

A STUDY OF POST LAPAROSCOPIC PORT RELATED COMPLICATIONS

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ABSTRACT

BACKGROUND

Rapid growths in health care technology have given the surgeon the power of not only treating diseases surgically but also limiting surgical invasiveness. Laparoscopic surgeries are preferred over open surgeries, but laparoscopic surgery is not a panacea to all the problems associated with open surgery. It has its own problems and complications. The present study is planned to assess the post laparoscopic surgery port related complications.

MATERIALS AND METHODS

The present study was a prospective descriptive study conducted in the Department of General Surgery at Era's Lucknow Medical College and Hospital over a period of eighteen months. A total of 310 patients were included in the study and followed up for a period of three months from the day of surgery.

RESULTS

Out of 310 patients enrolled in the study, complications were observed only in 8 (2.58%). Port site infections were present in 6 (1.94%) cases while metastasis and hypertrophic scar was observed in 1 (0.32%) case each.

CONCLUSION

The rate of port-site complication in the present study was found to be 2.58%. The study identified older age, smoking habit and diabetes as the potential risk factors affecting the complication rates.

KEYWORDS

Laparoscopy, Port Site, Complication, Infection.

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BACKGROUND

Rapid growths in health care technology have given the surgeon the power of not only treating diseases surgically but also limiting surgical invasiveness. Mouret in 1987 performed the first laparoscopic cholecystectomy changing surgical practice^[1] and an increase in frequency of laparoscopic abdominal surgery made it common by 1990.^[2] Laparoscopic surgeries are preferred over general surgeries because of lower cost, lesser pain and scarring, faster convalescence, lesser hospital stay and overall low cost^[3,4] besides these advantages complications are by far very rare.^[5] Common complications include infection, incisional hernia, bleeding, etc.

Reusable metallic or disposable plastic trocars are inserted through small skin incisions or ports. These ports form the portal of entry to perform the surgical procedure by means of specially devised instruments and telescope.

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One of the complications associated with laparoscopic surgery is port site infection, which is responsible for significant increase in morbidity, hospital stay and financial loss. However, port site infection is preventable. A vital component of safe effective laparoscopy is the ability to insert, secure, and maintain access ports in an optimal location while avoiding injury to surrounding structures.

The active surveillance for port-site infections in laparoscopic surgery remains a challenge, due to the early discharge and day care setting.^[6] In the absence of post-discharge surveillance, it is estimated that a third of all surgical site infections will be missed.^[7] The actual incidence of the port-site infections may be much higher than revealed.

Complications of laparoscopy includes abdominal wall bleeding, omental bleeding, abdominal vessel injury, retroperitoneal vessel injury, gastrointestinal perforation, bladder perforation, solid visceral injury, and infection.^[8]

Although Trocar site hernias (TSH) can occur in wounds of any size, ranging from 2 mm to 15 mm, most reported cases are in wounds larger than 10 mm.^[9] Nezhad et al. (1997)^[10] Reported that the occurrence of TSHs at 5-mm trocar sites was unusual, because the incidence was less than 0.1%. The first trocar site hernia/port site hernia case was described by Fear in 1968^[11]. In 1974 Schiff and Naftolin reported two cases of small bowel herniation occurred between the 14th and 21st postoperative days that required laparotomy with small bowel resection.^[12]

Jansen et al. (1997)^[13] reported an overall rate of major complications to be approximately 1.4 per 1,000 procedures following a laparoscopic procedure. However the incidence of port site complications following laparoscopic surgery had been considered to be approximately 21 per 100,000 cases^[14] and it has shown a proportional rise with the increase in size of the port site incision and trocar.^[15,16]

Sharma et al. (2013)^[17] reported potential complications associated with port sites as port site hernias (0.47%), port site infections (1.02%), discharge from wound (1.41%), minor bleeding from port site (0.70%), subcutaneous emphysema (0.58%), port site metastasis (0.0%) in Indian set-up.

The present study is planned to assess the post laparoscopic surgery port related complications.

Aim and Objective

- To determine the complications associated with ports after laparoscopic surgery.
- To identify the risk factors associated with the common port site complications after a laparoscopic surgery.

MATERIALS AND METHODS

The present study was a prospective descriptive study conducted in the Department of General Surgery at Era's Lucknow Medical College and Hospital over a period of eighteen months. A total of 310 patients were included in the study and followed up for a period of three months from the day of surgery.

All the patients received pre-operative and post-operative dose of antibiotic as per protocol set by the operating surgeon-

Port Site Complications were studied in Relation to-

- Incidence of complications in a patient.
- Age, Sex and Body Mass Index.
- Diagnosis and Surgical Procedure.
- Port site complication.
- Diabetes mellitus and smoking.
- Common Pathogens involved.

Inclusion Criteria

All patients undergoing various laparoscopic surgeries.

Exclusion Criteria

Those cases which were converted to open procedures were excluded from the study.

Statistical Analysis

Statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 Statistical Analysis Software. Chi Square test, Student 't' test & Fisher exact test was used to analyse the data. The values were represented in Number (%) and Mean ± SD.

The following Statistical Formulas were used-

1. Mean.
2. Standard Deviation.
3. Median.
4. Chi square test.
5. Fisher exact test for a cross tabulation.

6. Student 't' test.

7. Level of significance: "p" is level of significance.

- p > 0.05 Not significant.
- p < 0.05 Significant.
- p < 0.01 Highly significant.
- p < 0.001 Very highly significant.

RESULTS

The present study was conducted in the Department of Surgery, Era's Lucknow Medical College & Hospital to assess the post laparoscopic surgery port related complications. A total of 310 patients were monitored for port site complications.

Demographic Profile of Patients Enrolled in the Study is given in Tables below

Age Group (Years)	No. of Patients	%
≤20	10	3.23
21-30	82	26.45
31-40	97	31.29
41-50	73	23.55
51-60	36	11.61
61-70	10	3.23
71-80	2	0.65
Total	310	100.00

Table 1. Distribution of Study Population according to age

Min-Max (Median): 15-80 (36.00); Mean±SD = 38.86±11.83

Gender	No. of Patients	Percentage
Female	254	81.94
Male	56	18.06

Table 2. Distribution of Study Population according to Gender

Diagnosis	No. of Patients	%
Appendicitis	9	2.90
Cholelithiasis	287	92.58
Hypersplenism	1	0.32
Left Inguinal Hernia	2	0.65
Paraumbilical Hernia	1	0.32
Right Benign Ovarian Mass	1	0.32
Right Inguinal Hernia	2	0.65
Umbilical Hernia	7	2.26

Table 3. Distribution of Study Population according to Diagnosis

Laparoscopic Surgery	No. of Patients	%
Appendectomy	9	2.90
Cholecystectomy	287	92.58
Laparoscopic Excision of Ovarian Tumour	1	0.32
Laparoscopic Splenectomy	1	0.32
Mesh Hernia Repair	7	2.26
Transabdominal Pre-Peritoneal Repair	5	1.61

Table 4. Distribution of Study Population according to Laparoscopic Surgery

Complications	No. of Patients	Percentage
Port site hematoma	0	0.00
Port site infection	6	1.94
Gaping	0	0.00

Port site hernia	0	0.00
Metastasis	1	0.32
Hypertrophic scar	1	0.32
No complication	302	97.42
Total	310	100.00

Table 5. Distribution of Study Population according to Complications

Port site complications were not found among 97.42% of the patients undergoing laparoscopic surgery at our institute. Complications like port site haematoma, Gaping, Port site hernia were not found in any of the patients enrolled in the study. Port site infection was observed in only 6 (1.94%) patients and metastasis and hypertrophic scar was present in 1 (0.32%) of the patients. Complications were observed in only 8 (2.58%) of the patients.

Among 6 cases of infection most common causative organism was Staphylococcus aureus (n=4; 66.67%).

	No Complication (n=302)		Complications (n=8)		Total (N=310)	
	No.	%	No.	%	No.	%
Upto 20	10	3.31	0	0.00	10	3.23
21-30	81	26.82	1	12.50	82	26.45
31-40	97	32.12	0	0.00	97	31.29
41-50	68	22.52	5	62.50	73	23.55
51-60	35	11.59	1	12.50	36	11.61
61-70	9	2.98	1	12.50	10	3.23
71-80	2	0.66	0	0.00	2	0.65

Table 6. Association of Age with incidence of Complications

$\chi^2=10.978$ (df=6); p=0.089 (Fisher exact test for <40 yrs. vs >40 yrs. p<0.05)

Out of 8 patients who faced complications during the surgery, 1 (12.50%) was aged 21-30 years, 5 (62.50%) were aged 41-50 years, 1 (12.50%) each in age group 51-60 years and 61-70 years. Proportion of patients without complications was higher as compared to with complications was higher in lower age groups i.e. Upto 20 (3.31% vs. 0.00%), 21-30 years (26.82% vs. 12.50%) and 31-40 years (32.12% vs. 0.00%) while proportion of patients with complications was higher as compared to without complications among higher age groups 41-50 (62.50% vs. 22.52%), 51-60 (12.50% vs. 11.59%), 61-70 (12.50% vs. 2.98%). Out of 2 patients aged 71-80 years, none faced complications during the surgery. Association of age with incidence of complications in laparoscopic surgeries was not found to be statistically significant (p=0.048; Fisher's exact test).

Association of Gender with Incidence of Complications

Incidence of complications among female patients (2.83%) was found to be higher than that among male patients (1.82%). This association was not found to be statistically significant (p=1.000; Fisher exact test).

Association of Diabetes Mellitus and Smoking with incidence of complications

Incidence of complications among diabetic patients (11.54%) was found to be higher than that among non-diabetic patients

(0.78%). This association was found to be statistically significant (p<0.001; Fisher exact test).

Incidence of complications among smokers (15.63%) was found to be higher than that among non-smoker patients (1.08%). This association was found to be statistically significant (p<0.001; Fisher exact test).

	No Compli- cation (n=302)		Compli- cations (n=8)		Total (N=310)	
	No.	%	No.	%	No.	%
Appendicitis	9	100.00	0	0.00	9	100.00
Cholelithiasis	279	97.21	8	2.79	287	100.00
Hypersplenism	1	100.00	0	0.00	1	100.00
Left Inguinal Hernia	2	100.00	0	0.00	2	100.00
Paraumbilical Hernia	1	100.00	0	0.00	1	100.00
Right Benign Ovarian Mass	1	100.00	0	0.00	1	100.00
Right Inguinal Hernia	2	100.00	0	0.00	2	100.00
Umbilical Hernia	7	100.00	0	0.00	7	100.00

Table 7. Association of Diagnosis with incidence of Complications

$\chi^2=0.658$ (df=7); p=0.999 (Fisher exact test p=1.000)

Incidence of complications among cholelithiasis was 2.79% and in rest of the diagnosis was nil. Majority of patients enrolled in the study were diagnosed as Cholelithiasis (n=287; 92.58 %). Comparing the incidence of complications in cholelithiasis with other diagnosis this difference was not found to be statistically significant (p=1.000; Fisher's exact test).

Surgical Procedure	No complication (n=302)		Compli- cations (n=8)		Total (N=310)	
	No.	%	No.	%	No.	%
Appendectomy	9	2.98	0	0.00	9	100.00
Cholecystectomy	279	97.21	8	2.79	287	100.00
Laparoscopic Excision of Ovarian Tumour	1	0.33	0	0.00	1	100.00
Laparoscopic Splenectomy	1	0.33	0	0.00	1	100.00
Mesh Hernia Repair	7	2.32	0	0.00	7	100.00
Transabdominal Pre-Peritoneal Repair	5	1.66	0	0.00	5	100.00

Table 8. Association of Surgical Procedure with incidence of Complications

$\chi^2=0.658$ (df=5); p=0.985 (Fisher exact test p=1.000)

Incidence of complications among patients undergoing cholecystectomy was 2.79% which was higher as compared to other procedures (0.00% each). Majority of patients enrolled in the study had undergone Cholecystectomy (n=287; 92.58%). Comparing the incidence of complications among patients underwent cholecystectomy with other

procedures, this difference was not found to be statistically significant (p=1.000; Fisher’s exact test).

Nutritional Status (BMI kg/m ²)	No complication (n=302)		Complications (n=8)		Total (N=310)	
	No.	%	No.	%	No.	%
Underweight (<18.5)	59	19.54	2	25.00	61	19.68
Normal (18.5-24.9)	220	72.85	6	75.00	226	72.90
Overweight (25.0-29.9)	23	7.62	0	0.00	23	7.42

Table 9. Association of Nutritional Status (BMI) with incidence of Complications

$\chi^2=0.732(df=2); p=0.693$ (Fisher exact test p=0.828)

Proportion of patients with complications during surgery was higher as compared to those without complications among underweight (25.00% vs. 19.54%) and patients with normal nutritional status (75.00% vs. 72.85%) while proportion of patients without complications was higher as compared to patients with complications among overweight (7.62% vs. 0.00%). This difference was not found to be statistically significant.

DISCUSSION

Laparoscopic surgery has brought a paradigm shift in the field of surgery by offering minimal invasive surgery, thus optimizing the need for surgical incision and reducing the blood loss during surgery thereby offering a speedier recovery and shorter duration of hospital stay.

However, laparoscopic surgery is not a panacea to all the problems associated with open surgery. It has its own problems and complications. Difficulty in accessibility, visualization and intra-operative vascular damage are some of the complications associated with laparoscopic surgery. Access to targeted organ during laparoscopic surgery is obtained through the help of some small incisions called ports. Different port site complications associated with laparoscopic surgery include pyoderma gangrenosum,^[18] metastasis at the port site following laparoscopic oncosurgery,^[19] and port site infections (PSIs).^[20] These port-site complications associated with laparoscopic surgery, comprise the most intriguing surgical complications that have the capability to revert back the outcome of a surgery. They have great financial consequences too. Owing to these complications the duration of hospital stay is increased which leads to substantial cost escalations.^[21] Although evidence has shown that rate of port site complications are relatively lower in elective cases as compared to emergency surgery,^[22,23] yet even in highly sophisticated institutions, these complications are a great issue of concern and affect the surgical outcome and patient satisfaction. These complications are strong predictors of treatment success and failure in different types of surgical procedures.^[24,25] Even in laparoscopic surgery, port site complications, although infrequent can undermine the benefits of the surgery. Although most of these complications are not life threatening, but definitely add a lot to the morbidity, affects the postoperative quality of life, and spoils the aesthesis of the surgery.^[26]

With this background the present study was carried out with an aim to determine the complications associated with ports after laparoscopic surgery. For this purpose, a prospective observational study was carried out in which a total of 310 patients undergoing different laparoscopic procedures were enrolled. Age of patients ranged from 15 to 80 years with a mean age of 38.86 years. Majority of patients were females (81.94%). Cholelithiasis was the most common diagnosis (92.58%) and cholecystectomy was the most common procedure (92.58%). The study population had only 32 (10.32%) smokers and 52 (16.77%) diabetics.

Port-site complications were observed in 8 cases. Thus, incidence of port-site complications in present study was 2.58%. Among different complications, port site infection was seen in 6 (1.94%) cases while 1 (0.32%) case each had metastasis and hypertrophic scar as the port-site complications.

Studies, particularly from India, have not reported port-site hernia as a complication in their series and it has occasionally been reported as a rare entity finding place in literature as case report only.^[27] Incidentally, the duration of follow up, absence of obese patients and relatively lesser proportion of cases above 60 years of age (3.9%) in our study have been responsible for ruling out incisional hernia as the complication in our study. Moreover, in present study improvised techniques to avoid port-site hernia such as use of standard closure (via skin wound), direct visualization closure method and use of suture passer needle were used which itself help in reducing the port site hernia rate.^[28] Similar to our study, Singal et al.^[28] in their study also showed that use of improvised techniques can minimize the incidence of port-site incisional hernia to 0%.

In present study, apart from port site infection, there was 1 case each of port site metastasis and hypertrophic scar. These complications are relatively lesser and reported in only a few studies. As far as hypertrophic scar is concerned, among different studies reviewed by us, only one study (Adisa et al., 2014)^[29] had mentioned it as a complication in their series.

With respect to 1 case (0.34%) of port-site metastasis as seen in present study which is also a rare entity and limited only to cases of malignancy treated with laparoscopic method. Karthik et al., 2013; Adisa et al., 2014^[29] mentioned about oncologic surgery and reported of a single case of port site metastasis. On reviewing the literature, we found the mention of port site metastasis among exclusive series of oncologic laparoscopic surgeries to be ranging from 0% to 16%.^[30,31] The occurrence of metastasis at port site is generally reported as case-report only even in series covering laparoscopic oncologic surgery.^[31] This makes the occurrence of port-site metastasis in the series covering general laparoscopic surgeries (including some cases of oncologic surgery) to be rarest of rare. The almost negligible proportion of its occurrence in present study (0.32%) also signifies the same.

In present study, on evaluating the various possible clinical and demographic determinants of port-site complications, we found the incidence of port-site complications to be significantly higher among cases >40 years of age, presence of diabetes and habit of smoking. Interestingly, we did not find an association between BMI and complication rate. Patient’s age^[32,33] and co-morbidities^[34-37]

are recognized risk factors for port-site complications. The findings of present study endorsed them as potential risk factors for port-site complications. Studies have also mentioned obesity^[33,38] as a potential risk factor. However, in present study, we did not have any obese patient and hence are not in a position to comment on this aspect. Although, smoking has been recognized as a factor that increases the risk of surgical site infection^[39] in certain specific surgeries, however, it is not recognized as a potential risk factor in most of the studies evaluating port-site complication rate in laparoscopic surgeries.

However, a number of authors consider the port-site complication rate to be independent of predictors like age, sex, BMI, smoking or diabetes while some found the complication rate to be dependent on size of trocar being used or demographic characteristics like age and sex.^[38] There are other authors who have found no effect of age, sex, nature of procedure, duration of hospital stay, type of surgery or co-morbidities on the rate of port-site complications.^[40] Nevertheless, identification of such risk factors helps in minimization of port-site complications in a particular setting. Awareness of the predisposing factors and modification of techniques can help to reduce the risk.

The findings of present study were interesting and showed that port-site complication rate in our settings was lower than contemporary complication rate in our environment. One of the limitations of study was its shorter follow-up duration, owing to which complications like incisional hernia which generally take a longer time to manifest, could not be encountered.

CONCLUSION

- Out of 310 patients enrolled in the study complications were observed only in 8 (2.58%). Port site infections were present in 6 (1.94%) cases while metastasis and hypertrophic scar was observed in 1 (0.32%) case each.
- Among 6 cases of port site infection, causative organism was *Staphylococcus aureus* in 4 (66.67%).
- Port related complications were found in significantly higher proportion of patients aged >40 years (5.79%) as compared to ≤40 years (0.53%).
- Port related complications were found in significantly higher proportion of female patients (2.83%) as compared to males (1.82%)
- Port related complications were found in significantly higher proportion of diabetic patients (11.54%) as compared to non-diabetic patients (0.78%)
- Port related complications were found in significantly higher proportion of smokers (15.63%) as compared to non-smokers (1.08%)
- No association of diagnosis with port related complications was found.
- No association of surgical procedure with port related complications was found.
- No association of BMI and port related complications were found.
- The limitation of study was shorter duration of follow up.

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