



General Surgery

A STUDY ON INFECTION CONTROL AND PREVENTION OF PORT SITE INFECTIONS IN LAPAROSCOPIC CHOLECYSTECTOMY AND APPENDICECTOMY

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ABSTRACT Laparoscopic surgery or minimal access surgery for removal of appendix and gall bladder was first performed in India in the year 1990. Ports are the small key hole incisions via which the laparoscopic instruments enter the abdomen cavity. These key hole incisions can get infected in the post-operative period and this type of infections are usually a set of chronic, nagging, treatment-refractory complication. These chronic infections which are non-refractory to treatment are unique to laparoscopic procedures. Aim of our study was to assess the port site infections in laparoscopic surgeries performed at Sushrut hospital, nallasopara west, palghar and its prevention. With some changes in the sterilization techniques we attempted to eliminate the problem of port site infections and achieve a safe surgery with an excellent satisfaction rate. We conducted a study on 200 patients undergoing laparoscopic abdomen surgery. 160 patients with laparoscopic cholecystectomy were included and 40 with laparoscopic appendectomy were included in the study.

KEYWORDS : Laparoscopy, Appendectomy, Cholecystectomy, OT Sterilization, Infection Control, Ssi, Non Mycobacterium Tuberculosis.

INTRODUCTION

Laparoscopic surgery or minimal access surgery for removal of appendix and gall bladder was first performed in India in the year 1990. Since then, it has revolutionized the field of general surgery. The use of 3-4 small key hole incisions to remove the affected organ instead of a conventional muscle cutting large incisions of open surgery, has changed the post-operative course of stay for the patient undergoing the surgery as well. With lesser hospital stay, lesser pain, minimal complications, better cosmesis, lesser chances of hernia this technique has almost abolished the practices of open surgery in the past two decades. With the rising patient knowledge and awareness, demands of laparoscopic surgery far exceed the acceptance of open surgery which are now limited to only rural and government settings where infrastructure is lacking. Hence, it is safe to say that almost 70-80% patients with the diagnosis of either appendicitis (inflammation of appendix) or cholecystitis/ cholelithiasis (stone in gall bladder) undergo laparoscopic surgery.

In spite of the numerous advantages of laparoscopic technique, they come with their own complications, Port-site infections (PSIs) being one of them. Ports are the small key hole incisions via which the laparoscopic instruments enter the abdomen cavity. These key hole incisions can get infected in the post-operative period and this type of infections are usually a set of chronic, nagging, treatment-refractory complication. These chronic infections which are non-refractory to treatment are unique to laparoscopic procedures. They result in significant morbidity and erode the benefits of laparoscopic procedures.

From the period of 2020 – 2022 we identified many patients post laparoscopy who presented with the complication of PSI. We tried to find an answer as to why this problem existed and how to tackle it and prevent it. Our setup has an operation theatre equipped with laminar air flow and HEPA filters. We had a thorough strict protocols of operation theatre sterilization including regular OT fumigation, regular OT cultures etc. All the instruments were sterilized with the help of either autoclave or ETO. Staff followed strict protocols of surgical hand wash, donning of gloves etc. And yet the problems didn't cease to exist. It was depressing initially as the poor satisfaction rates due to the infections in the postoperative period causing patients to take very long course of antibiotics which were burdening financially to the patient as well. During discussions with colleagues, it was identified that this was not just our setup related problem, but was quite universal to all surgeons and setups. We decided to dig deeper in this. Aim of our study

was to assess the port site infections in laparoscopic surgeries performed at Sushrut hospital, nallasopara west, palghar and its prevention. With some changes in the sterilization techniques we attempted to eliminate the problem of port site infections and achieve a safe surgery with an excellent satisfaction rate.

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

- 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 delayed PSIs are elusive entities that evade diagnosis by routine microscopic and culture techniques (1) and are 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 and which do not respond to common antibiotics or anti tubercular drugs.

Despite the advances in the field of antimicrobial agents, sterilization techniques, surgical techniques, operating room ventilation, PSIs still prevail. The emergence of rapid growing atypical mycobacteria with multidrug resistance, which are the causative organism in most of the cases, has further compounded the problem. Laparoscopic port-site infections range from 1.39% to 6.7%, and rapidly growing nontuberculous mycobacteria (NTM) as a cause of such infections have been established in several reports. (2) Rapidly growing NTM are considered saprophytes which colonize the environment, soil, and tap water. They are known to cause nonhealing skin and soft-tissue infections, 3–4 weeks post-surgery due to exogenous contamination during sterile procedures sporadically or as outbreaks (3-5). PSIs are preventable if appropriate measures are taken preoperatively, intraoperative and postoperatively. PSIs can often be treated non-surgically, with early identification and appropriate management.

Atypical mycobacterial colonies often exist in tap water, natural waters and soil and so can easily contaminate solutions and disinfectants used in hospital settings. Infections with atypical mycobacteria have been primarily reported after laparoscopic procedures. 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 standard sterilization procedure has been a 20 minute exposure to 2.0 2.5% glutaraldehyde. At the current exposure

time, these solutions act only as disinfectants and not sterilants thus allowing bacterial endospores to survive. A study by Lorena et al [6] on *M. massiliense* BRA100 strain showed that it is resistant to even higher concentration of glutaraldehyde (GTA, 7%).

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. For the prevention of PSI, Disposable laparoscopic instruments is promoted as the best solution in western countries. However, with high costs involved in this, and limited resources available in developing country such as India, this seems to be an invalid option financially. The use of advanced sterilization systems like STERRAD, which utilizes gas plasma technology to kill spores at low temperatures, or using ethylene oxide gas for sterilization of insulated laparoscopic instruments can be done. However, cost of STERRAD is 70 lakhs and to bear the burden of this for a small scale hospital like us, is difficult to impossible.

Clinical Presentations of PSIs

Wound discharge and erythema around the port site are the most common presentation of non-mycobacterial infection usually occurring within a week of the surgery. They are usually limited to the skin and subcutaneous tissue [7-9]. There may be surrounding tissue inflammation with pain or tenderness and low grade fever. The delayed type of presentation commonly caused by mycobacteria manifests nearly a month after surgery, in the form of persistent multiple discharging sinuses or lumps/nodules, not responding to antibiotics. There may be pigmentation and induration at the port site starting in a single port and spreading to others.

There are five clinical stages of atypical mycobacterial PSI [10].

First Stage: A tender nodule appears in the vicinity of the port site, and its usual timing of appearance is around four weeks following the surgery.

Second Stage: Increase in the size of the nodule, and increased tenderness of the site along with other signs of inflammation with eventual formation of a discharging sinus.

Third Stage: Reduced pain sensation following discharge of the purulent material and necrosis of the skin surrounding the port site.

Fourth Stage: Chronic sinus discharging white or serous fluid.

Fifth Stage: Hyper-pigmentation of the skin surrounding the sinus and appearance of multiple nodules at different places.

Once the patients were diagnosed with a chronic port-site infection, they were managed according to a predetermined departmental protocol

Case Study

Aims

Laparoscopic cholecystectomy is a very common surgery performing in our hospital. One of the complications after the surgery is infection at port site. So, aim of this study was to assess the possible cause of port site infections in patients undergoing laparoscopic cholecystectomy and suggestion for standardization of sterilization method in our institution.

Objectives

The objectives of the study were: to make the necessary changes in respect to different methods of chemical sterilization of instruments, and to assess the outcome following treatment to the patients of this study group.

Study Sample

We conducted a study on 200 patients undergoing laparoscopic abdomen surgery. 160 patients with laparoscopic cholecystectomy were included and 40 with laparoscopic appendectomy were included in the study. All patients were operated at Sushrut hospital, nallasopara west, palghar district of Maharashtra.

Inclusion Criteria

All patients were selected by randomization. 100 patients undergoing laparoscopic cholecystectomy or appendectomy at Sushrut hospital, nallasopara west from 2020-2022 were included in group A and 100 patients operated from 2023-2024 were included in group B after implementation of four new protocols.

Exclusion Criteria

Gall bladder gangrene, pyocoe perforation, immunocompromised patients like AIDS, CA GB, steroid, and any comorbid condition like diabetes mellitus and uremia.

Patients undergoing laparoscopic appendectomy/cholecystectomy from the year 2020-2022 were included in the study group A. Patients who got converted to open surgeries due to complicated surgery were not included in the study. Patients who were sero positive were not taken in the study. Retrospective details of the patients were obtained from MRD after due permissions. These were included in study group A.

The new protocol of infection control was devised by our infection control team which included microbiologists, pathologist senior consultant surgeons and senior staff nurses of the hospital. (Dr Rohit Dandawate, Dr Varsha Dandawate, Dr Preeti Mopkar, Dr Sachin Mopkar, Dr Praseeda, s/n vandana, s/n Pinky) After changing the protocols of sterilization, parts preparation, surgery methods etc. and then surgeries were performed from the year 2022 onwards.

Patients undergoing laparoscopic appendectomy/cholecystectomy from the year 2023-2024 were included in the study group B. Patients who got converted to open surgeries due to complicated surgery were not included in the study. Patients who were sero positive were not taken in the study. Retrospective details of the patient were obtained from MRD after due permissions. These were included in study group B.

RESULTS

Group A included 100 patients from 2020 – 2022. Out of which 80 underwent laparoscopic cholecystectomy and 20 underwent laparoscopic appendectomy. Amongst 80 of laparoscopic cholecystectomy, 8 were found to have port site infections (10%). 6 of whom had to undergo prolonged dressings, long course of antibiotics. 2 had to undergo re surgery in the form of sinus exploration under anesthesia for one patient and incision and drainage for one patient. Amongst 20 undergoing laparoscopic appendectomy, 2 were found to have port site infections (1%). Both settled with long course antibiotics and dressings.

Umbilical port was found to be affected alone in 60% of cases of PSI. Umbilical along with other port were identified to be affected in 25% cases and single non umbilical port infection was identified in the remaining 15% patients

The most commonly isolated NTM species include the rapidly growing species *Mycobacterium abscessus*, *M. chelonae*, *Mycobacterium fortuitum*, and *Mycobacterium flavescens*.

Amongst Group B, 100 patients were included. 80 of whom had undergone laparoscopic cholecystectomy and 20 underwent laparoscopic appendectomy. No case of port site infection after cholecystectomy was identified.

CONCLUSIONS

With our experience of 2 years we have devised a plan of action to tackle this problem of PSI. We were able to eliminate the problem altogether with very few and cost effective changes. None were very economically burdening either to the hospital or to the patient. That being said, we recommend the following protocols for prevention of port site infections.

- 1) Use of 4% CHG scrub on abdomen wall with contact time of at least 3 minutes
- 2) Use of Chlorhexidine with ethanol for surgeons following betadine hand wash.
- 3) Use of multienzymatic detergent liquid to clear the debris off the instruments.
- 4) Use of CIDEX OPA instead of CIDEX
- 5) Use of distilled water instead of Normal saline for cleaning instruments after chemical disinfection by CIDEX OPA
- 6) Using non porous material like disposable camera cover plastic for retrieval of specimen instead of gloves endobag.



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