

Incisional Hernias after Laparoscopic Surgery

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Abstract

Objective: To review about incisional hernia following laparoscopic abdominal surgery and the relationship between the pathogenesis and clinical features and manifestation of trocar site hernias.

Methods: We searched for this subject on Medline and Google search by combining all these words like “trocar,” “port,” “hernia, and “laparoscopy.”

Results: We were not able to find a common factor that analyzed the factors related to trocar site hernia by multivariate analysis. Therefore, we could not indicate the only independent risk factor. However, we have referred to many reports that have logically indicated pathogenesis. The literature what we have gone through frequently point out that the main pathogenesis is not host factors but rather technical ones; besides, most accurate reason is that a large trocar size, leaving the fascial defect open, and stretching the port site were closely related to the occurrence of trocar site hernias.

Conclusion: The highlight of this review article is that the drain sites can possibly be one of the sources for bowel complications. We recommend closure of all 10 mm ports. If an intraperitoneal drain is necessary, it should be placed through a 5 mm port only.

Keywords: Laparoscopy, incisional hernia, small bowel obstruction.

INTRODUCTION

In 1987, Mouret performed the first laparoscopic cholecystectomy changing surgical practice and it was mentioned by Rosen and Ponsky.¹ Then the laparoscopic abdominal surgery increased and was common by the 1990s.² The adoption of this new technique resulted new, specific operative complications. Incisional hernias at the site of entry of a trocar is a serious complication in laparoscopy,³ as most trocar site hernias require further surgery.⁴

Fear⁵ reported first a trocar site hernia in his large series on abdominal laparoscopy in gynecological diagnosis. Many authors have recognized still this as the first report on trocar site hernias.^{2,6-8} Maio and Ruchman⁹ then reported on the trocar site hernia associated with small-bowel obstruction occurring immediately after laparoscopic cholecystectomy; this being the first report on trocar site hernias in digestive surgery. In the published reports there is enormously wide variation in the clinical aspects of trocar site hernias; so nowadays we became more concerned about the meaning of the medical term “trocar site hernia,” as it is not clearly defined.

MATERIALS AND METHODS

Data Sources: We searched for this subject on Medline and Google search by combining all these words like “trocar,” “port,” “hernia”, and “laparoscopy.”

Data Extraction and Study Selection: We limited the laparoscopic surgeries to cholecystectomy, colon and rectal surgery, fundoplication, and gastric surgery; finding a total of 44 reports on these procedures. Out of these, 19 case reports, 18 original articles and 7 technical notes on “how to do it” were collected. Another 19 additional reports were obtained using the references of those previously obtained study. So a total of 63 reports were reviewed (24 case reports, 27 original articles, 7 technical notes, and 5 review articles).

Data Synthesis: In this review study, we classified trocar site hernia into 3 types. The early-onset type being the first that occurred immediately after the operation, with a small-bowel obstruction, especially the Richter hernia. The late-onset type being the second one that occurred several months after the operation, mostly with local abdominal bulging with no small-bowel obstruction developing and the third one a special type that occurred indicated the protrusion of the intestine and/or omentum.

REVIEW OF LITERATURE

Crist and Gadacz¹⁰ defined trocar site hernia as the development of a hernia at the cannula site, and this same term has been used in many articles over this time; however,

“port site hernia” has also been used by many authors in some other articles in similar situations. Initially, we started searched this topic on Medline combining “trocar,” “hernia,” and “laparoscopy” and we got 186 reports in English. Second, we combined “port,” “hernia,” and “laparoscopy” the result was 90 reports in English. We then limited our search in the main operations such as cholecystectomy, colon and rectal surgery, fundoplication (i.e. operation for gastroesophageal reflux disease), and other gastric surgical procedures (e.g. obesity surgery) that are supposed to result in the same operative insult as digestive surgery. Forty-four articles were found on these procedures. Out of the 44 reports, 19 were case reports, 18 were original articles and 7 were technical notes on “how to do it.” We found an additional 19 articles using the references of those obtained (except for 3 gynecological articles).^{5, 7, 11} So total of 63 articles (24 case reports, 27 original articles, 7 technical notes, and 5 review articles). We finally chose trocar site hernia as the best and the relevant medical term as it was the most frequently used and the one that most clearly expressed the condition.

We can classify trocar site hernias into 3 types according to the reported cases that have been analyzed. Early-onset type indicates dehiscence of the anterior fascial plane, posterior fascial plane, and peritoneum. The early-onset type was recognized in many case reports as beginning to develop in the early stages after surgery, often presenting as a small-bowel obstruction. The late-onset type indicates dehiscence of the anterior fascial plane and posterior fascial plane. The hernia sac of late-onset type is the peritoneum. The late-onset type has often been recognized, in many large series, to be related to complications of the trocar insertion. Late-onset type hernias almost always develop in the late stages several months after surgery.

The special type indicates dehiscence of the whole abdominal wall. Protrusion of the intestine and other tissue (e.g. greater omentum) is recognized. The first case, reported by Fear,⁵ was of the special type: A loop of the bowel came through a defect as the laparoscope and sheath were withdrawn. Therefore, this first report points us toward expressing a protrusion of the bowel and/or omentum as a “hernia,” although in this type there is no hernial sac. Three case reports of the special type have been published since then.¹²⁻¹⁴

Several large series of postoperative complications of laparoscopic cholecystectomy have been reported, where the incidence of trocar site hernia was 1 in 500 cases,¹⁷ 3 in 1983 cases,¹⁸ 1 in 800 cases,¹⁹ 11 in 1300 cases,²⁰ and 10

in 1453 cases.²¹ Callery et al³ mentioned a very low overall incidence, while Mayol et al²² stated that all these figures represent only the early results of laparoscopic surgery or gynecologic laparoscopy (i.e. mostly diagnostic laparoscopy); currently all publications have drawn attention to this problem as the number is increasing. Moreover there will be a much higher true incidence and unknown percentage of patients who are asymptomatic might not seek medical examination^{6, 8} that is not reported. Coda et al¹⁴ noted that the onset of trocar site hernia is not immediate after surgery rather than early that might elude a surgeon in many surveys unless an extended follow-up procedure has been established. Recently, the incidence of trocar site hernia has been reported as a postoperative complication in gastrointestinal surgery (colorectal surgery for cancer, 0.6%,²³ colectomy for sigmoid diverticulitis, 0.9%,²⁴ Roux-en-Y gastric bypass, 0.3%²⁵ and 1.0%,²⁶ and gastric banding, 0.5%).²⁷

From 1995, a large series on digestive surgery on complications of the trocar site in digestive surgery has been published. The incidence of trocar site hernia has been shown to be 0.65% to 2.80%. The studies based on Mayol et al²² and Nassar et al²⁸⁻³¹ were based on data collected prospectively, and patients have been followed up for several months; therefore, it is supposed that the incidence reported by them (1.50% to 1.80%) is reasonably standard.

DISCUSSION

Diagnosis

We can diagnose the special type of hernia without any modalities. With the early-onset type we are able to locate the site of herniation by computed tomography and surgically reduce and repair the hernia with minimal enlargement of the same trocar puncture wound, thus avoiding a full laparotomy.^{41, 43, 46-48} In many other reports to diagnose early-onset-type hernias a computed tomography was taken^{9, 16, 32, 34, 38, 42, 45, 50} and were effective in diagnosing them. There were 3 reports of gastrointestinal contrast study which was effective.^{33, 38, 44, 49, 52, 53}

There was an unknown proportion of asymptomatic patients who do not get physically examined,⁸ that belonged in late-onset-type hernias although sometimes asymptomatic lumps were found.

Prevention

10 mm fascial defects or larger trocar sites should be closed to prevent hernia formation whenever possible.^{4, 10, 20, 34, 35, 38}

Moreover, Crist and Gadacz¹⁰ mentioned that, in general, 5.5 mm fascial defects by trocar sites need not to be closed. However, Sanz-Lopez et al⁸ insisted that the general consensus is that trocar site hernias of 5 mm and greater in diameter should be closed at the fascial level, and that defects of any size especially in children should be closed. Some authors have stated their opinion that all 5 mm ports sites routinely might not be necessary to close, but in active manipulation during prolonged procedures, to avoid complications they should be closed.^{54,55}

How to properly close a fascial defect is the problem. Matthews et al¹⁵ reported that there were trocar site hernias due to incomplete closure of fascial planes and that the peritoneum should also be closed along with the fascia to obliterate the preperitoneal space, and thus postoperative complication of hernia can be prevented. Velasco et al⁵¹ mentioned that under direct vision only the closure should be done, and it should incorporate all abdominal wall layers to eliminate the peritoneal defect. Callery et al³ stated that even if to extent the skin incision, all large trocar sites should be closed meticulously. We consider that larger trocar site of 10 mm and above should be closed completely (meaning closure of all layers including the peritoneum) with adequate muscle relaxation. Thus, the lateral trocar should also be closed as there are incidences of trocar site hernia at the lateral port.⁵⁶

Some surgeons recommended a fascial closure device,¹⁶ a spinal cord needle,⁵⁷ a suture carrier,⁵⁸ a 2 mm trocar,⁵⁴ or a Deschamps needle⁵⁹ to close the fascia and the peritoneum together. It would be advantageous to try one of these techniques to close all the layers so there won't be any defects. It might be better to use a device like those mentioned earlier if the fascial defect must be closed in a 5 mm trocar site.

Some authors have reported a new type of trocar: as 10 to 12 mm nonbladed trocar sites which is very useful and do not require fascial closure above the arcuate line in nonmidline port sites,⁶⁰ so the trocar site hernias frequency could be lowered significantly, from 1.83 to 0.17%, by switching from a sharp cutting device to a cone-shaped trocar tip,⁶¹ and a trocar that expands radially might be useful to prevent hernias. It is supposed that these devices are recognized as useful, but before abandoning fascial closure a randomized large prospective study of digestive surgery is needed.

Many authors have advised to deflate air completely before port removal then fascial closure so as not to draw omentum and intestines into the fascial defect.^{2,6,8,32} We

should stick to this rule of deflating intra-abdominal compressed gas before closure.

We believe that closing the fascial defect and peritoneum is the only effective way to prevent trocar site hernias, and that the other methods should be used after improper closure for the worst cases. When active manipulation through a 5 mm port for prolonged time has occurred then to avoid complications the fascial defect should be closed.

TREATMENT

Duron et al² investigated 24 cases of reoperated mechanical intestinal obstruction postoperative following laparoscopic surgery that were; 11 (46%) were due to trocar site hernia, 8 (33%) to adhesions, 4 (17%) to gastric bands, and 1 to cecal volvulus. The median interval to reoperation was significantly shorter for trocar site hernias (8 days) than for adhesions (25 days) or gastric bands (22.5 days). To conclude that trocar site hernia will be early onset of small-bowel obstruction. Velasco et al⁵¹ reported that all his patients required surgery to resolve small-bowel obstruction with early post laparoscopic bowel obstruction. They set for decision-making as 14 days after surgery to be the turning point. Moreover, some authors advised that correctly diagnosing Richter hernia will help to lessen any delay in a postlaparoscopic patient with symptoms of small-bowel obstruction.^{44, 50} Therefore, further procedures on patients with a small-bowel obstruction is advisable within 2 weeks of laparoscopic surgery. If diagnosis of the obstruction cannot be ruled out, computed tomography will be effective. Nonoperative management (nasogastric suction and other methods) will often end up in waste of time and money, and they will sometimes lead to critical conditions (i.e. strangulation).

CONCLUSION

In this review article, we tried to make a classification of trocar site hernia by studying previous reports and articles published. We think that a more accurate clinical identification is possible from this categorization. These will be useful to prevent complications if the surgeon is able to correlate between the identified types and clinical manifestations before the laparoscopic procedure.

The only surgeon who does not encounter complications is one who is not operating. Complications can happen even in the best of the best hands and it is important that these are recognized on table and addressed immediately. The importance of adequate training and the value of proper

experience are clear. It is a must to train ourselves in the necessary skills of laparoscopy and encourage the development of specially designed fellowships for those performing the most advanced procedures. When there are complications, excellent training and experience should make them bold enough to manage the same by laparoscopy.

Studies have shown wound infection rate is very less when compared to open cases with reduced postoperative pain and recovery period. Drain site related bowel complications, (Abdel-Halim et al) are rare, but its been reported before. Iwase et al reported an incarcerated perforated Richter's hernia through a drain site. Nomura et al reported two cases of bowel perforation due to pressure necrosis due to open silicone drains and when a thorough literature review was done it revealed eight similar cases (six of which were in relation to suction drains). This highlights that drain sites can possibly be one of the source for bowel complications. We recommend closure of all 10 mm ports. If an intraperitoneal drain is necessary, it should be placed through a 5 mm port only.

REFERENCES

- Rosen M, Ponsky J. Minimally invasive surgery. *Endoscopy* 2001;33:358-66.
- Duron JJ, Hay JM, Msika S, et al. Prevalence and mechanisms of small intestinal obstruction following laparoscopic abdominal surgery: A retrospective multicenter study. *Arch Surg* 2000;135:208-12.
- Callery MP, Strasberg SM, Soper NJ. Complications of laparoscopic general surgery. *Gastrointest Endosc Clin N Am* 1996;6:423-44.
- Azurin DJ, Go LS, Arroyo LR, Kirkland ML. Trocar site herniation following laparoscopic cholecystectomy and the significance of an incidental preexisting umbilical hernia. *Am Surg* 1995;61:718-20.
- Fear RE. Laparoscopy: A valuable aid in gynecologic diagnosis. *Obstet Gynecol* 1968;31:297-309.
- Plaus WJ. Laparoscopic trocar site hernias. *J Laparoendosc Surg* 1993;3:567-70.
- Rabinerson D, Avrech O, Neri A, Schoenfeld A. Incisional hernias after laparoscopy. *Obstet Gynecol Surv* 1997;52:701-03.
- Sanz-Lopez R, Martinez-Ramos C, Nunez-Pena JR, Ruiz de Gopegui M, Pastor-Sirera L, Tamames-Escobar S. Incisional hernias after laparoscopic vs open cholecystectomy. *Surg Endosc* 1999;13:922-24.
- Maio A, Ruchman RB. CT diagnosis of post laparoscopic hernia. *J Comput Assist Tomogr* 1991;15:1054-55.
- Crist DW, Gadacz TR. Complications of laparoscopic surgery. *Surg Clin North Am* 1993;73:265-89.
- Kadar N, Reich H, Liu CY, Manko GF, Gimpelson R. Incisional hernias after major laparoscopic gynecologic procedures. *Am J Obstet Gynecol* 1993;168:1493-95.
- Horgan PG, O'Connell PR. Subumbilical hernia following laparoscopic cholecystectomy. *Br J Surg* 1993;80:1595.
- Komuta K, Haraguchi M, Inoue K, Furui J, Kanematsu T. Herniation of the small bowel through the port site following removal of drains during laparoscopic surgery. *Dig Surg* 2000;17:544-46.
- Coda A, Bossotti M, Ferri F, et al. Incisional hernia and fascial defect following laparoscopic surgery. *Surg Laparosc Endosc Percutan Tech* 2000;10:34-38.
- Mathews BD, Heniford BT, Sing RF. Preperitoneal Richter hernia after a laparoscopic gastric bypass. *Surg Laparosc Endosc Percutan Tech* 2001;11:47-49.
- Cottam DR, Gorecki PJ, Curvelo M, Weltman D, Angus LD, Shaftan G. Preperitoneal herniation into a laparoscopic port site without a fascial defect. *Obes Surg* 2002;12:121-23.
- Voyles CR, Petro AB, Meena AL, Haick AJ, Koury AM. A practical approach to laparoscopic cholecystectomy. *Am J Surg* 1991;161:365-70.
- Larson GM, Vitale GC, Casey J, Voyles CR. Multipractice analysis of laparoscopic cholecystectomy in 1,983 patients. *Am J Surg* 1992;163:221-26.
- Baird DR, Wilson JP, Mason EM, et al. An early review of 800 laparoscopic cholecystectomies at a university-affiliated community teaching hospital. *Am Surg* 1992;58:206-10.
- Ahmad SA, Schuricht AL, Azurin DJ, et al. Complications of laparoscopic cholecystectomy: The experience of a university-affiliated teaching hospital. *J Laparoendosc Adv Surg Tech A* 1997;7:29-35.
- Al-Haijar N, Duca S, Molnar G, Vasilescu A, Nicolescu N. Incidents and postoperative complications of laparoscopic cholecystectomies for acute cholecystitis. *Rom J Gastroenterol* 2002;11:115-19.
- Mayol J, Garcia-Aguilar J, Ortiz-Oshiro E, De-Diego Carmona JA, Fernandez-Represa JA. Risks of the minimal access approach for laparoscopic surgery: Multivariate analysis of morbidity related to umbilical trocar insertion. *World J Surg* 1997;21:529-33.
- Lumley J, Stitz R, Stevenson A, Fielding G, Luck A. Laparoscopic colorectal surgery for cancer: Intermediate to long-term outcomes. *Dis Colon Rectum* 2002;45:867-72.
- Berthou JC, Charbonneau P. Elective laparoscopic management of sigmoid diverticulitis: Results in a series of 110 patients. *Surg Endosc* 1999;13:457-60.
- Schauer PR, Ikramuddin S, Gourash W, Ramanathan R, Luketich J. Outcomes after laparoscopic Roux-en-Y gastric bypass for morbid obesity. *Ann Surg* 2000;232:515-29.
- Dresel A, Kuhn JA, Westmoreland MV, Talaasen LJ, McCarty TM. Establishing a laparoscopic gastric bypass program. *Am J Surg* 2002;184:617-20.
- Chevallier JM, Zinzindohoue F, Elian N, et al. Adjustable gastric banding in a public university hospital: Prospective analysis of 400 patients. *Obes Surg* 2002;12:93-99.
- Nassar AH, Ashkar KA, Rashed AA, Abdulmoneum MG. Laparoscopic cholecystectomy and the umbilicus. *Br J Surg* 1997;84:630-33.
- Bowrey DJ, Blom D, Crookes PF, et al. Risk factors and the prevalence of trocar site herniation after laparoscopic fundoplication. *Surg Endosc* 2001;15:663-66.
- Susmallian S, Ezri T, Charuzi I. Laparoscopic repair of access port site hernia after Lap-Band system implantation. *Obes Surg* 2002;12:682-84.

31. Fitzgibbons RJ Jr, Annibaldi R, Litke BS. Gallbladder and gallstone removal, open versus closed laparoscopy, and pneumoperitoneum. *Am J Surg* 1993;165:497-504.
32. Wagner M, Farley GE. Incarcerated hernia with intestinal obstruction after laparoscopic cholecystectomy. *WMJ* 1994;93:169-71.
33. Bender E, Sell H. Small bowel obstruction after laparoscopic cholecystectomy as a result of a Maydl's herniation of the small bowel through a trocar site. *Surgery* 1996;119:480.
34. Freedman AN, Sigman HH. Incarcerated paraumbilical incisional hernia and abscess: Complications of a spilled gallstone. *J Laparoendosc Surg* 1995;5:189-91.
35. Boughey JC, Nottingham JM, Walls AC. Richter's hernia in the laparoscopic era: Four case reports and review of the literature. *Surg Laparosc Endosc Percutan Tech* 2003;13:55-58.
36. Montz FJ, Holschneider CH, Munro MG. Incisional hernia following laparoscopy: A survey of the American Association of Gynecologic Laparoscopists. *Obstet Gynecol* 1994;84:881-84.
37. McMillan J, Watt I. Herniation at the site of cannula insertion after laparoscopic cholecystectomy. *Br J Surg* 1993;80:915.
38. Hass BE, Schragger RE. Small bowel obstruction due to Richter's hernia after laparoscopic procedures. *J Laparoendosc Surg* 1993;3:421-23.
39. Patterson M, Walters D, Browder W. Postoperative bowel obstruction following laparoscopic surgery. *Am Surg* 1993;59:656-57.
40. McMurrick PJ, Polglase AL. Early incisional hernia after use of the 12 mm port for laparoscopic surgery. *Aust NZJ Surg* 1993;63:574-75.
41. Kopelman D, Schein M, Assalia A, Hashmonai M. Small bowel obstruction following laparoscopic cholecystectomy: Diagnosis of incisional hernia by computed tomography. *Surg Laparosc Endosc* 1994;4:325-26.
42. Schiller VL, Joyce PW, Sarti DA. Small-bowel obstruction due to hernia through the primary laparoscopic port: A complication of laparoscopic cholecystectomy. *AJR Am J Roentgenol* 1994;163:480-81.
43. De Giuli M, Festa V, Denoye GC, Morino M. Large post-operative umbilical hernia following laparoscopic cholecystectomy: A case report. *Surg Endosc* 1994;8:904-05.
44. Williams MD, Flowers SS, Fenoglio ME, Brown TR. Richter hernia: A rare complication of laparoscopy. *Surg Laparosc Endosc* 1995;5:419-21.
45. Matter I, Nash E, Abrahamson J, Eldar S. Incisional hernia via a lateral 5 mm trocar port following laparoscopic cholecystectomy. *Isr J Med Sci* 1996;32:790-91.
46. Waldhausen JH. Incisional hernia in a 5 mm trocar site following pediatric laparoscopy. *J Laparoendosc Surg* 1996;6 (suppl 1): S89-S90.
47. Nakajima K, Wasa M, Kawahara H, et al. Revision laparoscopy for incarcerated hernia at a 5 mm trocar site following pediatric laparoscopic surgery. *Surg Laparosc Endosc Percutan Tech* 1999;9:294-95.
48. Reardon PR, Preciado A, Scarborough T, Matthews B, Marti JL. Hernia at 5 mm laparoscopic port site presenting as early postoperative small bowel obstruction. *J Laparoendosc Adv Surg Tech A* 1999;9:523-25.
49. Ok E, Sozuer E. Intra-abdominal gallstone spillage detected during umbilical trocar site hernia repair after laparoscopic cholecystectomy: Report of a case. *Surg Today* 2000;30:1046-48.
50. Cadeddu MO, Schlachta CM, Mamazza J, Seshadri PA, Poulin EC. Soft-tissue images: Trocar-site hernia after laparoscopic procedures. *Can J Surg* 2002;45:9-10.
51. Velasco JM, Vallina VL, Bonomo SR, Hieken TJ. Post-laparoscopic small bowel obstruction: Rethinking its management. *Surg Endosc* 1998;12:1043-45.
52. Wallace DH, O'Dwyer PJ. Clinical experience with open laparoscopy. *J Laparoendosc Adv Surg Tech A* 1997;7:285-88.
53. Ramachandran CS. Umbilical hernial defects encountered before and after abdominal laparoscopic procedures. *Int Surg* 1998;83:171-73.
54. Reardon PR, McKinney G, Craig ES. The 2 mm trocar: A safe and effective way of closing trocar sites using existing equipment. *J Am Coll Surg* 2003;196:333-36.
55. Kulacoglu IH. Regarding: Small bowel obstruction and incisional hernia after laparoscopic surgery: Should 5 mm trocar sites be sutured? *J Laparoendosc Adv Surg Tech A* 2000;10:227-28.
56. Morrison CP, Wemyss-Holden SA, Iswariah H, Maddern GJ. Lateral laparoscopic port sites should all be closed: The incisional "spigelian" hernia. *Surg Endosc* 2002;16:1364.
57. Petrakis I, Sciacca V, Chalkiadakis G, Vassilakis SI, Xynos E. A simple technique for trocar site closure after laparoscopic surgery. *Surg Endosc* 1999;13:1249-51.
58. Li P, Chung RS. Closure of trocar wounds using a suture carrier. *Surg Laparosc Endosc* 1996;6:469-71.
59. Di Lorenzo N, Coscarella G, Lirosi F, Gaspari A. Port-site closure: A new problem, an old device. *JLS* 2002;6:181-83.
60. Liu CD, McFadden DW. Laparoscopic port sites do not require fascial closure when nonbladed trocars are used. *Am Surg* 2000;66:853-54.