THE COMPARISON OF PORT-SITE HERNIA IN OPEN VERSUS CLOSED TECHNIQUES FOLLOWING LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT:

Background: Port-site hernia is a rare but potentially serious complication of laparoscopic cholecystectomy. This study aimed to review the current literature, assess the incidence and causes of port-site hernias, and identify methods to reduce the risk.

Methods: The study was carried out at Surgical 'B' unit, PGMI LRH Peshawar from January 2008 to January 2010.It was a Prospective Interventional Randomized study.All patients suffering from symptomatic Gallstone underwent clinical evaluation and appropriate investigations. Patients who underwent laparoscopic cholecystectomy the frequency of port-site hernia in both open and closed method was analyzed. The objective of the study was to compare the frequency of port-site hernia in both open and closed techniques in laparoscopic cholecystectomy.

Results: 400 laparoscopic cholecystectomy were done. 200 patients by open technique and 200 patients by closed technique. Among them 350(75%) were female and 50(25%) were male. The youngest patient was 26 years of age while the oldest 70 years of age. Out of 400 patients, 4(1%) patients had port-site hernia. 1(0.5%) patient having port-site hernia had open technique, while the remaining 3(1.5%) patients who developed port-site hernia had closed technique (p=0.004).

Conclusion: Meticulous closure of the fascia, avoidance of unnecessary wound extension, the use of non-absorbable sutures when faced with defects more than 2 cms in size. Completely defining the extent of pre-existing hernia and repairing this at the time of port site closure, are recommended to minimize the incidence of port-site hernia after laparoscopic surgery.

Key Words: Laparoscopic cholecystectomy, Hasson technique, Port-site hernia (PSH) , Trocar-site hernia , Veress needle.

INTRODUCTION

Since the first laparoscopic cholecystectomy (LC) performed by Prof. Dr. Med Erich Mühe of Boblingen, Germany on September 12, 1985[1] the procedure has become widespread, significantly changing the surgical management of gallbladder disease. Tonouchi et al [2] recognized the first report in the literature of a port-site hernia (PSH) by Fear in the context of gynecological surgery (1968)[3].The first publication of a PSH following LC was in 1991 by Maio et al [4] Whilst this complication has long since been recognized, its significance is becoming more important with the increasing number of patients being treated in this way. The incidence of PSH in a range of laparoscopic procedures has been described as between 0.14% and 22% [5-9]. In addition to pain, PSH can lead to severe complications, including bowel obstruction, strangulation, and perforation.[2,9-15] Laparoscopic equipment and techniques have developed considerably over recent years. Numerous types of trocar designs are in use, and opinion on fascial closure varies considerably. It is not known whether the incidence of PSH has changed over time with modifications in technique.[16]

A difficulty with interpretation of the incidence is that PSH are often diagnosed late relative to the usual follow-up duration for LC, with many centers not offering any routine follow-up. There are few prospective studies designed with the aim of identifying postoperative PSH.[11-13,17-18] In these studies, the overall incidence was 3.2%.Three large studies published prior to 1995 were identified.[19-22] The incidence of PSH reported in each study was 1 in 500 (0.20%),[19] 3 in 1983 (0.15%),[20] and 1 in 800 (0.13%),[21]respectively. This equates to an overall incidence of 0.18%, which is considerably lower than that reported above in more recent studies. In one report, the study period was 9 months, and in the other 2, the study period was 15 months.[19,20,22] Follow-up was not reported beyond the study period; therefore, only early hernias were identified through this means. There may also have been a lack of awareness of the complication, because

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these articles reported the initial experience with LC.

A classification of PSH into early (dehiscence of fascial planes and peritoneum), late (dehiscence of fascial plane with intact peritoneal hernia sac), and special (dehiscence of whole abdominal wall) types has been described[2] but not widely used. In the majority of cases, PSH is not associated with any strangulation or bowel obstruction. In cases of strangulation, the hernia is typically of a Richter's type.[10,17,24] The interval between operation and diagnosis of PSH varies between studies and depends on follow-up regimes. When associated with few symptoms, they often present late, and where data were available, time to diagnosis ranged from 5 days to 3 years with an average of 9.2 months.[10]

MATERIAL AND METHODS:

All patients of gallstone disease were admitted through out patient department or casuality. Detailed history, clinical examination and investigations such as full blood count, ESR, and blood sugar random, serum urea and creatinine, complete liver function tests, HBsAg, AntiHCV antibodies, chest X-rays, ECG, ultrasound abdomen especially hepatobilliary system including size of CBD, wall thickness of gall bladder.

INCLUSION CRITERIA:

Symptomatic gallstones

Acute cholecystitis

Chronic cholecystitis

EXCLUSION CRITERIA:

Gallbladder mass

Acute pancreatitis

Contraindications to laparoscopy and general anesthesia.

The clinical study protocol was approved by Hospital Ethical Committee and the informed consent was taken from each patient also explaining the risk of conversion to open operation. Patients were eligible for enrollment in the study if they met the above mentioned inclusion criteria.

PROCEDURE:

The classical 4-port technique was used for LC in the majority of cases. As a routine protocol after induction anesthesia, the abdomen was thoroughly examined to rule out organomegly or any other pathlology. For an un-scarred abdomen, the initial site of Hasson's port or veress needle insertion was through a vertical incision at the base of umbilicus. For cases of paraumbilical laprotomy scars, the alternative site most commonly used was palmer's point located 3cm below the left costal margin in the midclavicular line. A nasogastric tube was routinely placed in the stomach before access was gained through palmer's point. In case of open technique the rectus sheath & peritoneum was opened under vision, stay sutures with vicryl 2/0 applied to the rectus sheath & Hasson's port was put in, while in case of closed technique right size veress needle was chosen & held with the little finger of the right hand acting as a guard, the needle was introduced after a proper abdominal wall left with the left hand. The needle intra peritoneal position was confirmed by an audible double click & normal saline drop test. During insufflations of CO2, a free flow of gas, a gradual rise in pressure, uniform abdominal distention, and obliteration of liver dullness was ensured. When an intraadominal pressure of 12 to 13 mmHg was achieved the primary trocar was blindly introduced. Laparoscopic cholecystectomy was performed in all patients. Data were collected on a separate Performa especially designed for the study. Randomization was done by Lottery method, with jar having 400 chits, 200 each of open and close technique.

RESULTS

Among 400 cases of laparoscopic cholecystectomy 350(75%) patients were female and 50(25%) were male, with female to male ratio of 7:1.. there mean age was 42 years (range 25-70yrs). 200 patients underwent laparoscopic cholecystectomy by open technique while 200 patients by closed technique. In open technique 170(75%) patients were female and 30(25%) were male with female to male ratio of 5.8:1.In closed technique female were 175(87.5%) and male were 25(12.5%) with female to male ratio of 7.5:1. According to Analysis of variance (ANOVA) the age was comparable between the two groups (p =0.912). The sex ratio as determined by Chi-square analysis, was also comparable (p =0.853).The mean operative time in open technique

Table 1: Gender, Age, Mean Operative Time in Open & Closed Groups

	Open	Closed	P value
Female : Male (total)	5.8:1(200)	7.5:1(200)	0.853
Median age	42(26-70)	40(28-65)	0.912
Mean operative time (min)	45±25.1	43±21.3	0.03

Table 2: Incidence of Port-site Henia in open versus closed Technique

	Patients	%age	P value
Open technique	1	0.5	0.004
Closed technique	3	1.5	

TABLE 3: Large Studies Presenting Port-site Hernias Following Laparoscopic

Author	No of patients	No of hernias	Incidence	Port site	Follow up	Open/closed
Ahmad1997	1300	11	0.85	11 umblical	One post op visit	300 closed 1000 open
Balakrishnam 2008	1332	5	0.38	5 epigastric	6 weeks	closed
Coda 2000	1210	16	1.3	13 umblical 1 epigastic 1 RUQ, 1 LUQ	unknown	Most closed
Nassar 1997	870	16	1.8	15 umblical 1 RLQ	3-6 months	closed
Mayol 1997	373	6	1.6	6 umblical	3-51 months	188 closed 185 open
Sanz-lopez 1999	123	3	2.4	2 umblical 1 epigastric	1-5 years	Unknown
Uslu 2007	776	42	5.4	41 umblical 1 epigastric	1 week	unknown

was 45 ± 25.1 minutes, while in closed method it was 43 ± 21.3 minutes.Out of 400 patients, 16(4%) patients were converted to open surgery, reasons for conversions were bleeding from Cystic artery (5 patients-1.25%), Adhesions (7 patients-1.75%) and Anatomy was not clear in Callot triangle (4 patients-1%). Out of 400 patients, 4(1%) patients had port-site hernia. In open technique 1(0.5%) patient was having port-site hernia, while in closed technique 3(1.5%) patients were having port-site hernia. According to Chi-square analysis, this difference was significant (p = 0.004). Three (75%) patients developed acute - onset type hernia, and 2 of which presented with small bowel obstruction. The median interval in the Early-onset cases was 5 days (range, 3-11days). One (25%) patient developed Late-onset type of hernia, presented with bulging abdomen without small bowel obstruction. The interval for appearance of Late-onset case was 2.7 months. The interval between original laparoscopy and the onset of trocar-site hernia is according to standard values [14,15].

DISCUSSION:

The presence of a preexisting umbilical/paraumbilical hernia has been identified in several reports as a risk factor for PSH[2-5,11-17,18,25-26.] Azurin et al[17] retrospectively reviewed 1300 patients who underwent LC. Postoperative PSH developed in 10 patients, 9 of these occurred in patients who were found at operation to have incidental ventral midline hernias. These patients had umbilical closure with figure-of-eight polyglycolic acid sutures. When a hernia was symptomatic or identified preoperatively, it was repaired at the time of surgery with nonabsorbable, interrupted sutures. None of these patients developed postoperative hernias.

Nassar et al[11] found that 12% of patients undergoing LC had preexisting umbilical or paraumbilical defects, of which 83.7% were asymptomatic. Defects were closed at the end of the procedure with a polyglycolic acid suture repair in 90% of patients, the remainder having nonabsorbable suture or formal hernia repair. Incisional PSH developed in 1.8% of patients, 25% of whom had a preexisting hernia with fascial closure at the time of surgery.

Male gender seemed to be associated with a higher incidence of hernia in one report, without statistical analysis.[11] In another study, the incidence was higher in women on univariate analysis but not in the multivariate analysis.[13] Obesity has been suggested as a predisposing factor in some studies,[2,5,13,15] with one study reaching significance in multivariable analysis,[13] but no statistical difference in others.[2,11,18] The majority of studies did not assess the effect of body mass index (BMI) on the incidence of PSH. One study suggested that there may be a correlation with sudden weight gain and hernia development following

surgery rather than obesity itself.[10] Examination of incisional hernias can be more difficult in the obese patient,[27] which can give rise to late presentation and diagnosis.

In the study by Coda et al,[10] large-diameter gallstones have been proposed as a predisposing factor with 5 of 13 cases of PSH being associated with gallstones ranging from 2cm to 5cm in size. All these were removed via the umbilical port and would have required extension of the port-site incision, which has been identified as a risk factor in many other reports identified below. A variety of medical comorbidities have been linked to hernias, including diabetes mellitus,[11,17] chronic obstructive pulmonary disase,[10] renal failure,[17]and acquired immune deficiency syndrome.[17] In one report, 9 of 10 PSH were associated with comorbidities, although without statistical significance.[17] The presence of cholecystitis or recent malnutrition has been proposed as a possible causal factor in some studies without statistical testing.[10,11]

Trocar diameter has been widely reported as a factor in development of PSH.[2-5,10,17,23,25,28]. PSH is more commonly occur if port sites e"10mm in diameter. However, there are many other reports in the literature of herniation through 5-mm ports,[10-12,29-32] particularly in children[29,30,33,]and indeed a single report of herniation through a 3-mm port site[26] Primary port insertion is either by a closed or open technique. The closed technique usually involves Veress needle insufflation followed by blind insertion of a trocar. In the open technique (Hasson or similar), the abdominal wall is opened, and the port inserted under direct vision. In a report on 373 patients, PSH only occurred in the closed insertion group.[18] However, these patients only had closure of the fascia when the incision had to be extended whilst all patients in their "open" group had suture closure of the fascia. It has been suggested that in the case of closed insertion, even when the fascia is sutured, the incidence of PSH is higher. Fascial closure can be more difficult when the closed technique has been used, particularly in obese patients. However, in a nonrandomized study of 1300 patients, the incidence of postoperative hernia was no different in the closed group (0.8%) compared with the open group (0.7%).[17] Secondary ports are less often the site of hernia development, but hernias do occur at secondary port sites. The type of trocar used is thought to be a determining factor.[5,28] Broadly, they can be divided into 2 types: cutting trocars and dilating trocars. The most common cutting trocars in use are reusable metal pyramidal trocars and disposable metal bladed trocars with or without a sprung protective sleeve. They generally require less force to use but have a higher incidence of complications, such as bleeding, pain, and hernias. Dilating or "radially expanding" trocars bluntly separate abdominal wall tissues.[9]They are thought to be associated with less bleeding and pain, although they require greater application of force to insert which could increase internal organ injury. Newer hybrid designs have also been developed in an effort to minimize these problems.[28]Shafer et al[28] measured the size of the tissue defect created by a range of different trocar types in a porcine model. The functional and measured tissue defect was smallest for the hybrid and radially dilating trocars compared with cutting or plastic bladed trocars, suggesting that the former may be associated with fewer PSH.

No controlled trials have been conducted which use different trocar designs in a clinical setting. Most series either use the same trocar design throughout or chose the type based on other patient/operative factors. In one study on 747 patients, 3735 port sites were created using a dilating trocar (VersaStep) without any occurrences of hernia.[9] Investigators encountered 9 PSH at Hasson ports used for induction of pneumoperitoneum. In another study, a bladeless, 12-mm visual entry trocar was used to gain access to the peritoneum and establish pneumoperitoneum in 849 gastric bypasses.[34]The rate of PSH after 10 months was 0.2%. It must be remembered however that no specimens were extracted via the port sites.

Antoniou et al [35]recently published online their review of single-incision laparoscopic cholecystectomy. They identified 29 large studies and found a single PSH in 1166 patients (0.09%). Three further recent studies are identified in the literature with no incidence of incisional hernia in 30, 80, and 29 patients.[36-38] The technique is relatively new but rapidly increasing in popularity, demonstrated by the fact that of the 32 studies cited above, 27 were published in 2009 or 2010. Long-term follow-up was not reported in these studies.There are anecdotal reports that prolonged manipulation and reinsertion of ports are associated with a greater risk of herniation.[10,11] In the multivariate analysis by Uslu et al,[13] increased duration of surgery was associated with an increased incidence of PSH.

Many reports identify extension of the port incision to facilitate extraction of the gallbladder as a risk factor for PSH.[2,10,11,18.] In one study, none of the 10 patients with PSH had extension of the incision[17]. Some studies suggest there may be a greater incidence of herniation in the midline ports rather than off-midline ports[5,8,39]. However, others suggest this is not the case but rather larger diameter ports and extraction of the gallbladder are more likely to occur at the midline ports[2,12]. Not closing the fascial defect is thought to be implicated in PSH formation,[2,11] although closing the fascia is certainly not preventative. This is demonstrated by the fact that in some studies, hernias were identified despite fascial closure in all cases.[11,17,23] Mayol[18]found a trend towards a slightly higher incidence of hernia in those who had ports closed; however, they were only closed when the port had to be extended for gallbladder removal. Unlike in most stud-

ies, Uslu et al[13]did not perform fascial closure in their series of 776 patients. In comparison, they identified a very high incidence of PSH at 5.4%. Whilst care has to be taken in drawing conclusions from this, it would suggest that not closing the fascia is at least partly responsible for their results.

One randomized trial involving 100 patients compared the use of a Berci fascial closure instrument (suture retrieval needle) with standard suture closure of the umbilical fascia.[40] With 50 patients in each group, the study was too small to be of clinical relevance, and no patient in either group developed PSH.In the absence of any preexisting hernia, there are no reports suggesting any method of suture closure is superior to another, although a poor closure technique has been identified as contributory factor in individual cases.[10] One institution has been using a Deschamps ligature needle for fascial closure of trocar sites. This hand operated, reusable, blunt-tipped device can be used to close all post sites, including 5-mm ports and the final port. In their series of 1400 laparoscopic procedures, they report no incidents of PSH.[41]

Wound infection has been implicated in the pathogenesis of umbilical incisional hernia in some reports.One randomized study investigating the effect of prophylactic topical rifamycin showed a reduction in incisional hernias with 2 of 24 patients in the control arm developing PSH (8%).[42] This incidence is very high; therefore, this work would need to be repeated before any conclusions are drawn. The use of a drain placed through a port site has been suggested as a risk factor for PSH in 2 studies, although this has not been fully evaluated.[5,31]

Patients with PSH following LC may have minimal symptoms, particularly in the late onset type. Together with a lack of long-term follow-up, this may give rise to an underreporting in the literature, and the true incidence of PSH may be considerably higher than measured[12,23]. There is some statistical evidence to suggest that age, body mass index, and duration of surgery increase the risk of PSH. It is likely that extending the port incision, preexisting fascial defects, nonclosure of ports, and trocar diameter are also important factors.Data would suggest that there has been no decrease in the incidence of PSH since 1995, although there is a lack of sufficient evidence to draw a formal conclusion.

Early reports suggest the risk of PSH associated with single-incision laparoscopy is low. Caution must be used in interpreting these initial reports without long-term follow-up data. Larger studies with longer follow-up will be available in time to better assess the safety of this new but increasingly popular technique. An effort should be made to identify any previously undetected hernia by digital examination of the fascia through the port site at the time of surgery. The fascia of the umbilical port should always be closed carefully with sutures and where there is a preexisting hernia, formal repair should be undertaken including defining borders of the defect and closing with interrupted nonabsorbable sutures.We suggest always using the umbilical port as the extraction site to minimize the number of sites at increased risk of herniation. If the epigastrium is used for gallbladder extraction, this should be closed in a similar manner.When the epigastrium is not used for gallbladder extraction, the incidence of hernia is low; however, we would suggest the use of a dilating trocar if the fascial defect is not to be closed.If a port is extended for extraction of the gallbladder, the entire resulting defect should be closed under direct vision.Secondary ports should be kept to as small a diameter as possible with the use of 5-mm camera and instruments where possible. Dilating or hybrid ports should be used in preference to cutting ports, but the experience of the operating surgeon and other risks such as trocar injury need to be considered. All secondary ports e”10mm in size should be closed if a cutting trocar has been used.Surgeons should avoid reinsertion of ports and unnecessary torsion as well as keeping overall operating times low.

CONCLUSION:

Port-site hernia in laparoscopic cholecystectomy is negligible in our unit especially if open technique is used and the trocar site is closed with interrupted Proline suture. Meticulous closure of the fascia, avoidance of unnecessary wound extension, the use of non-absorbable sutures when faced with defects more than 2 cms in size, completely defining the extent of pre-existing hernia and repairing this at the time of port site closure, are recommended to minimize the incidence of port-site hernia after laparoscopic surgery.

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