ABSTRACT

Background and Objectives: We present a case of small bowel volvulus around an endotack applied during total extraperitoneal laparoscopic hernia repair (TEP). This complication prompts reconsideration of the role of tacks during extraperitoneal laparoscopic hernia repairs.

Methods: We undertook a chart review and provide a case presentation with review of the literature.

Result: A 66-year-old male with bilateral inguinal hernias underwent elective, bilateral, total extraperitoneal laparoscopic hernia repair. During dissection, a small peritoneal tear occurred. The tear was closed with a spiral tack. On postoperative day 22, the patient developed an acute abdomen. Exploratory laparotomy revealed a volvulus rotated around an adhesion to the spiral tack.

Discussion: Volvulus can cause vascular compromise leading to bowel ischemia and necrosis. A tack resulting in adhesion and volvulus is an unusual, but serious, complication. Repair of a peritoneal tear during preperitoneal hernia repair is advocated to improve visualization obstructed by a pneumoperitoneum and decrease adhesions to the abdominal wall.

Conclusion: The use of blunt Endoloops or crimps may prove safer than tacks for repairing the peritoneum and placement in proximity to delicate or thin tissues. Additionally, careful placement of foreign bodies to ensure their stability and to minimize protrusion may decrease the risk of erosion of the hardware.

Key Words: Laparoscopic surgery, Volvulus, Complications, Hernia.

INTRODUCTION

Small bowel volvulus is a rare but dangerous condition that can rapidly cause intestinal vascular compromise and lead to bowel ischemia and necrosis. We present a patient who developed a small bowel volvulus around an adhesion formed between an endotack from a recent laparoscopic hernia repair and the midportion of the patient’s ileum. This unusual complication has not, to our knowledge, been reported in the literature. It heightens concern regarding the tack itself as a source of serious complications.

CASE REPORT

A 66-year-old male with diabetes mellitus and a history of atrial fibrillation initially presented with longstanding, gradually enlarging bilateral inguinal hernias. Both hernias reduced spontaneously. He was medically cleared for surgery and underwent elective, bilateral, total extraperitoneal laparoscopic hernia repair (TEP). Entrance to the preperitoneum was achieved using a Hasson trocar. During the dissection, a small peritoneal tear was made, allowing pneumoperitoneum and interfering with visibility in the preperitoneal space. The tear was closed in the following manner: both sides of the torn peritoneum were held up by smooth graspers so as to assure that no bowel was caught in the repair. The 2 sides were then approximated and sealed together with a spiral tack. Routine dissection was completed. Both hernia defects were covered with mesh, and they were held in position with a spiral tack placed into Cooper’s ligament. The patient’s early postoperative course was uneventful, and he was discharged home that same day. He was doing well 1 week later when seen at a routine postoperative office visit.

On postoperative day 22, the patient suddenly developed sharp, epigastric pain. He complained of nausea and anorexia but denied vomiting, fevers, and chills. He had had a normal bowel movement the previous day. When seen in the emergency room, he was found to have high-pitched bowel sounds and a soft, diffusely tender abdomen. There was no free air on the chest radiograph. The abdominal radiograph revealed 1 to 2 air fluid levels. A
computed tomographic (CT) scan was obtained that showed thickened loops of small bowel and ascities. There was a high index of suspicion for mesenteric ischemia because of the patient’s history of atrial fibrillation. For this reason, a mesenteric angiogram was obtained. The study showed angulation of the ileocolic artery and compression of the superior mesenteric vessels consistent with small bowel volvulus. The patient was taken to the operating room for exploratory laparotomy. Upon opening the abdomen, a large amount of bloody fluid was encountered. The terminal ileum and the ileocecal valve were necrotic, and there was hemorrhagic necrosis of the adjacent mesentery. The terminal ileum was found to be rotated clockwise around an adhesion extending from the midportion of the ileum to the spiral tack used in the peritoneal repair, which appeared to have eroded through the peritoneum. The volvulus was detorsed in a counterclockwise fashion. The gangrenous bowel, including the ileocecal valve, was resected and a side-to-side functional anastomosis between the small bowel and the cecum was created. There were no areas of questionable viability within the remaining bowel. The endotack was removed. The wound was closed in the usual fashion and reinforced with retention sutures.

No further complications occurred in the postoperative course. The patient’s bowel function returned gradually, and he was discharged home on postoperative day 7 having normal bowel movements and tolerating a regular diet. He has continued to do well when seen for follow-up appointments.

**DISCUSSION**

Most cases of acute obstruction after laparoscopic hernia repair are related to bowel herniation through a trocar site. Adhesions are another widely recognized cause of intestinal obstruction but are generally found in patients who have undergone intraabdominal procedures and are not usually associated with total extraperitoneal laparoscopic hernia repair. In the literature, adhesions are most commonly discussed as a direct cause of mechanical obstruction. However, when small bowel volvulus occurs, it is frequently associated with an adhesion as its axis. Cases of cecal and small bowel volvulus following intraabdominal laparoscopic procedures have been reported with theories on the cause including adhesions and iatrogenic malpositioning of intestines during surgery. Adhesions have been associated with foreign bodies as diverse as sutures, mesh, and umbilical piercing. Given these observations, it is not surprising that a tack might be the nidus for adhesion formation and lead to a clinically significant complication.

For a tack to serve as one end of an intraabdominal adhesion, it must have contact with peritoneal contents. Peritoneal violation may inadvertently occur during total extraperitoneal hernia, as occurred in our case. Protrusion of the tack, by any means, could allow contact with the peritoneum and might lead to erosion into the peritoneal cavity. We found no cases of tack erosion into the peritoneum reported in the literature, though this may be because few surgeons would have sought to make this observation. Kenton et al have reported two cases of tack erosion through the bladder. These cases were associated with mesh tacked to Cooper’s ligament for use in laparoscopic colposuspension for treatment of urinary incontinence. In these cases, as in our own, it is not clear whether significant perforation occurred at the time of operation or whether postoperative erosion occurred.

A tack used to seal a peritoneal tear may have contact with the peritoneal contents by erosion or through a minute but persistent defect. The sharp point that allows spiral tacks to penetrate and hold thick tissues may increase the risk when the device is used in thin tissues. This is particularly treacherous when the sharp edge risks contact with bowel, blood vessels, or other delicate structures. The spiral turns, designed to grip and affix tissues, combined with the sharp point, which can penetrate, irritate, and inflame suggests that the tack, by its very design, is a likely point of adhesion formation. Thus, we believe a tack is more appropriately used in parietal tissues and should be avoided in peritoneal repairs.

Repair of a peritoneal tear occurring during laparoscopic surgery is advocated primarily to improve visualization of the preperitoneal space that is obstructed by a developing pneumoperitoneum. Repair also decreases adhesions to the abdominal wall and avoids internal herniation through the tear. Endoscopic methods of repair include tacking, stapling, crimping, suturing, and suture loop ligation. One of the rare studies that attempts to evaluate and compare these techniques is done by Lau et al. They conclude that stapling or tacking, pretied suture loop ligation, and endoscopic suturing of peritoneal tear are safe and do not differ in the rate of postoperative complications; however, endoscopic suturing takes significantly longer than the other methods. Our case is one instance that calls into question the safety of sharp devices for peritoneal repair.

The ability to avoid peritoneal tears increases with the experience of the surgeon, and having an experienced surgeon assist while one is early in the learning curve is
widely recommended. However, peritoneal tears remain a relatively frequent complication of this procedure.\textsuperscript{11} If visualization is obscured, repositioning the instruments, adding an additional port to facilitate retraction, or placement of a Veress needle into the peritoneum to allow decompression are useful techniques. Early identification and repair of a tear stops the progression of pneumoperitoneum and facilitates completion of the procedure. A “wavy” or “shaking” appearance of the peritoneum may be the earliest sign of a tear during TEP. In light of the complication discussed here, we advocate the use of Endoloops, which may require serial placement to control a large tear, or suturing, despite the increased time required, as safe and effective methods to repair peritoneal tears. As the dialogue continues, this rare complication is a reminder that every foreign object left in the body has the potential to cause a variety of complications.

**CONCLUSION**

Though use of a tack resulting in adhesion and volvulus is an unusual complication, it is a serious one. It is also avoidable by choosing devices that, by their design, pose a smaller risk of erosion and adhesion, for use in thin and delicate tissues, such as the peritoneum. All foreign bodies must be placed with care to ensure their stability and to minimize protrusion.

**References:**

1. Felix, EL, Harbertson N, Vartanian S. Laparoscopic Hernioplasty: significant complications. *Surg Endosc.* 1999;13(4):328–31.
2. Fitzgibbons RJ Jr., Camps J, Cornet DA, et al. Laparoscopic Inguinal Herniorrhaphy. Results of a Multicenter Trial. *Ann Surg.* 1995;221(1):3–13.
3. Welch GH, Anderson JR. Volvulus of the small intestine in adults. *World J Surg.* 1986;10(5):496–500.
4. Frazee RC, Mucha P Jr., Farnell MB, van Heerden JA. Volvulus of the small intestine. *Ann Surg.* 1988;208(5):565–568.
5. Ulloa SA, Ramirez LO, Ortiz VN. Cecal Volvulus after laparoscopic liver biopsy. *Bol Asoc Med P R.* 1989;10(12):195–196.
6. Cuadra SA, Khalife ME, Char DJ, Wax MR, Halpern D. Intestinal Obstruction from Midgut Volvulus after Laparoscopic Appendectomy. *Surg Endosc.* 2002;16(1):215.
7. Luijendijk RW et al. Foreign material in postoperative adhesions. *Ann Surg.* 1996;223(3):242–248.
8. Ferrone R, Scarone PC, Natalini G. Late complication of open inguinal hernia repair: small bowel obstruction caused by intraperitoneal mesh migration. *Hernia.* 2003;7(3):161–162. [POSSIBLE ERROR]
9. Ventolini G, Kleeman S. Adhesions caused by umbilical piercing. *J Am Assoc Gynecol Laparosc.* 2003;10(2):281.
10. Kenton K, FitzGerald MP, Brubaker L. Multiple foreign body erosions after laparoscopic colposuspension with mesh. *Am J Obstet Gynecol.* 2002;187:252–253. [POSSIBLE ERROR]
11. Lau H, Patil NG, Yuen WK, Lee F. Management of peritoneal tear during endoscopic extraperitoneal inguinal hernioplasty. *Surg Endosc.* 2002;16(10):1474–1477.