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Original Research Article

Study of Port Site Infection Prevalence in Laparoscopic Surgery

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Abstract

Background: Even though port site infections are uncommon, they should be assessed and researched in order to raise the standard of healthcare. The benefits of laparoscopic surgery are generally established, but are there any drawbacks, such as infections at the port site? Does undergoing laparoscopic surgery ensure an infection-free recovery period? Complications at the port site are common. We want to know how common port site infections are among patients having various laparoscopic procedures, such as cholecystectomy, appendectomy, and hernioplasty, in our study. The purpose of this study is to determine the frequency and type of port site infections (PSIs) following laparoscopic procedures in patients of all ages.

Methods: The study tracked and included patients of all ages and genders who underwent laparoscopic procedures from January 2018 to December 2018 throughout a one-year span. Port sites were carefully checked for any signs of infection, and samples were sent for culture and sensitivity testing if there were any concerns. Patients who underwent laparoscopic procedures were recorded and examined in accordance with predetermined standards to determine the prevalence of PSI as well as the factors influencing its likelihood. The port sites where the infection was suspected were swabbed using standard swab sticks.

Results: 4 patients experienced port site infections out of the total sample size of 200. During the surgery, the portsites of both patients were contaminated. Age, sex, the kind of procedure, or the length of hospital stay had no effect on the rate of PSI in our study. Comorbidities or the type of surgery had no similar impact. Chi-square analysis was performed statistically.

Conclusions: A rare side effect of laparoscopic surgery is port site infection. The rate of postoperative morbidity has decreased since the development of laparoscopy. Nonetheless, if the port site were unintentionally contaminated, there were found to be high probabilities of PSI.

Keywords: Port Site Infection; Laparoscopic Surgery; Port Contamination.

Introduction

While the skin naturally protects against infection[1], any surgical wound could be a source of infection because it would disrupt the continuity of the epithelium and increase the risk of postoperative infection. Modern wound treatment now prioritises prompt body repair to its prior condition of normal form and function over infection avoidance. This specific objective is what gave rise to laparoscopic surgery.

Laparoscopic surgery has made significant progress towards being accepted as a standard procedure in surgery. Laparoscopic surgery has a wide range of benefits, including reduced postoperative discomfort, a quicker return to normal activities, and fewer postoperative problems[2]. It is most likely due to a smaller incision, quicker mobilisation, decreased post-operative pain, greater immune system function preservation, and a restrained inflammatory response to tissue injury. Laparoscopic surgery has been found to have less metabolic consequences after surgical harm than open surgery. Yet, accessing the peritoneal cavity by laparoscopic surgery has its own special set of risks. An uncommon consequence is port site infection. These infections can occasionally persist and reoccur, creating problems for the surgeon and distress for the patients. The prevalence and incidence of port site infections among patients undergoing various laparoscopic procedures were examined in this study.

Material and Methods

From January 2018 to December 2018, patients of all ages admitted to the Department of Surgery at the Government Medical College and Hospital, Bettiah, West Champaran, Bihar, had laparoscopic surgery with informed written consent.

After testing culture and sensitivity, the infection at the port site will be clinically evaluated and, if necessary, was confirmed by swab test. Laparoscopic procedures were immediately performed on the patients.

Following surgery, all patients were monitored until the sutures were removed one month later. All patients would be divided into two groups: those with infections at the port site and those without infections there.

The criterion to decide presence of infection would be based on the definition:

The term "superficial surgical site infection" (S.S.S.I.) refers to an infection of the skin and subcutaneous tissues that discharges pus or that the surgeon opens to drain.

The substance must be free of organisms, and the affected area must exhibit the traditional symptoms of inflammation, such as pain, redness, swelling, etc. The substance must be free of organisms, and the affected area must exhibit the traditional symptoms of inflammation, such as pain, redness, swelling, etc.

Results

Maximum 20% of patients are between the ages of 21 and 30. Minimum 3% are under the age of 10, however patients can be as old as 80. 38% of patients are female, whereas 62% of patients are men. 49% of patients spent between 4-6 days in the hospital; only 7% stayed for more than 7 days. A <3-day stay was recorded by 44% of visitors. Hospital stays encompass all days spent there, not just the days following surgery. 33% of cases were handled on an emergency basis, while 67% were handled on an elective basis. 32% of emergency cases involved acute appendicitis, and 1% involved acute cholecystitis. Laparoscopic appendectomy, cholecystectomy, and hernioplasty were performed laparoscopically on 34%, 46%, and 20% of the total patients, respectively.

While 98% of the wounds were healthy, there were only 2% of individuals who had an infection. Infection was observed in 2 individuals. They sent the swabs from the contaminated location. While another patient had a Klebsiella infection, one patient had E. coli. 5% of the patients had diabetes. Up to 78% of cases were resolved in under two hours, 8% in under an hour, and 14% in excess of two hours. In 2% of cases, the port site was poisoned while it was in operation. It results from bile spilling during the surgical procedure to remove the gallbladder. Even when the

condition was critical, we did not remove the specimen using a retrieval bag.

There is no specific age range where port site infection is more likely to occur. There is no statistically significant correlation between patient age and the likelihood of port site infection. A port site infection affected 2 patients. One was between the ages of 41 and 50, and the other was between 61 and 70. Chi-square values of 5.285 and 0.65 did not reach statistical significance at the 5% level. There is no preference for one sex over another. In our study, 62% men and 38% women were participants. The correlation did not amount to much (P=0.524). Table 6 shows how PSIs are related to hospital stays.

In our analysis, there was no evidence of a significant relationship between the length of stay and the risk of PSIs (P=0.923). The type of the method had no discernible effect on PSI in this study (P=1.000). This could be attributable to our institute's strict aseptic procedures.

There is evidence in the literature that gallbladder surgery increases the risk of infection, particularly when done openly. We discovered that the type of operation had no discernible impact on the PSI rate (P=0.302). According to this study, there is a significant relationship between PSI and port site contamination (P=0.000).

As none of the two individuals who got PSIs had diabetes, it may be concluded from this study findings that diabetes does not increase the likelihood of developing PSIs. For both cases, a culture was submitted, and it revealed E. coli infection in one case and Klebsiella infection in the other.

Despite the fact that diabetes is a known risk factor for wound infection, we were unable to identify a link between diabetes and PSIs in this investigation. All of our patients were thoroughly examined, and strict glycemic control is maintained during the perioperative period, which is a logical explanation for this finding.

Moreover, there was no relationship between PSIs and the length of the procedure (p=0.750). Application of Fisher's exact test in cases when every cell in a 2 by 2 contingency table is < 5, as opposed to Pearson's chi-square test.

Table 1 : Association of PSIs with nature of procedure

Elective/Emergency	PSIs		Total patients	Fisher's exact test P-value	Significance at 5% level
	No	Yes			
Elective	132	2	134	1.000	Not
Emergency	64	2	66		
Total	196	4	200		

Table 2 : Association of PSIs with surgery performed

Surgery	PSIs		Total patients	Chi-square value	Fisher's exact test P-value	Significance at 5% level
	No	Yes				
Lap. Appendectomy	68	0	68			
Lap. Cholecystectomy	88	4	92	2.396	0.302	Not
Lap. hernioplasty	40	0	40			
Total	196	4	200			

Table 3 : Association of PSIs with port site contamination

Presence of infection	PSIs		Total patients	Fisher's exact test P-value	Significance at 5% level
	No	Yes			
No	196	0	196	0.000	Yes
Yes	0	4	4		
Total	196	4	200		

Table 4 : Association between PSIs and diabetes

Diabetes	PSIs		Total patients	Fisher's exact test P-value	Significance at 5% level
	No	Yes			
No	186	4	190	1.000	Not
Yes	10	0	10		
Total	196	4	200		

Table 5 : Association between PSIs and duration of surgery

Duration of Surgery	PSIs		Total patients	Chi-square value	Fisher's exact test P-value	Significance at 5% level
	No	Yes				
<1 hour	16	0	16			
1-2 hours	152	4	156	0.576	0.75	Not
>2 hours	28	0	28			
Total	196	4	200			

Discussion

Infection can occur in any surgical wound. There are three types of wounds: clean, clean - polluted, and dirty. The majority of laparoscopic wounds are clean or clean-contaminated cases. Following laparoscopic surgery, there are about 21 problems at the port site per 100,000 patients[3]. Preoperative hospital stays longer than two days[4], longer than two hours[4], other immunocompromised conditions such diabetes, steroid use, preoperative blood transfusions, etc[5,6] are among the risk factors for port site infections (PSIs).

Another risk factor for port site infections is preoperative Staphylococcus aureus colonisation of the nacres (PSIs). Port site infections (PSIs) in laparoscopic cholecystectomy are not associated with obesity, preoperative antibiotics, or drains[7]. Another significant risk factor for difficulties at the port site is the port's number[8]. The fascial closure is recommended for more than 10 mm port size to reduce the incidence of port site hernia. At the moment of entrance or after surgery, port site problems can occur. It may occur quickly (within a few weeks) or slowly. Mycobacterial infection is typically to blame for the delayed appearance. Trocars must be carefully positioned such that their axes are aligned with those required for the procedure[9]. During laparoscopic surgeries, infections with atypical mycobacteria have been documented and are linked to elevated C-reactive protein levels without leucocytosis and normal differential counts [10]. When there is pain, erythema, and wound discharge within a week, a nonmycobacterial fresh wound infection is likely to be present. They have a low-grade fever and are the superficial infection. The most frequent offenders are gramme positive and gramme negative bacteria[11].

The onset of a delayed infection typically takes 3–4 weeks, and it is poorly responsive to standard antibiotics [12]. Complications at the port site are decreased by using a 10-minute autoclaving cycle or a 3-minute flash sterilisation for contaminated or dropped instruments during laparoscopic surgery [13]. No matter the size, character, or anatomical location of the wound, every surgeon hopes that it would heal without any issues after dressing. A successful wound dressing should prevent infection, maceration, and allergic reactions while maintaining the wound's health. Through the use of laparoscopy, we have been able to reduce the likelihood of both intraoperative and postoperative issues

such excessive bleeding, infection, morbidity, pain, length of hospital stay, etc. Although though the likelihood of infection is extremely low, the laparoscopic port site is not entirely risk-free.

The fact that preserving asepsis is high on the list of priorities in our institute may be a significant and essential factor in this. Surgical hand washing guidelines are strictly adhered to. The sufferer is meticulously painted and dressed.

We monitored all of the patients in our study who underwent various laparoscopic surgeries, such as cholecystectomy, appendectomy, and hernioplasty. All age groups, both sexes, elective and emergency patients, diabetic and non-diabetic people, were tracked down and checked for port site infections.

According to age category, it was discovered that there was practically an equal distribution of patients getting laparoscopic procedures. 38% of the sample's laparoscopic surgery patients were female, whereas 62% of the patients were men.

Only 7% of patients undergoing laparoscopic surgeries required a hospital stay of more than seven days, while the majority of patients 49% had to stay in the facility for four to six days on average.

33% of the patients that made up the total of 100% were emergency cases, while 67% were elective instances. 34% of patients had appendicectomies, 46% had cholecystectomies, and 20% had hernia repairs. 2% of patients later had infections at their port sites, while in the other 98%, the sites healed normally without any infections. Our findings align with those of other studies. With a few exceptions, the majority of studies that have been published in the literature have examined laparoscopic cholecystectomy[14-20]. Our research was likewise based on conventional laparoscopic procedures.

One of the 2% of infected patients had an E. coli infection, while the other had a Klebsiella infection. In our sample, 5% of patients had diabetes. A significant risk factor for developing infections is diabetes. DM has been linked to abnormalities in humoral immunity, neutrophil function, and a decreased T cell response [21]. As a result, DM makes a person more vulnerable to infections, including those that are common and virtually invariably only affect those with DM (such rhino-cerebral mucormycosis) [22].

Despite a compelling physiological justification, the literature does not fully support diabetes mellitus as a factor contributing to an increased frequency of wound complications in surgical wounds. A study by Mangrulkar *et al*. that evaluated data from 489 surgical patients with diabetes and was unable to discover a connection between an infected surgical wound and diabetes demonstrated this[23]. In the current investigation, none of the four infected subjects developed diabetes.

78% of the total were run for 1-2 hours. 8% of the time needed was under an hour, and 14% of the time needed was over two hours. In 2% of the patients, the port site had contaminated the entire sample. Moreover, the port site infections did develop in both of the individuals who had port site contamination. The statistical study revealed that the port site infection (PSI) rate did not accurately predict for any specific age group. Age of the patient did not significantly correlate with the frequency of port site infections ($p=0.625$). As a result, the patient's age does not increase the risk of port site infections. Similar findings from a research by Karthik *et al*.[24] indicated that port site problems were not patient age dependant. Port site infections had the highest rate of all problems (1.8%), although there was no evidence of a higher rate in any particular age group.

Moreover, there was no connection between the patients sex and the incidence

of infection. Although both illnesses occurred in male patients, the connection was insufficient to prove a causal link (p=0.524). 33% of women and 67% of men participated in our study. We also looked into whether the length of the hospital stay affected the port site infections. It is a frequent belief that nosocomial infections would occur with a prolonged hospital stay.

Yet, a research by Gunnarsson C *et al*. revealed that the nosocomial infection rate decreased in facilities where there were more laparoscopic surgeries[25]. They showed that laparoscopic procedures decreased total medical costs since the rate of nosocomial infections was significantly lower. In our study, there was no significant correlation between the length of hospital stay and port site infections (p=0.923).

Also, and perhaps surprisingly, no specific type of operation was linked to port site infection. Notwithstanding the scant evidence provided by S. Karthik that cholecystectomy increases the risk of port site problems[19], the link in our analysis was not significant. The laparoscopic cholecystectomy that was also associated with the infection in the two cases was not statistically significant (p=0.302).

Also, we took port site contamination into account. When the specimen was retrieved, the port site was polluted. Bile that was spilled during the removal of the gall bladder specimen is the cause. We have situations where the suturing site was cleansed after contamination at the port site occurred during the surgery. We discovered that the correlation was strong, indicating that port site contamination played a substantial role in the development of later port site infection (p=0.000). The port was polluted in both of the afflicted patients. Even in severe circumstances, we didn't remove the specimen using a retrieval bag.

We looked for a significant correlation between the risk of infection at the port site and the length of surgery, but we were unable to establish that the length of surgery was inversely related to the likelihood of infection.

Conclusion

Although there is a possibility, port site infections are extremely uncommon in individuals having laparoscopic surgery. The kind, length, and nature of the procedure have little bearing on the likelihood of infection.

Moreover, the risk of infections at the port site is unaffected by age, sex, or length of hospital stay. If the surgery results in contamination of the site, there is a substantial risk of developing port site infections.

References

1. Niyonsaba F, Ogawa H. Protective roles of the skin against infection: implication of naturally occurring human antimicrobial agent's beta-defensins, cathelicidin LL-37 and lysozyme. J Dermatol Sci. 2005; 40(3):157-68.
2. Targarona EM, Balagué C, Knook MM, Trías M. Laparoscopic surgery and surgical infection. Br J Surg. 2000;87(5): 536-44.
3. Aziz R. Practical manual of operative laparoscopy. New York: Springer-Verlag. 1992;1–8.
4. Lilani SP, Jangale N, Chowdhary A, Daver GB. Surgical site infection in clean and clean-contaminated cases. Indian J Med Microbiol. 2005; 23:249–252.
5. Owens CD, Stoessel K. Surgical site infections: Epidemiology, microbiology and prevention. J Hosp Infect. 2008;70Suppl 2:3–10.
6. Boni L, Benevento A, Rovera F, Dionigi G, Di Giuseppe M, Bertoglio C, *et al*. Infective complications in laparoscopic surgery. Surg Infect (Larchmt) 2006;7Suppl2: S109–S111.

7. Scott JD, Forrest A, Feuerstein S, Fitzpatrick P, Schentag JJ. Factors associated with postoperative infection. Infect Control Hosp Epidemiol. 2001;22: 347–351.
8. Neudecker J, Sauerland S, Neugebauer E, Bergamaschi R, Bonjer HJ, Cuschieri A, *et al*. The European association for endoscopic surgery clinical practice guideline on the pneumoperitoneum for laparoscopic surgery. Surg Endosc. 2002; 16:1121–43.
9. Fuller J, Ashar BS, Carey-Corrado J. Trocar-associated injuries and fatalities: An analysis of 1399 reports to the FDA. J Minim invasive Gynecol. 2005; 12:302-7.
10. Chaudhuri S, Sarkar D, Mukerji R. Diagnosis and management of atypical mycobacterial infection after laparoscopic surgery. Indian J Surg. 2010; 72:438–442.
11. Sasmal PK, Mishra TS, Rath S, Meher S, Mohapatra D. Port site infection in laparoscopic surgery: A review of its management. World J Clin Cases. 2015; 3(10):864–871.
12. Falkinham JO. Epidemiology of infection by nontuberculous mycobacteria. Clin Microbiol Rev. 1996; 9:177–215.
13. Voyles CR, Sanders DL, Simons JE, McVey EA, Wilson WB. Steam sterilization of laparoscopic instruments. Surg Laparosc Endosc. 1995;5(2):139-41.
14. Deepak Sharma, Kavach Patel, Anchalia MM. Study of cases of complications at port site complication. International Journal of Science and Research (IJSR); 2013. ISSN (Online): 2319-7064.
15. Mir MA, Malik UY, Wani H, Bali BS. Prevalence, pattern, sensitivity and resistance to antibiotics of different bacteria isolated from port site infection in low-risk patients after elective laparoscopic cholecystectomy for symptomatic cholelithiasis at tertiary care hospital of Kashmir. Int Wound J. 2013; 10:110–113.
16. Yanni F, Mekhail P, Morris-Stiff G. A selective antibiotic prophylaxis policy for laparoscopic cholecystectomy is effective in minimising infective complications. Ann R Coll Surg Engl. 2013; 95:345–348.
17. Taj MN, Iqbal Y, Akbar Z. Frequency and prevention of laparoscopic port site infection. J Ayub Med Coll Abbottabad. 2012; 24:197–199.
18. Shindholimath VV, Seenu V, Parshad R, Chaudhry R, Kumar A. Factors influencing wound infection following laparoscopic cholecystectomy. Trop Gastroenterol. 2003; 24:90–92.
19. den Hoed PT, Boelhouwer RU, Veen HF, Hop WC, Bruining HA. Infections and bacteriological data after laparoscopic and open gallbladder surgery. J Hosp Infect. 1998; 39:27–37.
20. Muller LM, Gorter KJ, Hak E, Goudzwaard WL, Schellevis FG, Hoepelman AIetal. Increased risk of common infections in patients with type 1 and type 2 diabetes mellitus. Clin Infect Dis. 2005;41(3):281-8. (Epub 2005 Jun 16).
21. Peleg AY, Weerarathna T, McCarthy JS, Davis TM. Common infections in diabetes: Pathogenesis, management and relationship to glycaemic control. Diabetes Metab Res Rev. 2007;23(1):3-13.
22. Mangrulkar S, Khair PS. Comparison of healing of surgical wounds between diabetics and non-diabetics. J Indian Med Assoc. 2009;107(11):765-70.
23. Karthik S, Augustine AJ, Shibumon MM, Pai MV. Analysis of laparoscopic port site complications: A descriptive study. J Minim Access Surg. 2013; 9:59–64.
24. Gunnarsson C, Rizzo JA, Hochheiser L. The effects of laparoscopic surgery and nosocomial infections on the cost of care: Evidence from three common surgical procedures. Value Health. 2009;2(1):47-54.