Robotic gastric bypass surgery

A key weapon in the fight against obesity

The use of robotic technology in gastric bypass surgery is increasing and heralds a major turning point in bariatric surgery. However, robotic bariatric surgery must be proven feasible and safe. This is exactly what the work of Rodolfo Oviedo, MD, FACS, FASMBS, Director of Robotic General Surgery at Houston Methodist Department of Surgery, has set out to demonstrate. His research has shown that robotic gastric bypass surgery provides numerous advantages to both patients and surgeons in terms of safety profile and cost efficiency when performed at a high-volume, experienced bariatric centre or even in rural community hospitals.

Robotic Roux-en-Y gastric bypass (RYGB) is one of the most commonly performed operations for weight loss in patients with severe obesity. This procedure involves creating a small pouch from the stomach. The pouch is connected directly to the small intestine, bypassing the majority of the stomach, the duodenum (upper portion of the small intestine) and part of the jejunum (middle portion of the small intestine). This reduces how much food and nutrients are absorbed, leading to weight loss. Following this procedure, patients lose on average 70% of their excess body weight. Weight loss after RYGB can also lead to the resolution of multiple obesity-related chronic illnesses such as diabetes, hypertension, gastro-esophageal reflux disease, hyperlipidemia and obstructive sleep apnoea, whilst losing weight in a predictable and sustainable manner. For these reasons, RYGB has remained the gold standard surgical treatment for morbid obesity since it was first described in the late 1960s.

The operation is usually performed laparoscopically (ie, via the inside of the abdomen) with low complication rates and is clearly superior to the alternative: an open procedure. Laparoscopic RYGB (L-RYGB) does however encounter limitations inherent to any laparoscopic procedure including two-dimensional vision, the counterintuitive movement of instruments, and limited degree of freedom. The application of laparoscopy techniques to morbidly obese patients also adds another set of obstacles, requiring techniques for dissection, exposure and port placement that is normally not necessary on patients with a lower body mass index. Indeed, laparoscopic RYGB is arguably one of the most challenging minimally invasive procedures in general surgery. To overcome the limitations of conventional laparoscopy, the surgical robot has been implemented in bariatric surgery and has proved extremely useful in this field, especially during challenging procedures such as RYGB.

**ROBOTIC ROUX-EN-Y GASTRIC BYPASS**

In 1998, a surgical robot was used for the first time in bariatric surgery for the implantation of a gastric band. The first robotic RYGB (R-RYGB) followed shortly afterwards in 2001. The robot is a telesurgical instrument that enables the surgeon, from a console away from the patient, to control up to three robotic arms and a binocular camera. The surgical robot was initially introduced in the gastric bypass for performing only a portion of the total procedure, namely the most technically demanding step. However, it has since been shown that a totally robotic approach is feasible for the entire gastric bypass.

Robotic surgery allows for more precise manipulations and increased dexterity by downscaling the surgeon’s movements and filtering out physiological tremors. Robotic surgery overcomes the restraint of torque on the instruments due to the thick abdominal wall and minimises port-site trauma because of remote centre technology. Furthermore, the three-dimensional surgical field of vision provided by the robot offers an unparalleled view of the abdomen to facilitate fine tissue dissection. Consequently, the use of this technology in R-RYGB facilitates the performance of this complex operation with finesse, less tissue trauma and less bleeding.

For patients, this means a shorter stay in hospital, less post-operative pain and a faster return to daily activities and work with low complication rates.

**WHAT ARE THE FINANCIAL IMPLICATIONS?**

Robotic surgery is an enhanced extension of laparoscopy, or a refined tool that should be learned and mastered to benefit both patient and surgeon. However, an understanding of the costs associated with implementing this technology is an essential consideration for the adoption of robotic surgery.

To address this, Dr Rodolfo Oviedo and his team examined if R-RYGB could be safely implemented, in a cost effective manner, at a robotic bariatric surgery programme in a community hospital. Dr Oviedo performed a total of 50 R-RYGB procedures at a community hospital in a rural setting that had no robotic platform and the team found that the inexperienced team did contribute to a longer operative time.

In the continuously evolving field of bariatric surgery, robotic surgeons are set to play a key role in future advancements.

Gastric bypass surgery is one of the most commonly performed operations for weight loss in patients with severe obesity.

Robotic surgery has proved extremely useful in this field, especially during challenging procedures such as RYGB.

In contrast, conventional laparoscopy allows for more precise manipulations and increased dexterity by downscaling the surgeon’s movements and filtering out physiological tremors.

Surgical room in hospital with robotic technology equipment.

Gastric bypass surgery is one of the most commonly performed operations for weight loss in patients with severe obesity.

Although opposition to the use of robotic technology in bariatric surgery has slowly decreased, there is still some resistance based on reports of longer operating times and concerns that complication rates may be greater than conventional L-RYGB.

Between March 2014–February 2017, Dr Rodolfo Oviedo performed 20 robotic general surgery cases, encompassing a variety of procedures, including his first robotic bariatric operation, a R-RYGB, and the first of its kind in the history of the city. The procedures were performed in a small community hospital without the resources that would normally be available in a large academic centre. A retrospective review of these cases revealed outcomes comparable to those found in a large academic centre.
Extensive experience with L-RYGB. The measured outcomes of the 50 R-RYGB cases including 30-day morbidity, mortality, re-interventions and resolution of co-morbidities, along with a financial analysis of cost reduction were compared with 50 L-RYGB cases also performed by the same surgeon. No significant difference between R-RYGB and L-RYGB with respect to any measured outcome was found. Interestingly, R-RYGB had in fact improved performance for most of the safety outcomes that were measured. R-RYGB achieved a high co-morbidity resolution rate, enabling patients to control and eradicate obesity-related chronic illnesses such as diabetes, hypertension, gastro-oesophageal reflux disease, hyperlipidaemia, and obstructive sleep apnoea.

The team also set out to determine which approach during gastric bypass surgery was the most cost effective; a hybrid approach using laparoscopic stapling, or a totally robotic approach using robotic stapling. They found that when a totally robotic approach was used there was a reduction in cost per case and thus cost savings for the hospital for the 50 R-RYGB procedures compared to the conventional laparoscopic approach.

L-RYGB demands advanced laparoscopic skills and the ability of the surgeon to operate in multiple quadrants of the abdomen, such that the learning curve has been estimated to be 75–100 procedures to achieve a high level of proficiency. However, Dr Rodolfo Oviedo’s work has shown that robotic surgical assistance decreases the number of cases necessary to master the learning curve, most likely due to the ergonomic advantage offered by the robotic platform. That do not have the resources normally available in large academic centres. Once a well-established bariatric programme masters the learning curve, a robotic gastric bypass has excellent outcomes. In the continuously evolving field of bariatric surgery, robotic surgeons are set to play a key role in future advancements.

**A KEY WEAPON IN THE FIGHT AGAINST OBESITY**

The use of robotics in bariatric surgery, in particular during challenging procedures such as RYGB, is increasing due to its ability to overcome the technical challenges of laparoscopic surgery, thereby reducing complications and optimising surgical outcomes. Dr Oviedo and his team have shown that R-RYGB provides several advantages to both patients and surgeons in terms of its safety profile and cost efficiency when compared to the conventional laparoscopic approach. Furthermore, robotic gastric bypass surgery can be safely implemented in community hospitals in rural settings.

**Behind the Research**

Rodolfo Oviedo pioneers the use of robotic gastric bypass surgery.

**Research Objectives**

Rodolfo Oviedo set out to determine which approach during gastric bypass surgery is the most cost effective; a hybrid approach using laparoscopic stapling, or a totally robotic approach using robotic stapling. He also aimed to determine the safety outcomes that were measured.

**References**


**Personal Response**

Aside from safety and cost, are there any other barriers, such as public misconceptions around surgical robots, to the widespread adoption of robotic technology in bariatric surgery?

The most important obstacle is the surgeon’s resistance to adapt and evolve while learning new techniques. Being very comfortable with one’s approach is a necessary skill in surgery, but it can also be a disadvantage when it interferes with our ability to become better surgeons and learn new ways to treat problems while thinking outside the box, in a more unconventional, unorthodox fashion. Robotic surgery is here to stay, and it is not the future. It is the present. Surgical robots exhibit a degree of limited artificial intelligence, and in years to come they will be performing certain operations. However, nothing can replace human judgment and experience.