



Review article

Trocar site incisional hernia in laparoscopic surgery

Jordi Comajuncosas,* Helena Vallverdú, Rolando Orbeal, David Parés

Servicio de Cirugía General y Digestiva, Parc Sanitari Sant Joan de Déu, Sant Boi de Llobregat, Spain

ARTICLE INFORMATION

Article history:

Received May 18, 2010

Accepted August 8, 2010

Keywords:

Trocar site incisional hernia

Hernia

Laparoscopy

A B S T R A C T

Trocar site incisional hernias (TSIH) are the most common complications in laparoscopic surgery. We have carried out a review of the literature with the aim of establishing their incidence, the reasons for them happening, and their prevention.

After a search in the MEDLINE PubMed and PubMed CENTRAL data bases from 1991 to 2009, combining the words: "hernia", "laparoscopy" and "trocar", we obtained 545 articles, of which we analysed 60 of them.

The incidence of TSIH varies between 0.18% and 2.8%.

The diameter of the trocar, obesity and age play a fundamental role when proceeding to close the fascia, a closure which is the most important factor to prevent these incisional hernias appearing.

The appearance of new laparoscopic material and the increasing more common closure of defects of the fascia means that new and more extensive prospective studies should be performed.

© 2010 AEC. Published by Elsevier España, S.L. All rights reserved.

Eventración de los orificios de los trocares en cirugía laparoscópica

R E S U M E N

La eventración de los orificios de los trocares (EOT) es la más frecuente complicación de la cirugía laparoscópica. Hemos realizado una revisión de la literatura con el fin de establecer su incidencia, las causas de aparición de las mismas y su prevención.

Tras una búsqueda en las bases de datos MEDLINE PubMed y PubMed CENTRAL desde 1991 hasta 2009, combinando las palabras: «hernia», «laparoscopia» y «trocar», obtuvimos 545 artículos de los cuales analizamos 60.

La incidencia de las EOT oscila entre el 0,18 y 2,8%.

El diámetro del trocar, la obesidad y la edad juegan un papel primordial a la hora de proceder al cierre de la fascia, cierre que es el factor más importante para prevenir la aparición de dichas eventraciones.

La aparición de nuevo material de laparoscopia y el cierre cada vez más frecuente de los defectos de la fascia hacen necesarios nuevos y más extensos estudios prospectivos.

© 2010 AEC. Publicado por Elsevier España, S.L. Todos los derechos reservados.

Palabras clave:

Eventración orificios trocares

Hernia

Laparoscopia

*Corresponding author.

E-mail address: jordi.comajuncosas@pssjd.org (J. Comajuncosas).

Introduction

Any new technique is associated with the development of new complications. The appearance (1987¹) and the subsequent widespread use of laparoscopic surgery during the last 20 years,² has resulted in a dramatic increase in the number of patients undergoing laparoscopic surgery. Therefore, interest has arisen in the complications inherent in this technique.

Among them, trocar site incisional hernia (TSIH) is possibly the most common. It is associated with all types of laparoscopic procedures in the abdomen and there is little advice in the literature³ regarding how it should be avoided or minimised.

The aim of this article is to review the incidence of this complication, the factors commonly cited as its causes and its prevention by examining the most recent articles published on these hernias.

Material and method

After a search of the MEDLINE PubMed and PubMed CENTRAL databases, using the keywords "hernia", "laparoscopy" and "trocar" for the period between 1991 and December 2009, 545 articles were obtained.

After analysing these articles, it was decided to limit our review to the general surgery and digestive apparatus laparoscopic procedures. Three articles about gynaecological procedures were also included for their significance (Fear⁴) or the number of cases reviewed (Montz⁵ and Kadar⁶).

Inclusion criteria were: comprising a significant number of cases (over 100), or providing information of interest regarding the prevention of TSIH or reasons for it occurring.

The final result was a total of 60 articles published until the review end date (December 2009).

There is no general agreement on how to classify the different published types of TSIH.^{3,4,7,8} Therefore, we have only considered the study results referring to late-onset

TSIH, according to Tonouchi et al,³ as these are the only studies about hernia sacs. We believe that the other types are actually eviscerations classified incorrectly as TSIH.

Incidence

The first to publish a TSIH was Fear⁴ in 1968 in a gynaecological procedure. Since then, many authors^{2,9-11} have confirmed these observations, with Maio and Ruchman¹² being the first to report a TSIH case after gastrointestinal surgery in 1991.

The incidence of TSIH in large series published from 1994 to 2006 ranged between 0.18% and 2.8% (Table 1). However, it is commonly accepted^{9,11} that a large number of TSIH cases are undiagnosed if there is no medium-long term postoperative follow-up. This is because patients are often asymptomatic or give little importance to any symptoms detected, and do not visit their doctors.

Therefore, the real impact of TSIH must be determined by prospective studies, and these do not begin to appear until 1997, with the 403-case series of Mayol,¹³ with an incidence of 1.50%, and that of Nassar,¹⁴ with 870 cases and incidence of 1.80%.

As well as these prospective studies, there are retrospective series of little worth with different results: 10 TSIHs in 1453 cases,¹⁵ 11 in 1300,¹⁶ 3 in 1983,¹⁷ 2 in 555,¹⁸ 10 in 1300,⁹ 1 in 500,¹⁹ and 12 in 9542.²⁰ Many of these series have very low incidence due to incomplete follow-up,^{11,21} or because they show the results of procedures at the beginning of the laparoscopic technique.¹³

The increase in laparoscopic procedures in diseases with a longer follow-up (colorectal, oesophageal hiatus, digestive anastomosis and obesity-related surgery) has led to TSIH cases being reported more frequently.²²⁻²⁶

Mechanism of appearance

The review of the literature revealed two groups of factors related to the mechanism of TSIH occurrence: a group relating to the surgical technique and the material used,

Table 1 – Incidence of hernias at laparoscopic portals in series published between 1994 and 2006

Author	Type of study	No. of patients	Surgery	No. LTSH cases	Incidence	Trocar diameter
Birdi et al ¹⁸ 1994	Retrospective	555	Cholecystectomy	2	0.36	Not specified
Azurin et al ⁹ 1995	Retrospective	1300	Cholecystectomy	10	0.77	10 mm
Mayol et al ¹³ 1997	Prospective	403	Cholecystectomy, fundoplication, colon and other abdominal surgery	6	1.50	10 mm
Nassar et al ¹⁴ 1997	Prospective	870	Cholecystectomy	16	1.8	10 mm, 5 mm
Sanz -López et al ³² 1999	Retrospective	123	Cholecystectomy	2	1.6	10 mm
Coda et al ²⁹ 2000	Retrospective	1287	Abdominal	13	1.0	11-12 mm
Bowrey et al ³⁰ 2001	Retrospective	320	Fundoplication	9	2.8	10 mm
Duca et al ²⁰ 2003	Retrospective	9542	Cholecystectomy	12	0.18	10 mm
Imme et al ³⁴ 2006	Retrospective	150	Abdominal	3	2.0	10 mm
TOTAL		4453		59	1.6	

Table 2 – Mechanism of appearance of the TSIH. Possible related factors mentioned

Related to surgical technique and material	Patient characteristics
Trocar location	Umbilical hernia
Trocar diameter	Obesity
Suture of the trocar hole	Age >60 years
Initial approach (Veress vs Hasson)	Wound infection
Enlargement of umbilical hole	Diabetes
Duration of intervention	

and other group in relation to patient characteristics^{3,27} (Table 2).

Regarding the surgical technique and material used, most retrospective series reviewed^{7,9,13,14,28-31} showed a higher incidence of TSIH at the umbilical trocar site. These findings may show that the trocar location greatly affects the appearance of TSIH; however, there were contradictory opinions and results. There were authors^{9,16} who reported that the incidental finding of an umbilical hernia led to a post-TSIH being developed. Other authors² reported that the anatomy of the lateral abdominal wall with two muscular structures, makes it more difficult for hernias to occur at these sites. While, in contrast, Nassar et al¹⁴ reported about 12% of patients with umbilical and para-umbilical parietal defects that would favour the appearance of a TSIH. Other studies³¹⁻³³ also revealed the occurrence of TSIH at side locations where the hole has a diameter ≥ 10 mm. As a result, we believe that the increased umbilical incidence of TSIH in the series^{5,9,13,14,29,30,32,34} is probably due mainly to abdominal surgery where the vast majority of 10 mm diameter trocars were located at the navel level ('1).

In addition, nearly all reviewed articles agreed that the orifice diameter of the trocar plays a fundamental role in predisposing the occurrence of TSIH. Thus, in most cases,^{9,11,16,21,35-39} over 80% of TSIH appeared at holes >10 mm. However, a significant number of authors^{5,33,34,40-43} highlighted the possibility of TSIH occurring at sites <5 mm when a series of factors were present in a patient.^{9,13,15,16,21,44} They will be discussed later.

The majority of the studies^{3,6,9,16,28,36,41,45} concluded that all sites ≥ 10 mm must be sutured at the fascia level; if not, the probability of a TSIH is very high. This is a view we share, as incomplete or defective suture plays an important role in the appearance of the hernia.

Several authors^{27,29-34,43} recommended that, regardless of its diameter, each site be individually evaluated depending on the patient and/or surgery characteristics.

Other technical factors, such as the initial approach using a Veress needle or Hasson trocar were also evaluated in different studies, such as Mayol et al.¹³ However, the lack of comprehensive studies did not allow us to draw any conclusions about it.

As a final technical note, several authors^{3,13,14} believed that the need to widen the umbilical injury may increase the risk of TSIH at that site.

Regarding the individual characteristics of each patient, the higher incidence of TSIH in obese patients is clear, as shown in several series.^{8,27,30,34} However we, like other authors,³ believe that this is related more to the difficulty of closing the holes in these individuals, rather than the obesity itself, as there are studies⁴³ with no statistically significant relationship between obesity and an increased occurrence of these hernias. Two studies of 600 and 776 patients, respectively,^{27,34} did appear to show a higher risk for people aged over 60, given other associated factors, such as obesity. There has been much discussion about the influence of poor nutrition on the development of a TSIH and hypoalbuminaemia should play a role in it, although no series showed this relationship.

Regarding infection, although some reviews^{13,46,47} link wound infection with the appearance of TSIH, none of them is large enough to confirm it. Lastly, Uslu et al²⁷ considered diabetes as an important factor when closing the fascia hole. They therefore advise that all trocar holes in diabetic patients be closed, irrespective of their diameter.

Prevention

Based on all the studies reviewed, it is clear that the diameter of the trocar hole plays a role in the emergence of TSIH. Therefore, many authors^{3,9,16,32,34,36,37,45} advise that all trocar holes ≥ 10 mm are closed at the fascia to prevent the occurrence of TSIH.

Some studies^{32,34,41,42,48,49} recommend closing <10 mm holes when combined with other factors such as advanced age, obesity, diabetes and a long intervention.

Closing the fascia is the best way to prevent TSIH occurrence, but the technical difficulty of closing the suture is evident.³ The studies reviewed provided different advice and conclusions regarding the suture: Tonouchi et al³ recommended suturing both the fascia and all incision levels, while other authors insisted that the suture must be under direct vision and the incision extended, if necessary.^{28,50,51}

When the usual technique cannot ensure a proper closure of the incision, some authors consider the use of special materials for the closure (e.g. a spinal cord needle,⁵² a 2 mm trocar,⁵¹ or a Deschamps needle³⁵ to close the fascia and peritoneum together).

The use of a polypropylene double-sided mesh (ePTFE), such as that described by Moreno-Sanz⁵³ or Sánchez-Pernaute,⁵⁴ may also be used to ensure a proper closure of the umbilical orifice.³ However, the use of prophylactic mesh in trocar holes has not yet been evaluated with adequate follow-up studies.

Lastly, the increasingly common use of blunt trocars may be a step towards preventing the occurrence of TSIH,⁷ as a number of series appear to confirm.⁵⁵⁻⁵⁹ There are some authors who argue that laparoscopic port sites do not require fascial closure if these trocars are used away from the midline.⁶⁰ However, like Tonouchi et al,³ we believe that prospective studies with a sufficient number of cases should be performed before considering such statements as valid.

Conclusions

Reviewing the literature on TSIH showed us that the rate of occurrence of these hernias is not negligible and should therefore be taken into consideration when starting a laparoscopic procedure.

TSIH is a complication that is often subclinical, and so the actual incidence may be much higher than that reflected in most of the series. Therefore, regularly monitored and controlled studies of laparoscopic surgery patients are necessary to find out its impact.

The trocar hole diameter is a fundamental factor in the emergence of TSIH. Therefore, ≥ 10 mm holes must be properly closed at all levels using all technical means available. Any predisposing surgical and patient factors should be properly assessed, and closing all holes of any diameter is advised in obese, diabetic or patients older than 60 years.

Further prospective studies with a large number of cases including all these factors are needed before drawing further conclusions.

Conflicts of interest

The authors affirm they have no conflict of interest.

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.
- Tonouchi H, Ohmori Y, Kobayashi M, Kusunoki M. Trocar site hernia. *Arch Surg*. 2004;139:1248-56.
- Fear RE. Laparoscopy: a valuable aid in gynecologic diagnosis. *Obstet Gynecol*. 1968;31:297-309.
- Montz FJ, Holschneider CH, Munro MG. Incisional hernia following laparoscopy: a survey of the American Association of Gynecologic Laparoscopists. *Obstet Gynecol*. 1994;84:881-4.
- Kadar N, Reich H, Liu CY, Manko GF, Gimpelson R. Incisional hernias after major laparoscopic gynecologic procedures. *Am J Obstet Gynecol*. 1993;168:1493-5.
- Matthews BD, Heniford BT, Sing RF. Preperitoneal Richter hernia after a laparoscopic gastric bypass. *Surg Laparosc Endosc Percutan Tech*. 2001;10:34-8.
- 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;12:121-3.
- 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.
- Rabinerson D, Avrech O, Neri A, Aschoenfeld A. Incisional hernias after laparoscopy. *Obstet Gynecol Surv*. 1997;52:701-3.
- Plaus WJ. Laparoscopic trocar site hernias. *J Laparoendosc Surg*. 1993;3:567-70.
- Maio A, Ruchman RB. CT diagnosis of post laparoscopic hernia. *J Comput Assist Tomogr*. 1991;15:1054-5.
- Mayol J, García-Aguilar J, Ortiz-Oshiro E, De Diego Carmona JA, Fernández-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.
- Nassar AH, Ashkar KA, Rashed AA, Abdulmoneum MG. Laparoscopic cholecystectomy and the umbilicus. *Br J Surg*. 1997;84:630-3.
- 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;11:115-9.
- Ahmad SA, Schuricht AL, Azurin DJ, Arroyo LR, Paskin DL, Bar AH, et al. Complications of laparoscopic cholecystectomy: the experience of a university-affiliated teaching hospital. *J Laparoendosc Adv Surg Tech A*. 1997;7:29-35.
- Larson GM, Vitale GC, Casey J, Voyles CR. Multipractice analysis of laparoscopic cholecystectomy in 1983 patients. *Am J Surg*. 1992;163:221-6.
- Birdi I, Hunt TM, Veltch PS, Armon M, Jervis P, Barr C. Laparoscopic cholecistectomy in Leicester: an audit of 555 patients. *Ann R Coll Surg Engl*. 1994;76:390-5.
- Voyles CR, Petro AB, Meena AL, Hqaick AJ, Koury AM. A practical approach to laparoscopic cholecystectomy. *Am J Surg*. 1991;161:365-70.
- Duca S, Bala O, Al-Hajjar N, Iancus C, Piuia IC, Munteanu D, et al. Laparoscopic cholecistectomy: incidents and complications. A retrospective analysis of 9542 consecutive laparoscopic operations. *HBP*. 2003;3:152-8.
- Baird DR, Wilson JP, Mason EM, Duncan TD, Evans JS, Luke JP, et al. An early review of 800 laparoscopic cholecystectomies at a university-affiliated community teaching hospital. *Am Surg*. 1992;58:206-10.
- 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 JG, 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, Zinzindohoué F, Elian N, Cherrak A, Blanche JP, Berta JL, et al. Adjustable gastric banding in a public university hospital: prospective analysis of 400 patients. *Obes Surg*. 2002;12:93-9.
- Uslu HY, Erkek AB, Cakmak A, Kepenekci I, Sozener U, Kocaay FA, et al. Trocar site hernia after laparoscopic cholecystectomy. *J Laparoendosc Adv Surg Tech A*. 2007;17:600-3.
- Callery MP, Strasber SM, Soper NJ. Complications of laparoscopic general surgery. *Gastrointest Endosc Clin N Am*. 1996;6:423-44.
- Coda A, Bossotti M, Ferri M, Mattio R, Ramellini G, Poma A, et al. Incisional hernia and fascial defect following laparoscopic surgery. *Surg Laparosc Endosc Percutan Tech*. 2000;10:34-8.
- Bowrey DJ, Blom D, Crookes PF, Bremner CG, Johansson JL, Lord RV, et al. Risk factors and the prevalence of trocar site herniation after laparoscopic funduplication. *Surg Endosc*. 2001;15:663-6.

31. Susmallian S, Ezri T, Charuzi I. Laparoscopic repair of access port site hernia after Lap-band system implantation. *Obes Surg*. 2002;12:682-4.
32. Sanz López R, Martínez Ramos C, Núñez Pena JR, Ruiz de Gopegui M, Pastor Sirera L, Tamales Escobar S. Incisional hernias after laparoscopic vs. open cholecystectomy. *Surg Endosc*. 1999;13:922-4.
33. 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;32:790-1.
34. Imme A, Cardi F. Incisional hernia at the trocar site in laparoscopic surgery. *Chir Ital*. 2006;58:605-9.
35. 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.
36. Freedman AN, Sigman HH. Incarcerated paraumbilical incisional hernia and abscess: complications of a spilled gallstone. *J Laparoendosc Surg*. 1995;5:189-91.
37. Boughy 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;13:55-8.
38. Fitzgibbons RJ, Annibali R, Litke BS. Gallbladder and gallstone removal, open versus closed laparoscopy, and pneumoperitoneum. *Am J Surg*. 1993;165:497-504.
39. Wagner M, Farley GE. Incarcerated hernia with intestinal obstruction after laparoscopic Cholecistectomy. *WMJ*. 1994;93:169-71.
40. Nakajima K, Wasa M, Kawahara H, Hasegawa T, Soh H, Taniguchi E, et al. Revision laparoscopy for incarcerated hernia at a 5-mm trocar site following pediatric laparoscopic surgery. *Surg Laparosc Endosc Percutan Tech*. 1999;9:294-5.
41. 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;9:523-5.
42. Paya K, Wurm J, Fakhari M, Felder , Puig R, Puig S. Trocar site hernia as a typical postoperative complications of minimally invasive surgery among preschool children. *Surg Endosc*. 2008;22:2724-7.
43. Waldhausen JH. Incisional hernia in a 5-mm trocar site following pediatric laparoscopy. *J Laparoendosc Surg*. 1996;6(suppl 1):S89-90.
44. Horgan PG, O'Connell PR. Subumbilical hernia following laparoscopic cholecystectomy. *Br J Surg*. 1993;80:1595.
45. Hass B.E, Schrager RE. Small bowel obstruction due to Richter's hernia after laparoscopic procedures. *J Laparoendosc Surg*. 1993;3:421-3.
46. Crist DW, Gadacz TR. Complications of laparoscopic surgery. *Surg Clin North Am*. 1993;73:265-89.
47. Ramachandran CS. Umbilical hernial defects encountered before and after abdominal laparoscopic procedures. *Int Surg*. 1998;83:171-3.
48. 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;10:227-8.
49. Lee JH, Kim W. Strangulated small bowel hernia through the port site: a case report. *World J Gastroenterol*. 2008 Nov 28;14:6881-3.
50. Velasco JM, Vallina VL, Bonomo SR, Hieken TJ. Post laparoscopic small bowel obstruction: rethinking its management. *Surg Endosc*. 1998;12:1043-5.
51. 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.
52. 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.
53. Moreno-Sanz C, Picazo-Yeste JS, Manzanera-Díaz M, Herrero-Bogajo ML, Cortina-Oliva J, Tadeo-Ruiz G, et al. Prevention of trocar site hernias: Description of the safe port plug technique and preliminary results. *Surg Innov*. 2008;15:100-4.
54. Sánchez-Pernaute A, Pérez-Aguirre E, García Botella A, Rodríguez L, Antona EM, Cabeza J, et al. Prophylactic closure of trocar orifices with an intraperitoneal mesh (ventralex) in laparoscopic bariatric surgery. *Obes Surg*. 2008;18:1489-91.
55. Leibl B.J, Schmedt CG, Schwarz J, Kraft K, Bittner R. Laparoscopic surgery complications associated with trocar tip design: review of literature and own results. *J Laparoendosc Adv Surg Tech A*. 1999;9:135-40.
56. Bhoyrul S, Payne J, Steffes B., Swanstrom L, Way LW. A randomized prospective study of radially expanding trocars in laparoscopic surgery. *J Gastrointest Surg*. 2000;4:392-7.
57. Holzinger F. Trocar site hernias. A rare but potentially dangerous complication of laparoscopic surgery. *Chirurg*. 2002;73:899-904.
58. Johnson WH, Fecher AM, McMahon RL, Grant JP, Pryor AD. VersaStep trocar hernia rate in unclosed fascial defects in bariatric patients. *Surg Endosc*. 2006;20:1584-6.
59. Liu CD, McFadden DW. Laparoscopic port sites do not require fascial closure when nonbladed trocars are used. *Am Surg*. 2000;66:853-4.
60. Boldó E, Perez de Lucia G, Aracil JP, Martin F, Escrig J, Martinez D, et al. Trocar site hernia after laparoscopic ventral hernia repair. *Surg Endosc*. 2007;21:798-800.