

Original Article

Early Laparoscopic Port Site Complications and Its Probable Cause

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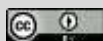
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ABSTRACT

Introduction: Laparoscopic surgery is one of the pillars of modern surgical care. Benefits include decreased postoperative pain and quicker return to normal activity minimizing the financial burden to the patient. There are, some unique complications associated with gaining access to the abdomen for laparoscopic surgery. **Aim of the study:** The aim of the study was to determine the incidence of early postoperative port site complications following laparoscopic surgery and their causes. **Methods and materials:** This prospective observational study was conducted at the Department of Surgery, BIRDEM General Hospital, Shahbag, Dhaka, Bangladesh. The study duration was 1 year, from January 2019 to December 2019. A total of 700 patients undergoing laparoscopic surgery were studied during the above-mentioned period.

The patients were observed at several intervals up to 6 months. **Results:** Regarding port site complications, the majority 29.3% patients had port site infection, 19.5% port site bleeding, 7 (17.1%) peri-umbilical bruising, and 12.1% port-site incisional hernia 9.1%, 9.1% and 9.1% had altered port site sensation, tuberculosis, and hypertrophied scar respectively. 4.9% and 4.9% patients had chronic discharging sinus and foreign body granuloma respectively. Instrument & peri-operative sterility, foreign body reaction, diabetes mellitus, and other comorbidities were major causes of complications. **Conclusion:** Laparoscopic surgery itself has many risks common with any surgery but port site complications in particular, although infrequent, are bothersome complications which undermine the benefits of minimal invasive surgery. Common complications at the port site include infection, bleeding, peri-umbilical bruising, and rarely, incisional hernia.

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INTRODUCTION

Revolutionary advancements in laparoscopic procedures have transformed the surgical landscape, allowing for the treatment of ailments through minimally invasive surgical methods, facilitated by cutting-edge advancements in health technology ^[1]. The surgical technique of laparoscopy involves the insertion of either reusable metal or disposable plastic instruments called trocars through small incisions or ports made on the skin, away from the surgical site ^[2]. Laparoscopic surgery offers several benefits, including decreased postoperative pain, faster return to normal activities, lower rates of postoperative complications, early ambulation, and quicker release from the hospital, which can help minimize the financial burden on patients, especially important in low and middle – income countries. However, there is a risk of uncommon but potentially dangerous complications during the initial access to the abdomen, such as accidental bowel or major vessel injury ^[3,4]. The rate of significant issues arising from laparoscopic surgeries is approximately 1.4 per every 1,000 operations performed ^[4,5]. The technology and methods used in laparoscopic surgery have significantly advanced in recent times. There are a wide range of trocar designs available, and views on the best way to close the fascia after surgery vary greatly ^[6]. The incidence of port site complications following laparoscopic surgery has shown a proportional rise with an increase in popularity and availability of laparoscopic facilities around the country. Laparoscopic surgery and its advantages have been long discussed and its efficacy and suitability

have been proven. The present study was done to determine the early laparoscopic port site complications in a tertiary level hospital and their probable causes.

METHODS AND MATERIALS

This prospective observational study was conducted at the Department of Surgery, BIRDEM General Hospital, Shahbag, Dhaka, Bangladesh. The study duration was 1 year, from January 2019 to December 2019. A total of 700 patients undergoing laparoscopic surgery were studied during the above mentioned period. The study population consisted of patients admitted for routine non-malignant laparoscopic surgery. Data was collected on the 1st postoperative day (POD), 15th POD, 3 months and at 6 months. They were observed post-operatively until they met criteria for discharge. Detailed information about the patient was obtained in each case. Relevant investigation reports were collected. All the information was recorded according to a fixed protocol. Collected data was classified, edited, coded, and entered for statistical analysis by using SPSS version 23.

Inclusion criteria:

- Patients undergoing routine laparoscopic surgery.

Exclusion criteria:

1. Patients requiring conversion to open procedures.
2. Laparoscopic oncosurgery for known malignant disease
3. Emergency Laparoscopic surgery

RESULTS

Among the participants, 41 (5.9%) out of 700 patients developed port site complications. The highest proportion of patients with port site complications was found in the laparoscopic rectopexy group (25%). The lowest was in the laparoscopic appendicectomy group (4%) (**Table – I**).

Table I: Incidence of early postoperative port site complications according to type of surgery (n=700).

Type of Surgery	Number of patients	Patients with port site complications	Percentage
Laparoscopic	402	25	6.2
Laparoscopic	175	7	4.0
Inguinal	115	7	6.1
Laparoscopic	8	2	25
Total patients undergoing	700	41	5.9

Among the patients in the study, more than half (53.7%) belonged to age 41 - 60 years. The mean age was found 45.1 ± 14.1 years with a range from 12 to 71 years. More than half (51.2%) patients were female, 12 (29.3%) were service holders, 36 (87.8%) were married and 19 (46.3%) had a BMI of 25.0 - 29.9 kg/m² (**Table –II**).

Table II: Distribution of the study patients according to demographic information (n = 41).

Demographic information	Frequency	Percentage
Age (years)		
≤ 20	2	4.9
21 -40	10	24.4
41 – 60	22	53.7
> 60	7	17.1
Mean ± SD	45.1 ± 14.1	
Range (min - max)	12 - 71	
Sex		
Male	20	48.8
Female	21	51.2

Occupational status		
Service	12	29.3
Homemaker	10	24.4
Businessman	6	14.6
Student	4	9.8
Farmer	3	7.3
Retired	3	7.3
Engineer	2	4.9
Day laborer	1	2.4
Marital status		
Married	36	87.8
Single	5	12.2
BMI (kg/m²)		
< 18.5 (Underweight)	1	2.4
18.5 - 24.9 (Normal)	18	43.9
25.0 - 29.9 (Overweight)	19	46.3
≥ 30.0 (Obese)	3	7.3
Mean ± SD	25.2 ± 3.1	
Range (min-max)	18 - 32	

Among the patients who developed port site complications, 7 (17.1%) of patients with gallbladder pathology reported hypochondriac pain, 4 (9.8%) upper abdominal pain, and 3 (7.3%) epigastric discomfort (**Table –III**).

Table III: Distribution of the study patients according to pre-operative chief complaints (n = 41)

Chief	Number	Percentage
Hypochondriac	7	17.1
Iliac fossa pain	7	17.1
Swelling at	7	17.1
Fever	5	12.2
Vomiting	5	12.2
Upper	4	9.8
Epigastric discomfort	3	7.3

Rectal	2	4.9
Incidental finding of gallstone on USG (Cholelithiasis)	2	4.9
Nausea	1	2.4

According to the table, more than one-third, 14 (34.1%) patients had hypertension, 14 (34.1) patients had diabetes mellitus type 2, 6 (14.6%) had heart disease, 3 (7.3%) patients were of BMI > 30 and 1 (2.4%) patient of BMI < 18, 3 (7.3%) had chronic kidney disease, 3 (7.3%) had bronchial asthma and 1 (2.4%) had a history of stroke (**Table – IV**).

Table IV: Distribution of the study patients according to Risk Factors for developing port site complications (n = 41).

Risk Factors	Frequenc	Percentag
Hypertension	14	34.1
Diabetes	14	34.1
Heart disease	6	14.6
Chronic kidney	3	7.3
Bronchial	3	7.3
Stroke	1	2.4
BMI > 30	3	7.3
BMI < 18	1	2.4
Chronic cough	4	9.8
Constipation	7	17.1
Strenuous work	15	36.6
Nicotine usage	8	19.5

In this table 25 (61.0%) patients underwent laparoscopic cholecystectomy, 7 (17.1%) underwent laparoscopic appendectomy, 7 (17.1%) underwent inguinal hernioplasty (TAPP) and 2 (4.9%) underwent laparoscopic rectopexy. Regarding the indication of operation, it was observed that the majority 21 (51.2%) had chronic calculous cholecystitis, 4 (9.8%) patients had acute cholecystitis, 7 (17.1%) had acute appendicitis and 7 (17.1%) had an inguinal hernia. Regarding the location of port site infection, 7 (17.1%) patients presented with epigastric port infection (**Table –V**).

Table V: Operative data of patients having port site complications (n = 41)

Per-operative work-up	Frequency	Percentage
Type of laparoscopic surgery		
Laparoscopic	25	61.0
Laparoscopic	7	17.1
Inguinal hernioplasty	7	17.1
Laparoscopic rectopexy	2	4.9
Indication of operation		
Acute appendicitis	7	17.1
Inguinal hernia	7	17.1
Acute cholecystitis	4	9.8
Chronic calculous	21	51.2
Rectal prolapse	2	4.9
Number of ports used per patient		
Three	15	36.6
Four	26	63.4
Location of port site complication		
Epigastric region	7	17.1
Umbilical port	34	82.9

It can be seen in Figure 1 that 12 (29.3%) patients had port site infection, 8 (19.5%) had port site bleeding, 5 (12.1%) had port site incisional hernia, 4 (9.1%), 4 (9.1%) and 4 (9.1%) had altered port site

sensation, port site tuberculosis and hypertrophied scar respectively. 2 (4.9%) and 2 (4.9%) patients had chronic discharging sinus and foreign body granuloma respectively (**Figure –1**).

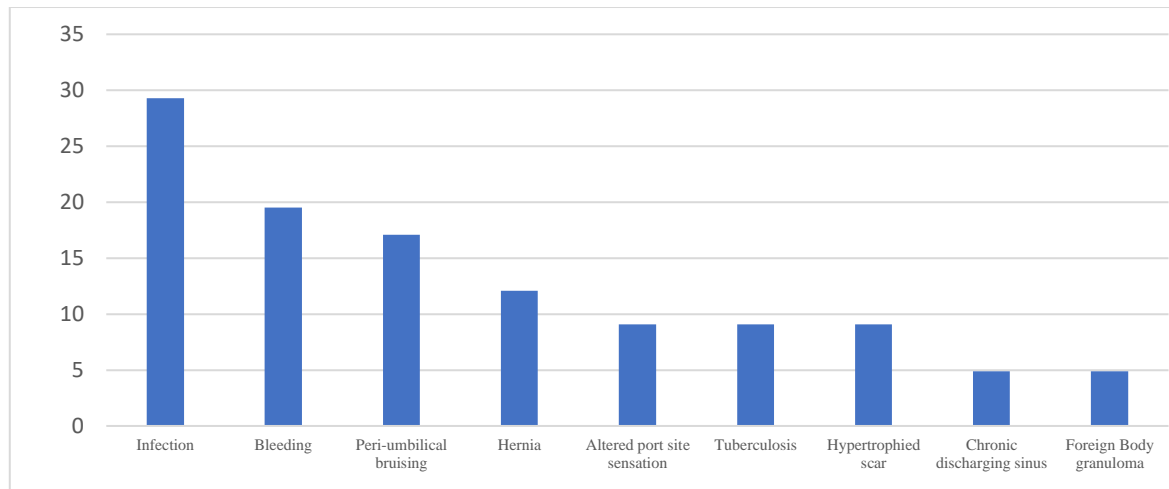


Figure 1: Bar diagram showing percentage of postoperative port site complications of the study patients (n = 41)

Regarding the presentation of complications in different periods of follow up, eight cases were found with bleeding in the 1st POD but not found in the 15th POD, 3 months, and 6 months

respectively. 7 cases presented with peri-umbilical bruising on the 1st POD and 2 cases on the 15th POD but not on the subsequent follow-up dates. The rest of the data is shown in the table (**Table – VI**).

Table VI: Distribution of complications in different periods of follow up (n = 41)

Complications	1 st POD	15 th POD	3 months	6 months
	n	n	n	n
Bleeding	8	2	0	0
Altered Sensation in Port Site	0	3	1	0
Wound Discharge: (Serous/ Sero-sanguinous/ Sero-purulent/ Frank pus)	1	11	1	5
Port site tuberculosis	0	0	1	3
Chronic discharging sinus	0	0	0	2
Port site incisional hernia	0	0	0	5
Foreign body granuloma	0	0	1	2

Regarding the probable causes as seen in the table above, complications include port site infection (9 patients, 75% of whom had diabetes mellitus), port site bleeding (7 patients, 87.5% of whom were on anticoagulants), port site incisional hernia (2 patients, 40% of whom had a BMI >

25), altered port site sensation (2 patients, 50% of whom had diabetic neuropathy), port site tuberculosis (2 patients, 50% of whom had a poor socio-economic status), chronic discharging sinus (1 patient), and foreign body granuloma (2 patients, both

of whom had poor suture technique or quality) (Table – VII).

Table VII: Distribution of complications in different port site surgical procedures and their possible/probable causes

Possible/probable causes	Number of patients(%)
Port Site Infection (n=12)	
Diabetes mellitus	9 (75.0)
BMI > 25 (Overweight or obese)	2 (16.7)
Immunocompromised due to CKD	1 (8.3)
Steroid usage for bronchial asthma	1 (8.3)
Intra-abdominal infection (Delivery of gangrenous appendix through the umbilical port)	1 (8.3)
Poor hygiene at umbilicus	1 (8.3)
Cigarette smoking	1 (8.3)
Port Site Bleeding (n=8)	
On Anticoagulants (aspirin)	7 (87.5)
Diabetes mellitus	5 (62.5)
Poor suture or quality	2 (25.0)
Port Site Incisional Hernia (n=5)	
BMI > 25	2 (40.0)
Strenuous work	2 (40.0)
Constipation	1 (20.0)
Chronic cough	1 (20.0)
Diabetes Mellitus	1 (20.0)
DM and CKD	1 (20.0)
Port Site Sensation (n=4)	
Diabetic neuropathy	2 (50.0)
Foreign body reaction	1 (25.0)
Poor skin apposition	1 (25.0)
Port Site Tuberculosis (n=4)	
Poor socio-economic status – exposure to tuberculosis	2 (50.0)
Diabetes and poor nutrition	1 (25.0)
Poor nutrition	1 (25.0)
Chronic Discharging Sinus (n=2)	
Foreign body reaction	1 (50.0)
Foreign Body Granuloma (n=2)	
Poor suture technique or quality	2 (100.0)
Intradermal sutures	2 (100.0)

DISCUSSION

In this prospective observational study, the incidence of early postoperative port site complications following laparoscopic

surgery was found to be 5.9% (41 out of 700 patients). The majority of patients belonged to the age group of 41-60 years (53.7%) with a mean age of 45.1 years.

51.2% of patients were female and 48.8% were male. The majority of patients (29.3%) worked in service, followed by homemakers (24.4%) and businessmen (14.6%). Here 87.8% of the patients were married and 12.2% were single. These findings are consistent with other studies in the field [7,8,9,10,11]. In our study, 46.3% of the participants had a BMI between 25.0 and 29.9 kg/m² with a mean BMI of 25.2 ± 3.1 kg/m² (range 18.0 to 32.0 kg/m²). A comparison study reported that only 53.33% of their 300 patients had a BMI between 18.5 and 25 kg/m² while 39 (13%) had a BMI lower than 18.5 kg/m² and 23.33% had a BMI between 25 and 30 kg/m² [12]. In our study, patients with gallbladder pathology presented with hypochondriac pain in 17.1% of cases, 9.8% had upper abdominal pain, 7.3% had cases, and 4.9% of asymptomatic cholelithiasis. Patients with acute appendicitis had iliac fossa pain in 17.1% of cases, fever in 12.2%, vomiting in 12.2%, and nausea in 2.4%. The inguinal hernia was diagnosed in 17.1% with swelling in the inguinal region and rectal prolapse was found in 4.9%. 34.1% of our participants had hypertension, 34.1% had diabetes mellitus type 2, 14.6% had heart disease, 7.3% had chronic kidney disease, 7.3% had bronchial asthma, and 2.4% had a history of stroke. Other risk factors included chronic cough (9.8%), constipation (17.1%), strenuous work or lack of rest following operation (36.6%), and nicotine usage (19.5%). Another study reported diabetes mellitus to be present in 13.79% of their study group and hypertension in 10.34% [10]. A similar study found hypertension was present in 6.2% and heart disease in 2.9% [7]. Out of the procedures, the majority were laparoscopic cholecystectomy, performed

on 61.0% of participants, followed by laparoscopic appendectomy in 17.1%, inguinal hernioplasty in 17.1%, and laparoscopic rectopexy in 4.9%. Rabindranath and Reddy [13] documented that the majority of procedures were cholecystectomy followed by appendectomy, while Mudgal et al. [12] reported 80% of their 300 patients underwent laparoscopic cholecystectomy, 10.67% underwent laparoscopic appendectomy, and 5.33% underwent laparoscopic hernia repair. In our study majority of the patients (51.2%) had chronic calculous cholecystitis, while 9.8% had acute cholecystitis, 17.1% had acute appendicitis, and 17.1% had an inguinal hernia [10]. Hasson's Open method was used to create pneumoperitoneum in all cases and standard 5 mm and 10 mm laparoscopic trocar and cannula were used. The number of ports per patient varied, with 36.6% having three ports and 63.4% having four ports [14]. Regarding port site complications, the study found that the majority of patients (29.3%) had port site infection, 19.5% had port site bleeding, 12.1% had port site incisional hernia, and 9.1% had altered port site sensation, port site tuberculosis, and hypertrophied scar. 2 patients each had chronic discharging sinus and foreign body granuloma [9]. A study by Vanitha et al. showed similar results with 11% of patients having port site infection, 14% having port site discharge, 5% having bleeding, and 6% having port-site incisional hernia [9]. Rabindranath and Reddy documented 6.4% of patients having port site infections (PSI), while Mir et al. observed PSI to be 6.7% [15]. The site of complications in our study varied, with 17.1% having an epigastric port site complications and 82.9% having an umbilical port

complication. The gallbladder specimen was routinely removed through the umbilical port. Other studies showed similar results with epigastric and umbilical ports being the most common sites of infection [8,16,10]. In some cases, peri-umbilical bruising was also observed, but it usually resolved within a month following surgery. Hernioplasty was used to treat incisional hernias one year after the initial operation. Four (9.1%) patients experienced altered port site sensation, which could have been caused by diabetic neuropathy, foreign body reaction, and poor skin apposition. Four (9.1%) patients had port site tuberculosis, which was likely due to poor socio-economic status, immunocompromised status, and poor nutrition. Tuberculosis was suspected in a long standing port site infection greater than 1-2 months. Diagnosis of port site tuberculosis was established by histopathological examination of tissue from abscess wall or sinus tract & treated as per WHO and national guidelines. Siddiqua et al [10] reported 1.72% cases of atypical mycobacteria and 5.17% cases of *Mycobacterium tuberculosis* among their study group. Two (4.9%) patients had chronic discharging sinus, and one (2.4%) patient had umbilical granuloma, which was likely due to poor suture technique or quality or the failed absorption of vicryl sutures used in skin closure. In these two cases presence of tuberculosis or atypical mycobacterium could not be proved, nor excluded. These complications were treated conservatively with wound dressing and antibiotics.

Limitations of the study

The study population was selected from one selected hospital in Dhaka city, so the

results of the study may not reflect the exact picture of the country.

CONCLUSION

The study's aim was to observe the incidence and variety of post-laparoscopy port complications and their probable causes. Laparoscopic surgery itself has many risks common with any surgery, but port site complications in particular, although infrequent, are one of the bothersome complications that undermine the benefits of minimally invasive surgery. Laparoscopic cholecystectomy is the most common procedure, followed by laparoscopic appendectomy. Percentage-wise, the incidence of complications noted in the study (5.9%) is comparable with statistics worldwide (0.2–6%). Most complications were manageable with minimal morbidity. In general, there are two types of risk factors. One group of risk factors cannot be altered by the surgeon, such as genetic predisposition or heart disease

RECOMMENDATIONS

Further studies can be undertaken by including larger numbers of patients in other centers with more detailed follow-up protocols. Regarding instrument sterility, all instruments should be dismantled and cleaned completely after each surgery. It is recommended to follow the proper technique for sterilization of laparoscopic instruments to prevent port site infections. Rate of wound infection can also be reduced by appropriate administration of antibiotic prophylaxis, sterile techniques, use of specimen bags during specimen extraction, toileting of ports by povidone iodine before closure and optimization of patient comorbidities before surgery.

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