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Clip Closure and Division Instead of Stapling for the Last Small Gastric Bridge Between Gastric Pouch and Remnant Stomach in Laparoscopic Roux-en-Y Gastric Bypass

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Ethical committee approval

Ethical committee approval was obtained from our hospital (ID 2016/5-6, Inonu University)

Research Registry

This study was registered to Research Registry (researchregistry 891).

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Abstract

Introduction: Here, a modification during gastric pouch forming was implemented in laparoscopic Roux-en-Y gastric bypass (LRYGB). We aimed to examine the feasibility of metallic clip closure for the remaining small stomach bridges (<1cm) between the pouch and the remnant stomach.

Methods: During pouch creation, after the last stapler firing, the remaining small bridge was closed with clips and divided instead of using a new stapler. Metallic clips for this aim were used in 41 of 520 LRYGB between September 2010 and January 2017. Preoperative mean body mass index (BMI) was 47.3 ± 5.3 kg/m² (male/female: 6/35, mean age 37.8 ± 9.1 years).

Results: Gastric bridges in 41 patients were successfully closed with metallic clips and divided. In one patient, intraoperative methylene blue test was positive from the anastomosis (not from the clipped place) and repaired by intracorporeal sutures. Abdominal drain was used selectively (32%). No postoperative leakage or other complications were seen. Mean length of hospital stay was 3.8 ± 1.1 days. Mean BMI was 30.3 ± 6.1 kg/m² after mean 17.6 ± 11.3 months follow-up.

Conclusion: In LRYGB metallic clip closure for a stomach bridge (<1cm) between the pouch and the remnant stomach is an easy, safe and reliable method.

Introduction

Laparoscopic Roux-en-Y gastric bypass (LRYGB) is a popular procedure for morbid obesity. In LRYGB, linear staplers are commonly used when creating gastric pouch. Generally, a small gastric pouch is formed using one transverse and two or three vertical staplers (1). Sometimes a small gastric bridge are left after the second or the third vertical stapling and all the surgeons use a new stapler to divide this small remnant bridge. In this study, we examined a modification of this routine procedure. If the remnant gastric bridge was less than 1 cm in width, we wanted to use endoscopic clips instead of staplers for closing and dividing the bridge. Our aim was to investigate the feasibility and safety of the technique. Ethical committee approval was obtained from our hospital and this study was registered to Research Registry.

Material and Methods

Between September 2010 and January 2017, a total of 520 morbidly obese patients underwent LRYGB according to indications of National Institutes of Health consensus criteria (2). LRYGB was performed as described previously in detail (1). When forming the gastric pouch, the first stapler (60 mm, blue cartridge, Endo GIATM Ultra, Covidien) was used in a transverse plane from the lesser curvature of the stomach. Then, two or three 60 mm endoscopic linear staplers (both blue cartridge) were used vertically toward to angle of His. If the last stapler was not able to complete the transaction, in cases of large bridges (10 mm <), another stapler closure was established but if the bridge was less than 10 mm in width, it was closed with metallic clips (Figure 1-3). At least two medium-large (9 mm) or large sized (11 mm) metallic clips were placed both on the remnant stomach and the gastric pouch, and the gastric bridge was divided with endoscissors. We used reusable endoscopic clip applicators. Other parts of the operation were the same in routine practice. Gastroenterostomy anastomosis was done by a linear stapler (blue cartridge) and we closed the common stapler orifices after the anastomosis by hand-sewn sutures. We did not use buttressing material to support the stapler lines. Gastric pouch and gastroenterostomy anastomosis was checked by giving methylene blue in each case. We used drains in LRYGB selectively. If the surgical area was not completely clean despite meticulous hemostasis due to negligible amount of subtle oozing, then we placed a drain around the gastric pouch. This indication was valid in this study as well and clipping a gastric bridge did not require an abdominal drain.

Age, gender, BMI, co-morbidities, intraoperative amount of blood loss, operating time, intraoperative and postoperative complications, length of hospital stay, and bariatric outcomes were analyzed. For statistical analysis, descriptive methods were used.

Results

This was a retrospective analysis of a prospective cohort database. There were total 41 patients (male/female: 6/35) with a mean age of 37.8 ± 9.1 (range 21-56 years). Preoperative mean body weight and BMI were 122.5 ± 16.5 kg (range 100 -162) and 47.3 ± 5.3 kg/m² (range 38.7-58.9), respectively. Eighteen of the patients had at least one obesity-associated co-morbidities (type II diabetes n: 12, hypertension n: 9, sleep apnea n: 3, chronic obstructive pulmonary disease n: 3). Average blood loss and operative time were: 25.8 ± 20.6 ml (range 0-100) and 136 ± 36 minutes (range 75-240), respectively. Only in one patient, a leak was identified by intraoperative methylene blue test. This leak was from the stapler line on the anastomosis, not from the clip closed bridge. That anastomotic leak was repaired by 3/0 prolene suture intracorporeally. Abdominal drains placed only in thirteen patients (31.7%). Postoperative leakage or another complication were not observed and patients were discharged in an average of 3.8 ± 1.1 days (range 2-6). Patients were followed for a mean of 17.6 ± 11.3 months (range 3-37). The average weight and BMI were 78.2 ± 13.9 kg (range 48-116) and 30.3 ± 6.1 kg/m² (range 19.9-43.7), respectively. Excess of BMI loss ratio (EBMIL%) was $65.3 \pm 20.6\%$.

Discussion

The cost of LRYGB was 37% more than open surgery depending on operation time and the stapler used (3). In order to minimize the operating cost, especially in developing countries, different technical pursuits can be emerged. One of the methods was performing gastrojejunostomy anastomosis by hand-sewn suturing instead of stapling. However, requirement of advanced laparoscopic experience and prolonged time of the operation were the factors limiting this technique. Here we described an easy alternative technique to the laparoscopic stapler use. We suggested that small gastric bridges under 1 cm in width could be safely closed with metallic clips. Surgical clips are usually used for the closure of tubular structures that not containing food (closure of cystic duct, tubal sterilization, vascularities). There was no data in the literature according to the using the clips for closure of the gastrointestinal structures such as esophagus, stomach, small intestine or colon during surgery. Today, using clips for closure for a food passing gastrointestinal tract was only

accepted for the appendiceal stump (4-6). Unlike the appendix stump closure, closure of the stomach with the clips may carry an increased risk for leakage due to the intraluminal pressure of the stomach. Intra gastric pressure in healthy individuals is at the average of 34 mmHg (21-45 mmHg) (7). These values could be as much as 43 mmHg (32-58 mmHg) in sleeve gastrectomy patients (7). Intra gastric pressure can reach the highest level during vomiting and the highest intra gastric pressure measured was 290 mmHg (8). An experimental study showed that in RYGB, intra gastric pressure did not cause problems until 150 mmHg for gastrojejunostomy anastomosis and gastric pouch integrity (9). However, some previous in-vitro studies clearly demonstrated that clip applications to the stomach can provide safe closures. Clips can withstand up to 300 mmHg intraluminal pressure (10). In normal circumstances, we could not find the intra gastric pressure measurements in the literature after LRYGB. We can conclude that intra gastric pressure after RYGBP should be lower than unoperated stomach due the absence of pyloric ring. Therefore, we believed that clips placed to the stomach provided a secure closure and we did not encounter any problems after these applications.

Lack of a control group (stapled vs. clipped) and the cost analysis of the both groups were the main limitation of this trial. Demonstrating the safety and reliability of this technique can enable the comparative studies in future. Although we practice with this modification, we have to say that using this technique requires substantial amount of experience with LRYGB and with advanced laparoscopic surgery.

As a result; operating costs in laparoscopic surgery is an important issue. Although the main issue of this study was not the cost analysis, it was clear that four clips were cheaper than a laparoscopic stapler cartilage. We did not do a cost analysis and we only evaluated the feasibility of the clip closure technique. For the first time, we demonstrated that laparoscopic clips can be used for closure of a food passing gastrointestinal tract and in LRYGB surgery, while preparing gastric pouch. The closure of the gastric bridge (<10 mm) with metallic clips was an easy, safe and reliable method.

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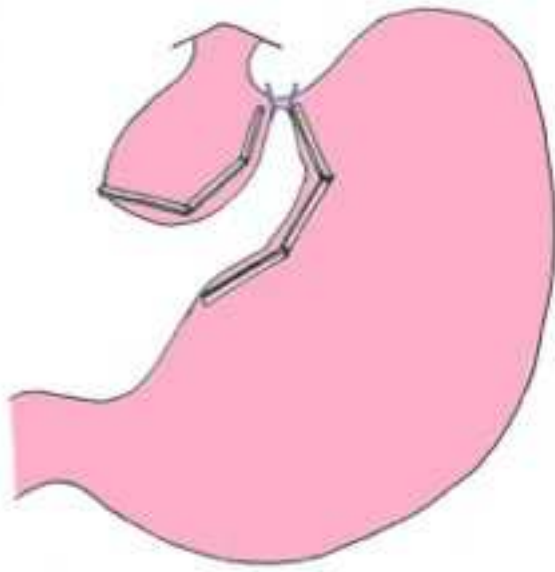
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Figure legends

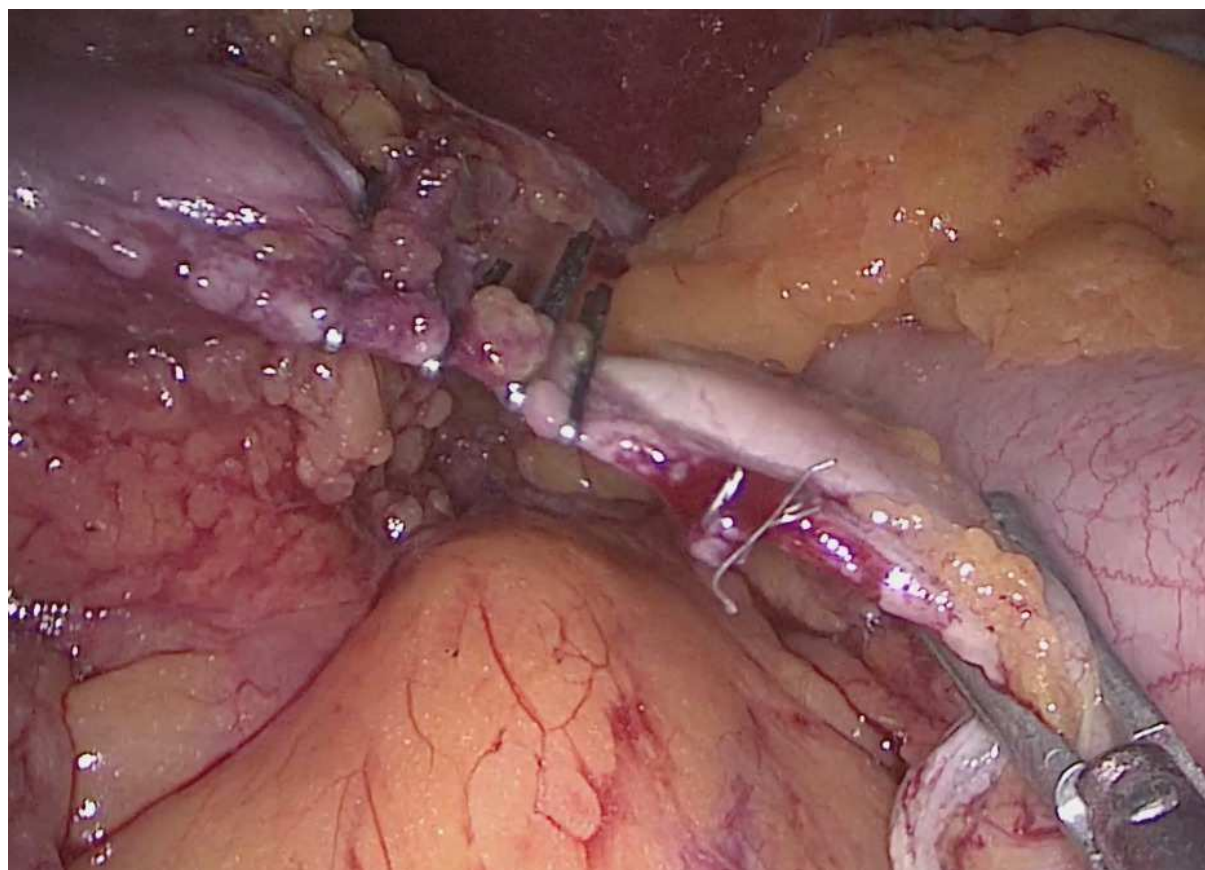
Figure 1. Schematic view of the technique.

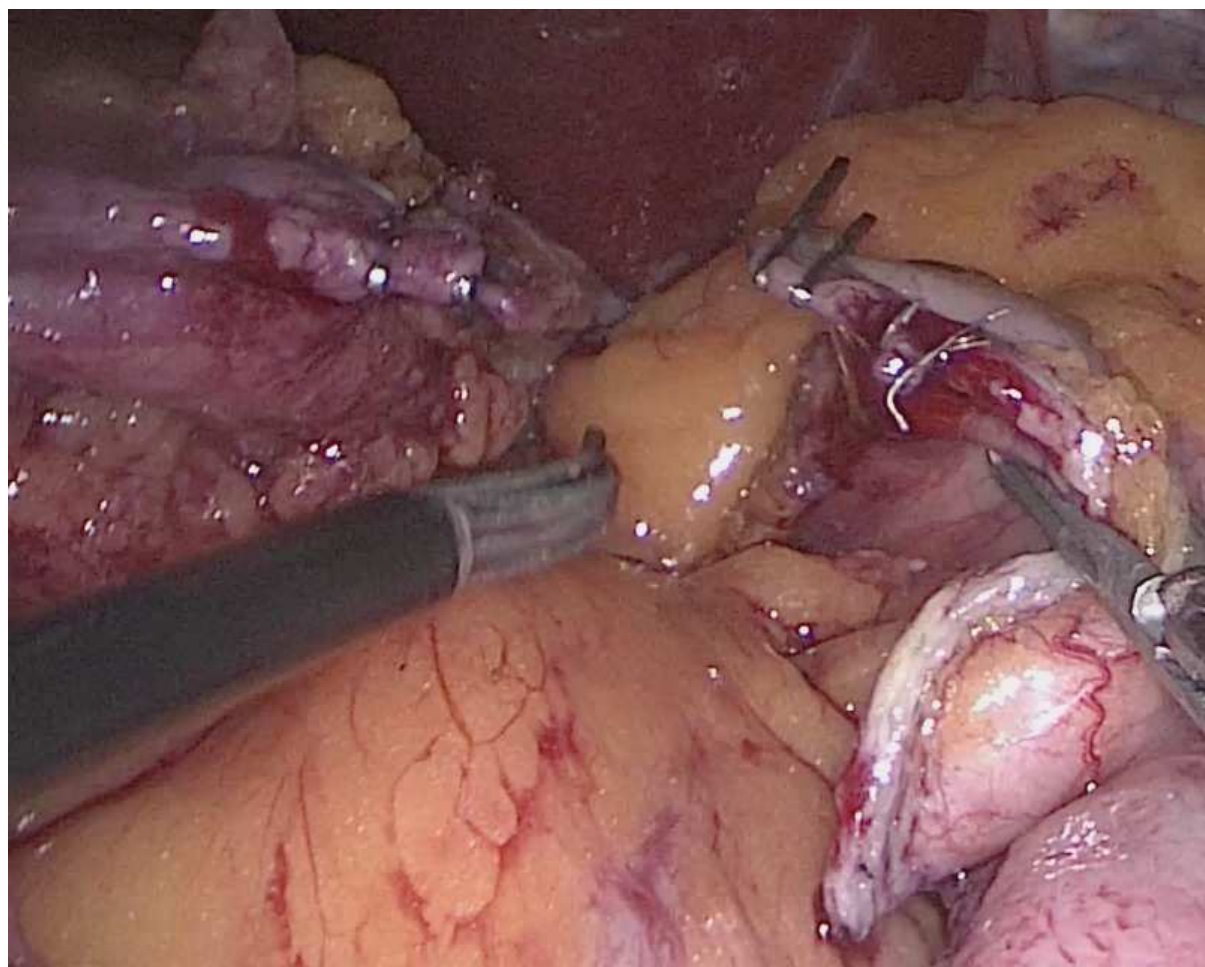
Figure 2. The gastric pouch bridge that was closed with metallic clips.

Figure 3. Divided gastric pouch bridge.



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Highlights

- . Operating costs in laparoscopic surgery is an important issue.
- . Laparoscopic metallic clips can be used for closure of a food passing gastrointestinal tract.
- . In LRYGB surgery, while preparing gastric pouch, the closure of the gastric bridge (<10 mm) with metallic clips was an easy, safe and reliable method.

International Journal of Surgery Author Disclosure Form

The following additional information is required for submission. Please note that failure to respond to these questions/statements will mean your submission will be returned. If you have nothing to declare in any of these categories then this should be stated.

Please state any conflicts of interest

All authors in this study declare that they have no conflict of interest.

Please state any sources of funding for your research

This study was not funded

Please state whether Ethical Approval was given, by whom and the relevant Judgement's reference number

Ethical committee approval was obtained from Inonu University(ID 2016/5-6, Inonu University)

Research Registration Unique Identifying Number (UIN)

Please enter the name of the registry and the unique identifying number of the study. You can register your research at <http://www.researchregistry.com> to obtain your UIN if you have not already registered your study. This is mandatory for human studies only.

This study was registered to Research Registry (researchregistry 891)

Author contribution

Please specify the contribution of each author to the paper, e.g. study design, data collections, data analysis, writing. Others, who have contributed in other ways should be listed as contributors.

Adem Yuksel: Study design, data collections, data analysis, writing.

Fatih Sumer : Data collections, data analysis

Cuneyt Kayaalp: Study design, data analysis, writing

Guarantor

The Guarantor is the one or more people who accept full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

Adem Yuksel is the guarantor.