Early Gastric Outlet Obstruction Caused by the Free End of Barbed Sutures Following Laparoscopic Gastric Resection with Roux-en-Y Reconstruction

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Patient: Male, 77-year-old
Final Diagnosis: Mechanical small bowel obstruction
Symptoms: Fatigue • vomit
Clinical Procedure: —
Specialty: Surgery

Objective: Unusual clinical course
Background: Recent developments in surgical suture material include the use of sutures with unidirectional barbs that facilitate laparoscopic suturing thanks to self-anchoring and tension-keeping properties. Complications deriving from the use of barbed sutures have been previously reported. In this report we present the case of a patient with gastric outlet obstruction by the free end of a V-Loc™ barbed suture (Medtronic, Dublin, Ireland) following Roux-en-Y gastric resection.

Case Report: In February 2023, a 77-year-old man who underwent laparoscopic subtotal gastrectomy for cancer followed by Roux-en-Y reconstruction developed symptoms of gastric outlet obstruction a few days after discharge. The patient was readmitted to the hospital due to vomiting 4 days after being discharged after an uneventful postoperative course. Imaging confirmed the presence of an occlusion at the level of the jejunojejunal anastomosis, with a noticeable change in caliber. During laparoscopy, a loop of bowel was entrapped around the tail of the barbed suture used to close the common enterotomy of jejunojejunal anastomosis. Following laparoscopic division of the anchoring suture, the bowel regained its normal caliber.

Conclusions: Although complications from the use of unidirectional barbed surgical sutures are rare, this report highlights bowel obstruction as a recognized postoperative complication. The preferred treatment is laparoscopic division of the suture’s tail. To prevent complications related to barbed sutures, it is essential to ensure that all barbs of the suture are properly unfolded.

Keywords: Gastrectomy • ileus • Laparoscopy • Suture Techniques

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Background

In laparoscopic surgery, intracorporeal suturing is one of the most important and difficult techniques, and mastering laparoscopic intra- or extracorporeal knotting can be achieved only with practice and patience [1]. It is essential in advanced laparoscopy and is a rate-limiting step in many procedures. After the barbed sutures were demonstrated to be safe and efficient and a faster means of suturing, their use has been adopted by multiple surgical specialties involving laparoscopic stitching [2,3].

However, use of barbed sutures has been reported to be associated with complications such as small bowel obstruction (SBO), volvulus, ischemia, and perforation, mainly related to the exposed barbs at the suture’s tail [4]. Among those complications, SBO is gaining recognition as a complication related to barbed sutures, with some documented cases and median time of presentation of 8.5 days [4].

Barbed sutures are now widely used in upper gastrointestinal (UGI) surgery, and complications following their use have been reported for these procedures [5-8]. Here, we present such a complication: SBO with gastric outlet syndrome caused by the free end of a V-Loc™ barbed suture (Medtronic, Dublin, Ireland) following Roux-en-Y gastric resection for cancer.

Case Report

In February 2023 a 77-year-old man underwent laparoscopic subtotal gastrectomy with D2 lymph nodes dissection for cT2N0 cancer of the gastric antrum, followed by Roux-en-Y reconstruction. The common enterotomies following the gastro-enteric and the entero-enteric stapled anastomoses were sutured using V-Loc™ barbed sutures. Intraoperative methylene-blue tests were negative for leaks and confirmed a good outflow from both anastomoses. The postoperative course was uneventful; following the negative hydro-soluble routine swallow test on postoperative day 2, the patient was discharged on a soft diet 5 days after the operation (Figure 1).

The patient was readmitted 4 days after hospital discharge for multiple episodes of post-prandial biliary vomiting, nausea, and fatigue. A nasogastric tube was inserted and 700 cc of biliary content aspirated. A computed tomography (CT) scan with soluble oral contrast revealed moderate distension of the gastric cuff and alimentary jejunal limb, with an evident change of caliber of the bowel at the level of the jejunojejunal anastomosis, and no evidence of anastomotic leakage or stenosis (Figure 2). A working diagnosis of SBO due to an internal strangulated hernia or volvulus was made, and an exploratory laparoscopy was undertaken.

Abdominal exploration revealed that the jejunum, a couple of centimeters from the anastomosis, was pinned and anchored by the barb of the tail of the suture used to complete the jejunojejunal anastomosis, creating a strangling girdle. There was no bowel necrosis or ischemia; the suture was divided and trimmed off the intestinal surface, and the intestine rapidly regained its normal caliber (Figure 3A, 3B).

The postoperative course was uneventful, and the patient was sent home on a soft diet after 2 days.
Discussion

In all reported cases, and certainly in this one, the tail of the suture was left long and unburied. The recommended length of 2 cm maximum, suggested by the manufacturers, is probably not universally known or maybe the suture is left long in purpose due to the perceived feeling of insecurity caused by the absence of the final knot to secure the suture [9]. Clearly, to minimize the risk posed by the barbs of the suture, the message from the producers of barbed sutures should be reinforced; they suggest trimming the suture close to the exit from the approximated tissue or, in case of an anastomosis, to unfold the end of it by taking 1-2 bites back along the suture line.

From the time Kitano reported the first minimally invasive gastrectomy in 1994, laparoscopic gastric resections have gained widespread acceptance in specialized centers [10,11]. Indeed, as many other advanced laparoscopic procedures, it requires mastering technically demanding surgical steps, including suturing and knotting.

In 1967 McKenzie reported the first use of barbed sutures, as opposed to smooth sutures, for the repair of long-flexor tendons, in vivo in dogs and in vitro in human cadavers [12]. The first use of a barbed suture for tissue reapproximating in a laparoscopic myomectomy was reported in 2008 by Greenberg and Einarsson, and hundreds of thousands of operations employ this technology [2,13,14].

Suturing and tying surgical knots in laparoscopy quickly and properly presents a novel challenge, and use of knotless barbed sutures can help in reapproximating tissues securely with less time, stress, and aggravation.

More specifically for gastrointestinal anastomosis, the non-inferiority of barbed sutures compared to conventional smooth sutures is well-established in the literature and some studies even reported a reduction in rates of bleeding and leaking [15,16], which is clearly very important because cutting barbs into sutures may reduce the suture’s tensile strength by weakening its core and narrowing its functional diameter. Although there is a growing body of evidence regarding the safety and effectiveness of the use of barbed sutures for knotless tissue control, it is still important to report the potential specific complications of barbed sutures to improve and correct the technique when using these sutures [2,17-19].

In the case herein reported, the tail of the suture was left unfolded, and the barbs pinned the jejunum, causing a strangling girdle, resulting in SBO. Twenty-five cases of SBO secondary to barbed sutures have been reported, mostly following laparoscopic hernia repairs or gynecologic procedures. Only 3 cases occurred after a laparoscopic Roux-en-Y reconstruction: 2 following a gastric by-pass for morbid obesity and 1 after a partial gastrectomy [6-8]. Some differences in the present case are worth reporting: the timing of symptoms onset was much earlier than that described in the literature (9 vs 26 days) and the only symptom was vomiting with nausea; pain, which is the most frequent reported symptom (90%), was completely absent. As in half of the reported cases, an increase in the caliber of the small bowel was evident at imaging, suggesting a mechanical SBO, but the final diagnosis was made intraoperatively [4].

After readmission, the working diagnosis was that of a gastric outlet syndrome possibly due to an internal hernia in the Petersen’s defect; the differential diagnosis included stricture, leakage, and adhesions.

Successful laparoscopic management has been reported in 75% of cases, but 2 cases had ischemia of the strangled bowel that required small-bowel resections. In the rest of the reported cases, the operation consisted exclusively of division of the suture, with immediate release of the entrapped bowel [4].

Figure 3. Intraoperative volvulus. (A) Intraoperative laparoscopic evidence of the strangling girdle. (B) long barbed suture tail before being divided and trimmed.
To avoid the tail of the suture disappearing into the bowel wall when it is divided off the serosa of the intestine, which can cause postoperative SBO, it can be anchored with 1 or 2 clips [20-22].

Potential future directions for study of barbed sutures might include a suture with a different color when the barbs are terminated. Probably, the most important point is to raise the awareness of this potential complication. Specifically, small-bowel volvulus around the tail of a barbed suture should be considered in the differential diagnosis in cases of mechanical bowel occlusion following the use of these sutures. The preferred treatment is laparoscopic division of the suture’s tail. To prevent complications related to barbed sutures, it is essential to ensure that all barbs of the suture are properly unfolded.

Conclusions

Although complications from the use of unidirectional barbed surgical sutures are rare, this report has highlighted that bowel obstruction is a recognized postoperative complication. The preferred treatment is laparoscopic division of the suture’s tail. To prevent complications related to barbed sutures, it is essential to ensure that all suture barbs are properly unfolded.

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