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PORT SITE INCISIONAL HERNIA AFTER MINIMAL ACCESS SURGERY

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Abstract

Incisional hernia is a common sequel to open abdominal surgery, affecting 5–15% of patients. The introduction of laparoscopic surgery into clinical routine more than 20 years ago has dramatically changed the field of surgery. It is commonly held that the frequency of incisional hernia has been reduced since the introduction of minimal access surgery. The incidence of port site hernia ranges from 1% to 6%.

The aim of this study is to identify most common causes of port site incisional hernia.

This is a retrospective study of 2116 patients who underwent laparoscopic surgery between January 2006 and December 2010. The information obtained according to indication of surgery, onset of hernia, clinical risk factors for incisional hernia like age& sex, BMI, co-morbidity, and those related to surgical factors such as port site, port size, port site infection and abdominal access techniques. The data were retrieved for patients who developed port-site incisional hernia (PSIH).

The incisional hernia rate for the entire series was 2.5%. Most port site hernias developed in the 10 mm port, in the umbilical and supra umbilical, midline and 0% for the off-midline. There was statistically significant difference in patient's related risk factors regarding age, BMI and wound infection with development of port site hernias.

Conclusion: In this series, the 10mm port in midline site is a significantly higher cause for incisional hernia than the off-midline and smallest port size. Open first access technique, obesity and port site infection also significantly increase the incidence of port site incisional hernia.

Introduction

Incisional hernia is a bulge or protrusion that occurs near or directly along prior abdominal surgical incision, it can occur at the site of any type of abdominal surgery from the breastbone down to the groin[1,2]. Incisional hernia is a common sequel to open abdominal surgery, affecting 5–15% of patients. The reported prevalence of this complication varies between studies, depending upon the type of incision employed, the patient group studied, and the duration of follow-up[3-5].

The introduction of laparoscopic surgery into clinical routine more than 20 years ago has dramatically changed the field of surgery. An abundance of case studies, randomized controlled trials and several carefully performed meta-analyses have demonstrated the advantages of this new technique on the highest level of evidence-based medicine[4,6,7]. Patients undergoing laparoscopic operations have less postoperative pain, less impairment of vital functions, a shorter hospital stay and they resume usual activities more rapidly[6,7]. Laparoscopy is said to be the third patient-friendly revolution in medicine following the introduction of asepsis and anesthesia. It is commonly held that the frequency of incisional hernia has been reduced since the introduction of minimal access surgery. Although there have been a number of case reports describing herniation at

laparoscopic trocar sites[6-10], there have been surprisingly few studies[11,12] examining the exact frequency of this complication after laparoscopic surgery. These studies show that the incidence of port site hernia ranges from 1% and 6%. Fear[13] first reported a trocar site hernia in his large series on laparoscopy in gynecological diagnosis. Crist and Gadacz[14] defined port site hernia as the development of a hernia at the cannula insertion site, and this term has also been used in other articles.

Classification:

Hitoshi Tonouchi et al[15] classify trocar site hernias into 3 types according to the reported cases (Figure 1). 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.

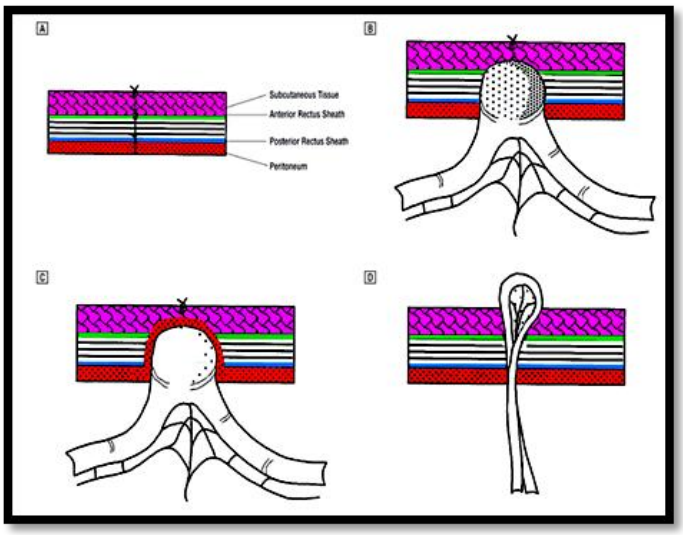


Figure 1: Classification of the 3 trocar site hernias. A, Normal stab wound of trocar site. B, Early-onset type: dehiscence of anterior and posterior fascial plane and peritoneum. C, Late-onset type: dehiscence of anterior and posterior fascial plane. Peritoneum constitutes hernia sac. D, Special type: dehiscence of whole abdominal wall. Protrusion on intestine and/or omentum.(Hitoshi Tonouchi et al: Trocar Site Hernia Arch Surg. 2004;139:1248-1256).

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 (eg, greater omentum) is recognized. The first case, reported by Fear[13] 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[16-18]. We can diagnose the special type without any modalities. With the early-onset type we are able to locate the site of incarceration by computed tomography and surgically reduce and repair the hernia with minimal enlargement of the puncture wound, thus avoiding a full laparotomy[19].

An unknown proportion of asymptomatic patients do not get physically examined[20], although asymptomatic lumps are sometimes found in late-onset–type hernias. There have been no reports on whether such insidious trocar site hernias in asymptomatic patients are worthy of any further examination[20].

In general the factors influencing healing of a wound[26]: Site of the wound, Structures involved, Mechanism of wounding (Incision, Crush, Crush avulsion), Contamination (Foreign bodies, bacteria), Loss of tissue.

Other local factors: Vascular insufficiency (arterial or venous), Previous radiation, Pressure.

Systemic factors: Malnutrition or vitamin and mineral deficiencies, Disease (e.g. diabetes mellitus), Medication (e.g. steroids), Immune deficiencies [e.g. chemotherapy, acquired immuno-deficiency syndrome (AIDS)] &Smoking.

Aim of Study

The aim of this study is to identify most common cause of port site incisional hernia regarding the port site, port size, first port access (close versus open), port closure or not and port site infection as local causes and Body Mass Index (BMI), immunosuppressants and smoking as a general factors.

Patients & methods

Study Design

This is a retrospective analysis where the required information collected from medical records of 2116 patients who underwent laparoscopic procedures for different indications under the care of a multiple consultant surgeons in the department of surgery Basrah General Hospital between January 2006 and December 2010. The information was obtained regarding the indication of surgery, onset of hernia, clinical risk factors for incisional hernia like age ,sex, BMI, smoking and co-morbidity, and those related to surgical factors such as port site, port size, port site infection and abdominal access techniques. Both open and closed technique was used to create the pneumoperitoneum in all patients. In our hospital we used 5-mm and 10-mm ports and a 3-edged reusable trocar for creation of ports. The data were retrieved for patients who developed port-site incisional hernia (PSIH). The analysis and follow-up of these complications are reported here in.

Selection Criteria

All patients who underwent laparoscopic surgery under the care of any laparoscopic surgeon in our hospital were included in this study regardless of American Society of Anesthesiology grading, body mass index, type of procedure, sex and age of the patient.

Abdominal Access

Pneumoperitoneum created by closed access technique was the practiced way of access by some surgeons in our hospital. Open fielding technique involves a small incision over the everted umbilicus at a point where the skin and peritoneum are adjacent were advocated by other surgeons. Palmer's technique (a small incision is made to allow the insertion of first port through left sub-costal margin) was the first access in patients underwent venteral hernia repair laparoscopically. The site for secondary port inset under direct vision, transillumination with illuminated telescope tip was done first to locate avascular area to avoid injury of subcutaneous vessels.

Port site and size

Transverse or vertical 1-1.2 cm midline incision in inferior or superior crease of umbilicus and transumbilical were used as first access in some patients and supra umbilical off midline (just right to midline) and Palmer's incisions were used in others. Secodary port were put in epigastrium 10 mm also in some patients transverse and vertical in other, in mid line or just right to mid line. All 5 mm ports were inserted laterally in all patients.

Withdrawal of instruments and ports:

Once the surgery is finished, all the instruments were removed carefully under vision. All the accessory ports were also removed and the gas was removed by releasing the valve of 10 mm cannulas. The primary port was taken out at last, when telescope introduced in and the cannula is pulled over telescope to prevent suction of omentum or bowel.

Port closure Technique

The ports were cleaned with 10% povidone iodine solution before closure. At the end of the procedure, the port pressure was released. Closure of the fascial defect and skin were performed for all 10 mm ports in opened techniques and only skin in closed techniques using 2.0 polyglycolic or polydiaxonone (PDS) sutures. The 5 mm ports were not need to be closed.

Port site infections

Port site infection information's were taken from patients whom developed port site hernia, witness of pus inside wound indicate infection.

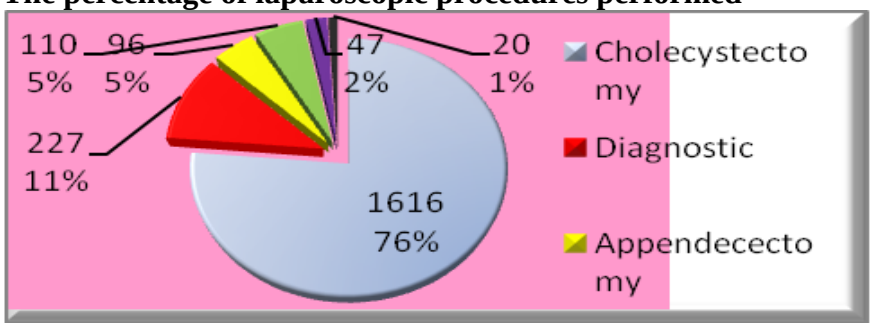
Statistical Analysis

Data were fed on computer program using SPSS (statistical package for social science-version 11). The results were presented in tables and Chi-square test and Fishers exact test was done. A $P \leq 0.05$ was considered to be statistically significant.

Results

Different laparoscopic procedures were performed in 2116 patients (figure 2). These included 1616 cholecystectomies, 96 appendicectomies, 227 diagnostic laparoscopies, 110 laparoscopic varico-celectomy, 47 Laparoscopic venteral hernia repair and 20 laparoscopic ovarian cystectomy.

Figure 2: The percentage of laparoscopic procedures performed



The mean age of patients was 52 years (range, 17-81). The 54 port-site incisional hernias (PSIH) were subsequently repaired as elective cases. The incidence therefore is 2.5%.Forty seven hernias developed after cholecystectomy and five hernias after diagnostic laparoscopy and two after laparoscopic appendicectmies. No immediate major complications or mortality was reported in relation to port-site hernia complications. The onset of hernia in all laparoscopic procedures was late type (Table I). Taking into consideration the above mentioned risk factors for development of Port Site Incisional Hernia (PSIH), table II showing relationship between surgical factors and developed port site incisional hernia after Minimal Access Surgery (MAS) and its statistical significance and table III showing relationship between clinical risk factors and development of incisional hernia after MAS and its statistical significance.

Table I: The Incidence of Port-site Hernia for Specific Procedures

Type of laparoscopic procedure	No. of patients	No. of port-site hernia and %	Onset of hernia
Cholecystectomy	1616	47(2.2%)	4-22 months
Diagnostic	227	5(0.2%)	4-14 months
Appendecectomy	96	2(0.09%)	5-17 months
Varicocelectomy	110	0	
Venteral hernia repair	47	0	
Ovarian cystectomy	20	0	
Total	2116	54(2.5%)	

Table II: Relationship between surgical risk factors and developed port site hernia.

Parameter	Port site hernia	Total number	P.value
Port size			
10mm			
5mm			
Port site			
Midline			
Supra umbilical	20	54	S
Infra umbilical	30		
Epigastrium	4		
Off midline			
Right supra umbilical (just right to midline)	0		
Port site infection			
Present	34	54	S
Absent	20		
Abdominal access			
Open	40	54	S
Close	14		

Table III: Relationship between clinical risk factors and port site hernia

Clinical risk factor	Port site hernia	Total number	P.value
Age Under 40 year Above 40 year	 24 30	54	NS
Sex (M/F) Male Female	 4 50	54	S
B.M.I(Kg/m2) Under 25Kg/m2 Above 25 Kg/m2	 18 36	54	S
Co.morbid Present Absent	 7 47	54	NS
Smoking Present Absent	 6 48	54	NS

NS: Not significant (P≥0.05) and S:significant (P≤0.05)

Discussion

Incisional hernias are a common problem after laparotomy. The incidence ranges from 5% to 15%[3]. Extensive studies have investigated how to repair these hernias after laparotomy (mesh vs no mesh), and recurrences still remain high with mesh repair (up to 20%)[2]. Since the evolution of laparoscopy, incisional hernia rates have been analyzed for many different surgical procedures (gastrointestinal, gynecologic, and urologic). The incidence of PSIH is variable from center to center, depending on several factors including surgical technique and, of course, surgical experience. Most of the reports discuss port-site hernias, and most conclude that any port-site hernia 10 mm or larger should have closure of the fascia[21,22]. Some also advocate that 5-mm port sites subjected to extensive manipulation should have closure of the fascia as well[22]. In our retrospective study the overall incisional hernia rate was 2.5%, which is well within the reported rates which approximately 1% to 6% of patients[21-27]. Interestingly, we found that all our incisional hernias were in the midline, possibly because of the absence of supporting muscle. Regarding port size we found that all hernias were develop in 10 mm port. Crist and Gadacz[14] regarded the use of a large trocar as one of the factors predisposing to the development of a hernia. Many authors have mentioned that a direct relationship of trocar size to the risk of subsequent herniation seems reasonable[14]. We also analyzed some of the factors that could play a role in the formation of trocar-site hernias in addition to the trocar site and trocar diameter including: the, the trocar design, preexisting fascial defects, and some operations and patient-related factors like age, wound infection rate, diabetes and other co-morbidity, smoking and BMI. With respect to these risk factors, we found statistically significant difference ($p \leq 0.05$) between the midline and off-midline port site, 10 mm trocar size versus 5mm size, obese and non obese patients. It is recommended that all 10 mm trocar sites be closed, incorporating the peritoneum into the fascial closure to obliterate the preperitoneal space. The thick preperitoneum is a potential space that allows for the development of a Richter hernia despite adequate fascial closure[28-32]. Many authors believe that inserting the 10-mm lateral trocar in an oblique fashion or as a Z-tract will reduce hernia formation by putting the external and internal fascias at different levels[33,34].

In a randomized, observer-blinded study, Tarnay et al[35] found that blunt conical trocar–cannula systems resulted in significantly smaller fascial defects than the widely used pyramidal and two cutting–dilating trocar–cannula systems. These smaller fascial defects could reduce the risk of incisional hernia and dehiscence. In our study we found that the port site hernias were more in open first access technique (40 vs 14) hernias after open and closed access respectively, although the fascial defects were not closed in the closed technique, closure of these wounds generally is quite difficult and rarely complete due to the small opening of he skin incision. This was in reverse to Mayol et al[36]. In that the incidence of trocar site hernia in closed laparoscopy was higher than in open. Regarding port site we found that most of hernias were develop in umbilical and paraumbilical region and in midline rather than in off midline site, this was the same as with Azurin et al[37]. And Ahmad et al[38] whom reported that an incidental umbilical hernia, which existed preoperatively, lead to a trocar site hernia. Nassar et al[39] also mentioned the incidence of umbilical or paraumbilical fascial defects in 12% of patients who had preoperative laparoscopic chole-cystectomy. Plaus[40] mentioned that puncture sites off the midline might be

less susceptible to herniation due to the overlapping of muscle and fascial layers. Duron et al[5] reported that the lateral wall is composed of 2 fascial planes and muscle, making it theoretically less prone to dehiscence. There have been two other explanations for this. First, that the frequent use of a large trocar in this area leads to a trocar site hernia in the umbilical and paraumbilical region[18] and second, that the small intestine is less often in contact with a lateral trocar site[5]. Four from total of 54 port site hernias in our series were develop in epigastrium, we thing that the cause was stretching of the Port Site for retrieval of specimens[36]. Nassar et al[39] mentioned the extension of the fascial defect is the most significant risk factor in their prospective study. Kopelman et al[41] emphasized fascial closure in stretching the trocar site, but McMillan and Watt[42] illustrated the need for careful fascial closure of all 10-mm trocar site–related wounds whether or not the gallbladder has been removed through them, and whether or not the wound have been extended. It is certain that forced dilation of the fascial layer is proposed as an etiological mechanism[43]. Duron et al[5] stated that the effects of Compressed Carbon dioxide might push the omentum or intestinal loops through the point of insertion in the fascia. The protruding structures might then be trapped by abdominal muscle contractions[4,9,40]. He was stated that a partial vacuum is created when the port is withdrawn, thus, drawing omentum and intestines into the fascial defect[23]. Regarding patient-related factors and development of port site hernia, in our study although some of these did not reach statistical significance, the morbidly obese are at a high risk for hernias because of their substantially thicker preperitoneal space and elevated intra-abdominal pressure[12]. There was a tendency to improperly close the fascial defect in obese patients. We consider that this technical flaw has had an influence on the high incidence of trocar site hernias in obese patients. A postoperative port site wound infection is one of the factors predisposing the development of a hernia[14,36]. Callery et al[26] reported that most often the umbilical incision is infected in laparoscopic procedures. Late-onset–type trocar site hernias might be related to infection from the stab wound, but there have been no large series reports clarifying any relationship between trocar site hernias and wound infection in digestive surgery. All type of hernias in our study were late in type and all hernias were repaired electively.

Conclusion

In this series, the 10mm port in midline site is a significantly higher cause for incisional hernia rate than the off-midline and smallest port size. Open first access technique, obesity and port site infections also significantly increase the incidence of port site incisional hernia.

References

1. Incisional hernias. North Penn Hernia Institute. Lansdale, Pennsylvania. http://www.hernia. tripod.com/incisional.html. Accessed 22 June 2006 .
2. O'Dwyer PJ, Courtney CA. Factors involved in abdominal wall closure and subsequent incisional hernia. Surg J R Coll Surg Edinb Ireland 2003 1:17–22.
3. Ger R. The management of certain abdominal herniae by intra-abdominal closure of the neck of the sac. Ann Roy Coll Surg Engl 1982;64:342–344.
4. 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;13:922-924.
5. 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;135:208-212.
6. Mouret P. From the first laparoscopic cholecystectomy to the frontiers of laparoscopic surgery: the future prospectives. Dig Surg 1991;8:124.
7. Bittner R. The standard of laparoscopic cholecystectomy. Langenbecks Arch Surg 2004;389:157–163.
8. Trondsen E, Reiertsen O, Andersen OK, et al. Laparoscopic and open cholecystectomy. A prospective, randomized study. Eur J Surg 1993;159:217–221.

9. Wagner M, Farley GE. Incarcerated hernia with intestinal obstruction after laparoscopic cholecystectomy. WMJ. 1994;93:169-171.
10. Berggren U, Gordh T, Grama D, et al. Laparoscopic versus open cholecystectomy: hospitalization, sick leave, analgesia and trauma responses. Br J Surg 1994;81:1362–1365.
11. Hendolin HI, Paakonen ME, Alhava EM, et al. Laparoscopic or open cholecystectomy: a prospective randomised trial to compare postoperative pain, pulmonary function and stress response. Eur J Surg 2000;166:394–399.
12. 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;12:121-123.
13. Fear RE. Laparoscopy: a valuable aid in gynecologic diagnosis. Obstet Gynecol. 1968;31:297-309.
14. Crist DW, Gadacz TR. Complications of laparoscopic surgery. Surg Clin North Am. 1993;73:265-289.
15. Hitoshi Tonouchi, MD, PhD; Yukinari Ohmori, MD; Minako Kobayashi, MD, PhD; Masato Kusunoki, MD, PhD. Trocar Site Hernia, Arch Surg. 2004;139:1248-1256.
16. Horgan PG, O'Connell PR. Subumbilical hernia following laparoscopic cholecystectomy. Br J Surg. 1993;80:1595.
17. 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;17:544-546.
18. 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.
19. 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;4:325-326.
20. Maio A, Ruchman RB. CT diagnosis of post laparoscopic hernia. J Comput Assist Tomogr. 1991;15:1054-1055.
21. Kadar N, Reich H, Liu CY, Manko GF, Gimpelson R. Incisional hernias after major laparoscopic gynecologic procedures. Am J Obstet Gynecol 1993 5:1493–1495.
22. Neshat C, Nezhat F, Seidman DS, Neshat C Incisional hernias after operative laparoscopy. J Laparoendosc Adv Surg Tech 1997 A 2:111–115.
23. Bowrey DJ, Blom D, Crookes PF, Bremner CG, Johansson JL, Lord RV, Hagen JA, DeMeester SR, DeMeester TR, Peters JH. Risk factors and the prevalence of trocar-site herniation after laparoscopic fundoplication. Surg Endosc 2001, 15: 663–666.
24. Chatzipapas IK, Hart RJ, Magos A. Simple technique for rectus sheath closure after laparoscopic surgery using straight needles, with review of the literature. J Laparoendosc Adv Surg Tech A 1999, 9: 205–209.
25. Holzinger F, Klaiber C. Trocar-site hernias: a rare but potentially dangerous complication of laparoscopic surgery. Chirurg 2002, 73: 899–904.
26. Callery MP, Strasberg SM, Soper NJ. Complications of laparoscopic general surgery. Gastrointest Endosc Clin N Am. 1996;6:423-444.
27. Buchweitz O, Wulfing P, Kiesel L. A prospective randomized trial of closing laparoscopic wounds by transcutaneous vs subcuticular suture or adhesive papertape. Surg Endosc2005, 19: 148–151.
28. Jorge C, Carlos M, Alejandro W. A simple and safe technique for closure of trocar wounds using a new instrument. Surg Laparosc Endosc 1996, 6: 392–393.
29. Chapman WH III Trocar-site closure: a new and easy technique. J Laparoendosc Adv Surg Tech A 1999, 9: 499–502.
30. Di Lorenzo N, Coscarella G, Lirosi F, Gaspari A. Port-site closure: a new problem, an old device JSLS 2002, 6(2): 181–3.
31. Conlon KC, Curtin J. A simple technique for the closure of laparoscopic trocar wounds. J Am Coll Surg 1995, 181: 565–566.
32. Di Lorenzo N, Coscarella G, Lirosi F, Gaspari A (2002). Port-site closure: a new problem, an old device JSLS 6(2): 181–3.
33. Fear R. Laparoscopy, a valuable aid in gynecologic diagnosis. Obstet Gynecol 1968, 31: 297.
34. Hellinger MD, Larach SW, Ferrara A, Blake TB. Effective peritoneal and fascial closure of abdominal trocar sites utilizing the Endo-Judge. J Laparoendosc Surg1996, 6: 329–332.
35. Tarnay CM, Glass KB, Munro MG. Incision characteristics associated with six laparoscopic trocar–cannula systems: a randomized, observer-blinded comparison. Obstet Gynecol1999, 94: 89–93.
36. 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;21:529-533.
37. 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;61:718-720.
38. 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.
39. Nassar AH, Ashkar KA, Rashed AA, Abdulmoneum MG. Laparoscopic cholecystectomy and the umbilicus. Br J Surg. 1997;84:630-633.
40. Plaus WJ. Laparoscopic trocar site hernias. J Laparoendosc Surg. 1993;3:567-570.
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;4:325-326.
42. McMillan J, Watt I. Herniation at the site of cannula insertion after laparoscopic cholecystectomy. Br J Surg. 1993;80:915.
43. De Giuli M, Festa V, Denoye GC, Morino M. Large postoperative umbilical hernia following laparoscopic cholecystectomy: a case report. Surg Endosc. 1994;8:904-905.