



PORT SITE COMPLICATIONS IN LAPAROSCOPIC SURGERY IN TERTIARY CARE CENTRE: A PROSPECTIVE STUDY

General Surgery

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ABSTRACT

Introduction: Several surgeons have contributed to the advancement of minimally invasive surgery. The rapid evolution in this field is due to their courage and ingenuity. The main reasons for preference of laparoscopic surgeries to abdominal surgeries are that they are low cost, less painful with minimal scarring, faster convalescence, lesser hospital stay, and less postoperative complications.

Aims And Objectives: To study the intraoperative and postoperative port site complications. To observe the rate and types of complications related to laparoscopic port and identify risk factors for their occurrence and the management of the port site complications.

Materials And Methods: This prospective observational study was conducted on 200 patients who underwent laparoscopic surgery for different indications. Veress needle and both techniques were used. Patients developing any kind of port site complications were assessed.

Results: The mean age was 45.76 ± 15.91 (9-85) years. Out of 200 patients, 21 patients (10.5%) developed port-site complications. Port site infection was present in 7 patients (3.50%), port site discharge in 5 patients (2.50%), bleeding & hypertrophic scar was seen in 3 patients each (1.50%), port site hernia in 2 patients (1%), and omental injury in 1 patient (0.5%).

Conclusion: Laparoscopic port site complications are rare in elective laparoscopic surgeries and it can be further reduced by selecting proper patients, and following basic principles of sterilization strictly and prevention apart from meticulous surgical technique during entry and exit at all the port sites. It is a safe and effective procedure in all patients, still it has procedure related complications.

KEYWORDS

INTRODUCTION

Several surgeons have contributed to the advancement of minimally invasive surgery. The rapid evolution in this field is due to their courage and ingenuity. Laparoscopic techniques have transformed the field of surgery. Rapid growth in health care technology has given surgeons not only the power of treating diseases surgically but also limiting surgical invasiveness¹. Laparoscopic surgery became the standard of care for many gynaecological and surgical conditions with documented benefits and excellent outcome². The main reasons for preference of laparoscopic surgeries to abdominal surgeries are that they are low cost, less painful with minimal scarring, faster convalescence, lesser hospital stay, and less postoperative complications³.

The many laparoscopic procedures performed daily range from basic to advanced complexity. Laparoscopic surgery has the risk of a few complications, but as compared to open surgery, this is still much lesser. The commonly encountered perioperative complications include port site complications, injury to vital neurovascular structures, liver bed injury, bowel injury and other soft tissue organ injuries.

The port site complications of laparoscopic surgery include the following and can be categorized as: Abdominal wall hematoma; Visceral injury; Vascular injury; Omental injury; Intraoperative Bleeding; Organ injury; Bowel injury; CBD injury; Other structures related to the type of surgery. Postoperative: Infections; Discharge; Bleeding; Subcutaneous emphysema; Port site Hernia; Port site Metastasis etc³.

Port site infection soon erodes the advantages of laparoscopic surgery, with the patient becoming worried about the indolent and nagging infection and losing confidence in the operating surgeon. The whole purpose of minimal access surgery to achieve utmost cosmesis is turned into an unsightly wound, and the quality of life of patients is seriously affected.

Various factors are attributed to the occurrence of these complications including a) removal of the ports before complete deflation of the peritoneal cavity, b) inadequate/faulty closure of the port site incisions and c) large incision at the port site. They can be avoided or managed as follows: a) After the procedure, all the ports should be removed under careful vision, b) all the accessory ports to be removed under vision followed by the releasing pneumoperitoneum by opening the valve of 10 mm cannulas, c) after the release of gas is completed, the primary port and telescope are to be removed together, with a clear view at all

times that the port is free of any entrapped bowel, d) to limit the size of the port incisions, and e) a secure and adequate closure of the port sites of size 10 mm and above should be ensured⁴.

This prospective observational study aims to study the intraoperative and postoperative port-site complications in laparoscopic surgeries. The occurrence and frequency of these complications may vary widely depending on the type, location, and size of ports created, as well as the type of port employed in creating them.

AIMS AND OBJECTIVES

- To study the intraoperative and postoperative port site complications.
- To observe the rate and types of complications related to laparoscopic port and identify risk factors for their occurrence.
- To study the management of the port site complications.

MATERIALS AND METHODS

This is a prospective observational study of patients who underwent laparoscopic surgery from 1st January 2019 to 1st June 2020 for different indications. Veress needle and open techniques both were used to create pneumoperitoneum using 5, 10 & 12mm trocars depending upon the type of operation.

All patients have been given appropriate prophylactic and post-operative antibiotics. Closure of the port was done with vicryl suture after cleansing with povidone iodine. Data have been further analyzed for patients developing any kind of port site complications.

Exclusion Criteria:

Patient converted from laparoscopy to open surgery.

ASSESSMENT TO BE DONE:

All relevant preoperative investigations including mainly:

- Blood investigations: Complete hemogram, random blood Sugar, HIV, HBsAg, HCV, PT/INR, blood urea, serum creatinine, serum electrolytes, serum protein.
- Urine: routine/ microscopy.
- Radiological investigations: chest x-ray, X-ray abdomen standing & supine, USG whole abdomen, CECT scan abdomen / pelvis.
- Histopathological examination of resection / biopsy specimens.

STATISTICAL ANALYSIS:

Data was entered in MS excel software; Microsoft Inc. Data has been analyzed using IBM SPSS statistical software version 21. Descriptive was expressed as mean, mean +SD, frequency and proportion.

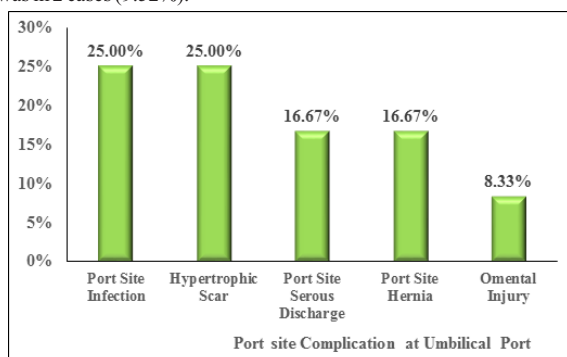
Quantitative data was analyzed using student's T test (paired/unpaired).

RESULTS

Table 1: Complication in Relation to Type of Port

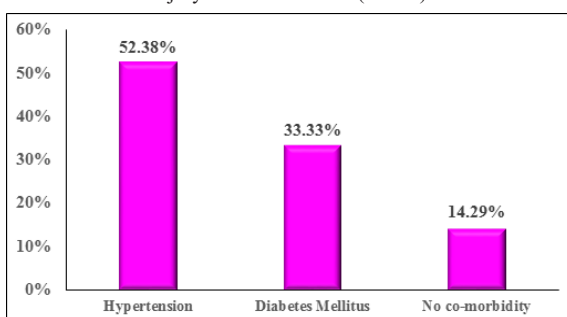
Port Type	No. of complications	Percentage
Umbilical	11	52.38%
Epigastric	6	28.57%
Right Iliac	3	14.28%
Right Hypochondrium	2	9.52%
Total	21	100%

Out of total 21 port site complication, the umbilical port was most common in 11 cases (52.38%) as compared to epigastric port in 6 cases (28.57%) and right iliac in 3 cases (14.28%). Right hypochondrium was in 2 cases (9.52%).



Graph 1: Distribution of Complication at Umbilical Port

Out of total 12 umbilical port site, the most common complication was in 3 cases (25%) each of port site infection and hypertrophic scar. Port site discharge and port site hernia were observed in 2 cases (16.67%) each. The omental injury was seen in 1 case (8.33%).



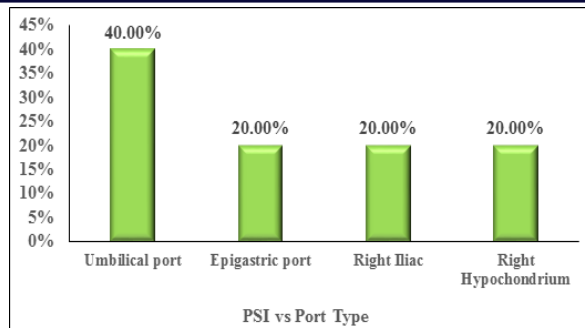
Graph 2: Complications in Relation to Patients Co-morbidities

Maximum number 11 (52.38%) of complications were seen in patients with co-morbidities than without co-morbidity (14.29%). Hypertension was seen in 11 patients (52.38%) and diabetes mellitus was in 7 (33.33%) patients as a co-morbid condition.

Table 2: Port Site Infection in Different Surgeries

	PSI	No.	Percentage
Types of Surgery	Lap. Cholecystectomy (131)	5	71.43%
	Lap. Appendicectomy (24)	1	14.29%
	Lap. Varicocele (2)	1	14.29%
Port Type	Umbilical	3	42.86%
	Epigastric	3	42.86%
	Right Iliac	1	14.29%
	Total	7	100%

Out of 7 port-site infections (3.5%) in different surgeries maximum 5 cases (71.43%) were in laparoscopic cholecystectomy. Out of two laparoscopic varicocele one (50%) had a port site infection. One case of laparoscopic appendicectomy out of 24 cases had an infection. Port site infection (n=7, 3.5%) was seen maximum in umbilical port and epigastric port three in each, followed by the right iliac port (1). Out of total 7 PSI, 5 (71.43%) were accessed as open and 2 as close technique. i.e., open technique had more number of PSI as compared to closed technique.



Graph 3: Port Site Discharge in Relation to Type of Port

Out of total 200 patients, 5 (2.5%) were having port site discharge. Out of them umbilical port was most common in 2 cases (40%) and one each in epigastric port, right iliac and right hypochondrium port (20%).

Table 3: Port site discharge V/s Types of Surgery, Port Size and BMI

		Port site Discharge (n=5)	Percentage
Type of Surgery	Diagnostic Laparoscopy	1	20.00%
	Lap. Cholecystectomy	4	80.00%
Port size	Large (≥ 10 mm)	3	60%
	Small (< 10 mm)	2	40%
BMI	≥ 25	4	80%
	< 25	1	20%

Port site discharge was seen maximum in laparoscopic cholecystectomy (80%) patients than other surgeries. Out of 5 port site discharge cases, three cases had a large port size and 2 had small port size.

Obese patients i.e., patients of BMI more than 25 had more (80%) occurrence of port site discharge as compared to patients (20%) with BMI less than 25.

Table 4: Port Site Bleeding in Relation to Type of Port (n=200)

Port Type	No. of complications	Percentage
Epigastric	2	66.66%
Right Hypochondrium	1	33.33%
Umbilical	0	0%
Right Iliac	0	0%
Total	3 (1.5%)	100%

Out of 3 port site bleeding cases, epigastric port was involved in 2 (66.66%) and right hypochondrium port was in 1 case (33.33%).

Table 5: Port site hernia in relation to port size, Age group and BMI

		Port site hernia	Percentage
Port size	Small (< 10 mm)	0	0%
	Large (≥ 10 mm)	2	100%
Age group	< 20	0	0%
	20-39	0	0%
	40-59	1	50%
	60-79	1	50%
	> 80	0	0%
BMI	< 25	0	0%
	25-50	2	100%
Type of port	Umbilical port	2	100%

Of all port site hernia cases (2) all were having a large port size (100%). Port site hernia was seen in 60-79 years of age group and 40-59 years of age group. Port site hernia was seen in 25-50 BMI only. Both cases of hernia were seen at umbilical port.

DISCUSSION

In our study maximum number of patients were in the age group of 40-59 years (43%) followed by 30% in 20-39 years of age. Patients with age > 60 years were 21.50%. The mean age in our study is 45.76 ± 15.91 years ranging from 9-85 years which correlates with the incidence of gall stone in that age group with patients undergoing laparoscopic surgery which is commonly performed surgery in this study.

A study by Maharaul et al¹ showed female predominance with 65% females to 35% males. The percentage of males & females in Karthik S et al¹ study was 53.8% and 46.2% respectively. Similar to the above studies females were more 110 (55%) than males 90 (45%) in our study. Female preponderance in our study is attributed to a higher incidence of gallstones in the female population and in our study 65.5% of patients undergoing laparoscopic surgery for gall stones.

Surgeries performed were mainly laparoscopic cholecystectomy in 131 cases (65.50%) followed by laparoscopic appendectomy in 24 cases (12%), laparoscopic inguinal hernia repair in 16 cases (8%), diagnostic laparoscopy in 9 cases (4.50%), laparoscopic umbilical hernia repair in 8 cases (4%), laparoscopic Nissen fundoplication and epigastric hernia repair in 3 cases (1.50%) each and laparoscopic varicocele and laparoscopic hiatus hernia repair in 2 cases (1%) each.

200 patients underwent laparoscopic surgery, out of which 21 patients (10.5%) developed port-site complications. Port site infection was present in 7 patients (3.50%), port site discharge in 5 patients (2.50%), bleeding & hypertrophic scar was seen in 3 patients each (1.50%), port site hernia in 2 patients (1%), and omental injury in 1 patient (0.5%). Similarly in Kartik S et al¹ study a total number of 570 patients underwent laparoscopic surgery, out of which 17 (3%) developed complications related to the port site specifically within a time interval of three months. Port site infection (PSI) was the most frequent (n = 10, 1.8%), followed by port site bleeding (n = 4, 0.7%), omentum-related complications (n = 2, 0.35%), and port site metastasis (n = 1, 0.175%). Memon RJ et al² reported 12 (12%) patients with port site complications. The port site complications are less in elective laparoscopic surgeries and can be further reduced by proper selection of patients, cautious insertion of trocar, use of safety trocar, closure of sheath with port closure needle, proper surgical techniques, and strictly following basic principles of sterilization and prevention can minimize these complications further.

In most laparoscopic surgeries, the umbilical port is primarily used as an access port, and its also used during tissue retrieval, therefore it is the most common site of infection. The umbilicus is inverted and hence acts as a nidus for infection if proper care is not taken preoperatively. Karthik S et al¹ reported in their study that the most common encountered port for complication was an umbilical port with 8 (47.13%) cases, followed by the epigastric port with 6 (35.25%) cases, suprapubic port 2 (11.75%) cases, and 1 (5.87%) cases of left iliac port. The study of Ravindranath GG et al⁶ showed an umbilical port with 11 (52.4%) cases, followed by an epigastric port with 8 (38.1%) cases, and 1 (4.76%) case each of suprapubic port and palmer's port.

Maximum number (n=18, 85.71%) of complications were seen in patients with co-morbidities than without co-morbidity (n=3, 14.29%). Diabetes Mellitus increases the risk of port site infection (PSI) due to microangiopathy and neuropathy leading to an increase in the colonization of staphylococcus aureus. Maharaul et al¹ in their study observed out of 120 patients 60% (72) patients were diabetic and 40% non-diabetic which was comparable to the Usman et al⁷ study in which there were 52% diabetic and 48% non-diabetic patients. Out of which 10% of diabetic patients developed PSI, and 6.67% of non-diabetic developed PSI.

In present study out of 7 port-site infections (3.50%) maximum were in laparoscopic cholecystectomy (n=5, 71.43%). Out of 2 laparoscopic varicocelectomies, 1 (50%) had a complication. Only 1 case of laparoscopic appendectomy had infection out of 24 cases. All PSIs are superficial, involving only the skin and subcutaneous tissue. In the study by Ravindranath GG et al⁶ 6.4% of the patients had port site infections. The cause of the PSIs was accredited to the reusable trocars, similar incidence were found in various studies⁸⁻¹⁰ which was 5.7%, 6.3%, 5.3%, and 5.5%.

A study done by Vanitha et al¹¹ showed maximum port site infection cases at umbilical port (78%) and 22% at epigastric port. In our study, port site infection (7 cases) was seen equally at umbilical port (3 cases) and epigastric port (3 cases) and one case at right iliac port. Out of 7 port-site infections (PSI), 5 (71.43%) were accessed through open method while 2 through close method. i.e., open method has a greater number of PSI as compared to the closed method. The maximum number of patients with PSI (n=3, 42.86%) belong to the age group of 20-39 years, followed by 2 cases (28.57%) in age group of 40-59 years

and 60-79 years each.

Vanitha et al¹¹ study showed that port site infection was found to be 76% in open method and 24% in closed method. While in the Mudgal M. M. et al¹² study out of 300 patients, the Verres needle (closed) was used for creating pneumoperitoneum in 164 (54.66%) patients and Hasson's (open) method was used in 136 (45.33%) patients.

In present study port site discharge was seen mainly in laparoscopic cholecystectomy (80%) patients as compared to other surgeries. Out of 5 port site discharge cases, 2 cases were at umbilical port, followed by one case each at epigastric, right iliac and right hypochondrium port. While, out of that 5 port site discharge cases 3 cases had a large port size and 2 had a small port size. Obese patients i.e., patients of BMI more than and equal to 25 were more prone (80%) to port site discharge as compared to patients (20%) with BMI less than 25. In present study out of 5 patients, 2 patients were managed through aspiration with syringe, and the remaining 3 patients didn't required any treatment and the discharge stopped on 5th to 7th postoperative day. Port site discharge was the most common presentation of non-mycobacterial infection usually occurring within a week of the surgery. They were usually limited to the skin and subcutaneous tissue.

Kartik S et al¹ study showed that the incidence of port-site discharge is 0% and reported zero cases. In a study done by Amonkar et al¹³ only one case was noted having PSD from the left iliac port. which was seen on the 4th postoperative day, where no active surgical intervention was needed and the laparoscopic procedure was laparoscopic appendectomy. Vanitha et al¹¹ reported 14 patients with port site discharge, among them 8 had a large port size and 6 had a small port size. They reported port site discharge in relation to BMI in 14 patients. Out of 14 patients, 11 patients had BMI more than and equal to 25 whereas 3 patients had BMI <25.

In our study, there were 3 port site bleeding cases, in which 2 cases were at epigastric port site and 1 case was at right hypochondrium site. The incidence of port site bleeding was found to be 1.5%. Our results were comparable with other studies¹³⁻¹⁵. Bleeding from the abdominal wall may not become apparent until the trocar is removed as it serves as a tamponade. In addition to visual inspection of the access site and its creation, the site should also be inspected during the removal of trocar. Bleeding points can usually be identified and managed with electrocautery. In present study PSB was seen in 3 patients, in which 2 patients were managed through compression, cauterization, and suturing, while in 1 patient bleeding was controlled by compression only. On occasions, the skin incision may need to be enlarged to control the bleeding. If bleeding continues, a foleys catheter can also be inserted, inflated, and gentle pressure applied to tamponade the site.

Augustine et al¹⁴ showed that the incidence of port-site bleeding was 0.7% and was comparable to the results worldwide and the other studies. All the PSB cases were seen during the placement of secondary ports. The PSB was most commonly seen at the epigastric port and the procedure was laparoscopic cholecystectomy. The PSB generally stops on its own and doesn't require any active surgical intervention. In the study by Sharma et al¹⁵ it showed PSB accounted for 0.7%, hence they concluded that laparoscopic surgeries were not without complication. Amonkar et al¹³ observed that the incidence of port-site bleeding was 8%. In his study PSB was related to injury to epigastric vessels and was related to carelessness during the placement of secondary trocars, as it should be placed under direct vision and with prior illumination of the abdominal wall.

All the port site hernia cases (n=2) were found in umbilical port and all PSH had a large port size (100%). Port site hernia was seen in the age group of 60-79 years and 40-59 years. Port site hernia was seen in patients having BMI >25. The incidence of port-site hernia in our study was 1%. This complication was found more in the old age group, patients having large port size, high body mass index, and in whom open technique was used. The risk of developing incisional hernia was low with the use of trocars <=10 mm, radially dilating trocars or bladeless trocars. Some surgeons close fascial defects if >10 mm port was used, regardless of the type of trocar. The fascia should be closed to reduce the risk of developing a port-site hernia. Although rare, the hernia has been reported even for 5 mm trocar sites. When port site hernia is identified following laparoscopy, the site should be repaired to prevent the development of intestinal complications (i.e., obstruction, strangulation). In the present study, both patients of PSH

were treated by open hernia repair (Herniorrhaphy).

Karthik S et al¹ showed that the incidence of port-site hernias was 0.35% which was most commonly seen at the umbilical port site. Amonkar et al¹³ did not observe any case of PSH. According to them port-site hernias were mostly observed at the umbilical port-site and all ports larger than 10mm should be closed. DC Moran et al¹⁶ concluded that the development of port-site hernia in the post-operative period can be associated with significant morbidity and with meticulous closure of port-site (10mm or larger), the incidence of PSH may be reduced.

CONCLUSION

Laparoscopic port site complications are rare in elective laparoscopic surgeries and it can be further reduced by selecting proper patients, and following basic principles of sterilization strictly and prevention apart from meticulous surgical technique during entry and exit at all the port sites. It is a safe and effective procedure in all patients, still it has procedure related complications. Port site complications are usually non-life threatening except for accidental major vessel injury. In our study we highlighted laparoscopic port site related complications including port site infection, port site discharge and port site bleeding, which were manageable with minimum morbidity. The widespread acceptance of laparoscopy in traumatic situations can blunt the sequelae associated with negative laparotomies. Maintaining comprehensive and exceptional levels of patient care will be upheld through understanding the risks associated with laparoscopy.

REFERENCES

1. Deng Y, Zhang Y, Guo TK. Laparoscopy-assisted versus open distal gastrectomy for early gastric cancer: A metaanalysis based on seven randomized controlled trials. *Surg Oncol*. 2015; 24:71-77.
2. Mehrabi A, Hafezi M, Arvin J, Esmailzadeh M, Garoussi C, Emami G et al. A systematic review and meta-analysis of laparoscopic versus open distal pancreatectomy for benign and malignant lesions of the pancreas: it's time to randomize. *Surgery*. 2015; 157:45-55.
3. Maharaul Honeyalsinh H, Nitin Jain and Paheli Garg. Port site complications following laparoscopic surgeries. *International Journal of Surgery Science* 2019; 3(3): 318-324.
4. Karthik Somu, Alfred Joseph Augustine, Mundunadackal Madhavan Shibumon, Manohar Varadaraya Pai. Analysis of laparoscopic port site complications: A descriptive study. *A descriptive study. J Min Access Surg* 2013; 9: 59-64.
5. Memon RJ, Qureshi ZZ, Shah FH, Laghari M. Port Site related complication and their management in patients undergoing Laparoscopic Cholecystectomy. *JIMDC*. 2018; 7(3):208-212.
6. Ravindranath G. G., S. V. Rama Mohan Reddy. Laparoscopic port site complications: a study in a tertiary care centre. *Int Surg J*. 2016 Aug; 3(3):1121-1124.
7. Usman J, Janjua A, Ahmed K. The Frequency of Port-Site Infection in Laparoscopic Cholecystectomies. *Pak J Med Health Sci*. 2016 Oct 1; 10(4):1324-6.
8. Kumar SS, Babu DK, Grace DR, Anpian JC, Bhaskar M. A study of port site infections in laparoscopic surgeries. *Journal Dent Med Sci*. 2015; 14(4):20-2.
9. Shindholimeth VV, Seenu N, Parshed R, Chaudhry R, Kumar A. Factors influencing wound infection following laparoscopic cholecystectomy. *Trop Gastroentero*. 2003; 24:90-2.
10. Den HPT, Boelhouwer RU, Veen HF, Hop WC, Brikinig HA. Infections and bacteriological data after laparoscopic and open gall bladder surgery. *J Hosp Infect*. 1998; 39:27-37.
11. Vanitha, Varneikip Chiru., Prospective Study On Port Site Complications In Laparoscopic Surgeries. *IOSR Journal of Dental and Medical Sciences* Volume 17, Issue 5 Ver. 13(May. 2018), PP 20-25.
12. Mudgal Madan Mohan, Pradeep Kumar Kothiya, Naveen Kushwah, Raghvendra Singh. Port site complications following laparoscopic surgeries: a prospective study. *Int Surg J*. 2018; 5(2):598-601.
13. Amonkar A, Ballal R, Jha AA. A Comparative Study Of The Various Port Site Complications Of Laparoscopic Surgery. *IJRAR- International Journal of Research and Analytical Reviews*. April – June 2018; 5 (2) : 93-99.
14. Augustine AJ, Karthik S, Shibumon MM, Pai MV. Analysis of laparoscopic port site complications: A descriptive study. *J Min Access Surg* 2013; 9:59-64.
15. Sharma D, Patel K, Anchalia MM. Study of cases of complications at port site. *Int. J. Sci. & Research*. 2013.
16. Brendan J. Moran, Khan Muhammad Najm, Tony Fayyad, Tom D. Cecil. Laparoscopic Versus Open Appendectomy: the Risk of Postoperative Infectious Complications. *JLS* (2007) 11:363–367.