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Original Research Article

PORT SITE INFECTIONS A CHALLENGING SITUATION IN LAPAROSCOPIC SURGERIES. A REVIEW OF INSIGHT AND MANAGEMENT.

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ABSTRACT

Background: Port site infection following laparoscopic surgeries is a troublesome complication nowadays. It has corroded the advantages of minimal access surgery. **Objectives:** The study aimed to understand the cause of port site infection and how to manage the port site infection after laparoscopic surgery.

Materials and Methods: Twenty-eight patients who underwent laparoscopic surgeries and developed port site infection were included in the study between Jan. 2020 to Jan. 2024. Data regarding patient demographics, type of surgery, prior treatment and management of port site infections obtained from hospital record and was reviewed. The port site infections were divided into two groups. Early within first week of surgery and delayed after 4-6 weeks of surgery. Chronic wounds were classified into two types, tubercular mycobacterium TMs and non-tubercular mycobacterium NTMs.

Results: In the present study the male to female ratio was 10:18(n=28). The mean age was 46.3 years, range 26-72 years. The index surgery was lap. Cholecystectomy (n=16), followed by lap. Appendectomy (n=7), lap. Ovarian cystectomy (n=3) and lap. Varicocelectomy (n =2). 07 patients had prior history of ATT intake out of which 05 patients had completed ATT before surgery. 09 patients were treated with excision of sinus tract and ATT. 07 patients were treated with oral antibiotics as per culture sensitivity. 12 Patients were treated with combination of Ciprofloxacin and Clarithromycin for 3 months for NTMs. All patients responded well to oral antibiotics and no patient had relapse or recurrent infection. The mean follow up was 32 months.

Conclusion: Port site infections have corroded the advantages of minimal access surgery (MAS). Drug resistant mycobacteria are difficult to treat. Aggressive treatment with excision of sinus tract and oral antibiotics are effective. Sterilization should be improved, proper microbiological methods should be employed and utmost care of aseptic techniques in Operation Theatre is very important.

Keywords: Port site infection (PSI), Minimal access surgery, Tubercular mycobacterium (TMs), Non tubercular mycobacterium (NTMs), Ethylene oxide (ETO), Plasma sterilization, Minimal access surgery (MAS).

INTRODUCTION

Minimal access surgeries/ laparoscopic surgeries has become the standard of care in current surgical practices.[1,2] Laparoscopic techniques are now applied from simple procedures like laparoscopic cholecystectomy to more complex procedures like Whipple procedure.[3,4] The advantages of minimal access techniques include, less pain, early ambulation, better cosmoses and early return to work and many more. But the laparoscopic surgeries are not immune to complications. The port

site infection (PSI) a troublesome complication after laparoscopic surgeries has overshadowed the benefits of laparoscopic techniques. The port site infections following laparoscopic surgeries can be early, which occur during 1 week of the procedure and delayed/chronic port site infections, which occur beyond 4-6 weeks of procedure.[5] Early port site infections are due to normal commensals and respond well to empirical antibiotics and wound care. Chronic port site infections due to non-tubercular mycobacterium (NTM) also called as atypical mycobacterium, are the troublesome as they evade the diagnosis and sterilization by routine techniques. Tubercular mycobacterium (TM) responds well to treatment. Secondly the heat insulation of laparoscopic instruments makes it further difficult for routine sterilization. Non tubercular mycobacterium NTM are drug resistant and causes relapses.[6] There are no clear-cut guidelines for port site infection management. Here we present our experience of management of port site infections in 28 patients following laparoscopic surgeries in our institution.

MATERIALS AND METHODS

This retrospective study was conducted in the postgraduate department of surgery, government medical college Jammu over a period of 05 years between Jan. 2020-Jan 2024. Total laparoscopic surgeries performed during this time were 936 and patients who developed PSIs were included in this study. Ethical clearance from ethical committee of the institution was sought, before study was initiated. All patients irrespective of age and gender, who underwent laparoscopic surgery in our hospital and developed port site infections, were included in the study. Data was obtained from hospital records and from their follow up data about PSI and reviewed. Data includes patient demography, index surgery, any prior treatment before presentation, imaging, laboratory findings, antibiotic therapy and other treatment received in our hospital. Microbiological and pathological records were obtained from computer information of the respective departments. Chronic port site infections were diagnosed on the basis of port site infection after 4-6 weeks of laparoscopic procedure, non-healing wound and persistent discharge. The chronic port site infections were classified according to the Chaudhuri et al findings.[5] Table -1.
Figure 1-3, showing the different stages of wounds who presented to us post operatively.

Figure 1: Showing early port site infection following lap. Cholecystectomy

Figure 2: Showing nodule formation in epigastric port one month after surgery

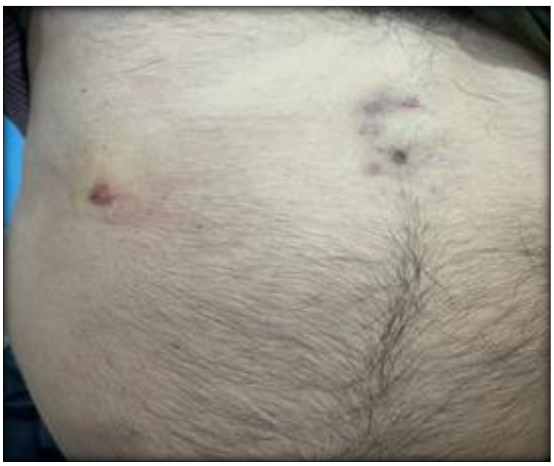

Figure 3: Showing sinus tract formation in epigastric port.

Patients diagnosed with port site infections, were managed by an inexorable road map. Figure -4.

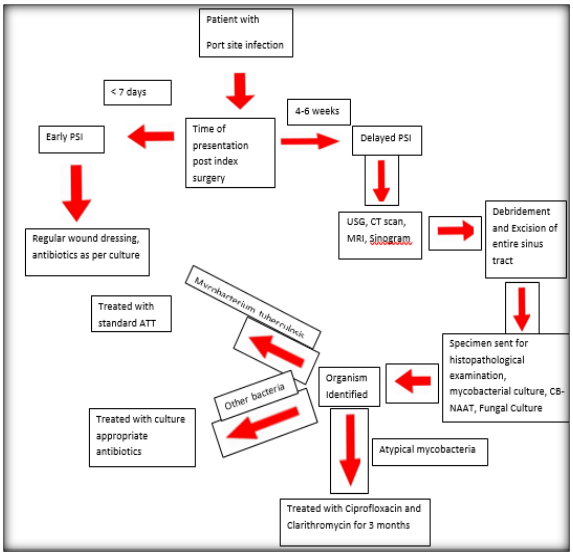

Figure-4. Road map for management of PSIs

Blood investigation especially hemogram, total proteins and serum albumin were done in all patients. All patients underwent USG for any collection and sinus tract. CT scan, MRI and sinogram were done as and when required. All patients with sinus tract were treated by complete excision of the tract. The sinus tract was then sent for culture and sensitivity including fungal, bacterial and mycobacterial cultures along with histopathological examination. The wounds which needed debridement only, again after debridement underwent culture for fungal, bacterial, and mycobacterium along with histopathology. All wounds after debridement were left open to heal by secondary intention and with negative pressure wound therapy. All patients received antibiotics as per culture sensitivity. SPSS -26 Version was used for analysis of data.

Table 1: Clinical staging of port site infections (Chaudhauri et al).[5]

Clinical stage	Clinical features
Stage- I	Tender nodule in the vicinity of port site after 4 weeks
Stage-II	Nodule enlarges, becomes more tender and inflamed. A discharging sinus may appear.
Stage-III	Pus discharge and reduction in pain. Necrosis of overlying skin occurs.
Stage-IV	Chronic discharging sinus develops.
Stage –V	Darkening of surrounding skin. Multiple nodules may appear.

RESULTS

In the present study, the age of the patients ranges between 26-72years with mean age of 46.3 years. The male to female ratio was 10:18.

Index surgery.

16 patients with PSIs had an index surgery of laparoscopic Cholecystectomy followed by laparoscopic Appendicectomy in 07, laparoscopic ovarian cystectomy in 03 and laparoscopic Varicocelectomy in 02 patients as shown in table -2.

Presentation and imaging findings.

The Clinical presentation and radiological imaging revealed wound discharge followed by the sinus tract as the most common finding as shown in table -3.

Ports involved.

The commonest ports involved in the present study were umbilical port followed by epigastric, other ports and multiple ports as shown in table-4.

Microbiology.

The microbiological examination revealed atypical mycobacterium in most of the patients as shown in table-5.

Treatment received.

Nine patients who had port site infections due to mycobacterium tuberculosis MTs were treated with anti-tubercular therapy, twelve patients with port site infections due to atypical mycobacterium NMTs were treated with combination of ciprofloxacin and clarithromycin for three months and seven patients were treated with amoxicillin, clavulanic acid and linzolid as per culture sensitivity as shown in table-6.

All patients improved with oral antibiotic therapy and were asymptomatic on follow up. The mean follow up was 32.3 months. There was no relapse in any patient. Residual sinus tracts after complication of therapies as mention above were excised and also sent for histopathology.

Table 2: Showing index surgeries in patients with PSIs

Index Surgery	No. of patients	Percentage
Laparoscopic Cholecystectomy	16	57.14%
Lap. Appendicectomy	07	25%
Lap. Ovarian cystectomy	03	10.71%
Lap. Varicocelectomy	02	7.14%

Table 3: Showing Clinical presentation and imaging findings in patients with PSIs

Imaging	No. of patients	Percentage
Sinus tract	09	32.14%
Wound discharge	11	39.28%
Local collection	03	10.71%
Chronic inflammation	05	17.85%

Table 4: Showing port site involvement in patients with PSIs

Port site	Number of patients	Percentage
Epigastric	07	25%
Umbilical	12	42.85%
Other ports	06	21.42%
Multiple ports	03	10.71%

Table 5: Showing microbiological results in patients with PSIs

Microbiology	No. of patients	Percentage
AFB (TB)	09	32.14%
NMTS atypical mycobacterium	12	42.85%
Other organisms	07	25%

Table 6: Showing treatment received by patients with PSIs

Diagnosis	Treatment	No. of patients
PSIs with Tuberculosis	ATT	09
PSIs with NTMs	Combination of Ciprofloxacin 500mg BD + Clarithromycin 500mg BD X 3 months	12
Others	Amoxicillin + clavulanic acid or Linezolid	07

DISCUSSION

The surgical wounds are classified in to 4 types such as clean, clean contaminated, contaminated and dirty wounds. Most of the wounds following laparoscopic surgeries fall in clean or contaminated catageory.[7] In one study the incidence of port site infection after laparoscopic procedures is 0.002 percent.[8] The overall incidence in the literature varies from 1.4-6.3%.[9] This varies from centre to centre depending upon the availability of sterilization methods, available instrument sets and patient load. In our set up with limited resource with high volume of patients it is around 1.6%. Predisposing factors for the development of port site infection after laparoscopic surgery are diabetic patients, patient on steroids, immune comprised, low nutrition, anaemic, CKD, pre-operative hospital stay of more than 2 days and prolonged operation duration (> 2 hours). The port site infections can be early within 4 weeks or delayed after 4-6 weeks of index surgery. It is the delayed port site infections which are worrying to the surgeon especially those caused by atypical mycobacteria NTMs because they are resistant to the conventional antibiotics. Once inoculated into the ports they grow slowly and rarely cause dissemination but grow locally. Woksinky,[10] described that the two types of atypical mycobacterium, mycobacterium chelonae and mycobacterium fortuitum grow rapidly and colonize in water and soil and cause contamination anywhere. Reusable trocars are the main source of PSIs.[11] When the laparoscopic instruments are not cleaned properly, the blood, charred tissue gets collected in the joints of the laparoscopic instruments. Usage of such contaminated instruments are responsible for transmission of disease.[12] The PSIs can be exogeneous or endogenous. Endogenous source can be minimised by proper bowel preparation and by specimen retrieval in Endo bags. Exogenous source needs proper methods of sterilization. Laparoscopic instruments are heat labile and hence autoclave is not an option unlike the conventional instruments. Currently glutaraldehyde is used for the disinfection of the instruments. Glutaraldehyde in 2.0-2.5 percent with 20 minutes contact time is good disinfectant but not a good steriliser. As per current guidelines, the 3.5 percent solution of glutaraldehyde with a minimum exposure time of 8-12 hours has a desired level of sporicidal activity. The concentration of glutraldehyde solution, contact time and how often you change the solutions is important. As per guidelines, the solution should not be used for more than 100 cycles over 14 days (2.5 % glutraldehyde) or 28 days (3.4% glutraldehyde).[13] Glutraldehyde of 3.4% with contact time of 8-12 hours has a sporicidal activity.[14] Finally after exposure to glutraldehyde, the laparoscopic instruments should be rinsed with sterile water. Glutraldehyde has numerous shortcomings. Orthophthaldehyde and pre acetic acid is a good alternative for high level disinfection with good efficacy. Plasma sterilization like STERRAD is less expensive and provides effective alternate for low temperature sterilization. Ethylene oxide (ETO) and formalin gas chambers are also an effective alternative but, their cast is the hinderence.[5] sometimes these port sites may have persistent discharge due to some spilled stone or sometimes due to retained haemolock clips.[15,16] The port site infections are complex but preventable.[17] They increase morbidity, reduce quality of life and may lead to confidence reduction in surgeon. To prevent / minimise port site infections, preventive measure should be taken into consideration by heart and soul. The pre-operative measures like preoperative antiseptic shower in the morning of surgery, new and ironed clothes after shower, trimming nails, high preoperative oxygen fraction, maintaining skin integrity. Preoperative skin preparation with 2% chlorhexidine gluconate or isopropyl alcohol reduces the catheter related blood born infections.[10] Proper sterilization protocol should be followed. Intra-operative precautions includes use of sterile draps, govens, gloves, proper

handling of instruments, maintaining aseptic conditions, proper skin preparation, proper trocar size and placement to avoid nerve injury, wound protectors, maintain pneumoperitoneum sterility, minimize operative time, use of antimicrobial coatings, gentle tissue handling, proper closure technique, intraoperative irrigation of the surgical field, and education of staff and surgeon. Post operatively daily dressings, wound cleaning, drainage and debridement should be done and irrational antibiotics should be avoided.

CONCLUSION

Port site infections increase the morbidity and overshadow the benefits of minimal access surgery. Early port site infections due to normal skin flora respond well to antibiotics. Chronic port site infections are the troublesome as they are drug resistant. Better way to prevent these infections is to follow the standard methods of sterilization and take every measure to maintain the sterilization chain. Thorough microbiological methods should be employed to avoid the usage of empirical antibiotics.

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REFERENCES

1. Gumbs AA,Gayet B, Hoffman JP.Whipple procedure with a two layered pancreatojejunostomy. Surg Endosc.2011;25:3446-3447.
2. Peterson CY,Palazzi K, Parson JK, Chang DC,Ramamoorthy SL. The prevalence of laparoscopy and patient safety outcome: an analysis of colorectal resections. Surg Endosc.2014;28:608-616.
3. Cuschieri A,Dubois F,Mouiel J et al. The European experience with laparoscopic cholecystectomy. Am J Surg. 1991;1(161):385-387.
4. Rassweiler J,Frede T,Guillonneua B. Advanced laparoscopy. Eur Urol.2002; 42:1-12.
5. Chaudhuri S, Sarkar D, Mukerji R. Diagnosis and management of atypical mycobacterium infection after laparoscopic surgery. Indian J Surg.2010; 72:438-442.
6. Alam MR, Nuruzzaman M, Begum M, Alim MA, Rahman MM, Karim MR, Alam MI. The frequency of port site infection in laparoscopic cholecystectomies. Med Today.2021;25:22-26.
7. Vikas Kumar Heer, Suhail Khuroo, Aijaz Ahmad Wani, Sonia Nagyal, Beena Jad. Outcome of surgical management of post laparoscopy atypical mycobacterial port site infections: Is early surgery a better alternative. Surgery in practice and science.2022;8:1-5.
8. R. Aziz. Practical manual of operative laparoscopy. Springer-Verlag, New York.1992:1-8.
9. E Wolinsky. Nontuberculous mycobacteria and associated disease. Am Rev Respir Dis.1997;119(1):107-159.
10. Sasmal P, Mishra T,Rath S,Mehar S. Port site infection in laparoscopic surgery. A review of its management.http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4607803
11. M. A. Mir, U Y Malik, H Wani, B.S Bali. Prevelance, patteren, 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.
12. R. Krishnappa, I. Samarasam. Atypical mycobacterial infection in post laparoscopy surgical wounds: Our observation and review of literature. Int. Surg J. 2017; 4(9):2943-2946.
13. Ramkaran Chaudhary, Vibhor Tak, Akshat Dutt et al. Current trends in the management of port site infections: A case series and review of published work. Cureus. 2023;15(6): e40936.
14. H. Ramesh, K. Prakash, V. Lekha, G. Jacob, A. Venugopal, B.Venugopal. Port site tuberculosis after laparoscopy: report of eight cases. Surg Endosc. 2003;17: 930-932.
15. Rosenberg L, Pollitano A, Sawyer R. The surgical care improvement project and prevention of post-operative infections, including surgical site infections. http://www.liebertpub.com/dio/abs/10.1089/sur.2010.083.
16. Dreznik Z, Soper NJ. Trocar site abscess due to spilled gallstone: an unusual late complication of laparoscopic cholecystectomy. Surg Laparosc Endosc.1993;3:223-224.
17. Narreddy SR, Guleria S, Agarwal S, Svr CM, Mandal S. Recurrent abscess at site of laparoscopic cholecystectomy port due to spilled gallstones. Indian J Gastroenterol.2001;20:161.