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Original Research Article

Prevalence of port site infection in laparoscopic cholecystectomy: A prospective descriptive study

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Abstract

Background: Port site infection (PSI) is an infrequent surgical site infection that complicates laparoscopic surgery but has a considerable influence in the overall outcome of laparoscopic cholecystectomy. The aim of this study was to evaluate factors that influence PSI after laparoscopic cholecystectomies and to analyse which of these factors can be modified to avoid PSI in a trail to achieve maximum laparoscopic advantages.
Objective: The main objective of this was to study the frequency and causes of port site infection in laparoscopic cholecystectomy and measures to prevent them.
Materials and Methods: Prospective descriptive qualitative research, non-randomized, institution-based, performed on patients undergoing laparoscopic cholecystectomies. For culture and sensitivity, swabs were obtained from each patient who experienced PSI. Under general anesthesia, biopsy samples were obtained for mycobacterium tuberculosis identification using polymerase chain reaction, excisional biopsies were taken for histological investigations, and patients with deep surgical site infections and wound debridement were examined. Following surgery, all patients were monitored for six months. We examined variables such as gender, the location of the infected port, the kind of microorganism, acute vs chronic cholecystitis, the kind of infection (deep or superficial), and intraoperative stone, bile, or pus spillage in our sample. Total 180 patients of laparoscopic cholecystectomy for gall stone disease were studies.
Result: Ninety-eight operations (4.5%) had a port site infection rate; male patients (4/49, 8%), acute cholecystitis (3/25, 12%), bile, stone, or pus spills (8/24, 30%), and epigastric ports (7/9, 77%), all had higher rates. Surface infections accounted for 77.5% of all PSI, with non-specific microorganisms accounting for 4/9 (44%).
Conclusion: Both the surgeon and the patient find port site infection to be an unpleasant experience following elective laparoscopic surgery. Even though it happens seldom, not being aware of this consequence causes the illness to worsen over time. Stringent guidelines for PSI sterilization.

Keywords: Laparoscopic cholecystectomy, Port site infection (P.S.I.), Microorganism, Minimally invasive, Surgery

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1. Introduction

These days, laparoscopic cholecystectomy is the GOLD STANDARD for gallstones. When laparoscopic surgery, also known as surgery that is minimally invasive, was initially introduced in the 1980s, it quickly rose to prominence as the preferred surgical procedure for a variety of procedures.[1] The gold standard procedure for treating symptomatic gallstones is now laparoscopic cholecystectomy.[2] In general, problems might arise from the majority of surgical operations. Surgical site infection is one of these side effects (SSI). Due to the human body's capacity to support a diverse range of microorganisms that may get infected as a consequence of surgical intervention, infection may be intrinsic or extrinsic.[3]

Under some conditions, the patient's bacterial flora may become opportunistic and cause illness. This can happen during open surgeries as well as, to a lesser extent, during laparoscopic procedures.[4] It is a known fact that compared to open cholecystectomy, laparoscopic cholecystectomy is related with less SSI. Its benefits include a shorter recovery period in the hospital, an earlier return to work, a reduction in post-operative pain,[5] fewer surgical incisions, which leads to better cosmetic outcomes, and fewer problems following surgery. Thus, it not only replaced open cholecystectomy but also effectively put a stop to attempts at extracorporeal shock wave treatment and bile salt therapy, two non-invasive gallstone management techniques.[6-7] Nevertheless, a growing

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number of port site infections are being performed alongside more laparoscopic cholecystectomies these days. These infections are rare, but they have a major impact on the overall results of the procedure, including delayed return to work, higher costs, and unsatisfactory cosmetic outcomes that are upsetting to both the patient and the surgeon. Three different kinds of surgical site infections can happen at the port site:[8-9] The first is superficial surgical site infection, which affects just the skin and subcutaneous tissues and develops 30 days after surgery in a patient who at least has one of the following conditions: A purulent discharge from the superficial incision (a) or an organism isolated from a culture of fluid or tissue from the superficial incision (b) that was collected aseptically. The second kind of surgical site infection affects deep soft tissues, such as muscles and fascia, that extend to the wound and first appears 30 days after surgery. The patient has two or more of the following conditions: an abscess, dehiscence of the deep incision, and purulent discharge from the wound. The third type is organ/space SSI where infection involves any organ and spaces other than the incision which was opened or manipulated during surgery.[10]

2. Materials and Methods

In this prospective descriptive qualitative study conducted at MSD Medical college Bahraich from 1st of march 2022 to 31st of March 2024 (36 months) period, patients who underwent laparoscopic cholecystectomies were included in our study, all had been given broad spectrum antibiotics (pipercillin tazoactem 4.5 gm vial thrice daily by intravenous infusion) in addition with metronidazole 500 mg three times daily intravenously for 24 hours postoperatively, and for period of five days for those with acute cholecystitis. All operations were done by experienced surgeons, using four ports procedures, with reusable instruments; gallbladder was extracted from the epigastric port in all operations, without using retrieval bag. Sub-hepatic tube drain was used in most of the patients and removed next day after the operation. Stitches were removed 7th day postoperatively without the presence of infection. Swabs were taken for culture and sensitivity in all patients who developed PSI. Exploration under general anaesthesia was done for patients with chronic deep site infections, presented with persistent discharging sinus, wound debridement was done and the wound was left open to heal by secondary intention. Excisional biopsies for chronic discharging sinuses had been done and sent for histopathological studies & tissue samples examined for polymerase chain reaction (PCR). In patients proved to have TB, anti TB-therapy was given orally (Ethambutol 800-1200 mg daily, rifampicin 600 mg daily, isoniazid 300 mg daily and pyrazinamide 1000-1500 mg daily) for nine months. All patients responded well within six months of follow-up. For the same reason, and to avoid iatrogenic complications of beginner surgeons, we collect the data of experienced surgeons who have good documentation and postoperative follow-up. Factors as gender, site of infected port, type of microorganism, acute versus chronic cholecystitis, type of infection (superficial or deep infection) and intraoperative spillage of stones, bile or pus were analyzed in our sample. The method of sterilization used in our sample was washed the instruments finally emersion Cidex for 30 minutes then rinse with tap water.

Statistical analysis all data were collected in preformed format and statistical analysis was done. Descriptive statistic “tables” were used to displays variables.

3. Results and discussion

180 patients who underwent laparoscopic cholecystectomy were included in our study, their ages ranged (20-65 years) mean age 43.1 years, PSI was found in 4/49 male patients (8%). Regarding gender 5 in 131 female patients, percentage of the PSI was 3%. There is an association between male gender and infection, p-value0.03 as in

Table 1: The incidence of PSI in relation to gender

Gender	Infected/Total	Percentage (%)	P Value
Male	4/49	8%	0.03
Female	5/131	0.38%	
Total	40//180	-	

Regarding the status of gallbladder before the operation, 25/180 patients (13.4%) were operated during an acute attack and 155/180 patients (86.6%) were suffering from chronic cholecystitis. P value was 0.001, i.e., there is a significant association between infection and acute cholecystitis as shown in.

Table 2: Incidence of PSI in relation to the clinical diagnosis of the gallbladder pre-operatively

Condition	Total	Percentage (%)	P Value
Chronic choleystits	155	86%	0.01
Acute cholecystitis	25	14%	
Total	180	-	

Incidence of PSI in relation to spillage of bile, stones, or pus during operation PSI Infected/total Percentage (%) P value with spillage 8/24 (33%) Without spillage 1/156 (0 .6%)

Table 3: Incidence of PSI in relation to spillage of bile, stone, or pus during operation

PSI	Infected/Total	Percentage (%)	P Value
With spillage	8/24	33%	0.0001
Without spillage	1/156	0.6%	
Total	9/180	-	

Total 9/180 - According to the site of port infection, 7 patients (77%) developed an infection at the epigastric port, 1 patients

(11%) developed an infection at the umbilical port and 1 patients (11%) developed an infection at the lateral ports. P value was 0.0001, which is highly significant and site of gallbladder extraction could be a cause of PS. Study was done in governmental medical college in India which also shows high association between epigastric port and infection (88.2%)[19] and in another study, shows surgical site infection in umbilical port more than epigastric port and this related to umbilical flora and gall bladder extraction through umbilicus in single port surgery.

Table 4: Incidence of PSI in different port sites

Port site	No	Percentage (%)	P Value
Umbilical port	1	11%	0.0001
Epigastric port	7	77%	
Lateral port	1	11%	
Total	9	-	

Table 5. Types of PSI

PSI Number Percentage (%) Superficial infection 77.5 Deep site infection 22.5. Also, superficial infection is more common than deep infection as reported by study done by Mir, et al. at tertiary care hospital of Kashmir 2012 (87.7% for superficial infection compared with 13.3% for deep infection)[12]

Table 5: Type of PSI

PSI	Number	Percentage (%)
Superficial infection	7	77.5
Deep site infection	2	22.5%
Total	9	-

Table 6. Type of microorganism associated with post laparoscopic cholecystectomy infection Gram -ve Enterobacter spp., E. coli.

About results of swabs culture and PCR of tissue samples, 2 patients (40%) were infected by Gram –ve bacteria, 1 patient (20%) were infected by Gram +ve bacteria, 1 patient (20%) were infected with mixed infection, 1 patient (20%) were infected by mycobacterium species.

Table 6: Type of microorganism associated with post laparoscopic cholecystectomy

Type of Infection	Microorganism	Microorganism	No. of cases
Non-specific infection	Gram- ve 40%	Enterobacter sppp.	2
	Gram+ve 20%	E coli	
		Staphylococcus auaras spp.	
		Entrococcus spp.	
	Mixed		2 cases
	No growth		
	Atypical		
Specific infection(Mycobacterium tuberculosis)	Typical 20%		

Because laparoscopic surgeries are less intrusive than open ones and have less of an effect on the immune system, the rate of PSI following a laparoscopic cholecystectomy is lower than that of an open one.[11] Our sample has a port site infection incidence of approximately 5% (9 patients out of 180), which is lower than the 6.7%[12] results of a study by Khurshid et al. conducted in the Hospital of Kashmir in 2012 and higher than the 2.4% [14] results of a study by Jasim Saud et al. conducted in the AL Basrah General Hospital in 2010. The differences among the three studies may be due to differences in environment, population and sterilization technique which could be different from hospital to another and there may be rapid turnover on the expense of adequate sterilization.

According to our analysis, 131 (or 72%) of the 180 patients who had laparoscopic cholecystectomy were female. Similarly, 5 out of 9 patients with port site infections were female. In contrast, Al-Naser KH Int J Med Res Health Sci 2017,[6] 132-137 135 7 females (63.63%) and 4 males (36.36%)[13] had PSI in 11 patients (2.98%) of the 369 patients in that study, of which 301 (18.43%) were male and 68 (18.47%) were female. In both studies, although number of female is higher than males but after statistical analysis we found the p-value of male gender is significant (0.03) i.e., associated with higher incidence PSI. Also, perforation of gallbladder during operation more in males than in females.[14]

Gallstone spillage during laparoscopic cholecystectomy procedures ranges from 5% to 40%[10,16] of procedures, and gallbladder perforations during surgery commonly occur at a rate of 10% to 40%,[17] These can occur as a result of traction applied with forceps or as a result of electro-surgical thermal injury during gallbladder removal from its bed,[15] While pigment stones sometimes contain live bacteria and might cause further infections if left in the peritoneal cavity, escaped stones, which are mainly made of cholesterol, are less likely to cause an infection,[15] In our investigation, spills happened during operations, accounting for 13% of the 180-person sample. Out of 180 instances without spillage, only one patient (.57%) had PSI, whereas eight patients (24%) with spillage presented with port site infection. A strong correlation has been shown[15] between the retention of stones, pus, or bile in the abdomen or wound and the development of abscesses and port site infection, with a statistically significant difference (p=0.0001). Stones, clips, or fragments of plastic sheath might be examples of foreign bodies retained. An additional research conducted at the Taj Surgical Hospital in Pakistan over a three-year period from 2009 to 2012 revealed a correlation between intraoperative spillage and port site infection in 5.3% of perforated patients

following laparoscopic cholecystectomy,[18] In our study, the percentage was higher maybe due to lack of usage of retrieval bag which prevent direct contact of port wound with the content of infected gallbladder. Which indicates that site of gall bladder extraction was the most common site of PSI.[20]

In our study as recurrent discharging single or multiple sinuses (seven at epigastric port, one at umbilical port and one at lateral port). Three of these were infected with atypical mycobacterium species, three were infected with typical mycobacterium tuberculosis, one patient had retained stone in deep layers where infection was mixed, other patient had retained foreign body (plastic sheath of a laparoscopic instrument) inside deep layers of falciform ligament where no growth of bacteria was obtained and only chronic granulomatous reaction with chronic inflammatory cells was found and a patient had abscesses deep in the abdominal wall between epigastric and lateral port which were sterile. By taking detailed history, one of the patients infected with mycobacterium species has close her husband who was changing her dressing working in hospital of infectious disease.

Another theory about the origin of the mycobacterium is that using tap water to clean laparoscopic equipment after they have been fully sterilized might reintroduce mycobacterium to the device and subsequently to the wound. The fact that the tools have joints and are wrapped with plastic insulation renders their sterilization inadequate.

Furthermore, the ideal sterilizing time is sacrificed in the haste with which processes are switched out. The best practices in cutting-edge facilities include using disposable laparoscopic instruments, employing ethylene oxide or advanced sterilization techniques like STERRAD, a system that uses gas plasma technology to quickly, safely, and effectively remove toxic residue from devices, or low-temperature sterilization. Another method is to store equipment in a formalin gas chamber for a whole day.

4. Conclusion

PSIs are linked to bile, stone, pus spillage, gallbladder extraction port, and acute cholecystitis. Chronic deep surgical site infections should be considered due to mycobacterium tuberculosis. Most superficial PSIs are common in males.

5. Source of Funding

None.

6. Conflict of Interest

None.

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