

Novel Technique to Reinforce the Weak Point of a Side-to-side Anastomosis

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Abstract

In gastrointestinal surgery, the quality of the anastomosis is one of the most important factors influencing the nature of the postoperative course. Anastomotic leak may require reoperation and in severe cases can be life threatening. Changing device technology has increased the variety of anastomotic techniques, and the increase in laparoscopic surgery has increased the frequency of the side-to-side anastomosis. We use this anastomosis in a wide variety of situations, but the fact remains that the crotch of this anastomosis is a weak point. We devised a simple and easy method to reinforce this weak point with a synthetic material.

Keywords: Side-to-side anastomosis; Reinforce; Neoveil[®]; Stapler; Surgical technique.

Introduction

A typical method for anastomosis using a linear stapler is the side-to-side anastomosis [1]. There are numerous scenarios in which this technique can be used:

- Overlap method of the esophagus and jejunum after total gastrectomy
- Side-to-side of small intestinal anastomosis
- Gastro-jejunostomy after gastrectomy or bypass surgery

- Functional end-to-end anastomosis after small or large intestine resection

These methods are increasing in frequency with the increasing use of laparoscopy.

Even in open surgery, though, a mechanical side-to-side anastomosis is easy, quick and cost-effective as it requires only a single stapling device [1]. On the other hand, an end-to-side reconstruction requires both linear and circular staplers to complete the anastomosis, incurring additional cost.

However, side-to-side anastomoses are weak in the crotch area. As stapling devices have been improved to three staple lines from two lines, and the strength of the side of the anastomosis has increased, the weakness of the crotch has become more clinically important [1]. We perform reinforcement of the crotch as much as possible, but this can be difficult laparoscopically as intracorporeal suturing is difficult in this modality. It would be ideal if reinforcement could somehow be incorporated into the stapling device itself [2]. Here we describe our novel technique to reinforce the weak point of the side-to-side anastomosis [3].

Technique

We can use this method for every side-to-side anastomosis. Here, we describe a side-to-side anastomosis of the large intestine. First, we cut a Neoveil[®] tube to a 2 cm length, and attach it to a cartridge fork and anvil fork. We position the tube so that the tip of the tube comes too approximately within 3 mm of the cut line. Neoveil[®] varies

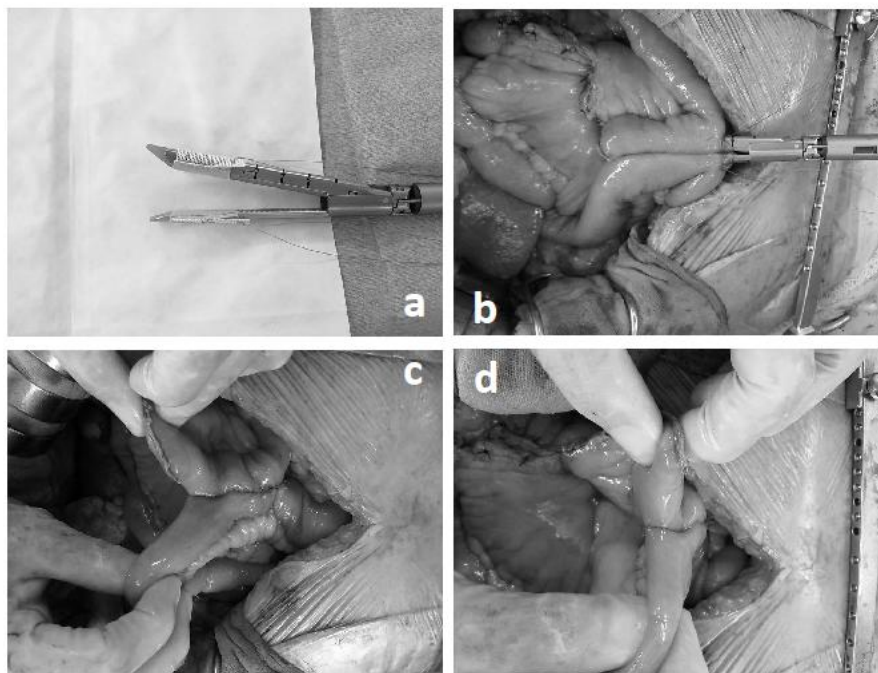
in size and we choose a tube size that adheres snugly to the stapler device so there is not the case that the tube easily slips off.

The stapling device with Neoveil[®] was inserted from the enterotomy on the intestinal stump and fired on the anti-mesenteric side. Unnecessary knots were removed by pulling a thread. We checked the lumen for patency and the cut surface for bleeding. If there was bleeding, we inverted the staple line. The hole was closed with a stapler and a part of the overlapped stapler was reinforced. In the crotch Neoveil[®] is slightly transparent. This method (Figure 1) can be adapted to all side-to-side anastomoses (Figure 2).

Discussion

The main reason for the weakness of the crotch is mechanical. As shown in the Figure 1, staples are exposed in the crotch area. In addition, staples themselves damage the intestinal tract wall in the crotch area when force is applied in the direction of the intestinal tract. The side of the anastomosis is not as vulnerable.

Figure 1



- (a) Neoveil[®] cut into short piece to length of 2cm is attached to stapler
- (b) Intraoperative image of side-to-side anastomosis creation
- (c) Intraoperative image after the closure of the entry point utilized to insert the stapler
- (d) Intraoperative image of the crotch of side-to-side anastomosis

Suture strength has clearly increased with the evolution of the stapler, but the crotch remains a weak area. In a prior experiment, we performed a side-to-side anastomosis with the gastrointestinal tract of a pig. We demonstrated the differences between the side and the crotch areas (gastrojejunostomy, esophagujejunostomy, small and large intestinal anastomoses). We performed side-to-side anastomoses using the Endo GIATM60-3.5 with three staple lines on one side, and measured burst pressures of the side and crotch. The burst pressures were 109.9 mmHg on the side and 39.8 mmHg on the crotch. This brought our attention to the importance of crotch reinforcement [3].

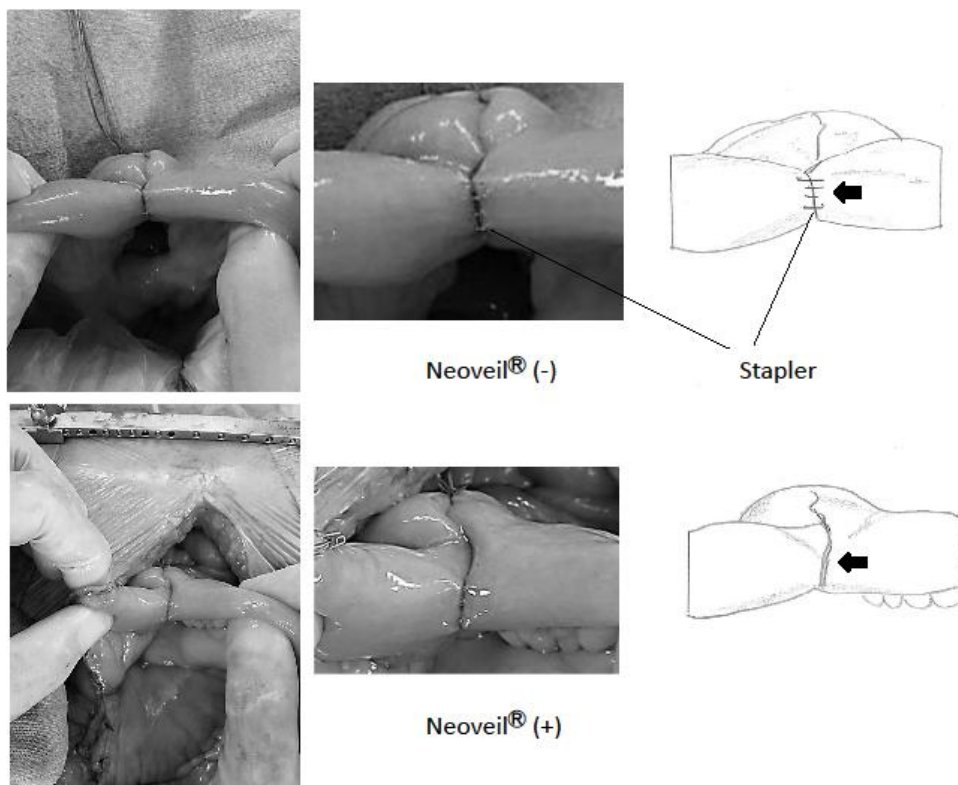
Various reinforcing materials have been reported upon. Examples of clinically available buttress reinforcement materials are bovine pericardium (Peri-strips), expanded-poly-tetrafluoroethylene carbonate (TMC), copolymer (Gore Seamguard), and small intestinal submucosa (Surgisis) [4-6]. These products have demonstrated some success in reducing leak rates and bleeding complications associated with staple lines. Application of reinforcement material in the staple line is

thought to moderate tension of the staple line because it acts as a neutralization plate. Further, the buttressing materials seal off the staple holes and narrow the spaces in between each staple. Thus, leak, bleeding, and tearing at the staple line can be reduced, especially in diseased and fragile tissue. Neoveil[®] is readily available commercially and proven to be safe. The Neoveil[®] sheet in itself is thin and soft, but retains its shape when applied to a stapler. When we use Neoveil[®] for the full length of the anastomosis, closure of the enterotomy becomes difficult.

It is sufficient to reinforce only the crotch area. Thus, we cut Neoveil[®] to a 1.5 cm length and put it on the tip of the stapling device in the experiment. With this reinforcement, the burst pressure increased from 39.8 to 83.3 mmHg.

We use this method for gastrojejunostomy, and for small and large intestinal anastomosis. In all cases, we did not reinforce the crotch and there were no anastomotic problems. The same method can be used in both open and laparoscopic surgery.

Figure 2:



The crotch of side-to-side anastomosis

- (a) Crotch of the side-to-side anastomosis with Endo GIA60AMT: The staplers of the tip are exposed
- (b) Crotch of the side-to-side anastomosis with Endo GIA60AMT reinforced with Neoveil[®]: The exposure of staples is not seen

References

1. Goto T, Kawasaki K, Fujino Y, et al. Evaluation of the mechanical strength and patency of functional end-to-end anastomoses. *Surg Endosc* 2007; 21: 1508-11.
2. Saito Y, Omiya H, Shomura Y, et al. A new bioabsorbable sleeve for staple-line reinforcement: report of a clinical experience. *Surg Today* 2002; 32: 297-9.
3. Kimura M, Terashita Y. Use of bioabsorbable staple reinforcement material in side-to-side anastomoses: Suture line reinforcement of the weak point of the anastomosis. *Ann Med Surg* 2016; 23:50-5.
4. Kawasaki K, Fujino Y, Kanemitsu K, et al. Experimental evaluation of the mechanical strength of stapling techniques. *Surg Endo* 2007; 21: 1796-99.
5. Miller KA, Pump A. Use of bioabsorbable staple reinforcement material in gastric bypass: a prospective randomized clinical trial. *Surg Obes Relat Dis* 2007; 3: 417-22.
6. Basu NN, Leschinsky D, Heath DL. The use of Seamguard[®] to buttress the suture repair of a staple line leak following laparoscopic gastric bypass for obesity. *Obes Surg* 2008; 18: 896-7.

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