

INCIDENCE OF PORT SITE HERNIA POST LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Background: Laparoscopic cholecystectomy is a minimally invasive surgical procedure used to treat gallbladder disease, replacing open cholecystectomies since the 1990s. It is recommended for treating cholecystitis, symptomatic cholelithiasis, biliary dyskinesia, acalculous cholecystitis, gallstone pancreatitis, and gallbladder masses/polyps. **Aim:** To evaluate the frequency, risk factors, and prevention for the port site hernia. **Patients and Methods:** A retrospective cohort study was conducted at Rizgary Teaching Hospital in Erbil, Iraq, focusing on patients who underwent lap. cholecystectomy. The study included 839 cases, out of the eligible sample, 556 patients were examined, with only 9 developing PSH. The study aimed to identify patients who developed an incisional hernia at the trocar site after the surgery. **Results:** The study found that only 9 patients developed port site hernia, with an incidence of 1.6%. The majority of patients with post-operative wound infection were females with a significant difference between PSH and non-PSH groups. Open entry was found in 77.8% of PSH and 35.1% of non-PSH groups, while close entry was found in 22.2% and 64.9% of PSH and non-PSH groups, respectively. Port site suturing was not significantly different between PSH and non-PSH groups. The use of antibiotics and entry types were not significant. Early hernia was reported in 28.6% of patients with an open entry, but no significant difference was found in diagnosis time. **Conclusion:** Port-site hernia (PSH) is a serious complication after laparoscopic surgery, with females and open entry without suturing being the most prominent risk factors.

KEYWORDS: Cholecystectomy, Hernia, Incidence, Laparoscopy, Port.

INTRODUCTION

Laparoscopic cholecystectomy is a minimally invasive surgical procedure used to remove a diseased gallbladder, replacing routine cholecystectomies since the early 1990s. It is recommended for treating cholecystitis, symptomatic cholelithiasis, biliary dyskinesia, acalculous cholecystitis, gallstone pancreatitis, and gallbladder masses/polyps. Gallstone incidence increases with age, with females more likely to form them. Complications can occur, including high mortality rates and port site issues, including gastrointestinal, genitourinary, vascular, and omentum issues.^[1,2]

Since the early 1990s, port-site hernias have been a problem; Dr. Maio described the first occurrence

following laparoscopic surgery. With many trocar designs in use, laparoscopic tools and techniques have greatly improved in recent years. Because of its affordability and ease of use, the conventional method of port-site closure is often used. However, because of the anticipated concern that the needle may harm or involve the omentum, bowel loops, or other abdominal organs, this closure may occasionally be challenging.^[3] The design of trocars is crucial for preventing port-site incisional hernia (PIH). Modern trocars consist of a cannula, seal, and obturator. There are several generations of trocars with modified tip designs. First generation trocars had sharp cutting edges, posing a risk of bleeding. In order to prevent injuries, next-generation trocars were disposable shields with spring-loaded mechanisms. Visual entry devices, sometimes referred to

as optical trocars, are the most recent advancement in trocar technology.^[4,5] As the trocar tip dissects successive tissue layers as it passes through the abdomen, these systems use a crystal tip at the distal end of the obturator/trocar through which a zero degree laparoscope is inserted to transmit real-time pictures. The development of port-site hernia can be attributed to various factors, such as the site of incision, size of incision, trocar design, and patient-specific risk factors.^[6]

Port Site Herniation (PSH) is a common complication after laparoscopic gastrointestinal surgeries, with the highest incidence in colorectal surgeries (1.47%). It can be avoided by using nonabsorbable sutures, closing the fascia properly, avoiding needless incision extension, and carefully repairing any paraumbilical hernias or abnormalities. Given that 86.3% of PSHs occur with a diameter of at least 10 mm, the size of the trocar utilized for port formation is critical. All malformations in adults and children bigger than 5 mm should require facial closure. There is a considerable risk of herniation for defects in the midline close to the umbilicus. Digital inspection, the "oblique paramedian approach," and the "Z-Shaped path" are some of the trocar insertion techniques that have been suggested. Late-type PSHs frequently show up with pain and edema, and their presentation period can range from two days to eighteen months after surgery.^[6-8]

The kind of hernia and the time of manifestation determine how PSH is managed. Primary anatomical repair or mesh repair using open or laparoscopic techniques are two ways to fix hernias. In order to prevent strangulation, early and unique kinds need to be treated surgically right away. Intraperitoneal onlay mesh repair and imaging of the herniated intestine are made possible by laparoscopic techniques. Primary repair is required if there are gangrenous alterations. Mechanical fascial closure and minimum port site expansion are necessary for late-onset type PSH.

Proper port site closure is crucial for PSH prevention, but closure can be difficult due to small skin incisions, especially in obese patients. Techniques can be classified into three groups: first, which requires pneumoperitoneum presence, and third, which can be used without pneumoperitoneum.^[9,10] The current study aimed to evaluate the frequency, risk factors, and prevention for the port site hernia.

PATIENTS AND METHODS

Study design, setting, and period

A retrospective cohort study design was adopted and the cohort who were undergo lap. Cholecystectomy at

Rizgary Teaching hospital in Erbil (Kurdistan region at Iraq).

Studied sample size

All the lap. Cholecystectomy that done at the Rizgary Teaching hospital were collected and reviewed and then summarized in steps. Any patient who underwent lap. cholecystectomy at Rizgary Teaching hospital was included in the current study, by reviewing all the patients' files and it was 839 cases, to find anyone who develop an incisional hernia occurring at the trocar site after the lap. cholecystectomy.

All Pregnant patients, patients with Chronic obstructive pulmonary disease (COPD), patients with benign prostate hyperplasia (BPH) were excluded from the study. Out of the collected sample, 192 patients were further excluded because they cannot be reached for the further assessment. Twenty seven patients who had already had hernia and they were supposed to be examined before the surgery, were also excluded. The eligible sample was 556 patients and only 9 patients among them developed PSH who were contacted and further assessment by history and examination, and all them were sent for ultrasound examination. A verbal consent was obtained from each participant of the study after brief explanation of the study objectives.

Data collecting tools

After reviewing the patients files and the eligible sample was determined, the investigator contacted these patients and reviewed by direct interviews and the checklist was fulfilled regarding the age, sex, body mass index (BMI). The type of entry, presence of post-operative wound infections, the use of antibiotics, and diagnosis time. Complete assessment was done and all were sent for ultrasound (US).

Statistical analysis

The data collected during the study were summarized in sheets of Microsoft Excel 2010, the statistical analysis performed by using statistical package for social sciences IBM- (SPSS 26). The categorical data were expressed in frequencies and percentages, and Chi square test was used to evaluate the difference between the parameters in the 2 by 2 tables and Fisher exact test was used instead of chi square when any cell had an expected value below 5. P- value less than 0.05 considered as significant.

RESULTS

Among the total eligible studied sample, only 9 patients were developed port site hernia, and the incidence was 1.6% as shown in figure (1).

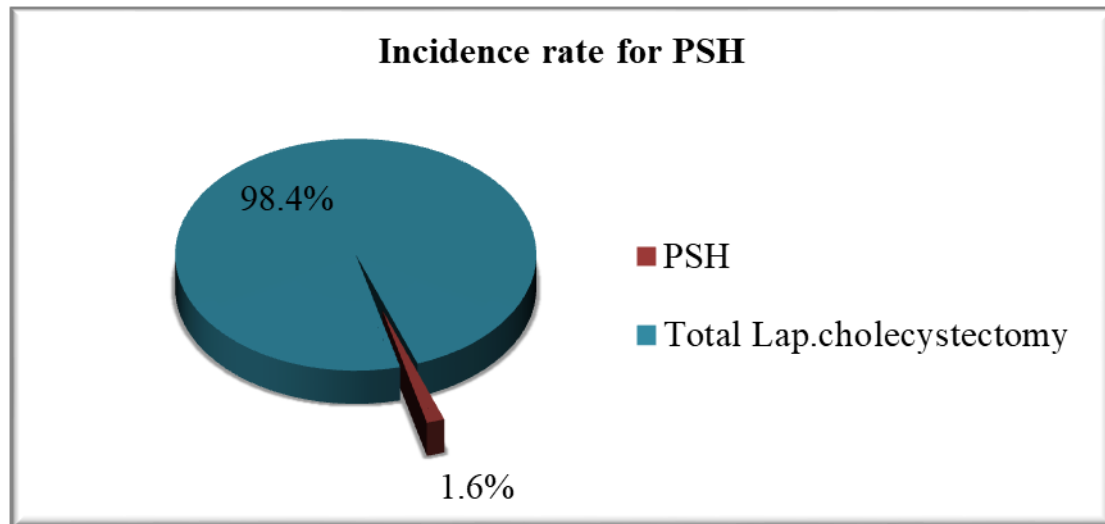


Figure (1): The incidence rate for PSH.

The comparison between PSH and non-PSH groups concerning the studied parameters was shown in table (3.1). This table elicited that 11.1% of PSH group and 27.1% of the non PSH group were males; the difference was statistically significant ($p=0.000$). Among PSH, 55.6% had post-operative wound infection while among the non-PSH only 3.7% had infection with a statistically significant difference ($p=0.000$). Open entry was found among 77.8% of PSH group and 35.1% of non-PSH with while close entry found among 22.2% and 64.9% of PSH

and non-PSH groups respectively with a statistically significant difference ($p=0.012$).

Concerning the port site suturing, it was found that 77.8% of PSH and 27.8% of non-PSH had no suturing with significant statistical difference ($p= 0.003$) in comparing to those underwent suturing. Regarding the use of antibiotics the studied groups showed no statistically significant difference.

Table (3.1): The comparison between the PSH and non-PSH groups.

Studied parameters		PSH (n=9)	No PSH (n=547)	p-value
		No. (%)	No. (%)	
Sex	Males	1(11.1)	148(27.1)	0.000*
	Females	8(88.9)	399(72.9)	
Post op. wound infection	Yes	5(55.6)	20(3.7)	0.000**
	No	4(44.4)	527(96.3)	
Antibiotics	Yes	7(77.8)	477(87.2)	0.329**
	No	2(22.2)	70(12.8)	
Entry types	Open	7(77.8)	192(35.1)	0.012**
	Close	2(22.2)	355(64.9)	
Port site suturing	Yes	2(22.2)	395(72.2)	0.003**
	No	7(77.8)	152(27.8)	

*Chi square test; **Fisher exact test

Comparison of the studied parameters in relation to port site suturing was demonstrated in table (3.2) and revealed that all patients with port site suturing were females but with no significant statistical difference ($p=1.000$). Postoperative wound infection and the use of antibiotics statistically showed no significant differences. Regarding the entry types, all the two patients who underwent suturing had an open entry comparing to 5 patients who had no port site suturing with no significant statistical difference. Among the patients who underwent port site suturing, early diagnosis was reported in one patient and late diagnosis in the other patients while

among those without suturing, one patients had early hernia and 6 patients had late hernia.

Table (3.2): Comparison of the studied parameters in relation to port site suturing.

Studied parameters		Port site suturing		p-value*
		Yes (n=2)	No (n=7)	
		No. (%)	No. (%)	
Sex	Males	0(0.0)	1(14.3)	1.000
	Females	2(100.0)	6(85.7)	
Post op. wound infection	Yes	1(50.0)	4(57.1)	1.000
	No	1(50.0)	3(42.9)	
Antibiotics	Yes	1(50.0)	6(85.7)	0.417
	No	1(50.0)	1(14.3)	
Entry types	Open	2(100.0)	5(71.4)	1.000
	Close	0(0.0)	2(28.6)	
Diagnosis time	Early	1(50.0)	1(14.3)	0.417
	Late	1(50.0)	6(85.7)	

*Fisher exact test

The comparison of the studied parameters in relation to entry types showed that 100.0% of closed entry were females in comparison to 85.7% of the open entry; the difference was statistically not significant ($p=1.000$). All patients with closed entry developed postoperative wound infection while only 42.9% of the open entry

developed the infection, this difference was not significant ($p=0.444$). neither the use of antibiotics nor the port site suturing showed significant differences. Early hernia was reported only in patients with an open entry represented 28.6% but with no significant difference ($p=1.000$), as shown in table (3.3).

Table (3.3): Comparison of the studied parameters in relation to entry types.

Studied parameters		Entry types		p-value*
		Closed (n=2)	Open (n=7)	
		No. (%)	No. (%)	
Sex	Males	0(0.0)	1(14.3)	1.000
	Females	2(100.0)	6(85.7)	
Post op. wound infection	Yes	2(100.0)	3(42.9)	0.444
	No	0(0.0)	4(57.1)	
Antibiotics	Yes	2(100.0)	5(71.4)	1.000
	No	0(0.0)	2(28.6)	
Port site suturing	Yes	0(0.0)	2(28.6)	1.000
	No	2(100.0)	5(71.4)	
Diagnosis time	Early	0(0.0)	2(28.6)	1.000
	Late	2(100.0)	5(71.4)	

*Fisher exact test

The comparison of the studied parameters in relation to diagnosis time was demonstrated in table (3.4), this table elicited that the differences of all parameters were

statistically not significant concerning the diagnosis time apart from the use of antibiotics which showed significant difference ($p=0.028$).

Table (3.4): Comparison of the studied parameters in relation to diagnosis time.

Studied parameters		Diagnosis time		p-value*
		Early (n=2)	Late (n=7)	
		No. (%)	No. (%)	
Sex	Males	0(0.0)	1(14.3)	1.000
	Females	2(100.0)	6(85.7)	
Post op. wound infection	Yes	0(0.0)	5(71.4)	0.167
	No	2(100.0)	2(28.6)	
Antibiotics	Yes	0(0.0)	7(100.0)	0.028
	No	2(100.0)	0(0.0)	
Port site suturing	Yes	1(50.0)	1(14.3)	0.417
	No	1(50.0)	6(85.7)	
Entry types	Closed	0(0.0)	2(28.6)	1.000
	Open	2(100.0)	5(71.4)	

*Fisher exact test

DISCUSSION

An incisional hernia is characterized by a defect in the abdominal wall where surgical incisions are placed. Clinical examinations and/or imaging studies can identify them. Since the pathology causing the laparoscopic surgery is typically benign and no additional follow-up is considered necessary, the incidence of trocar site incisional hernia has been poorly documented over the years. This could be because there are few symptoms and no long-term postoperative follow-up. Consequently, in most situations the follow-up is not sufficient to detect TSIH.^[11]

In the current study, the incidence of PSH was 1.6%. In line with this result, a study conducted by Bunting found that the overall incidence of port-site hernia was 1.7% (range, 0.3% to 5.4). Lower incidence of port site hernia was reported in 0.20% of patients in Nofal et al.^[12] study. In Chatzimavroudis et al.^[13] study, 0.94% of patients presented port site hernia. This may be contributed to performing only one type of operation in the previous studies which was laparoscopic cholecystectomy. Moreover, Damani et al.,^[14] reported that the true incidence of acute postoperative robotic port-site hernia is 0.032%. In a retrospective investigation of 1055 patients who had surgery for urologic malignancies, Chiong et al.^[15] discovered a TSIH incidence of 0.66%. They were all radiologically verified by computed tomography after being clinically suspected. A TSIH incidence of 0.5–2% was also reported by a comprehensive analysis based on 19 prospective and retrospective investigations, totaling 30,568 adults and 1098 children. Only three cases of TSIH (0.6%) were reported in a retrospective review of 500 patients who had laparoscopic and robotic gynecological surgery in 2013. These cases were diagnosed on physical examination with radiologic confirmation; one of them required emergency reoperation for hernia reduction, and the other two presented with asymptomatic bulges. The average time to TSIH appearance was 21 days. Although Comajuncosas et al.^[16] reported an incidence of 0.18–2.8% in a narrative review published in 2011, the authors came to the conclusion that the true incidence may be greater. The same group published a prospective observational research three years later that included 241 patients and showed a 25.9% incidence after a follow-up of 46.8 months. The majority of TSIH in this research were found via clinical examination; however, in instances that were questionable, an abdominal ultrasonography was performed. On the contrary to the present result, Sayed and Abu^[3] study reported port site hernia in 4% of patients. Higher TSIH rates were found in Ciscar et al., study^[17], in which the incidence detected by physical examination was 27.6%, compared to 23.7% when assessed by ultrasound. After having been a neglected issue, during the last decade, few authors have addressed the incidence and risk factors of TSIH after laparoscopic surgery. Moreover, in Hernandez et al.^[18] study that included 241 patients undergoing laparoscopic appendectomy, the incidence of

port site hernia after laparoscopic appendectomy was 20.3%, all of which were diagnosed via abdominal CT scan. These differences can be attributed to different follow-up durations in each study, which underlines the importance of an adequate follow-up time and denotes that a few cases of asymptomatic port site hernia (especially in overweight and obese patients) remain undiagnosed; therefore, the true incidence of port site hernia may be considerably higher than reported.

The current study showed that most of the patients who developed PSH were females which was corresponding to findings of Sayed and Abu^[3] who reported higher female prevalence among port site hernia cases, the female prevalence was higher, and the male: female ratio was 1:2. Moreover, Nofal et al.^[12] reported that female gender was a risk factor for development of port site hernia. While in the study conducted by Hashim et al.^[19] there was no significant difference was reported between studied groups regarding gender and this might be due to smaller sample size in his study compared to the previously mentioned studies. According to other research, male patients are more likely to experience surgical problems and contract an infection.^[20,21] A higher inflammatory pattern of cholecystitis in men, differences in male anatomy that complicate surgery, and a tendency for male patients to seek medical attention less frequently than female patients—thus receiving care at a far more advanced clinical stage—are some possible explanations for this association.^[21]

In the current study, the post-operative wound infection was significantly higher among the group of PSH in comparison to those with non-PSH which suggested the role of infection in the development of hernia and this was in agreement with conclusion of Nofal et al.^[12] about the effect of wound infection for port site hernia. In Hashim et al., study^[19], incidence of postoperative infection among patients who had port site hernia was higher when compared to patients who had no port site hernia (50% vs 0%; $p < 0.001$). Also Sayed and Abu^[19] reported that port site infection was a possible cause of port site hernia in 16.7% among patients with port site hernia.

The benefits of laparoscopic surgery (LS) are quickly undermined by port site infection (PSI), since the patient loses trust in the operating surgeon and worries about the persistent and bothersome infection. As a result, the patient has a considerable rise in morbidity, hospitalization, and financial loss. The patient's quality of life is severely impacted, and the entire goal of minimum access surgery (MAS), which is to attain the highest level of cosmetics, is transformed into an unattractive wound. Because of the new, fast-growing atypical mycobacteria that are resistant to the common anti-tubercular medications, there is a focus on treating PSI. There is no surgical wound that is totally impervious to infection.

PSIs continue to occur in spite of advancements in antibacterial agents, sterilizing methods, surgical procedures, and operating room airflow. Because of the small laparoscopic incision sizes, the incidence of PSI following elective laparoscopic cholecystectomy is lower than that following open elective cholecystectomy.^[22,23] Most of the patient who developed PSH in the current study were undergo an open entry technique, while majority of the non-PSH patients had closed entry; the difference was statistically significant, this finding highlighted the importance of using closed type to minimized the risk of PSH post-operatively. Hussain et al.^[24], using a sample of 5541 patients, employed the closure approach in 2009 to close the Port Site fascial defect. They hypothesized that the conventional laparoscopic port site closure was linked to a manageable incidence of Port-Site Hernia (0.1%). Aziz^[25] proposed in 2013 that the closure of the fascial sheath should remain straightforward, easy, economical, and quick to apply. This suggestion may lead to a new method to prevent or reduce the incidence of port-site incisional hernias if the current laparoscopic port site fascial defect closure techniques are modified. Also, it need to be risk-free and trouble-free. However, in 2012, Yi et al.^[26], using 400 patients as a sample, found that the incidence of port-site hernia was 0.5%. They used the non-closure method to treat the port site fascial defect, and they hypothesized that skilled surgical teams and experience would help prevent risks.

For this cause, the surgical teams had performed the laparoscopic cholecystectomies of patients of this study. They were well trained and expert; thus, they had no Port Site Hernia as complications of laparoscopic cholecystectomy. Soroush et al.'s^[27] study in 2013 that included 220 patients reported an incidence rate of Port-Site Hernia of 2.3%. They reported that such PSH occurred in 10mm port sites more in the fascial non-closure method than fascial closure. Consequently, suturing the fascia is recommended until further studies can be carried out. Karthik et al.'s study^[28] in 2013 had included 579 patients with different forms of cholecystitis. They had cholecystectomies laparoscopically for their patients. They had closed the port site for fascial defects. The incidence rate of PSB in their study was 0.70%. They reported that laparoscopic surgery is associated with minimal port-site complications. They concluded that complications are related to the increased number of ports; umbilical port involvement is common. Most complications are manageable with minimal morbidity and can be further minimized with meticulous surgical technique during the entry and exit of the laparoscopic ports. Jamil et al.^[29] in 2016 reported that their study included 450 patients PSH with an incidence rate of 1.10% using the closure method for the fascial sheath defect. Also, Singal et al.^[30] in 2016 reported that 200 patients were divided into two groups. The blunt trocar was introduced into the abdomen to be safe, without visceral injury, and no bleeding was seen in both groups. Also, they had not encountered any patient

PSH during their follow-up that ranged from 6 - 8 months where they used blunt trocar to split the muscle fibers at the site of entrance of trocar instead of cutting them by sharp trocar was used through our study. Al-Dhahiry et al.^[31], in the study in 2017, included 570 patients. They used the non-closure method for the fascial sheath defect. Their study had PSH with an incidence rate of 0.35%, eliciting that the closure of 5 and 10mm laparoscopic port site fasciae was not essential because non-closure was associated with a very low incidence of PSH. Also, closure of the laparoscopic port site fascia prolongs the time of surgery and unnecessary use of suture material that should economically increase the cost of surgery.

The study has some limitations: The study included follow-up of all patients who underwent laparoscopic cholecystectomy. It was very difficult to communicate with some of them, which led to their exclusion from the study. There were also cases of hernia of the outlet, but it was not possible to confirm whether it occurred as a result of the operation or because of it. Twenty-seven patients were excluded. It is worth noting here that one of the hernia cases was due to Omentum suture during fascia suturing.

CONCLUSION

According to the findings of this study, port-site hernia is a potentially dangerous side effect of laparoscopic surgery. When compared to previous research, the incidence rate fell within the acceptable range. The most common risk factors for PSH were female gender and open entrance without suturing.

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