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Laparoscopic Adjustable Gastric Banding: Technique

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Standard Technique

After induction of general anesthesia and placement of inflatable pressure garments on the legs to minimize the risk of deep vein thrombosis, the abdomen is prepped and draped in the usual way. The patient is given subcutaneous heparin and a prophylactic antibiotic after induction.

I perform the surgery with the patient flat, in moderate reverse Trendelenburg position. I stand on the patient's right side, with my assistant and the scrub nurse opposite me.

Access to the abdomen is gained with an optical viewing port and a zero-degree laparoscope via an incision 1 cm below the end of the left costal margin. Once the abdomen is insufflated, a 30° scope is used for the rest of the procedure. A Nathanson liver retractor is placed via an incision over the xiphisternum. Three ports are placed in a line across the abdomen from the Optiview port—a 5 mm, a 15 mm, and another 5 mm—which is at the end of the right costal margin.

I use an Allergan AP Standard band for all women, irrespective of size, and for smaller men who are not diabetic. I use an Allergan AP Large for most men, due to their increased intra-abdominal fat. I make that determination before we start the case, and insert the band through the 15 mm port as soon as it's in place.

All the instruments should be extra long, at least 45 cm. A soft grasper is inserted through the right 5 mm port, to be used by the surgeon. Another is placed through the left 5 mm port. This grasper is passed to the top of the stomach, over the omentum. The handle is pushed towards the head, causing the tip of the grasper to sweep towards the feet, taking the omentum with it, thus putting the fundus on stretch, and exposing the hiatus and gastroesophageal junction. The assistant holds that grasper steady with their left hand during the entire procedure, maintaining an excellent exposure. A hook dissector is placed through the 15 mm port.

The first step is to assess the hiatus. It is essential to repair any hiatal hernia, or crural defect, no matter how small. We at NYU have shown that it significantly reduces the need for reoperation to treat reflux. Some surgeons do a crural repair in every case.

Using the hook, the peritoneum over the left crus of the diaphragm is divided, and the fundus completely mobilized off the diaphragm (Fig. 1). This is done by a combination of hook and blunt dissection, always pushing the tissue towards the feet. Once the left crus is exposed, the dissection continues across the front of the esophagus to the right crus. There will often be a thickened peritoneal reflection over the front of the esophagus, which is pushed superiorly along the esophagus. The right crus is then exposed in a similar fashion (Fig. 2). In many cases, all that is required is to close the crura anteriorly, using a 0 Prolene figure-of-8 suture. If there is a true, large hiatal hernia, it is better to repair it posteriorly, behind the esophagus. I use mesh reinforcement for large or paraesophageal hernias. I prefer the shaped Cook mesh, which I hold in place posteriorly with ProTacks, and anteriorly with sutures. It is important not to use tacks anteriorly, due to the risk of injuring the pericardium. It's worth stating that even a very large paraesophageal hernia is not a contraindication to a band.

Attention is then turned to placing the band. The lesser omentum is incised over the caudate lobe of the liver. The right crus always disappears into a small fat pad, where it meets the left crus. The point of dissection is right at that fat pad. A small incision is made there with the hook. There is a beautiful plane behind the esophagus starting at that point. It is essential for the assistant to maintain the sweeping retraction of the fundus. The surgeon's left hand grasper is then gently inserted into the small incision and passed behind the esophagus, to emerge in front of the left crus (Fig. 3), often going behind the spleen. There should be no resistance at all when the grasper is passed. If there is, it's usually that the fundus is being inadequately retracted, or that it has not

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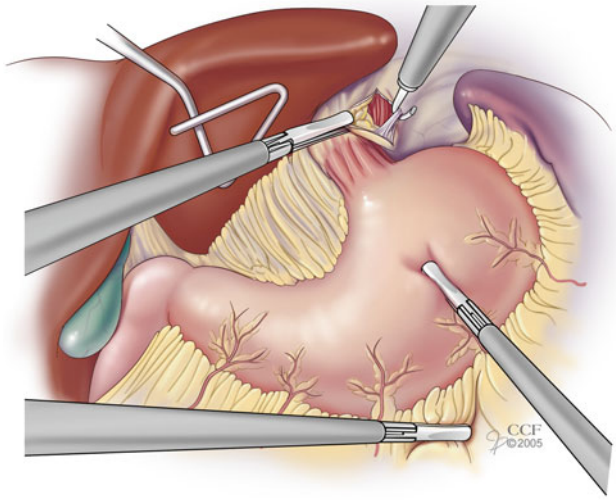

FIG. 1. Exposure of the angle of His. The lateral segment of the left lobe of liver is retracted upwards. The omental fat has been retracted downwards and the fundus is drawn downward by the assistant. The diathermy hook is opening the peritoneum over the left crus. Copyright CCF, with permission.

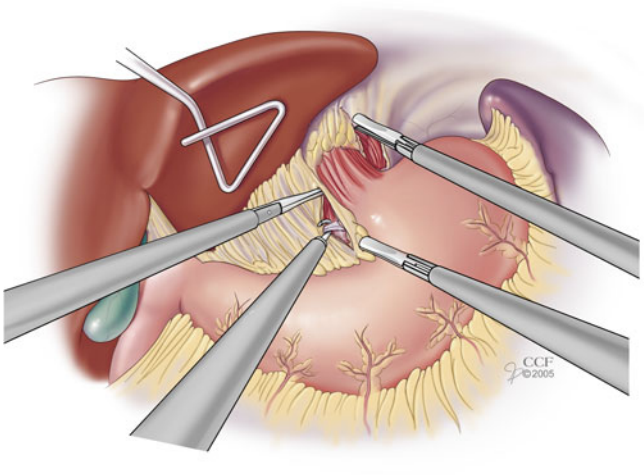

FIG. 2. Exposure of the right crus. Hiatal hernia, if identified, should be reduced and repaired. Copyright CCF, with permission.

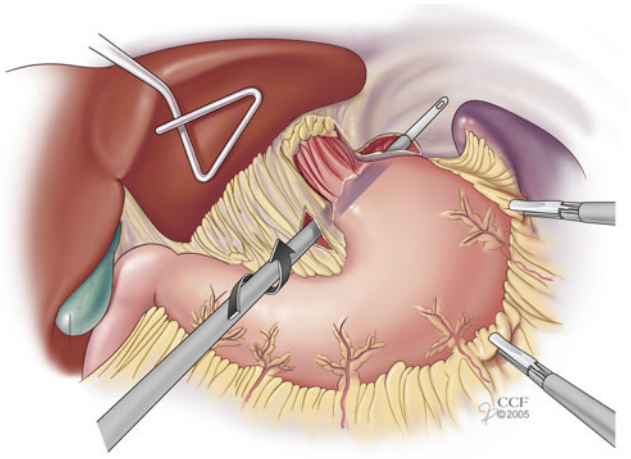

FIG. 3. The peritoneum has been opened and a tunnel developed using the grasper. The instrument should be passed easily without resistance. Copyright CCF, with permission.

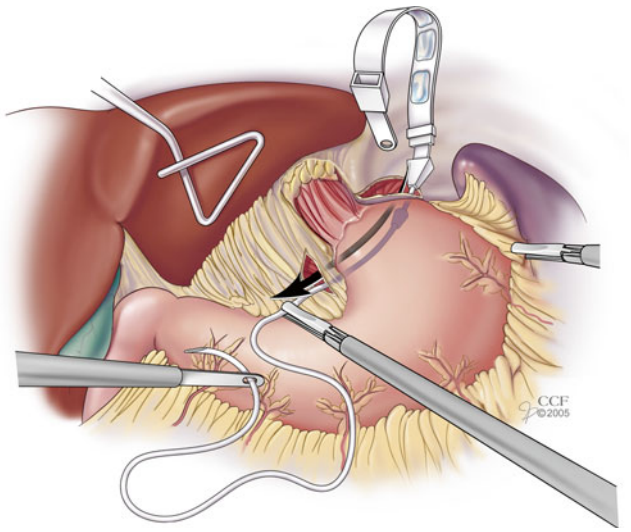

FIG. 4. The tubing is pulled through the tunnel to position the band in place. Copyright CCF, with permission.

been adequately mobilized off the left crus. The key maneuver is for the surgeon to keep their left hand grasper completely horizontal. There is a natural tendency for the tip of the grasper to slide anteriorly, a tendency that should be avoided.

The tubing of the band is brought up and grasped, then drawn behind the esophagus (Fig. 4). The band is locked (Fig. 5). The end of the tubing should come across in front of the liver like a spear, going easily into its socket. The key to locking the band is to do it gently, keeping the parts in the same plane. Any rotation will cause the silicon to lock.

There are two schools of thought about band fixation, either none at all or to use gastrogastric sutures.

Martin Fried, from Prague, has advocated using no sutures. From January to September 2006, he randomized 100 patients undergoing banding to group 1 ($n=50$, ≥ 2 imbrication sutures) or group 2 ($n=50$, no imbrication sutures).

The 3-year EWL was 55.7 % ± 3.4 % and 58.1 % ± 4.1 % for groups 1 and 2, respectively. The body mass index at 3 years was 34.0 ± 5.8 kg/m^2 and 30.3 ± 6.4 kg/m^2 (range 1.2–6.2) for groups 1 and 2, respectively ($P<0.01$). He found that slippage occurred in 1 patient (2.2 %) and 1 patient (2.0 %) and migration in 1 patient (2.2 %) and 1 patient (2.0 %) in

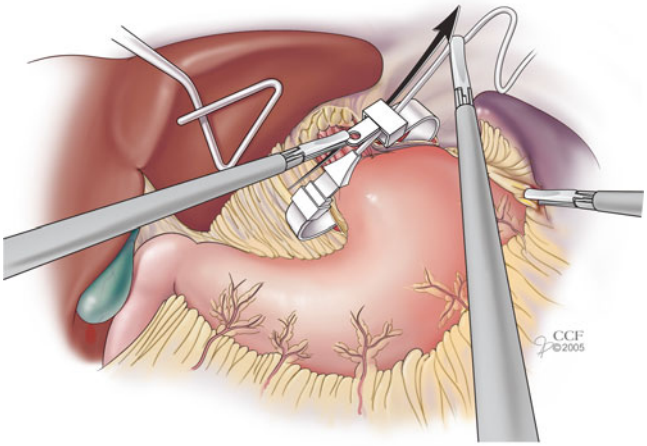

FIG. 5. The band is locked in place. Copyright CCF, with permission.

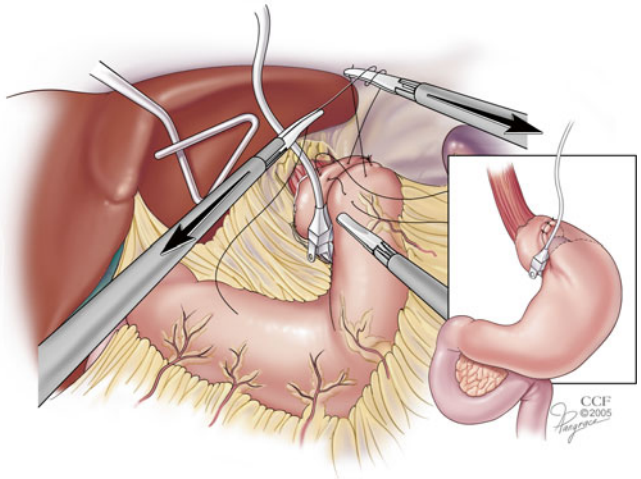

FIG. 6. Completion of anterior fixation with avoidance of bringing the gastric wall against the buckle of the band. Copyright CCF, with permission.

groups 1 and 2, respectively (P = NS). Martin concluded that the band is effective and safe with and without imbrication sutures.

Paul Super, from Birmingham, England, has taken the opposite view. Between April 2003 and June 2007, he performed banding in 1,140 consecutive patients. He used a gastropexy suture in addition to the two routine gastro-gastro tunnel sutures in all cases. The gastropexy picks up four bites of fundus and brings it to the diaphragm near the left crus. Excess percent BMI loss in these patients at 36 months was 58.9 %. Slippage with urgent readmission occurred in one patient (0.08 %) at 5 months. Two partial slippages were noticed at 12 and 18 months, respectively.

Both these approaches have delivered great results. Our choice has been to incorporate what Paul Super does by using a 2-0 Prolene to do a gastropexy, then another to do a running gastrogastric suture over the band, stopping 1 cm from the buckle (Fig. 6). I then add another gastropexy below the band, the Patterson stitch, devised by Emma Patterson, of Portland, Oregon. It's definitely belt and braces, but if it helps reduce slip, it's worth it.

The tubing is then brought out through the 15 mm port and attached to the port. A small disk of mesh is sutured to the back of the port. The port is then placed on the deep fascia, where the mesh sticks and fixes the port in position.

The wounds are closed with Monocryl and the patient sent to the recovery room, ready to start their weight loss journey.

Single Incision Band Surgery

Surgeons have recently been performing many surgical procedures, including appendectomy, cholecystectomy, fundoplication, Heller myotomy, distal gastrectomy, segmental colon resection, laparoscopic adjustable gastric band (LAGB), sleeve gastrectomy, and Roux-en-Y gastric bypass (RYGB) through single incision laparoscopic surgery (SILS) or, in the case of gastric procedures, a single working incision, and another for liver retraction. The obvious benefit is cosmesis, especially if the incision is placed inside the umbilicus.

At NYU, we performed a retrospective review of 1,644 LAGBs performed at our institution between November 1, 2008 and November 30, 2010. Of these, 756 were performed as SILS bands (46 %) and 888 as non-SILS (54 %) with the standard 4–5 trocar incisions.

In our initial experience, we limited SILS to women with lower BMIs. As our experience grew, we included men and women with higher BMIs. We excluded patients with any incision at the umbilicus. A relative exclusion was a long torso, where the distance from xiphoid process to umbilicus was greater than 26 cm, as it would impact on the ease of instruments reaching the diaphragm with any mobility. We still prefer standard technique in men with BMI over 50 due to the difficulty retracting omentum and peri-gastric fat.

When starting to use SILS, we did it in a stepwise fashion, gradually removing ports and moving to the umbilical approach over at least 20 cases. This allowed us to develop some facility with the crossed-hands and limited angulation technique required for SILS.

Our SILS technique uses a single periumbilical 3–4 cm incision with placement of a 12 mm trocar via the Hassan technique under direct vision. The band is placed through a 1 cm incision at the base of the umbilical stalk. This is exactly the same incision we have used for thousands of laparoscopic general surgery operations. The band is inserted into the abdomen prior to placement of the 12 mm trocar through the 1 cm umbilical defect. Then, two 5 mm ports are placed to the right and left of the 12 mm trocar to minimize clashing. These trocars are staggered in length: on the right

side a long trocar and the left side a short one, flush with the skin. Liver retraction is obtained either via the same infraumbilical incision (Genzyme liver retractor) or via a subxiphoid percutaneous method (Nathanson liver retractor).

The band is placed via the standard pars flaccida technique. Once all ports are inserted, a left-handed grasper is used to retract the greater curvature, exposing the angle of His. Electrocautery, held in the right hand, is used to divide the phrenoesophageal ligament and mobilize the angle of His, exposing the left crus. If a hiatal hernia or dimple in the crura is appreciated, the hiatus is fully dissected and the hernia is repaired. The gastrohepatic ligament is then divided, and the right crus exposed. A flexible grasper held in the right hand is then curved and inserted at the base of the right crus into a retrogastric tunnel, exiting at the angle of His. The band is pulled through, locked, and fixed using a 2-0 nonabsorbable gastrogastric running plication suture. Finally, the tubing is pulled out through the left-sided 5 mm trocar. The fascial defect is closed using a 0 Vicryl suture in a figure-of-eight manner and the port is attached and fixed to the anterior fascia, to the right of the umbilicus.

The mean operating time of an SILS band was 44.7 ± 20 min (12–179 min), compared to 51.1 ± 19.6 min for non-SILS bands (15–147 min). This difference was found to be statistically significant ($P < 0.001$). Over the 2-year follow-up, 37 patients (5 %) in the SILS group and 22 patients (3.7 %) in the non-SILS patients had reoperations for port complications and band slip. One SILS patient developed an umbilical hernia.

Can SILS LAGB be done? Certainly. The data in our study confirm that the two techniques are equitable in terms of operating time, complications, and outcomes.

Should it be done? Yes, but only if the surgeon finds the technique interesting, is prepared to carefully accumulate the necessary skill set, and feels that the cosmetic benefit is worth the extra trouble and difficulty. Triangulation of instruments is the key to an easy day in the operating room doing laparoscopic surgery. It becomes second nature and governs all port positions. SILS does away with triangulation. The jump from 5-port LAGB placement to one or two ports is challenging. To this end, we recommend a staged approach to starting SILS LAGB surgery. This explains why we have so many non-SILS cases over the time period, most from the first year. Our practice now is to perform SILS in the majority of our cases.

In an attempt to maximize triangulation, our preference is to use individual ports in the same incision. We have tried all available SILS port systems and found that they all restrict movement much more than do individual ports. It is also nice to use one's normal ports and instruments. This technique also reduces fascial incision size. The incision we use is 1 cm at the base of the umbilical stalk. We don't incise fascia at all. We have used the same incision for thousands of general laparoscopic operations for over 20 years, and there is minimal risk of umbilical hernia. It needs to be 1 cm to allow nontraumatic insertion of the lap band. This is in contrast to the incision size needed for all available SILS ports.

The key with SILS is to become comfortable with crossed-hands operating and operating with hands almost in parallel. SILS is definitely more difficult than standard laparoscopy, and many surgeons will think it's not worth the extra time and trouble. That being said, when you have developed those skills, it's very satisfying to be able to offer a patient an operation with scars that are almost invisible at 3 months. Given that the only benefit of this technique seems to be cosmetic, we prefer to hide the incision in the umbilical crease, rather than place it in a more visible superior position. The addition of a tiny xiphoid incision for the Nathanson liver retractor barely diminishes this benefit, especially in men with body hair.

It must seem strange that a SILS operation can be quicker than a 4- or 5-port technique. We gradually accumulated our skill set, such that by the second year, we were able to perform these surgeries in a very timely manner. The lower time probably reflects having to place fewer ports and close fewer wounds. We have no explanation as to why the SILS group did better with weight loss. One possible, though very nebulous, idea is that they were more motivated and enthusiastic in their follow-up after they saw their good cosmetic outcome.

SILS is a step forward for patients if they are worried about their scars. The main benefit is that the total experience for the patient is better. This is especially so for women who don't have body hair to hide incisions. This is important after bariatric surgery and it removes the need to explain incisions until patients are comfortable discussing their surgery, enhancing their privacy and comfort zone. This cosmetic benefit is also very valuable for African-Americans who are more prone to keloid scarring.

Many patients comment favorably on the incision at follow-up, feeling that it has enhanced their overall experience. The joy of laparoscopic surgery is that we help people without hurting them too much. Now we can do it without leaving them easily visible incisions. Using what we have learned from SILS bands, we have extended our experience to include Roux-en-Y gastric bypass, sleeve gastrectomy, Heller myotomy, and Nissen fundoplication.

We have found the SILS band placement is a valid technique, with outcomes at least as good as those with standard LAGB. If time is taken to gradually accumulate the different skill sets required to operate this way, by starting in a staged fashion, and excluding patients with a very long torso, or males with a high BMI, there would seem to be a benefit to the patients, in an improved overall experience. Its difficulty, though, should not be underestimated.

Conclusion

Band surgery is gentle. The risks are very low and if the band is placed properly, and if hiatal hernias are fixed, the need for reoperation is small (Video 1).

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