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Modern Surgery: Technical Innovation

Staplerless Laparoscopic Gastric Bypass: a New Option in Bariatric Surgery

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The staplerless Roux-en-Y gastric bypass (RYGBP) is a new option in bariatric surgery. The first to describe it was Himpens (2004) utilizing the LigaSure Atlas™ (LSA) in a series of 10 patients. The laparoscopic RYGBP is performed utilizing the LSA for the gastric and jejunal partition; after that, an imbricating running suture is performed to ensure stomach and bowel hermetic closure. All anastomoses are hand-sewn. Technical disadvantages are: learning curve; complications related to suture failure; possible thermal/electricity related injuries; longer operating time. Advantages are: stapler-associated bleeding, leaks, staple-line disruption, and fistulas are avoided; cost reduction. The staplerless RYGBP is complex; the surgeon involved requires expertise and ability. This technique will evolve and will be used by more surgeons. It is a new option for the surgeon preoccupied with costs, which is particularly important in developing countries.

Key words: Staplerless, ligasure, laparoscopic gastric bypass, bariatric surgery, morbid obesity, cost-saving

Introduction

The staplerless laparoscopic Roux-en-Y gastric bypass (RYGBP) is a new technical option in bariatric surgery. The first surgeon to perform the RYGBP without the use of staplers was Dr. Jacques Himpens of Belgium who presented a video with bariatric procedures utilizing the LigaSure Atlas™ (Valleylab, Tyco, Boulder, CO, USA) to divide the stomach and the jejunum at the 2004 IFSO Congress in Japan.[1] This approach allows for a temporary seal of the lumen, which enabled him to perform a continuous suture of the divided organs safely without intraoperative leaks. The seal at the stomach obtained with the LigaSure Atlas™ (LSA) is not perfect but sufficient to avoid spillage of gastric juice and maintain a clean field.[2] The LSA also enables the sealing of the bowel while it is being divided. Himpens described in his abstract a series of 10 patients with the following laparoscopic procedures: duodenal switch (2 patients), sleeve gastrectomy (2 patients) and RYGBP (6 patients).[1,2] During the 2005 IFSO meeting in Maastricht, The Netherlands, the Brazilian surgeons Almino Ramos and colleagues,[3] presented a video demonstrating a staplerless laparoscopic RYGBP utilizing the LSA. They reported a mean operating time of 150 minutes without major complications in their series of 30 patients.

To perform the staplerless RYGBP safely, the surgeon should be skilled, and have extensive experience and a high-volume practice. The LigaSure™ is an electrothermal bipolar vessel sealer (EBVS), which was developed as an alternative to suture-ligatures, hemoclips, staplers, and ultrasonic coagula-

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tors to ligate vessels and tissue bundles. The EBVS seals vessels up to 7 mm in diameter by denaturing and fusing collagen and elastin within the vessel wall and the surrounding connective tissue.[4] It has an average thermal spread of approximately 2 mm, and also grasps and holds sealed tissue for easy transection. The LSA has a blade in its tip which enables the cutting of the coagulated tissues; this makes the procedure faster because the surgeon does not need to withdraw the LSA to use a scissors for dividing the structures. The LSA has been used in adhesiolysis, appendectomy, colectomy, Nissen fundoplication, adrenalectomy, gastrectomy, splenectomy, and nephrectomy.[5] The use of the LSA for the purpose of dividing and sealing organs such as the stomach and bowel is an innovation.

During the Brazilian Bariatric Society Meeting in Florianópolis, November 2005,[6] we discussed with Dr. Almino Ramos the importance of publishing the staplerless laparoscopic RYGBP technique and exposing this worldwide. Thus, we describe staplerless RYGBP performed by Dr. Ramos, which is shown Figures 1 to 14.

Description of Technique

The patient is positioned in the supine position, and 5 trocars are used. The 10-mm LSA must be regulated for an intermediate power to obtain a sealing capacity; this is the number 2 of the Ligasure generator power-scale which varies from 1 to 5. The gastric pouch construction is initiated with an opening 5 cm from the gastro-esophageal junction. Then the initial horizontal gastric partition is performed with a 12-mm diameter bougie placed in the stomach to serve as a mould, following which the vertical partition is executed with the LSA tip towards the angle of His. The constructed cylindrical gastric pouch has a capacity of ~20 cc. The LSA causes temporary closure of the stomach on both sides, avoiding spillage of gastric contents into the abdominal cavity, and an extramucosal Ethibond® 2-0 running, imbricating suture is used to make sure that the gastric pouch and the bypassed stomach are hermetically closed.

The greater omentum is divided with the LSA to facilitate the pulling of the jejunum towards the gastric pouch to perform the ante-colic, ante-gastric gastrojejunostomy. The biliopancreatic limb is measured from the ligament of Treitz to a point at 60-80 cm. Then the intestinal limb is guided to the supramesocolic area towards the gastric pouch (as a "Billroth II" isoperistaltic limb) without dividing the jejunum.

The hand-sewn gastrojejunostomy is done with an extra-mucosal Ethibond® 2-0 running suture, and the anastomosis is calibrated to 11-12 mm.

The alimentary limb (left side of the gastric pouch) is mobilized to 150 cm, and a side-to-side enteroanastomosis with an extramucosal Ethibond® 2-0 running suture is performed. At the end, the "Billroth II"-like loop is converted to a Roux-en-Y gastric bypass by just dividing the jejunum with the LSA, and the jejunal stump is sutured bilaterally. The mesenteric rent is closed with a running suture of 2-0 Ethibond®, and the alimentary limb is fixed to the bypassed stomach, avoiding angulation of the gastrojejunostomy. Finally, a methylene blue leak-test is done.

Discussion

Dr. Ramos began to perform the staplerless RYGBP in August 2004. Since that time, he has operated on 82 patients. In his first series of 30 patients, the mean operating time was 150 minutes; the minimum time was 100 minutes and the maximum operating time was 240 minutes. BMI varied from 38 to 42 kg/m^2, and all patients met the 1991 NIH guidelines for bariatric surgery.[7] There were no major complications such as fistulas, leaks, sepsis, bowel obstruction, strictures or bleeding. All operations were performed by the same surgeon (ACR). There was a rate of 30% LSA failure in sealing the stomach, which caused technical difficulty making the operative time longer, because suturing had to be done before the total gastric division in those cases. There was no sealing failure during the bowel division with the LSA. The patients had an average 36-hour hospital stay. Weight loss has been similar to the stapled RYGBP.

We must compare the advantages and disadvantages of the staplerless technique. The disadvantages are: 1) This technique leads to a new learning curve; however, the staplers are well known and commonly used by bariatric surgeons; 2) How to justify complications related to suture failure without using the staplers; 3) The LSA can cause ther-

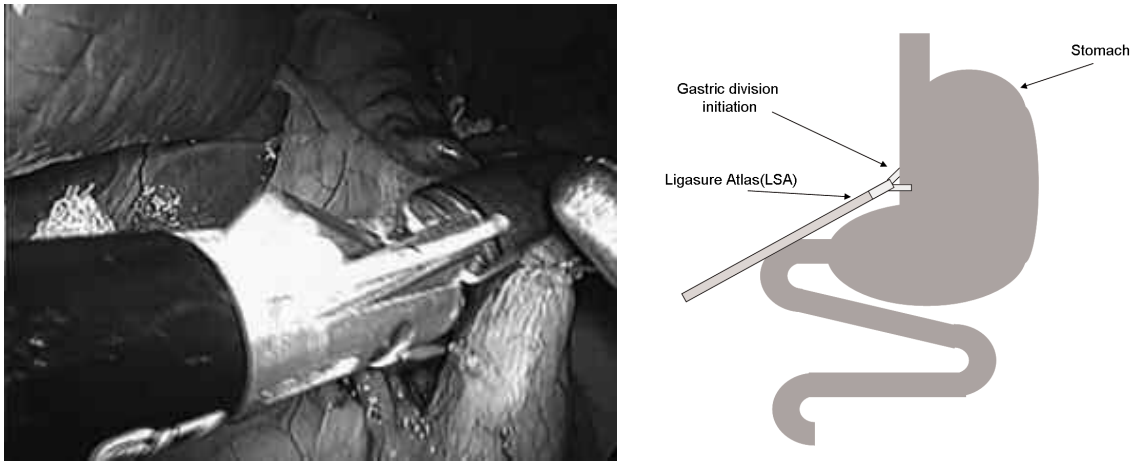


Figure 1. Initiation of gastric pouch construction with the LigaSure Atlas™ (LSA).

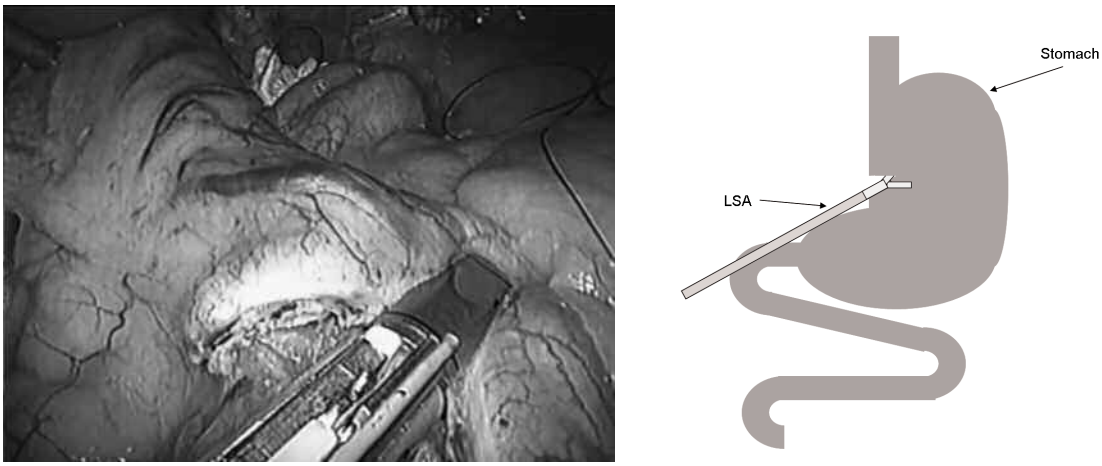


Figure 2. The ALS sealing and dividing the stomach.

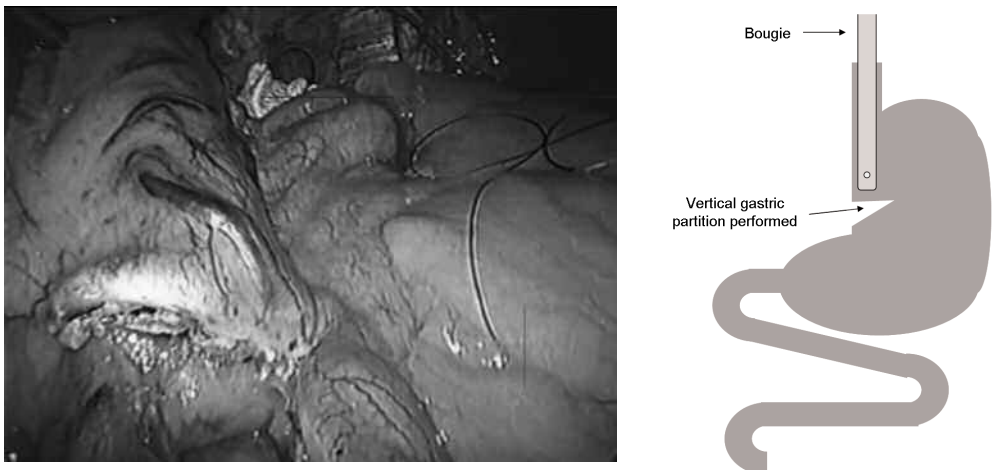


Figure 3. The horizontal gastric partition completed.

Figure 4. The vertical gastric partition being initiated.

Figure 5. Completion of the gastric partition.

Figure 6. Running imbricating suture of the gastric pouch.

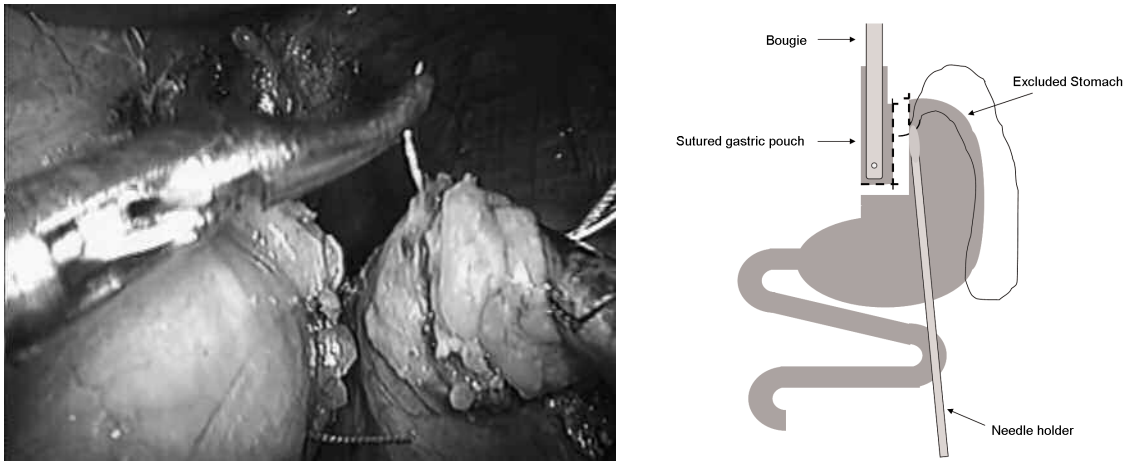


Figure 7. The bypassed stomach is also sutured.

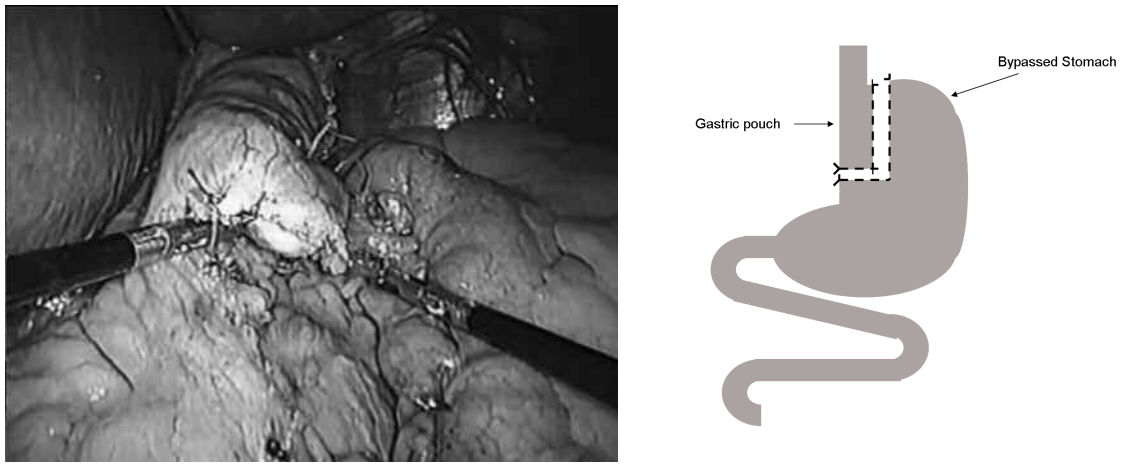


Figure 8. The neo-stomach and the bypassed stomach already sutured.

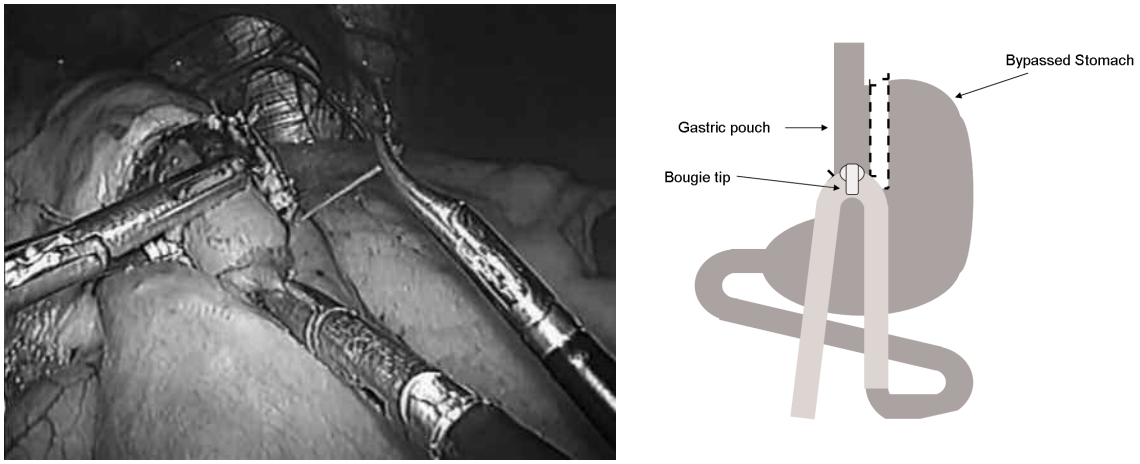


Figure 9. The hand-sewn ante-colic ante-gastric gastrojejunostomy.

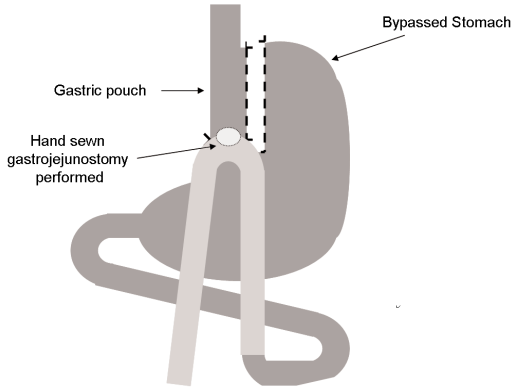
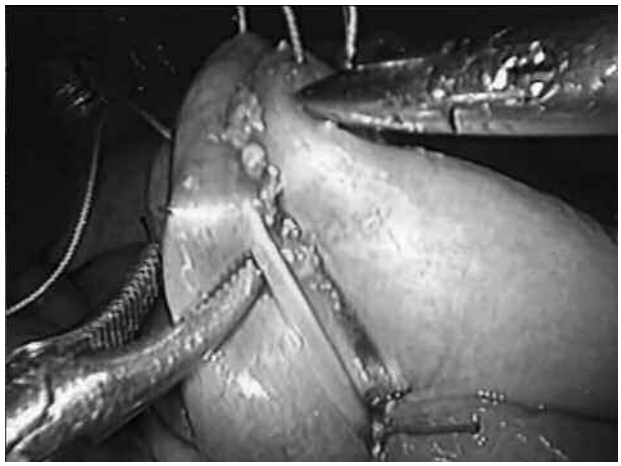


Figure 10. Gastrojejunostomy completion.



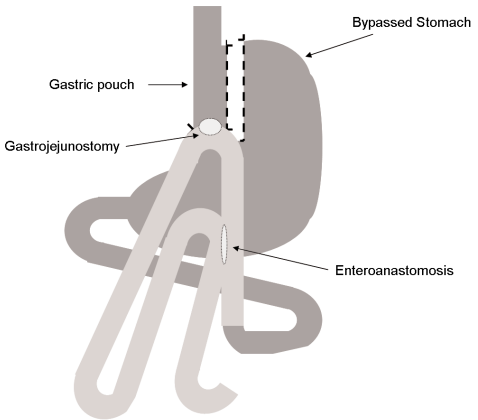
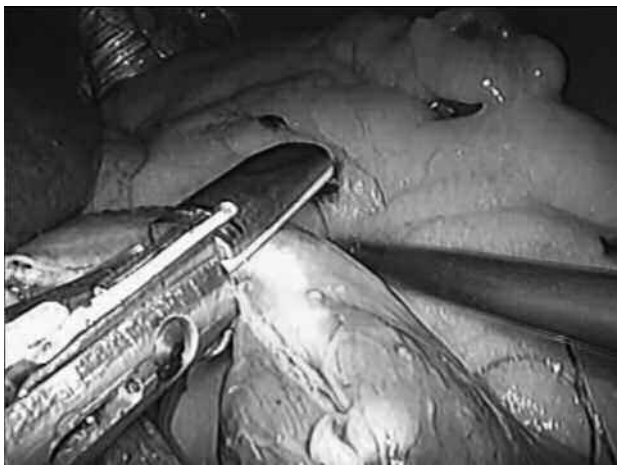


Figure 11. The hand-sewn enteroanastomosis is performed.



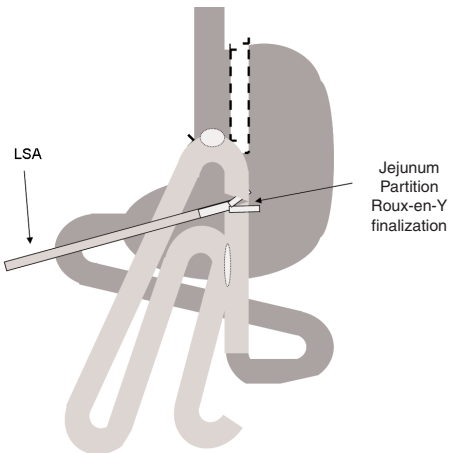


Figure 12. The jejunum is divided with the LSA to complete the Roux-en-Y.

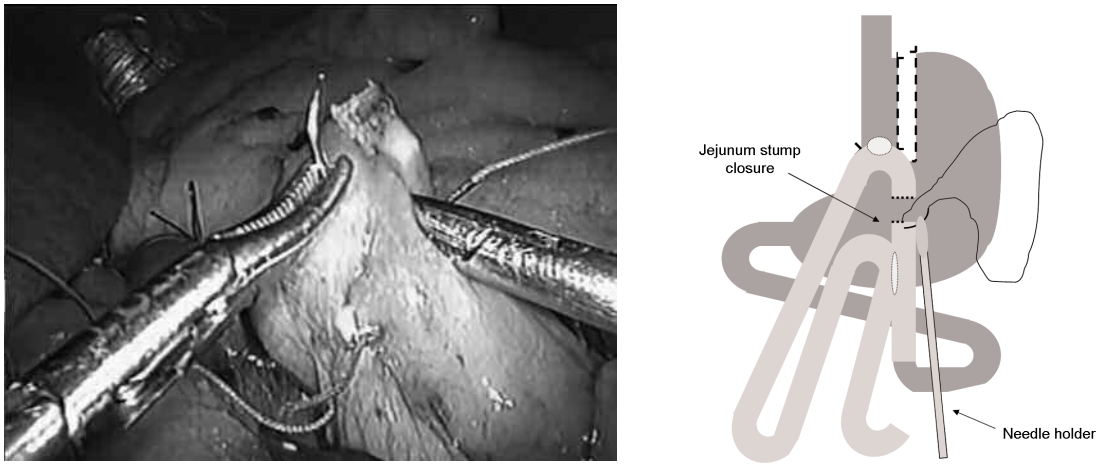


Figure 13. Closure of the jejunal stump.

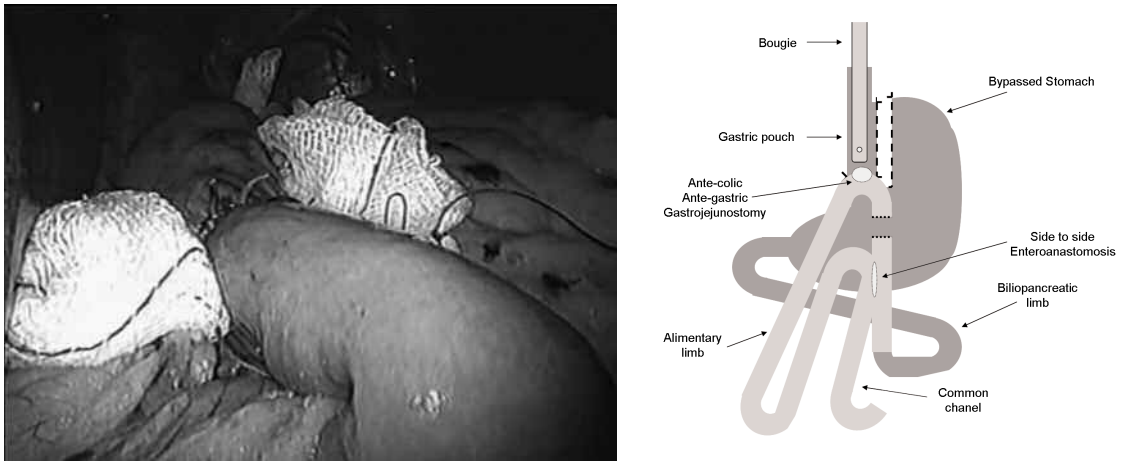


Figure 14. Gastrojejunostomy testing with methylene blue.

mal and electrical-related injuries; 4) Is the initial longer operating time of the staplerless operation acceptable and could it reach the RYGBP times? The advantages are: 1) Staplers are associated with bleeding,[8,9] leaks,[9] staple-line disruption and fistulas,[10] which are avoided; 2) One great advantage of this surgical alternative is cost reduction for the procedure.[2] In developing countries like Brazil, this is even greater because the material is imported, the Brazilian currency has an inferior value compared to the American dollar, and the importation taxes are very high. The final cost for the stapler for the laparoscopic RYGBP in Salvador, Brazil is R$ 3,220 (Brazilian Reals) = US$ 1,340 (US dollars). A laparoscopic cartridge costs R$ 1,260 = US$ 525. The total cost per operation using one stapler plus 7 cartridges is R$ 12,040 = US$ 5,016. The LSA costs 4,200 = US$ 1,750 per operation. If the LSA is utilized instead of the stapler and cartridges, a saving of R$ 7,840 = US$ 3,266 is achieved. This significantly decreases the cost for this operation.

A similar cost-cutting measure can be done if the open RYGBP is performed with the LSA. In the US, it is estimated that 200,000 bariatric operations are performed each year; moreover, this number is increasing and staplers are used worldwide. Angus et al[11] in 2003 reported a total cost of US$ 6,350 ± 75 for the laparoscopic RYGBP in the US.[11] Lowering this expenditure would benefit more patients.

The Hospital São Rafael & Cidade bariatric surgery team routinely performs the laparoscopic RYGBP with staples, and the incidence of complications with this technique is low. The surgeon, when beginning the learning curve of the staplerless RYGBP, should select patients for operation without an android body habitus, without an enlarged liver and avoid patients with super-obesity. The laparoscopic RYGBP is evolving continuously in terms of technique and limits.[3] It is likely that more surgeons will use the staplerless technique with the improvement in the LigaSure Atlas™. The ideal is equipment that seals, cuts and sutures or "overseals" at the same time, and the medical manufacturing industry will likely develop it. Large series of staplerless RYGBP and stapled RYGBP should be compared in prospective randomized controlled trials to evaluate complication rate and operative time.

Conclusion

Staplerless laparoscopic RYGBP is a complex operation. The surgeon with considerable expertise can perform this technique safely. This method represents a cost-saving, which is particularly important in developing countries.

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