in bariatrics allowed the procedures to mature and resulted in significantly fewer risks and complications as well as a decline in the mortality rate.

Dr. Gagner believes this improvement in outcomes is due in great part to changes in technology. “Initially, the available technology limited us and perhaps that’s why we had higher complication rates early on,” he said. “However, industry responded by making better flexible, long staplers for super obese patients as well new suture material to do running sutures, more intelligently designed, smaller bougies and balloons with holes for leak tests.”

By 2005, the number of bariatric procedures performed laparoscopically surpassed that of the open approach nationwide.

“It took time to become more mainstream, but by the mid-2000s, about 60% of all weight loss surgeries were done laparoscopically and today the percentage is closer to 90%,” said Dr. Pomp, Leon C. Hirsch Professor and vice chairman, Department of Surgery, chief, Section of Laparoscopic and Bariatric Surgery, Weill Medical College of Cornell University, NewYork-Presbyterian Hospital. “Although some practices still perform open bariatric surgery with good results, most of the time, there’s significant patient-driven demand to do minimally invasive surgery.”

Dr. Nguyen recently mapped the changing landscape of bariatric operations performed in the United States (*J Am Coll Surg* 2013;216:252-257). He and his colleagues found that of 60,738 bariatric procedures performed between Oct. 1 2008 and Sept. 20 2012, laparoscopic sleeve gastrectomy rose from the third most popular procedure to the second, accounting for 36.3% of all bariatric procedures done in 2012. This increase in laparoscopic sleeve gastrectomy accompanied a significant decline in laparoscopic gastric banding (23.8% in 2008 to 4.1% in 2012) as well as a reduction in laparoscopic gastric bypass (66.8% in 2008 to 56.4% in 2012), which continues to be the most commonly performed bariatric procedure.

Part of the reason laparoscopic sleeve gastrectomy outstripped laparoscopic gastric banding in popularity is because it affords better weight loss (55% vs. 47% excess weight) with fewer reoperations down the road, said Dr. Pomp.

More importantly, Dr. Wittgrove noted, laparoscopic gastric banding doesn’t alter patients’ hormone levels like laparoscopic gastric bypass or sleeve gastrectomy does. “Now we’re really understanding that to get a durable, predictable response, the procedure has to manipulate our hormones in a beneficial and lasting way,” he said. In other words, patients need a metabolic operation, not just a weight loss one.

Down the Road

A major concern for the future is that obesity has become the “new norm,” according to Dr. Pomp “This is the first generation that won’t live as long due to accumulating cardiovascular problems and diabetes,” he said.

Despite a growing obese population, patients have limited access to preventative and surgical care, largely due to social stigma and inadequate insurance coverage.

“People tend to perceive this as radical surgery and every time a complication occurs, it gets a headline,” Dr. Pomp said. “However, 99.7% of patients live through this operation, with a 3% to 4% likelihood of a major complication.”

Dr. Wittgrove agreed, noting that surgery is clearly the best treatment for metabolic syndrome and for the serious comorbidities that accompany it, including diabetes, hypertension, dyslipidemia and obstructive sleep apnea. Arthritis, depression and many other comorbidities of morbid obesity also can be treated effectively.

Looking to the future, Kelvin Higa, MD, FACS, director of Minimally Invasive and Bariatric Surgery, Fresno Heart and Surgical Hospital, in California, defined where the focus of attention should be (*Medscape J Med* 2008;10:101): “It’s about time that we recognize the disease of obesity for the multifaceted killer that it is, understand better why it has become so prevalent in today’s society, work on preventative measures, and treat those already afflicted.”

By the Numbers

By **2005**, the number of bariatric procedures performed laparoscopically surpassed that of the open approach nationwide.