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Microorganisms Isolated from Port Site Infection: Aclinico-Microbiological Study

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Abstract
Background: *Port-site infection (PSI) is a prevailing, chronic, nagging, treatment refractory complication of laparoscopic cholecystectomies. It neutralizes the advantages of minimally invasive surgery and increases morbidity, treatment cost of patient, leading to loss of confidence on operating surgeon, patients and common people. PSIs are preventable with appropriate preoperative, intraoperative, and postoperative measures. Not only Atypical Mycobacterium but also a lot of non-mycobacterial pathogens are associated with nonhealing postlaparoscopic wound infections, causing outbreaks or sporadic cases worldwide.*
Aim: *In our retrospectively studied we tried to isolate the microorganisms from the port site wounds, their magnitude, planning for adequate management and to recommend the measures to prevent them in future in our tertiary health care centre in a rural setup.*
Methods: *This observation and investigation based study carried by the Department of General Surgery at MaldaMadical College Hospital, Malda, West Bengal over a period of 3 years (July 2014 to June 2017). The study was carried out in 200 patients who underwent laparoscopic cholecystectomy by our team. 19 cases out of 200 patients presented with chronic pus discharge from either one or all ports which delayed onset and not responding to antibiotics. The pus was collected from all 19 PSI patients and examined for isolation and identification of the causative agents. Gram stain and Ziehl–Neelsen staining methods were used for direct examination. Culture media included blood agar, Robertson's cooked meat broth, MacConkey agar, and Lowenstein–Jensen medium in our hospital.The pus also sent to a standard laboratory for DNA-PCR which is not available in our hospital, for more specific isolation of microorganism.*
Results: *Of the 19 cases, the pus/discharge specimens examined in the form of direct staining and microscopy, culture and DNA-PCR study for isolation and identification of organism. 13 patients showed non-specific bacterial infections in the form of both Gr +ve and Gr –ve respectively 6(45%) and 4(30.67%). Three of the cases had mixed infection of Staphylococcus aureus andPseudomonas spp. with NTM. Six (15%) cases were diagnosed as Mycobacterial infections. Out of six, 5(83.33%) patients were infected with Atypical Mycobacteria. All these isolates were rapid growers most of them belong to either Mycobacterium fortuitum or Mycobacterium abscessus.*
Conclusions: *Our present study shows, the PSI dramatically should be reduced by adopting strict antiseptic measure, with no compromise on sterilization or by using disposable instruments. The use of advanced sterilization systems like STERRAD, which utilises gas plasma technology to kill spores at low temperatures, or using ethylene oxide gas for sterilization of insulated laparoscopic instruments.*
Keywords: *Laparoscopic cholecystectomy, Atypical Mycobacteria, port site infection (PSI)*

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I. Introduction

Minimal access surgery also commonly termed laparoscopic surgery (LS) is a weapon of modern surgery limiting invasiveness to reduce morbidity such as postoperative pain, quicker return to normal activity, and less postoperative complications. However, LS has a lot of unique complications. Besides, major complications such as bowel or vascular injury, port-site infections (PSIs), port-site herniation, pyoderma gangrenosum, and metastasis at the port site following laparoscopic onco-surgery are indolent but growing problem nowadays.[1] It has been observed that metabolic complications due to surgical injury are less in laparoscopic surgery as compared to open surgery. However, laparoscopic surgery is associated with unique complications related to gaining access to the peritoneal cavity. Port site infection is an infrequent complication.

Sometimes these infections become protracted and recurrent and pose a dilemma for the surgeon and become distressing for the patients.

Rate of PSI varied from 3.3% to 10% depending on area of reporting and type of surgery.[1,2] PSI is a type of surgical-site infection (SSI) confined to skin and soft tissue or rarely muscles around the ports through which surgeons gain access into the abdomen and present within a month of the operative procedure. Most LS belongs to Classes 1 (clean) and 2 (clean-contaminated) wounds as per the CDC criteria for SSI 2015.[3]

Since port site infections have not been given much attention in the medical literature, the objective of this study toisolate the microorganisms from the port site wounds, their magnitude, planning for adequate management and to recommend the measures to prevent them in future in our tertiary health care centre in a rural setup. [4]

The surgical infection is defined as, "infection which occurs within 30 days of the surgical procedure." The centre for Disease Control (CDC), USA, classifies surgical site infections into three categories. [5]

1. Superficial (skin and subcutaneous tissue).
2. Deep (fascia and muscles.)
3. Organ/Space.

In this context, a port site infection (PSI)[6]is definedas an infection of the skin and subcutaneous tissue at the site of ports created during laparoscopic cholecystectomy which discharges purulent material spontaneously or is opened to drain the same by the surgeon.

Organisms have to be isolated from an area of infection, and the surroundings show typical signs of inflammation like pain, redness, swelling, discharge, wound gap etc. The wound infection rates fell dramatically after the advent of antibiotics.

The causative organisms are generally those which more prevalent in institute e.g. Staph aureus, E. coli. These types of infections are easily treated with antibiotics which are most commonly prescribed in the Institute.

Atypical mycobacteria have been reported at the port site in the literature. They are collectively indicated as MycobacteriumFortuitum-abscessus complex. Primary or secondary anti-tubercular treatment is required in such cases [7,8]. Few refractory cases required debridement and excision of sinus tract followed by anti-tubercular or antibacterial treatment [9].

This study willisolate the various type of microorganisms fromsuperficial as well as deep port site infections in patients undergoing planned laparoscopic cholecystectomies.

II. Aim

In our retrospectively studied we tried to isolate the microorganisms from the port sites wound, their magnitude, planning adequate management and to recommend the measures to prevent them in future in our tertiary health care centre in a rural setup.

III. Material And Methods

This prospective study was conducted in the Department of General Surgery at MaldaMadical College Hospital, Malda, West Bengal over a period of 3 years (July 2014 to June 2017). Approval from the hospital ethical committee was obtained. Total 200 patients with symptomatic gallstones were admitted through outdoor department following through Pre Anaesthetic Check-up (PAC), their age range was between 20-72 years and underwent planned Laparoscopic Cholecystectomies day after admission.Thethird-generationhospital supply antibiotic (ceftriaxone 1gm) usually given via I.V route. First dose at the time of induction of anaesthesia and rest after the surgery. The patients were monitored for port site infection using standard National Nosocomial Infections Surveillance (NNIS) System definitions given by the Centres for Disease Control and Prevention (CDC).

Study population: 19 casesout of 200 cholecystectomies those suspected to have developed PSI with the evidence of delayed wound healing, breakdown of wounds after initial healing, redness or discharge from any wound, nodules in or around the vicinity of the wounds, and nonresponsive to empiric antibiotic therapy were included in the study. No emergency surgical cases were included. Detailed pre- and post-operative history and physical examination were done on predesigned pro forma.

Sampleprocessing: Patients were sent to Microbiology Department where any available discharge or fine needle aspirates or scraping from the wounds or nodules was subjected to Gram stain and Ziehl–Neelsen (ZN) stain. Then, all the samples were cultured on blood agar, MacConkey agar, Robertson's cooked meat broth, and two sets of Lowenstein–Jensen (LJ) medium at 37°C. Any positive nontuberculous mycobacterium (NTM) culture was confirmed by repeating process with the second sample. Screening was also done from water source, staining solutions to exclude contamination of saprophytic NTM from environmental sources. The pus from all PSI also sent to a standard laboratory for DNA-PCR which is not available in our hospital, for more specific isolation of microorganism.

Identification of isolates: Gram stain and Ziehl–Neelsen staining methods were used for direct examination from discharge.Any growth on LJ medium was examined by ZN stain; growth rate and pigmentation were noted. Aerobic bacterial isolates were identified by routine laboratory methods. The reports of DNA-PCR also compiled and verified with our hospital reports.

IV. Results

In our study laparoscopic cholecystectomy was performed in 200 patients, which included 122 females (61%) and 78 males (39%). Their age range was between 20- 72years. Out of these 200 patients 19 (9.5%) of patients developed port site infection. The patients who developed wound infections includes 11 females and 8 males. 38 persons (19%) out of our study cases were diabetic and 6 persons developed port infections. Most common port site involved was epigastric port, which developed infection in 7 patients (77.77%), followed by umbilical port which got infected in 5 patients (26.31%). Gall bladder was extracted through epigastric port site in 180 patients (90%) and through umbilical port site in 20 patients (10%). both epigastric and umbilical port infected in 3 patients (33.33%) and lastly all four ports got infected in 4 patients (22.04). Out of the 19 patients who developed port site infection, gallbladder was perforated while extraction in 6 cases (30%). Out of these 19 patients who developed wound infection, 3 (15.78%) patients had operative findings of (acute cholecystitis) empyema Gall Balder and 3 patients (15.78%) had thick walled gallbladder. Rest other patients 13 (68.42%) had chronic cholecystitis. All wound infections under controlled by conservative and surgical management.[Table 1]

variables	value
Total no patient studied	19 (9.5%)
Male: Female	11: 8
Age group	20 - 72
Incidence of port infection • Epigastric • Umbilical • Both epigastric and umbilical • All four ports	 7 (77.77%) 5(26.31%) 3(33.33%) 4(22.04%)
Gall bladder status of 19 cases • Empyema gall bladder • Thick walled gall bladder • Chronic calculus cholecystitis	 3(15.57%) 3(15.78%) 13(68.42%)
Type of port infection • Superficial PSI • Deep PSI	 15(78.94%) 4(20.05%)

Table 1: Summary of 19 port-site infection cases included in the study

Most of the patients complained of serosanguinous discharges from the nonhealing wound dehiscence at port sites on several occasions. The wounds were healed initially after surgery over 1–2 weeks. Then, induration appeared at port sites followed by swelling which subsequently ruptured to form sinus. Wound was nonresponsive to 1-week antibiotic therapy (either amoxicillin-clavulanic acid combination, ofloxacin, cefuroxime etc). No patient was reported to have any pain, fever, or systemic complications. The average interval between surgical procedure and onset of discharge from port site was 28–64 days. Of the 19 cases, the pus/discharge specimens examined in the form of direct staining and microscopy, culture and DNA-PCR study for isolation and identification of organism. 13 patients showed non-specific bacterial infections in the form of both Gr +ve and Gr –ve respectively 6(45%) and 4(30.67%). Three of the cases had mixed infection of Staphylococcus aureus andPseudomonas spp. Six (15%) cases were diagnosed as Mycobacterial infections. Out of these six, 5(83.33%) patients were infected with Atypical Mycobacteria.All these isolates were rapid growers most of them belong to either Mycobacteriumfortuitum or Mycobacteriumabscessus [Table 2].

Type of Infection	Microorganism		No. of cases
Non-specific infection 13/19 (68.42%)	Gram +ve 6 (45%)	Staphylococcus auras spp. 4 (66.66%)	19 cases
		Enterococcus spp. 2(33.33%)	
	Gram - ve 4 (30.67%)	Enterobacter spp. 2(50%)	
		E. coli 2 (50%)	
	Mixed 3 (23%)		
	No growth 0 (0%)		

Specific infection (Mycobacterium tuberculosis) 6/19 (15%)	Atypical 5 (83.33%)	
	Typical 1 (16.66%)	

Table 2: Type of microorganism associated with post laparoscopic cholecystectomy

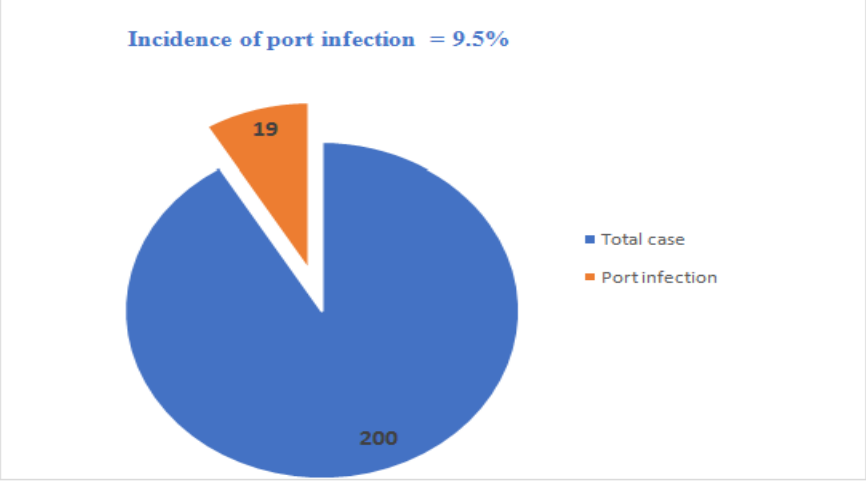

Chart 1

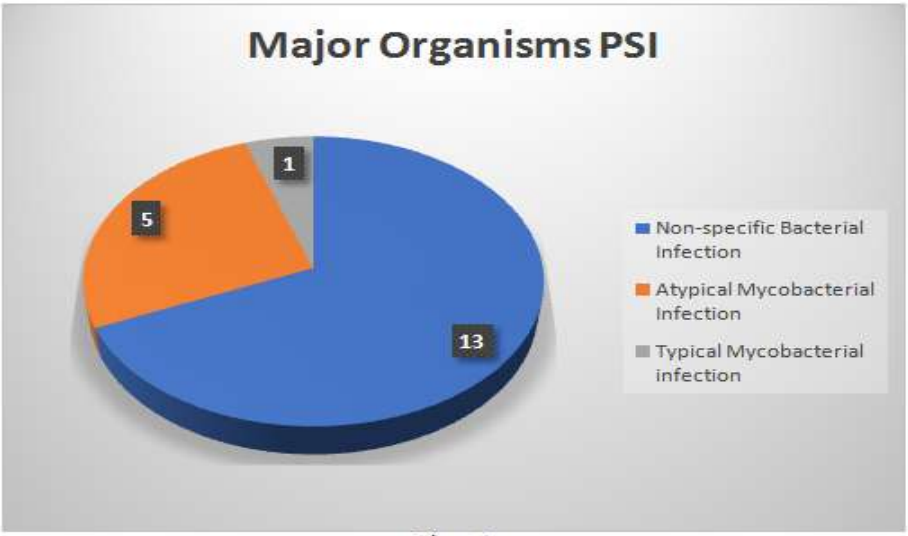

Chart 2

Pic 1. Epigastric and Umbilical Port Infection showed chr. discharging sinuses

Pic 2. Umbilical Port showed nodule formation few months after operation

Pic 3. All four Ports Infection and all debrided and finally healed

V. Discussion

No surgical wound is completely immune to infections [10]. Despite the advances in the fields of antimicrobial agents, sterilization techniques, surgical techniques, and operating room ventilation, PSIs still prevail [11]. Wound infection is the most common complication of almost every open surgery. Same applies to laparoscopic surgery. Although laparoscopic surgeries have less incidence of wound infections [12], still they can produce undesirable effects and increase morbidity. Mycobacterial infections due to atypical mycobacteria at the laparoscopic port site are a common menace encountered in patients undergoing laparoscopic surgery. Atypical mycobacterial colonies often exist in tap water, natural waters and soil and so can easily contaminate solutions and disinfectants used in hospital settings. These infections have been a source of significant morbidity for patients recovering from laparoscopic surgeries.

Port Site Wound infections in laparoscopy can be of two types: [13]

- The first type occurs immediately within 1 week of laparoscopic surgery due to gram negative or positive bacteria derived from infection acquired during surgery from the infected gall bladder or from the skin or the surgical procedure itself and can be treated by common antibiotics and local wound dressing.
- The second type is caused by atypical mycobacteria which includes the group of mycobacterial species that is not part of the M. tuberculosis complex having an incubation period of 3 to 4 weeks which do not respond to common antibiotics

Infections with atypical mycobacteria have been primarily reported after laparoscopic procedures. [14] This is because, unlike open surgery, the instruments used for laparoscopic surgery have a layer of insulation that restricts the use of the autoclave in the sterilization process as the high temperatures involved destroy the insulation on them. The higher incidence of port site infections in our study may be due to the use of reusable metallic ports. as the cost of disposable ports for every case is not affordable either by the patient nor by the hospital. All instruments are re-used frequently after sterilization in CIDEX (CIDEX-OPA Solution, containing 0.55% ortho-phthalaldehyde,[15] is a fast and effective way to high level disinfect a wide range of endoscopes and other semi-critical devices) at least 3 to 4 cases per OT-day.The standard sterilization procedure has been a 20minute exposure to CIDEX. At the current exposure time, these solutions act only as disinfectants and not sterilise thus allowing bacterial endospores to survive.Also, when proper mechanical cleaning of the instruments is not done, blood and charred tissue deposits are left in the joints of the instruments during laparoscopic surgery. These Contaminated instruments deposit the endospores on to the subcutaneous tissue during the surgery which then germinate following which clinical symptoms appear after an incubation period of 3 to 4 weeks. [16]

Poor skin hygiene and malnutrition are another most frequent cause of operative wound infection. In our set up, the patients come from very poor socio-economic status and most of them are suffering malnutrition and unhealthy skin. [17] We also observe that the surgeries which taken long time, the chance of port infection also increased. Another culprit for PSI is diabetes. [18] The patients suffering from long duration of diabetes and irregular medication, their chance of port infection also very high and invariable their gall balder was contracted and thick walled and also taken long time for surgery. 38 persons (19%) out of our study cases were diabetic. 6 diabetic patients out of total 19 patients (31.58%) developed port infections in our study.

VI. Conclusion

With innovation of minimal invasive surgery (MIS) the port site infection (PSI) is a burden in health care system, and still on and off patients do develop port site infection, which not only disturbs the patient, but also agitates the operating surgeons, because it not just increases the duration of recovery but also increase the cost. We feel it can be reduced by adopting strict antiseptic measure, with no compromise on sterilization or by using disposable instruments.The use of advanced sterilization systems like STERRAD, which utilises gas plasma technology to kill spores at low temperatures, or using ethylene oxide gas for sterilization of insulated laparoscopic instruments.

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