



Offending staple as an unusual but preventable cause of internal hernia with bowel obstruction

Case report and review of the Literature



Ann Ital Chir, 2021; 10 - Sept. 20
pii: S2239253X2103629X
Online Epub

Eva Intagliata, Ada Cinquerrui, Rosario Vecchio

Department of General Surgery and Medic Surgical Specialties, University of Catania, Italy

Offending staple as an unusual but preventable cause of internal hernia with bowel obstruction. Case report and review of the Literature.

In the laparoscopic era, the use of the stapler is a common practice and it adds to the possible causes of post-operative bowel adhesions with obstruction. In this study, we reviewed the Literature in order to study the pathogenesis and the incidence of bowel obstruction after using the laparoscopic stapler. Furthermore, we report a case of a woman who went to our observation for incoming bowel obstruction after laparoscopic ileal resection. In the emergency setting, the laparoscopic exploration revealed that a staple created adherence between an intestinal loop and its mesentery with consequent internal hernia and volvulus. The patient was treated by laparoscopy with removal of the offending staple and resection of the intestinal necrotic segment. Tips and tricks of the surgical technique for avoiding such rare but threatful complication, are discussed.

KEY WORDS: Internal hernia, Mechanical bowel obstruction, Laparoscopic stapler, Volvulus

Introduction

The consolidated use of laparoscopic surgery has involved the routine use of endostapler in order to shorten the surgical time for resection and suturing of bowel and vessels¹. As for every method, the use of endostapler is not free from possible complications. However, a proper surgical technique may considerably reduce the incidence of complications².

In this study, we reviewed the Literature in order to discover the incidence of bowel obstruction due to an accidental adherence between two intestinal loops after using the laparoscopic stapler, and to assess the possible tips

and tricks for avoiding this complication. Furthermore, we reported a case of a mechanical bowel obstruction due to an accidental bowel adhesion by a staple after a laparoscopic ileal resection, causing an internal hernia with volvulus.

Case Report

A 66-year-old-woman presented to the emergency department with abdominal pain lasting from about 12 hours at the right lower quadrant of the abdomen up to the mid-abdomen. She reported chills, nausea and vomiting. On examination, she was afebrile and tender in the right lower abdominal quadrant with mildly distended abdomen. An abdominal X-ray showed multiple air-fluid levels (Fig. 1). She underwent enhanced computed tomography (CT) scan, which showed twisted dilated small bowel loops in the right lower quadrant with two transition points, and decompressed small bowel around this region, suggestive of internal hernia with bowel obstruction (Fig. 2). Two months before, she underwent a laparoscopic small bowel resection with latero-lateral entero-anastomosis by stapler because of volvulus. She was submitted to an exploratory laparoscopy. A staple

Pervenuto in Redazione Aprile 2021. Accettato per la pubblicazione Maggio 2021

Correspondence to: Eva Intagliata, MD PhD, Department of General Surgery and Medical Surgical Specialties, Policlinico "G. Rodolico-S.Marco", Via S. Sofia 78, 95123 Catania, Italy (email: evaintagliata@vodafone.it)

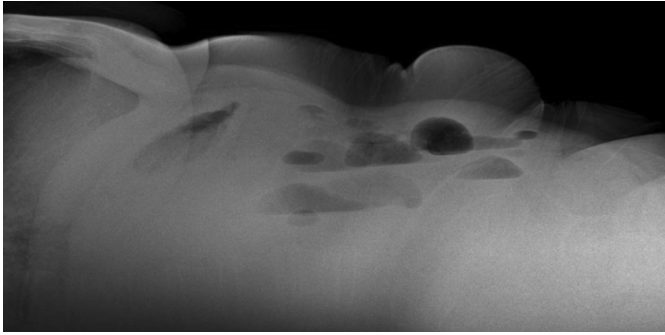


Fig. 1: Multiple bowel air-fluid levels.



Fig. 2: Internal hernia containing a small bowel loop with bowel obstruction.

attached to the ileal stump created a loop between the small bowel and its mesentery, causing an internal hernia containing a small bowel loop (Fig. 3). The staple was laparoscopically freed and removed with no full thickness defect of the small bowel (Fig. 4). A small bowel resection was necessary since the herniated ileal loop was ischemic. The postoperative course was uneventful and the patient was discharged after 6 days.

Discussion

The use of stapler in laparoscopic surgery is a consolidated procedure where the peculiarity of the technique leads to specific post-operative complications. We made a review of the Literature by inserting in Pubmed database the research terms “bowel obstruction” AND “stapler”. The search has not been limited by year of publication. For each publication, type of previous surgery where the stapler was used, pathogenesis of intestinal occlusion, type of solving surgery, Authors’ suggestions for avoiding this complication have been evaluated. Twelve papers were found, but 9 of them were selected since inherent to the topic.

The revised Literature reports very few cases of post-operative bowel obstruction related to the use of the

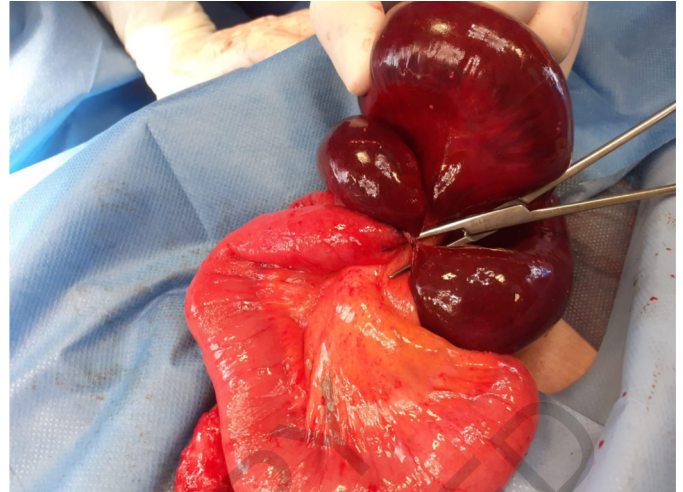


Fig. 3: Staple attached to the ileal stump causing an internal hernia containing a small bowel loop.



Fig. 4: Ischemic herniated ileal loop.

endostapler³⁻¹¹, and no studies are reported about the mechanism with whom a bowel obstruction is created by a stapler. In the majority of them, the mechanism responsible for bowel obstruction due to stapler used in a previous surgery is not always well understood and specified^{3,6-8} (Table I).

Huntington et al. reported a case of small bowel obstruction after stapled division of the ovaries during laparoscopic-assisted vaginal hysterectomy. The obstruction was due to a partially formed endoscopic staple that hooked the small bowel and adhered to part of the adnexal staple line. The Authors recommended minimizing the staple spillage and careful inspecting the staple line⁶.

Kuehnel et al. reported a case of mechanical small bowel obstruction after laparoscopic appendectomy. At re-intervention, they found three spilled intraperitoneal staples hooked to the base of an ileal loop causing the obstruction. Their recommendations were to explore the

TABLE I - Iatrogenic internal hernia: review of the Literature

Authors	Year of publication	Previous surgery	Pathogenesis of injury	Treatment	Recommendation
Petrocelli [3]	2003	Laparoscopic appendectomy	Hooking staple	Adhesiolysis	Remove the loose staples
Petersen [4]	2014	Laparoscopic appendectomy	Hooking staple	Staple removed	Remove the loose staples + reinforce the staple line with running suture
Rajan [5]	2014	Laparoscopic appendectomy	Hooking staple	Staple removed + cover the staple line with omentum	Remove the loose staples + cover the staple line with omentum
Huntington [6]	1999	Laparoscopic-assisted vaginal hysterectomy	Partially formed staple	Staple removed	Remove the loose staples
Kuehnel [7]	2007	Laparoscopic appendectomy	Spilled staples	Staple removed	Remove the loose staples
Lee [8]	2018	Laparoscopic hysterectomy	Adherence around the staples	Adhesiolysis	Not to expose the staples + to use anti-adherent substances
Tamura [9]	2020	Laparoscopic appendectomy	A free unformed staple	Staple removed	Remove the loose staples
Kim [10]	2019	Laparoscopic appendectomy	A freed staple	Staple removed	Remove the loose staples
Nottingham [11]	2001	Laparoscopic appendectomy	Loose staples	Staple removed	Remove the loose staples
Vecchio [present report]	2021	Ileal resection	Loose staple hanging a loop with internal strangulated hernia	Staple removed + ileal resection	Remove the loose staples + tips and tricks in using the endostapler + reinforce the staple line with running suture

peritoneum at the end of the procedure, in order to find and remove possible loose staples, and to improve the staplers in order not to make the free staples fall into the peritoneum ⁷.

Lee et al. reported a late onset of obstructive ileus due to a fibrous band around the surgical staples of previous laparoscopic hysterectomy, extending to the greater omentum causing a closed loop of a segment of the bowel. When they performed adhesiolysis of the adherence and of the adhesive band, they saw that a surgical clip was holding a portion of the small intestine. They recommended not to expose the staples to the peritoneum and to use anti-adherent substances ⁸.

Petroncelli et al. reported a case of bowel obstruction due to a staple of the mechanical suture on the caecum hooking to bowel mesentery strangulating a bowel loop 3 days after laparoscopic appendectomy. They retreated laparoscopically the patient by adhesiolysis and recommended to remove all the loose staples at the end of the procedure ³.

Less frequent seems to be the presence of free staples in the peritoneum as a cause of bowel obstruction for adherence. Tamura et al reported a case of late onset of bowel obstruction with superior mesenteric vein occlusion after

laparoscopic appendectomy. Emergency exploratory laparoscopy revealed a strangulated bowel loop due to a free unformed staple. The patient was treated laparoscopically without need of bowel resection. The recommendation was to remove as many spilled and unformed staples as possible ⁹.

Kim et al. reported a case of volvulus requiring bowel resection, due to a staple freed in the peritoneum of the small bowel mesentery after laparoscopic appendectomy. They recommended inspecting the staple line, to choose the appropriate staple size and to remove the free malformed staples if fallen into the peritoneum ¹⁰.

Nottingham et al. reported a case of bowel obstruction due to loose intraperitoneal staples after laparoscopic appendectomy. They recommended retrieving as many as possible staples at the end of the surgical procedure ¹¹.

Very few cases of internal hernia due to offending staple are reported in the Literature ^{3,4}.

Petersen et al reported a patient who presented with bowel obstruction consequent to a staple attaching the appendicular stump and the small bowel mesentery, thus creating an internal hernia about 7 days after the laparoscopic appendectomy. The offending staple was removed

laparoscopically. They recommended the removal of the loose staples and to reinforce the staple line with running suture⁴.

Rajan et al. reported a case of early onset of bowel obstruction due to a peritoneal defect created by a staple between the appendicular staple line and the adjacent small bowel mesentery through which an internal hernia undertook. The Authors removed the offending staple and covered the staple line with omentum. The Authors recommended the final inspection of the peritoneum to remove eventual loose staples⁵.

The Literature reports mainly two mechanisms through which a bowel obstruction can occur after using the endostapler: staples holding bowel loops, and free intraperitoneal staples causing fibrous band adhesions. In light of the above, we recommend firing the endostapler after having seen that the two branches of the stapler are including only the tissue that needs to be sectioned^{12,13}. While firing the stapler, its branches should be overlapping one above the other, in order to avoid the spillage of the possible free staples not included in the sectioned tissue while opening the stapler after firing. It should be useful to reinforce the staple line with a running suture of the bowel stump or to cover it with the omentum, whenever possible.

Riassunto

Nell'era laparoscopica, l'uso della suturatrice meccanica è una pratica comune e si aggiunge alle possibili cause di aderenze intestinali post-operatorie con ostruzione. In questo studio, abbiamo rivisto la Letteratura al fine di studiare la patogenesi e l'incidenza dell'ostruzione intestinale correlato all'utilizzo della suturatrice meccanica. Inoltre, riportiamo un caso di una donna che è giunta alla nostra osservazione per ostruzione intestinale dopo resezione ileale laparoscopica. L'esplorazione laparoscopica in regime di urgenza ha rivelato che un punto metallico creava aderenza tra un'ansa intestinale e il suo mesentere con conseguente ernia interna e volvolo. La paziente è stata trattata per via laparoscopica con rimozione del punto metallico e resezione del segmento necrotico intestinale. Vengono discussi suggerimenti e trucchi di tecnica chirurgica per l'utilizzo della suturatrice meccanica al fine di evitare complicanze così rare ma minacciose.

References

1. Vecchio R, Intagliata E, Marchese S, La Corte F, Cacciola RR, Cacciola E: *Laparoscopic splenectomy coupled with laparoscopic cholecystectomy*. JLS, 2014; 18(2):252-7, doi: 10.4293/108680813X13693422518434, PMID: 24960489, PMCID: PMC4035636.
2. Vecchio R, Marchese S, Leanza V, Leanza A, Intagliata E: *Totally laparoscopic repair of an ileal and uterine iatrogenic perforation secondary to endometrial curettage*. Int Surg, 2015; 100(2):244-8, doi: 10.9738/INTSURG-D-13-00267.1, PMID: 25692425, PMCID: PMC4337437.
3. Petrocelli P, Corsale I, Giannessi S, Cerone M, Colugnat D, Matocci GC: *Complications due to mechanical sutures in laparoscopic surgery: Bowel obstruction caused by staple. Case report and literature review*. Minerva Chir, 2003; 58(4):591-94.
4. Petersen LF, Nally MC, Agos A, Petty K: *Internal hernia and small bowel obstruction caused by a linear cutter staple at appendiceal stump following laparoscopic appendectomy*. JSCR, 2014; (2 pages).
5. Rajan M, Dip F, Szomstein S, Zanghi A, Cavallaro A, Di Vita M, Cardì F, Di Mattia P, Cappellani A, Lo Menzo E, Rosenthal R: *Staple line as a cause of unusual early internal hernia after appendectomy*. International Journal of Surgery, 2014; S159eS161.
6. Huntington TR, Nishitani R, Belue JB, Klomp GR, Kuehnel: *Small bowel obstruction secondary to stapled laparoscopically assisted vaginal hysterectomy*. Surg Endosc, 1999; 13(3):246-49.
7. Kuehnel F, Marusch F, Koch A, Gastinger I: *Vein occlusion caused by a retained free intraperitoneal staple after laparoscopic Retained loose linear cutter staples after laparoscopic appendectomy as the cause of mechanical small bowel obstruction*. Int J Colorectal Dis, 2007; 22:717-18.
8. Lee CS, Kim MK: *Obstructive ileus caused by metal staples 6 years after the initial surgery. A case report*. Medicine, 2018; 97:49(e13426).
9. Tamura K, Nakayama H, Kono H, Kuroki R, Maeyama R, Yamamoto H, Ueki T, Okido M, Ichimiya H: *Atypical clinical presentation of mechanical small bowel obstruction with superior mesenteric appendectomy: A case report*. Asian J Endosc Surg, 2020; 1-4.
10. Kim R, Moore R, Schmidt L, Martin K, Sjöholm LO, Mason L, Beard J: *Volvulus caused by a free intraperitoneal staple after laparoscopic appendectomy: A case report*. International Journal of Surgery Case Reports, 2019; 65:259-2, 12:4:289-90.
11. Vecchio R, Gelardi V, Intagliata E, Barbaros U, Cacciola RR, Cacciola E: *How to prevent intraoperative risks and complications in laparoscopic splenectomy*. G Chir, 2010; 31(1-2):55-61, PMID: 20298668.
12. Vecchio R, Leanza V, Genovese F, Accardi M, Gelardi V, Intagliata E: *Conservative laparoscopic treatment of a benign giant ovarian cyst in a young woman*. J Laparoendosc Adv Surg Tech A, 2009; 19(5):647-8, doi: 10.1089/lap.2009.0138, PMID: 19489679.