

Site Complications in Patients Undergoing Laparoscopic Surgeries in AIIMS, Bhopal

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Abstract:

Objective: To study the various port site complications associated with laparoscopic surgeries

Methods: Single centre observational retrospective and prospective study conducted at AIIMS, Bhopal between Jan 2018 to Jan 2020 (MRD), February 2020 to January 2021 (Department of General Surgery). Sample size was based on convenience sampling and included all the files retrieved from MD of patients who have undergone laparoscopic surgery and the patients who underwent laparoscopic surgeries. Data such as patient demographics, diagnosis, procedure details and complications were noted. Patients were contacted telephonically and asked about any discharge from surgical site or any swelling at surgical site.

Results: The mean duration of surgery for all procedures was 112.48 minutes with a standard deviation of 45.28. the mean post-operative stay was 4.36 days with a standard deviation of 2.73. the frequency distribution of ports >10mm. 5 patients of the 133 had surgical site infection, with a frequency of 3.75%. 1 Patient reported port site hernia. 95.48% of the study population did not reports any port site complication. The association of port site complication with diagnosis. 3 of the 5 patients who had surgical site infection had cholelithiasis. One had appendicitis and one had hernia. One patient reported port site hernia at umbilical site also had cholelithiasis.

Conclusion: The incidence of port site complications is higher in laparoscopic cholecystectomies. There is a higher chance of surgical site infections in patients who have diabetes. The incidence of port site infections is higher at umbilical sites as compared to other port sites. No association was found between technique of closure and port site infections.

Keywords: Port Site Complications, Laparoscopic Cholecystectomies.

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Introduction

Laparoscopy is a minimally invasive technique for abdominal surgeries using an endoscope inserted transabdominally to observe organs within the abdominal and pelvic cavities. Minimally invasive surgeries such as laparoscopic surgeries have become the order of the day for many surgical diseases.

Laparoscopic surgeries have brought a paradigm shift in the approach to modern surgical care. It has the advantages of early postoperative recovery, less pain, improved aesthetics and early return to work, which has led to its popularity amongst surgeons and patients. Its application has progressed from relatively simpler procedures such as cholecystectomies and appendectomies to various other fields including gastrointestinal surgery, gynecology, urology, and onco-surgery. Like other surgeries, laparoscopic surgeries have their own set of complications. These complications, not only add

to morbidity of the patient but also spoil the reputation of the surgeon.

The main reasons for preference of laparoscopic surgeries over open abdominal surgeries i.e. laparotomies are less pain, faster convalescence, lesser scars and shorter hospital stay. More and more surgeries are being performed laparoscopically because of advancement in medical science. Two absolute contraindications to laparoscopy are - a patient unfit for general anesthesia, and the surgeon's lack of skill pertaining to the particular procedure concerned. [1]

With an increase in the number and complexities of laparoscopic surgeries, there has also been a reported increase in complications, many of which are due to abdominal access with laparoscopic trocars, for example, vascular injuries, visceral injuries, air embolism, subcutaneous emphysema, etc. These complications are by far very rare. Major complications have been reported in approximately

1.4 per 1000 laparoscopy procedures. [2] There are unique complications associated with access approach to the abdomen in laparoscopic surgery. Though uncommon, injury to intra-abdominal organs like bowel or major vessels may be life-threatening.

Port site complications in laparoscopic surgeries have shown a proportional increase with increased incision size and are considered to be around 21 per 100,000 cases [3,4] The most widely accepted practice is to close all port sites especially those >10mm in adults and >5mm in children incorporating the peritoneal layer with fascial closure [5] Port site associated complications can be port sites infections, port site incisional hernia and metastasis at the port sites.

Standard closure involves removal of trocar and suturing of all layers with a figure of 8 suture while grasping the fascial layers with Allis forceps or Kochers forceps [6] Though rare, port site hernias are a well-known complication of laparoscopic procedures. They have been classified into

- Early: occurring in the first 2 weeks. There is dehiscence of fascial planes and peritoneum.
- Late-onset: Occurring after 2 weeks with an intact peritoneum and dehiscence of facial plane
- Special: dehiscence of the whole abdominal wall. [5]

These are most commonly seen in port sizes >10mm and very rarely in those around 5mm [7]. Single-incision laparoscopic surgeries are gaining popularity amongst surgeons and patients. These depend on 12 mm ports. According to some studies these are shown to have higher incidence of hernias as compared to conventional laparoscopy. [8]

Materials and Methods

Table 1: Distribution of study population according to procedure

Procedure	N	%
Diagnostic laparoscopy with adhesioysis	1	0.8
Diagnostic laparoscopy with appendicectomy	1	0.8
Laparoscopic appendicectomy	8	6.0
Laparoscopic Deroofing	1	0.8
Laparoscopic hernia repair	13	9.8
Laparoscopic cholecystectomy	106	79.4
Laparoscopic cholecystectomy with umbilical hernia repair	2	1.6
Laparoscopic cholecystectomy with appendicectomy	1	0.8
Total	133	100

Table 2: Distribution of study population according to pneumoperitoneum technique

Technique	N	%
Closed	117	88.0
Open	16	12.0
Total	133	100.0

Study Type: It is a single centre observational retrospective and prospective study conducted at AIIMS, Bhopal

Duration of study: Jan 2018 to Jan 2020 (MRD)

February 2020 to January 2021 (Department of General Surgery)

Sample size was based on convenience sampling and included all the files retrieved from MRD of patients who have undergone laparoscopic surgery and the patients who underwent laparoscopic surgeries

Study Population:

Inclusion criteria for study participants: All patients who have undergone laparoscopic procedures in AIIMS, Bhopal between Jan 2018 to January 2021.

Exclusion criteria for study participants:

- Loss to follow up
- All patient files not retrieved from MRD

Methodology:

Procedure:

- Files of Patients who have undergone laparoscopic surgery in the time duration of Jan 2018 to Jan 2020 were collected and data such as patient demographics, diagnosis, procedure details and complications were noted.
- Similar data of patients who underwent laparoscopic surgery in the time duration of February 2020 to January 2021 was collected.
- Patients were contacted telephonically and asked about any discharge from surgical site or any swelling at surgical site.

Observation Chart

Table 3: Distribution of Study population according to closure technique

Technique	N	%
External vision Vicryl	127	95.5
Prolene at umbilicus, External Vision	1	0.8
Suture passer at epigastrium (internal vision)	5	3.7
Total	133	100.0

Table 4: Mean distribution of surgery and post op stay

Variable	Mean	SD
Duration of surgery	112.48 minutes	45.28
Post –op stay	4.36 days	2.73

Table shows the frequency distribution of ports >10mm. 8 patients of the 133-study population had a port measuring >10mm (12mm). the rest of the population had the largest port measuring 10mm

Table 5: Frequency distribution of ports >10mm

No. of port site	N	%
0	125	94.0
1	8	6.0
Total	133	100.0

Table 6: Distribution of study population according to port site complications

Type of Complication	N	%
SSI	5	3.75
Port site hernia	1	0.75
No complication	127	95.48
Total	133	100

Table 7: Association of complication to diagnosis

Diagnosis	No Complication (n=127)	SSI (n=5)	Umbilical Hernia (n=1)	Total (n=133)
Cholelithiasis	106(96.37%)	3(2.73%)	1 (0.9%)	110
Appendicitis	7(87.5%)	1(12.5%)	0	8
Hernia	9(90%)	1 (10%)	0	10
GB diseases other than cholelithiasis	2 (100%)	0	0	2
Pain abdomen under evaluation	3 (100%)	0	0	3

Table 8: Distribution of study population according to comorbidities

Co-morbidities	No Complication (n=127)	SSI (n=5)	Port site hernia (n=1)	Total (n=133)
Hypertension	4	0	0	4
Diabetes	4	2	0	6
Hypertension and Type II DM	2	2	0	4
Hypertension, Type II DM & renal caculi	1	0	0	1
Hypothyroidism	6	0	0	6
Hypertension and Hypothyroidism	1	0	0	1
Sickle cell disease	1	0	0	1
Rheumatoid Arthritis	1	0	0	1
None	107	1	1	109

Table 9: Distribution of study population according to closure technique and rate of complications

Technique	No Complication (n=127)	SSI (n=5)	Port Site Hernia (n=1)	Total (n=133)
Vicryl, external vision	122(96.1%)	5(3.9%)	0	127
Prolene at umbilicus, external vision	0	0	1(100%)	1
Suture passer (internal vision)	5(100%)	0	0	5

Table 10: Association of complications with port size

Port size	Complication
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	SSI	Port site Hernia
>10 mm	0	1
10 mm	5	0
5mm	0	0

Results

127 of 133 of the study population had closure done using vicryl while visualizing the wound externally. 5 patients had port closure using suture passer at the epigastric port. These patients had their umbilical port closed with vicryl under external vision but were not counted separately in both. 1 patient had port closure using prolene at umbilical port, visualized externally.

The mean duration of surgery for all procedures was 112.48 minutes with a standard deviation of 45.28. the mean post-operative stay was 4.36 days with a standard deviation of 2.73. the frequency distribution of ports >10mm. 8 patients of the 133-study population had a port measuring >10mm (12mm). the rest of the population had the largest port measuring 10mm. frequency distribution of number of 10mm ports. 112 patients had two 10mm ports, 13 had one, 6 patients had no 10mm ports, they had 12mm ports instead. Two patients had three 10mm ports.

Distribution of study population according to port site complication. 5 patients of the 133 had surgical site infection, with a frequency of 3.75%. 1 Patient reported port site hernia. 95.48% of the study population did not reports any port site complication. The association of port site complication with diagnosis. 3 of the 5 patients who had surgical site infection had cholelithiasis. One had appendicitis and one had hernia. One patient reported port site hernia at umbilical site also had cholelithiasis.

Association of complication with gender. 3 of the 5 patients who had surgical site infection were females, 2 were males. One patient reported port site hernia, was male. No female patients reported port site hernias. The association of complications with age group. 2 of the 5 patients who had SSI were in the age group of 66-76 years, with a frequency of 28.6%. We found that the rate of SSI is 2.9%, 2.7% and 4.5% in the age groups 30-41 years, 42-53 years and 54-65 years respectively reported SSI. One patient had port site hernia and was of the age group 42-53 years.

The distribution of study population according to comorbidities and the complications associated. It was found that 4 of the 5 patients who had SSI had diabetes mellitus. One patient who reported port site hernia had no comorbidities. Distribution of study population according to procedure performed and the rate of complications in each. It was found that 3 of the 5 patients who had SSI had undergone

laparoscopic cholecystectomy, one underwent laparoscopic hernia repair and one underwent laparoscopic appendectomy. One patient reported umbilical hernia, he had undergone laparoscopic cholecystectomy with herniorrhaphy of umbilical hernia, and developed umbilical hernia again 8 months after the procedure.

Distribution of study population based on technique used for port closure. It was found that 1 patient that developed port site hernia had undergone closure with prolene at umbilical site under external vision. All 5 patients who developed SSI had undergone fascial closure with vicryl under external vision, i.e. 3.9% of the cases who underwent fascial closure using vicryl under external vision developed SSI. Association of complications with size of port. It was found that 1 out of 8 patients with umbilical port >10mm developed port site hernia, with a frequency of 12.5%. All the patients who had SSI had it at their 10mm umbilical port. None of the patients had SSI at 5mm port.

Statistical Analysis: Statistical analysis was carried out using statistical packages for IBM SPSS Statistics 20.0 for Windows. Continuous and categorical variables was expressed as mean \pm SD and percentages, respectively. Chi-square test was used to compare categorical variable. Two-sided p values were considered as statistically significant at $p < 0.05$.

Discussion

It is widely reported that port site complications can be either access-related or postoperative. They affect everyone regardless of age or gender. [9-13] In this study Laparoscopic cholecystectomy was the most performed procedure and was found to be most associated with port site complications. This was comparable to the observations made by Fuller et al. [14] It was found that 2.73% cases of laparoscopic cholecystectomy had Surgical site infection and 0.9% had port site hernia. [15-19]

Karthik et al reported that laparoscopic cholecystectomy, which was the most performed procedure had highest port site complications (52.9%) in the study population. Umbilical port sites (47%, n = 8) were most involved. In this study, we found that of the 106 patients that underwent laparoscopic cholecystectomy, 3 (2.8%) developed SSI and 1(0.9%) developed port site hernia at umbilical port site. This is followed by laparoscopic appendectomy where we found that 1 out of 7 cases had SSI. [20]

Port site SSI - According to the Centre for Disease Control (CDC), SSIs were categorized into:

1. Superficial SSIs which involve skin and subcutaneous tissue
2. Deep SSIs which involve fascia and muscle layers
3. Organ/Space SSIs.

The overall incidence of SSI was found to be 3.7%. Sasmal et al reported a SSI incidence of 8%. (39) Mudgal et al reported a frequency of 2.6% [15] All reported cases of SSI were superficial, involving only the skin and subcutaneous tissue. All cases reported SSI at Umbilical port site. These can be prevented by prophylactic antibiotics, maintaining sterile precautions, and the use of specimen retrieval bags. They are treated with proper cleaning and dressing, and antibiotics according to culture and sensitivity testing.

4 out of the 5 patients who had SSI also had diabetes mellitus.

A multi-centre prospective study was conducted by Verma et al in 3 North Indian tertiary centers. Patients who underwent laparoscopic surgeries between the years 2013 to 2016 were included in the study. Patients underwent conventional laparoscopic procedures and Veress needle was used to create pneumoperitoneum except in patients who had had previous laparotomy scars, where open technique of pneumoperitoneum was done. They reported that, between the years 2013 and 2016, 656 patients underwent laparoscopic surgery, out of which 31 (4.72%) developed port site associated complications in the first three months after surgery. Most commonly encountered complication was port site infection (n = 21, 3.2%), followed by bleeding (n = 4, 0.6%), omentum-associated complications (n = 1; 0.15%), and metastasis (n = 2, .30%). One patient also developed port site tuberculosis. Around 13(1.98%) patients developed hypertrophic scars. [40]. Port site infections occurred in 22 ports in 21 patients (3.2%). One patient had Port site infection of two different ports. Of these, 15 were superficial infections and 6 were deep infections. The infections involved the umbilical port in nine cases, epigastric port in ten patients and right upper quadrant port in one patient. They found that, Occurrence of wound infection was not significantly associated with the type of procedure (P = 0.34), its duration (P = 0.84) or the closure technique employed (P = 0.06). But they found a statistically significant association between occurrence of wound infection and the site of the ports (P = 0.004). In this study we did not encounter any port site bleeding, omentum associated complications, port site tuberculosis or metastasis. However, 8(6.01%) patients reported hypertrophic scarring at port sites. The overall incidence of SSI was found to be 3.7%, all of which were superficial SSI. We did not find any

association between duration of surgery and port site complications. However, all the SSI encountered were at umbilical ports, suggesting association between port site and SSI. [21-26]

A single centre descriptive study was carried out by Karthik et al on 570 patients who underwent laparoscopic surgeries for various diseases. They excluded patients who had history of previous abdominal surgeries and those who had been converted to open surgery. They studied Port site infections, Port-site bleeding and omentum related complications in relation to their frequency, the type of procedure performed, size of port and port position. Complications were also studied in relation to age, gender, BMI, number of ports and closure technique. They reported a total of 17 (3%) patients who had port site complications. [13] Based on sex they found that complications were more common in females as compared to males with a p value of >0.05. In our study, 3 out of the 5 patients who developed SSI were females. [13] Port site complications were common in the 20-40 age groups (p >0.05). In our study we found that most complications occurred in patients over 40 years of age. Studies have found that complications increased with increased number of ports (p = 0.23); however, a causal relationship was not established. Technique of port closure seemed to have no influence on incidence of complication. But it has been reported that omentum-related complications were seen with conventional port closure. Of the 17 complications, 10 (58%) were port site infections. All were superficial wound infections. Four (23.5%) patients developed port site bleeding; all of which were due to minor vessel injury during the placement of secondary trocars. The ports involved were epigastric (n = 2), suprapubic port (n = 1), and left lateral lumbar port (n = 1). They also reported that Two patients had immediate postoperative omental herniation from the site of umbilical port and late herniation of the omentum from the umbilical port scar (port site hernia). [27- 29] Both of these closed by conventional method. However, a significant difference was not found in the complication rates between port closure needle and standard suturing. One case of port site metastasis was seen in a patient who underwent laparoscopic-assisted hemicolectomy for ascending colon carcinoma. The specimen was retrieved from the midline incision which was extending through the umbilical port site. The recurrence was found fixed to the abdominal wall at the umbilical port site and was coming from previous anastomotic site. [13]

Fascial closure can be accomplished in several ways. A wide range of instruments are designed for closure of fascial defect at the port site. One patient reported port site hernia at umbilicus, although this patient had an umbilical hernia preoperatively and the defect was closed with prolene using retractors

to visualize the fascial defect externally. [30,31] The incidence of port site hernia was found to be 0.7%. [32,33] studies have reported incidences of 1.33 % Mudgal et al [15]. Several large studies have been done to study postoperative complications of laparoscopic cholecystectomy, where the incidence of trocar site hernias was 1 in 500 cases [34], 3 in 1983 cases [35] 1 in 800 cases [36], 11 in 1300 cases [37] and 10 in 1453 cases [38] Technique of closure was not found to influence SSI or hernia at port site.

Port site bleeding: no cases of port site bleeding were recorded in this study. Although an incidence of 20% has been reported in a study conducted by Maharaul et al. [33] Mudgal et al reported an incidence of 2% [15] Obesity has been shown to be a major risk factor for port site complications due to the need for a larger skin incision, longer trocars, limitation in mobility of the instrument, increased subcutaneous tissue, and poorer wound healing. However studies performed previously with a mean BMI of 23.2 (SD = 3.12) had no significance in relation to the frequency of port site complications [13]. In our study we could not assess relation between obesity and port site complications as part of the study was retrospective and BMI at the time of surgery could not be recorded.

Port Site Metastasis: No cases of port site metastasis were reported in this study. Although studies have reported 0.3% incidence of port site metastasis in patients who underwent laparoscopy assisted resection of colon cancers.(40) 8 patients reported hypertrophic scar at port sites. All of them had undergone laparoscopic cholecystectomy. They all reported scarring at both 10 and 5mm ports. A 6% incidence of hypertrophic scar was found. Studies have reported 1% incidence [15].

Conclusion

The incidence of port site complications is higher in laparoscopic cholecystectomies as compared to other procedures, which may or may not be because it is the most commonly performed laparoscopic procedure. There is a higher chance of surgical site infections in patients who have diabetes. The incidence of port site infections is higher at umbilical sites as compared to other port sites. No association was found between technique of closure and port site infections.

Though only one case of port site hernia was reported, the incidence of it is higher at ports more than or equal to 10mm.

Limitations

Due to small sample size, an adequate representation of port site complications could not be achieved. The on-going pandemic has significantly affected this study in relation to few procedures performed. There was loss to follow up for patients who could not be contacted

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The variety of surgeries performed was limited.

Declarations:

Funding: None

Availability of data and material: Department of General surgery AIIMS Bhopal

Code availability: Not applicable

Consent to participate: Consent taken

Ethical Consideration: There are no ethical conflicts related to this study.

Consent for publication: Consent taken

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