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Analysis of Port Site Complications After Laparoscopic Procedures in a Tertiary Care

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ABSTRACT

Laparoscopic surgery, or minimal access surgery, is now the gold standard for treating various thoracic, abdominal, urological and gynecological conditions. It offers better outcomes and fewer complications compared to traditional open surgeries. With advancements in technology, many procedures once performed via open surgery are now done laparoscopically, though new complications related to access and specific procedures have emerged. This study aimed to evaluate the frequency and types of port-site complications after laparoscopic surgery and to identify the most common complication. This prospective observational study was conducted in the Department of General Surgery. The study included 145 patients who underwent both elective and emergency laparoscopic surgeries. Patients were monitored during the immediate postoperative period and followed up for 3 months to identify any delayed port site complications. Among the patients, majority were male, with the largest proportion in the 21-30 years age group. Laparoscopic appendectomy was the most frequently performed procedure and it was also linked to the majority of port site complications. In total, 33.10% of patients (48/145) experienced complications related to the port site. Early complications included discharge, surgical site infections, port site bleeding, and port site emphysema. These complications were more common in patients where the open or Hasson's technique was used for access, when a large port size (greater than 5 mm) was employed, and when a specimen retrieval bag was not utilized. The umbilical port was the most frequent site for these complications. Overall, complications related to laparoscopic port sites are infrequent and generally manageable with minimal morbidity.

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Key Words
Laparoscopic Surgery, port site complications, Surgical site infection

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INTRODUCTION

Laparoscopic surgeries have become the preferred standard in surgical practice, significantly replacing open surgeries and transforming the management of various surgical conditions. The preference for laparoscopic procedures over traditional open abdominal surgeries is largely due to reduced postoperative pain, minimal scarring, quicker recovery, fewer wound-related complications, shorter hospital stays and overall lower morbidity. Complications such as vascular injuries, perforation of hollow organs, air embolism, local port site emphysema, infections at the port site, hernia at the port site, and metastasis of tumors to the port site are directly related to abdominal access achieved via trocars[1-2]. However, with the increasing scope and complexity of laparoscopic interventions in recent years, there has been a corresponding rise in both the incidence and variety of complications. The overall incidence of major complications in laparoscopic surgeries is approximately 1.4 per 1,000 procedures[3-4]. Additionally, port site-related complications occur in about 21 per 100,000 cases, with the frequency of these complications being directly correlated with the size of the port site incision and the trocar used[5-6].

The complications or iatrogenic injuries associated with laparoscopic procedures affect various organ systems, including the gastrointestinal tract (0.06%), genitourinary system (0.03%), vascular structures (0.01%) and the omentum (0.04%). Pyoderma gangrenosum, although rare, is a potential port site infection (PSI) that may be linked to polymicrobial and anaerobic organisms. Another rare but serious complication following laparoscopic cancer surgery is port site tumor metastasis[7-8]. Identifying these complications, along with their underlying causes and associated risk factors, is crucial for improving patient outcomes. In light of these factors, the study aimed to assess the incidence of port site complications after laparoscopic surgeries and to determine the most frequent complications, along with their possible etiologies and risk factors.

MATERIAL AND METHODS

The present study, which was prospective and observational in nature. A total of 145 patients of either gender, admitted for both elective and emergency laparoscopic surgeries in the Department of General Surgery, were included. Patients who were lost to follow-up were excluded from the analysis.

All patients underwent a pre-operative evaluation, which included an abdominal ultrasound, chest X-ray, and electrocardiogram. Basic laboratory investigations such as hemogram, blood urea, serum creatinine, blood glucose, HIV and HBsAg tests were conducted. A pre-operative anesthetic evaluation was performed, and written informed consent for surgery was obtained from all participants. A prophylactic antibiotic was administered on the day of surgery, and post-operative antibiotics, either oral or intravenous, were provided as required.

All surgeries were performed under general anesthesia. Port site incisions were closed in accordance with the standard operating protocols of the institution. For ports measuring 10 mm or larger, a two-layer closure was implemented: the inner rectus sheath was sutured with absorbable polyglactin No. 1 using simple interrupted stitches, while the skin and subcutaneous tissues were closed with non-absorbable monofilament polyamide (2-0) using vertical mattress sutures. For 5 mm ports, a single-layer closure was performed using the same non-absorbable monofilament suture and technique.

Most patients were discharged on the 3rd or 4th post-operative day, provided they were vitally stable, ambulatory, able to tolerate oral intake, and had uncomplicated surgical wounds. Patients were monitored for port site complications during both the intraoperative and post-operative periods. Post-operatively, they were observed for 3-4 days and followed up weekly for one month and then monthly for at least three months in the surgical outpatient department. Any complications that arose were managed appropriately, and details were documented and analyzed. Individual complications were also evaluated. Statistical analysis was performed using SPSS version 25.0 and Microsoft Excel 2016, with the data presented in terms of numbers and percentages.

RESULTS AND DISCUSSIONS

The study recorded a total of 48 port site complications out of all laparoscopic procedures conducted, accounting for 33.10% of the total cases. The most frequent complication observed was port site discharge, which occurred in 20 patients, constituting 13.79% of the total complications. This was followed by port site infections in 12 patients, representing 8.28%. Port site bleeding occurred in 10 patients (6.90%), while subcutaneous emphysema was noted in 6 patients (4.14%). Importantly, no instances of port site metastasis, hernia, or omental trapping were observed in this cohort. These results highlight that while port site complications are not uncommon, their severity varies, and some complications are entirely absent in this study (Table 1, Figure 1).

Table 1: Port Site Complications After Laparoscopic Procedures

Port Site Complication	n	%
Port site infection	12	8.28
Port site discharge	20	13.79
Subcutaneous emphysema	6	4.14
Port site bleeding	10	6.90
Port site metastasis, hernia and omental trapping	0	0.00
Total	48	33.10

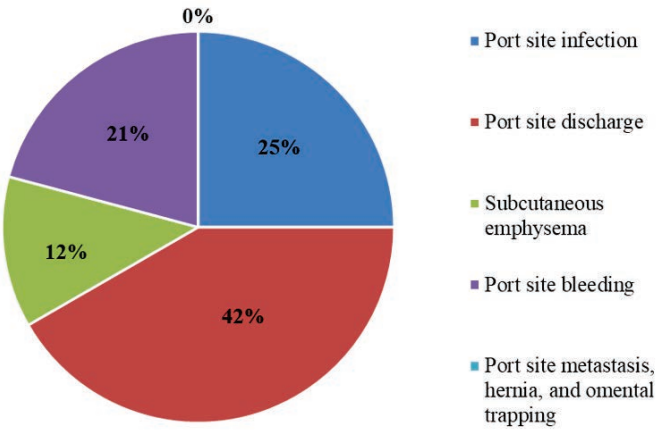

Fig. 1: Graphical presentation of Port Site Complications after Laparoscopic Procedures

Among the patients, the majority were male, with the highest representation seen in the 21-30 year age group. Laparoscopic appendectomy was the most commonly performed surgery and accounted for most of the port site complications. Early postoperative complications included discharge, infections at the surgical site, port site bleeding and port site emphysema. These issues were more prevalent in cases where the open or Hasson technique was used for entry, a larger port size (greater than 5 mm) was selected, or when a specimen retrieval bag was not utilized. The umbilical port was the most frequent location for these complications.

Port site complications can be categorized into early or perioperative complications and late or postoperative complications. These complications have been documented across all age groups and genders, with females being more frequently affected than males. The majority of affected patients fell within the 20-40-year age range. Approximately 33.10% of patients developed port site complications. The highest number of these complications was associated with laparoscopic appendectomy, the most commonly performed procedure. Among the observed complications, port site discharge was the most frequent and in most cases, the discharge was serous and resolved without the need for medical intervention. Around 6.90% of patients experienced port site bleeding, particularly during the insertion of secondary trocars in the perioperative period.

In a study conducted by Karthik *et al.* in Mangalore, Karnataka, which included 570 patients, 3% experienced port site complications during a follow-up period of 3 months[8]. Port site infection (PSI) was the most commonly reported complication, affecting 1.8% of patients, followed by port site bleeding (0.7%) and omentum-related complications (0.35%). In the current study, port site morbidity was observed in 33% of patients. This variation in the overall rate of complications could be attributed to differences in sample size and the higher proportion of infected cases, such as acute appendicitis, in this study.

In our study, we observed an 8.28% incidence of PSI, which is slightly higher than the rates reported in studies by Den Hoed *et al.*, Shindholimath *et al* and Colizza *et al.* However, our findings were consistent with those from studies by Voitk and Tsao, as well as Hamzaoglu *et al.* Kumar *et al.*, in a study of 104 patients, reported a 5.7% incidence of PSI. The higher infection rate observed in our study could be attributed to a greater number of cases involving complicated appendicitis, a predominance of patients with fatty abdominal walls (more common in females), and potential breaches in standard sterilization protocols[9-20].

The majority of PSIs were superficial in nature, affecting only the skin, subcutaneous fat and loose areolar tissue. The juxta-umbilical region was identified as the most frequent site for PSI occurrences. Potential causes for umbilical PSIs include the presence of debris and umbilical flora and challenges in adequately cleaning the umbilicus during preoperative disinfection. In laparoscopic cholecystectomy, the gallbladder is typically extracted through the epigastric port, with or without a retrieval bag. Conversely, in laparoscopic appendectomy, the specimen is generally removed through the umbilical or suprapubic port, also with or without a retrieval bag. To minimize wound infections, adherence to the following ten standard protocols for preventing PSI is recommended[11-13-16-20].

In the present study, port site bleeding was observed in 7% of patients, which aligns with the findings reported by Kumar[9]. All instances of bleeding occurred during the placement of secondary trocars. These adverse events can be minimized by positioning secondary trocars under direct visualization and through a well-illuminated abdominal wall. Identified bleeders should be secured using electrocautery, sutures, or hemoclips.

Port site complications are notably more frequent in obese patients or those with a fatty, pendulous abdominal wall[21-22]. These complications may arise due to the use of longer trocars than usual, restricted mobility of instruments, and the need to extend the skin incision to access or close the fascial layer[23]. While our study did not include BMI as a parameter, the observations were consistent with the aforementioned factors.

A limitation of this study is the small sample size and the higher proportion of patients with acute appendicitis, despite random selection. To address

these limitations, future studies should consider increasing the sample size and including a greater number of clean, non-infected patients, such as those undergoing hernia repairs.

CONCLUSION

The complications observed at the port site included infection, discharge, bleeding and subcutaneous emphysema, with serous discharge being the most frequently encountered issue. These complications were more common in cases where larger port sizes were used, the open or Hasson's method of access was employed, or a specimen retrieval bag was not utilized. While intraoperative complications were more frequently associated with secondary ports, the umbilical port experienced the highest overall complication rate. All observed complications were manageable without resulting in significant morbidity. Adherence to standard surgical techniques and sterile precautions, such as preventing spillage and using specimen retrieval bags, were found to significantly reduce port site-related complications.

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