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Infection of port holes may lick the coveted goals: A surgical audit of port site infections in 700 cases of laparoscopic cholecystectomy

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Abstract

Background: Port site infection is not an uncommon entity in laparoscopic cholecystectomy. It has been reported in 1.4 – 6.7% of the cases.

Patients and methods: It is a surgical audit of port site infections in 700 cases of laparoscopic cholecystectomy operated in our institute.

Results: Females (85%) predominated over the males (15%). Mean age was 42.71 years with a standard deviation of 13.79 years. About 1/3rd (34.85%) of the cases in the present study were also suffering from an associated comorbid illness. Port site infection (PSI) was noticed in 3.71% (n=26) of the cases, it was only a superficial PSI in 1.71% (n=12) cases while a deep PSI in rest 2% cases

Conclusions: Proper mechanical cleaning, sound selection of sterilisation method, strict compliance to the sterilisation steps without any enticements are the keys to avert the unsought complications like PSI in this novel laparoscopy technique.

Keywords: port site infections, laparoscopic cholecystectomy, Laparoscopic surgery

Introduction

Laparoscopic surgery has become the order of the day due to its time-tested vantages over conventional open surgery; better cosmesis, less pain, faster convalescence and early return to work are the few of the rewards which appeal to the masses resulting in their overwhelming espousal over the past few decades.^[1-3] Even in developing countries like India, there is a recent surge in pursuing the art of laparoscopy among all surgical specialities both in private and public hospitals with a substantially hike with the advancing time. Laparoscopic cholecystectomy has literally supplanted open cholecystectomy as the “gold standard” procedure for symptomatic gallstone disease. All surgeons are thriving to endeavour the art of laparoscopic cholecystectomy for better treatment of gallstone disease due to its high incidence particularly in this region of the globe.

It is not wrong to mention that despite all installed rewards, the laparoscopic cholecystectomy is still not altogether free of complications. In fact, with this novel technique surgeons are facing a quite different spectrum of complications with which they were not cognizant in the conventional open cholecystectomy. Traumatic injuries related with access and manipulation of laparoscopic instruments, diathermy injuries due to coupling, inadvertent contact with viscera resulting in heat related injuries, hepatobiliary injuries due to improper traction, unsuitable application of clips and energy sources and port related complications like infection, metastasis, bleeding, hypertrophic scar and incisional hernia are the few crucial issues demanding a substantial tutelage especially from budding surgeons.^[4,5] It is further acceded that complications rate improves with the learning curve and teaching institutes are more likely to combat a higher complication rate due to teaching and frequent change of surgeons across all cadres of hierarchy.

Port site infection is not an uncommon entity in laparoscopic cholecystectomy. It has been reported in 1.4 – 6.7% of the cases.^[4, 6-8] It may be accredited to use of reusable trocars, practice of improper sterilisation techniques, associated comorbidities and spillage of bile and stones while retrieving the gallbladder. Although we are enthusiastically basking art of laparoscopy in

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our newly established institute but Still, there exist some worries about the safety and overall outcome of laparoscopic cholecystectomy both amongst patients and budding surgeons. Therefore, it is planned to audit and share the ground zero report of our experience of port site infections in 700 cases of laparoscopic cholecystectomy operated in our rural institute.

Materials and methods

It is a surgical audit of port site infections in 700 cases of laparoscopic cholecystectomy operated in our rural institute BPS Govt Med College Khanpur Kalan, India from July 2013 to June 2018. All cases were operated under general anaesthesia with standard four port technique (periumbilical and epigastric both as 10 mm while lateral both ports as 5 mm) of laparoscopic cholecystectomy. Preoperative antibiotic (inj. Ceftriaxone, 1 gm) was administered in all cases as a routine practice except 8 drug sensitive cases where it was replaced by ciprofloxacin. Closed method (Veress needle) was used to create the pneumoperitoneum with carbon dioxide gas except 11 cases where open Hasson’s technique was employed due to technical difficulties. Reusable trocars were used in all the cases which were sterilised by glutaraldehyde solution and autoclave randomly. Routine port closer was not done in any case except the cases where port was extended either due to use of Hasson’s access technique or to retrieve the gallbladder specimen.

Inclusion criteria

All cases of symptomatic gallstone disease operated by laparoscopic technique

Exclusion criteria

Cases converted to open technique
 Postoperatively, all port site wounds were examined for any infection. Port site infections were classified into superficial and deep infections according to centre for disease classification where infections limited to skin and subcutaneous tissues were classified as superficial infections while those involving the deeper planes like fascia and muscles were classified as deep infections [9]. Out of total 26 cases of port site infections, 12 cases were reported within 4 weeks (early) of surgery while 14 cases (delayed) were reported between 4th -8th weeks of the surgery. Delayed cases of port site infections were further divided into five grades of the disease as classified by chaudhuri *et al.* [10] The first stage is characterised by tender nodules, which appears 4 weeks after surgery and projects out at port sites. In the second stage, the nodules enlarge in size and become more tender and inflamed and eventually forms a sinus discharging

white pus.

In the third stage, pain subsides due to pus discharge and overlying skin gets necrosed. In the fourth stage, the area develops into a chronic sinus discharging white fluid followed by the fifth stage where the area darkens with necrosed skin. All cases of early port site infections were managed by antibiotics and wound care while delayed cases did not respond to the conservative management. Pus culture was negative in all the cases while biopsy revealed a granulomatous disease in all the cases. However, AFB could be detected only in two cases. Being a endemic region of tuberculosis and dubious biopsy report, ATT (cat-I) was started to all 14 cases of deep port site infections. Out of 14 cases, 12 responded well to it while other two were lost from the follow up after commencing the ATT.

Statistical analysis

The data was tabulated for its descriptive statistical analysis. Categorical variables were analysed using Fischer’s exact test and Chi-square test. Student t-test was used for statistical analysis of continuous variables while using a SPSS 20.0 version. The level of significance was considered as $p < 0.05$.

Results

Among the 700 cases of laparoscopic cholecystectomy, females (85%) predominated over the males (15%). Mean age was 42.71 years with a standard deviation of 13.79 years. The youngest patient was 19 years old while oldest one was 85 years of age.

Table 1: Age distribution of the patients

s.no	Age group (years)	No of patients (n=700)	Percentage (%)
1	11-20	09	1.28
2	21-30	163	23.28
3	31-40	188	26.85
4	41-50	140	20
5	51-60	118	16.85
6	61-70	74	10.57
7	>70	08	1.14

Majority of cases (70.13%) belongs to 21-50 years of age with a peak distribution (26.85%) in the fourth decade of life as depicted in table 1. About 1/3rd (34.85%) of the cases in the present study were also suffering from an associated comorbid illness as depicted by table 2. The odd ratio and relative risk of PSI was also calculated in cases associated with comorbid diseases as summarised in table 2.

Table 2: PSI association with comorbid illnesses

Sr. No	Associated disease	Total cases(n=700)	No of cases with PSI (n=7)	P value	Odd ratio (OR)	Relative risk (RR)
1	Diabetes	49	03	0.418	1.78	1.74
2	Hypertension	80	01	0.346	0.301	0.310
3	Anaemia	57	01	0.714	0.441	0.451
4	COPD	42	02	0.665	1.32	1.307

Majority of the cases were suffering from chronic cholecystitis (61.1%) followed by acute cholecystitis (22%), mucocele (11%) and empyema (5.9%) of gallbladder as evidenced by table 3.

Table 3: PSI association with type of cholecystitis

Diagnosis	Sup. PSI	Deep PSI	Total	I	II	III	IV	V	OR	RR
Acute Cholecys.	03	02	05	0	0	0	2	0	0.84	0.87
Chr. Cholecys.	08	12	20	0	2	8	1	1	2.17	2.34
Mucocele	00	00	00	0	0	0	0	0	-	-
Empyema	01	00	01	0	0	0	0	0	0.62	0.63

Port site infection (PSI) was noticed in 3.71% (n=26) of the cases, it was only a superficial PSI in 1.71% (n=12) cases while a deep PSI in rest 2% cases. Majority of the cases (66.67%) with superficial PSI and deep PSI (85.71%) were suffering from chronic cholecystitis. Females were predominately involved (88.46%). According to Chaudhuri *et al* classification, cases of deep PSI were further divided in to five grades. Majority of the cases (57.14%) were having a grade III disease followed by grade IV (21.42%) and grade II (14.28%) disease.

Epigastric port was most commonly infected (75%) site followed by paraumbilical port (15.62%) and midclavicular port (9.38%). Epigastric PSI was also associated with synchronous umbilical and midclavicular PSI in 6 cases (3 cases each). All cases of superficial PSI were successfully managed with antibiotics and wound care. However, the cases of deep PSI who typically presented between 4th to 8th weeks of surgery didn't respond to the standard care. Pus cultures were sent which were surprisingly sterile keeping the ball rolling. Biopsy was sent which suggested a granulomatous disease in all the cases, but AFB could be detected in only two cases. Keeping histopathological findings and endemic region of tuberculosis in centre, trial of ATT was given in all cases of deep PSI. Fortunately, all cases responded well to it except the two cases who were lost during the follow up.

Discussion

Laparoscopic cholecystectomy is a boon not only for the patient, but health care system is also beatified by its glorifying outcomes. Although it has become a gold standard treatment for symptomatic gallstone disease, but it is not totally free from the complications. The present study is aimed to specifically evaluate the incidence of port site infections in cases of laparoscopic cholecystectomy.

The mean age of our patients was 42.71 ± 13.79 years. Majority of cases (70.13%) belonged to 21-50 years of age with a peak distribution (26.85%) in the fourth decade of life. Adisa *et al* reported³ a mean age of 38.1 years while Al-Salamah reported¹¹ a mean age of 43.7 years in their respective studies, which are comparable to the present study. Females were predominating over males with a ratio of 5.7:1 in current study which is also corresponding with the literature^[11].

Port site infection is not an uncommon entity in laparoscopic cholecystectomy. It was reported in 3.71% cases in the present study which is equivalent with other studies^[4, 6, 8] (1.4 – 6.7%) It may be accredited to use of reusable trocars, improper sterilisation techniques, associated comorbidities and spillage of bile and stones while retrieving the gallbladder^[11]. In the present study too, all these factors prevailed as reusable trocars were used in all the cases for cost effective practices in our rural government centre. The most common port involved in PSI was the epigastric port (75%) followed by umbilical port in the present study which surprisingly differs from other studies, where umbilical port was the commonest site for PSI^[5, 6]. It may be due to our standard practice of gallbladder specimen extraction through 10 mm epigastric port. Spillage of stones, bile, pus in empyema in wider 10 mm port may invite a PSI at epigastric port. Moreover, suction and irrigation canula was also used through this port which might further appended the chances of atypical mycobacterial infections due to a sterilisation lapse in present study. Lateral ports were infected in only 9.38% cases in present study which is likewise other studies.^[5, 6] Smaller port sizes (5mm) and less exposure to intraoperative contamination might be the key factors due to the common universal practice of avoiding these ports for specimen extraction.

Out of total 26 cases of PSI, 12 cases had a superficial PSI while 14 cases had deep PSI according to centre for disease control classification.^[9] The superficial PSI occurred within 7-10 days of the surgery. All cases of superficial PSI were successfully managed by standard wound care and antibiotics. Similar results were also reported by Karthik *et al*.^[5] and Adisha *et al*.^[3] Interestingly, all cases of deep PSI were reported typically from 4th to 8th week of the surgery. Majority of these cases had a grade III deep PSI (57.14%) followed by grade IV (21.42%) and grade II (14.28%) PSI as per Chaudhuri *et al* classification^[10]. None of these cases responded to standard treatment by wound care and antibiotics. Biopsy was done in all these cases which confirmed a granulomatous disease in all the deep PSI cases. However, AFB could be detected in only 2 cases and thus kept the dilemma on. Routine culture was not conclusive in any of the cases. Empirical treatment with ATT was done in these cases which showed a overwhelming response in all cases except the 2 cases who lost to follow up after embarking on ATT.

Comorbid illnesses may increase the chances of wound infection due to low immunity, poor healing and other related changes in the tissues. Although 34.85% of the cases in the present study were also suffering from an associated comorbid illness but only 23% cases of PSI were suffering from a comorbid illness as depicted by table I. The odd ratio and relative risk of PSI were also not significant as summarised in table 1.

Chances of PSI are likely to be high in cases of empyema and acute cholecystitis due to more frequent bile/pus spillage, difficult specimen retrieval and prolonged duration of the surgery as compared to chronic cholecystitis cases^[13, 14]. But surprisingly, Majority of the cases (66.67%) with superficial PSI and deep PSI (85.71%) were suffering from chronic cholecystitis and none out of the acute cholecystitis, chronic cholecystitis, mucocele and empyema have shown a significant association with PSI as reflected by table 2.

Chaudhuri *et al* in their study on post laparoscopic cholecystectomy PSI also reported 19 cases of deep PSI with a presentation resembling the present study^[10]. Pus cultures were also similarly negative for AFB. These cases were diagnosed as *M. chelonae-fortuitum* infections and further divided into five stages. Without adequate treatment, the infection continued for months and multiple nodules appeared in different area. All cases were treated successfully by oral ciprofloxacin and clarithromycin for a month in BID doses along with local infiltration of injection amikacin at PSI in resistant cases.

Atypical mycobacterium may colonise tap water, natural water and solutions used for sterilisation and disinfection of laparoscopic instruments^[15]. Their endospores may survive even a high-level disinfection commonly practiced by many surgeons and hence demands either an autoclaving or a prolonged contact with a glutaraldehyde solution over 8-12 hours^[16]. Moreover, a resistant to glutaraldehyde solution due to defect in porin expression in the atypical mycobacterial cell walls has been reported which may further exasperate the condition^[17]. Improper mechanical cleaning of laparoscopic instruments may allow the accumulation of dirt, blood, grime and tissues in poorly accessible parts of these instruments leading to an outbreak^[18]. Once contaminated, these instruments may lodge these endospores in subcutaneous planes where they germinate over a time of 3-4 weeks as in present study^[19]. Although it has a high affinity for the dermis and subcutaneous tissues, but protective mechanisms of the peritoneal cavity destroy these organisms and hence prevent its peritoneal transmission^[10]. It is quite challenging task to isolate and diagnose these organisms as it takes a long time to grow and difficult to culture^[20].

Moreover, culture of pus from PSI is frequently negative demanding a tissue from the wall of the cavity which too further require at least 3 weeks for the bacterial growth.

Conclusions

Laparoscopic surgery demands not only a technical grooming on the surgeons end but a meticulous strategy regarding sterilisation of laparoscopic instruments is also equally crucial motif to prevent undesirable complications like PSI. A proper mechanical cleaning, sound selection of sterilisation method, strict compliance to the sterilisation steps without any enticements are the keys to avert the unsought complications like PSI in this novel laparoscopy technique. Further, a high index of suspicion and a prompt and punctilious approach in diagnosis and treatment may further ameliorate the erroneousness peculiarly in the cases of PSI.

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