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Original Research Article

A study of port site infections in patients underwent laparoscopic cholecystectomy and its prevention and management

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ABSTRACT

Background: Rapid growths in health care technology have given the surgeon the power of not only treating diseases surgically but also limiting surgical invasiveness.
Methods: It is an institution based non-randomized, prospective, analytical study at Burdwan Medical College and Hospital.
Results: As far as our study is concerned all the hospitals from where patients came were using"activated di-aldehyde" solution for sterilization of laparoscopic instruments; it may be a strongpossibility that there might have been a growth of atypical mycobacteria in this solution, as four out of the five cases reported here found to be seropositive for tuberculosis.
Conclusions: Port site infection (PSI), although infrequent, can be a frustrating complication in minimal access surgery (MAS), both for the patient as well as the operating surgeon. After the surgery, all the instruments should be dismantled completely. Cleaning and washing the instruments should be done under running water.

Keywords: Infections, Laparoscopic Cholecystectomy, Prevention, Management

INTRODUCTION

Rapid growths in health care technology have given the surgeon the power of not only treating diseases surgically but also limiting surgical invasiveness. The greatest example is minimal access surgery (MAS) also commonly termed laparoscopic surgery (LS) or keyhole surgery, which has caused a paradigm shift in the approach to modern surgery, by limiting the access related morbidities. The historical development of laparoscopy can be traced back to 1901 when George Kelling of Germany inserted a cystoscope into the abdomen of a living dog after creating a pneumoperitoneum using air. A century ahead, we are now more technical and technological. With the culmination of technological advances, laparoscopic surgery is ingrained in our surgical practice and we are able to perform diverse and complex laparoscopic procedures, also termed minimally invasive surgery. LS involve the use of reusable metallic or disposable plastic trocars inserted through small skin incisions or ports made on the skin away from the site of surgery. This ports form the portal of entry to perform the surgical procedure by means of specially devised instruments and telescope. It has gained popularity due to better aesthesis, lesser pain, early ambulation and discharge from the hospital with early return to work, minimizing the financial burden to the patient. Ever since Philips Mouret reported the first laparoscopic cholecystectomy in 1987, the approach has been adopted for many other surgical procedures including appendectomy, hernia repair, colonic surgery, gastric surgery, urological and gynaecological surgery. This is because of the combination of advancement in technology with the increasing acceptance of MAS by patients, which has led to the expansion of the horizon of LS. Minimally

invasive surgery particularly laparoscopic surgery has become the surgical treatment for many surgical diseases. Laparoscopic surgeries are associated with shorter hospital stay and convalescence, less pain and scarring. Major complications are usually due to access related complications. Major vascular injury or inadvertent bowel injury are the serious life-threatening complications usually occurring during initial access in to the abdomen.[1,2]

The total complication rate of laparoscopic surgeries was 3.6/1000 procedures and the rate of major complication was 1.4/1000 procedures.[3]

\LS, however, has its package of unique complications. One such complication, which is preventable although, is the port site infection (PSI). PSI soon erodes the advantages of LS, with the patient becoming worried with the indolent and nagging infection and losing confidence on the operating surgeon. There occurs a significant increase in the morbidity, hospital stay and financial loss to the patient. The whole purpose of MAS to achieve utmost cosmesis is turned into an unsightly wound, and the quality of life of patients is seriously affected. Current practice of immersing laparoscopic instruments for 20 min in 2% alkaline glutaraldehyde should be re-examined, according to a recent study.[4]

They also recommend that disinfectant solution used for sterilization was responsible for port site infections. Aim of our study is to assess the port site infections in laparoscopic surgeries and its management. To prevent the infection, proper sterilization and storage of instruments is recommended. The centers for disease control and prevention classification (CDC) categorized surgical site infection (SSI) in to incision site infection and organ space infection. The incision site infection is divided in to superficial and deep infection. Superficial means only skin and subcutaneous tissue infection whereas deep means fascia and muscle involvement.[5]

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 rate of port site infections in patients undergoing laparoscopic cholecystectomy in a rural based medical college, and suggestion for standardization of sterilization method in our institution.

Objectives

The objectives of the study were: to quantify the port site infection in respect to different methods of chemical sterilization of instruments (Cidex, OPA, Paracetic acid solution), and to assess the outcome following treatment to the patients of this study group.

METHODS

Study design

It is an institution based non-randomized, prospective, analytical study.

Study area

The area of the study was Burdwan Medical College and Hospital.

Study population

Patients of 10-60-years age group attending surgical outpatient department and postoperative patients in ward with clinically diagnosed non healing surgical wounds and fulfilling inclusion and exclusion criteria were a part of the study population.

Study period

The study period was from February 2017 to July 2018.

Sample size

Total 96 patients consisted of the sample size.

Inclusion factors

All patients of age group between 10-60 years underwent laparoscopic cholecystectomy due to various pathology to gall bladder and not converted to open surgery were included.

Exclusion factors

Patients having any communicable infective disease (e.g. tuberculosis), patients taking steroids or immunosuppressant for long time, any superficial skin infection, and uncontrolled diabetics were excluded.

Methodology

All cases are selected from the study population complaining of port site infection. In all the patient's preoperative preparation was done by complete bath prior to surgery using antiseptic soap and the parts were prepared by shaving method. Some of them received prophylactic antibiotics during induction of general anesthesia. All surgeries were done under general anesthesia. Most of the patients were given pre-op antibiotic prophylaxis. Skin was prepared with aqueous solution of povidone-iodine. Surgery was done by standard 4 port technique. In few cases pneumo-peritoneum was created using veress needle and others by open method by infra umbilical incision. Through the same incision, a 10 mm safety trocar (primary trocar) introduced in to the abdominal cavity. The time duration from abdominal

incision to primary trocar entry was calculated. Some specimens of gallbladder were extracted with endobag and others were retrieved without endobag. All 10 mm port closure was done by hand sewn intermittent suture. All laparoscopic instruments were sterilized by 2% glutaraldehyde (CIDEX)/OPA/paracetic acid solution with a contact time of approximately 30 minutes. Before surgery all the instruments were washed with warm saline.

RESULTS

In the present study, maximum number of female patients belongs to the age group of 31-40 years (Table 1).

Table 1: Age wise distribution (n=94).

Age group	No. of male patients	No. of female patients
11-20	1	3
21-30	2	12
31-40	10	33
41-50	10	13
51-60	5	7

In the present study, out of 9 PSI cases, 7 patients were belonging to female category (Table 2).

Table 2: Sex wise demonstration of PSI among study population.

Sex	Port position		Total
	Epigastric port	Umbilical port	
Male	1	1	2
Female	1	6	7

Table 3 indicates around 22% of cases results in PSI after treated with sterilization agents.

Table 3: Comparison of percentage of PSI among different sterilizing agents.

Sterilizing agents	No. of cases	No. of PSI among cases	Percentage
CIDEX	46	5	10.87
OPA	29	2	6.89
Peracetic acid	21	1	4.76

Table 4 shows as the duration of surgery increases, incidence of PSI also increased.

Table 5 shows 5 umbilical PSI cases were recorded without endobag retrieval technique.

Table 6 shows, 6 cases of umbilical PSI results from only antibiotic treatment only.

Table 7 shows, maximum (87%) cases result in superficial PSI only.

Table 4: Relation of PSI and the duration of surgery in the study group.

Duration of surgery (in minutes)	No. of surgery in this duration	No. of PSI
31-40	7	0
41-50	25	0
51-60	31	0
61-70	19	3
71-80	5	4
81-90	1	1

Table 5: Infection of epigastric and umbilical port in comparison to retrieval technique either with endobag or without endobag.

Port position	Retrieval of gall bladder	
	Endobag	Umbilical port
Epigastric PSI	1	Epigastric PSI
Umbilical PSI	2	Umbilical PSI

Table 6: Different types of management done in different cases of PSI.

Parameters	Antibiotic only	Local antibiotic infiltration	Wound debride-ment
Epigastric port PSI	2	1	1
Umbilical port PSI	6	3	1

Table 7: No. and percentage of superficial and deep PSI.

Type of PSI	No. of cases	Percentage
Superficial PSI	7	87
Deep PSI	1	13

DISCUSSION

Laparoscopy has become procedure of choice for most of surgeries since it has advantage of smaller incision, which reduces pain and shortens recovery time, as well as resulting in less post-operative scarring but should be done in experienced hands with utmost care for sterilization. A series of laparoscopy port site infections due to *Mycobacterium chelonae* were found in thirty-five patients following laparoscopy at a single hospital over a six-week period. The contaminating source was ultimately identified as the rinsing water used for washing chemically disinfected instruments.[3]

Port site tuberculosis following laparoscopic cholecystectomy has alsobeen reported in a study which concluded that the source of infection is usually a nosocomial with the laparoscopic instrument or its accessories.[4,5]

Sethi et al concluded that M. fortuitum is a clinically important nosocomial pathogen in patients who underwent laparoscopic tubectomies. Port site infection is also reported after laparoscopic appendicectomy by atypical mycobacterium and it was thought to be associated with dropped stones or at the site of physical injury following laparoscopic cholecystectomy. Amongst the port site epigastric port (88.2%) is affected more than umbilical port (11.7%). Memon et al reported that thecauses of port site infection were gross spillage of infected bile, obesity and umbilical stitch sinus.[6-9]

As far as our study is concerned all the hospitals from where patients came were using "activated di-aldehyde" solution for sterilization of laparoscopic instruments; it may be a strongpossibility that there might have been a growth of atypical mycobacteria in this solution, as four out of the five cases reported here found to be seropositive for tuberculosis. The three patients of laparoscopic cholecystectomy were operated during the span of one month only. So, there is high possibility of using same solution for sterilization in all the three patients.

Savita et al concluded that combined procedure in addition to the benefits of minimal access, patient gets theadditional advantage of single hospital stay and single anesthesia exposure but we strongly discourage the use of combined procedure specially if prosthetic material is being used in surgery.

Firstly, the instruments should be thoroughly mechanically cleansed after each use, with complete dismantling of parts to ensure removal of all organic soil.

This is best achieved by using an ultrasonic technology. Secondly, it is necessary to limit glutaraldehyde disinfectants and replace it with ethylene oxide gas sterilization, as this has been shown to be highly effective in reducing atypical mycobacterial infections following laparoscopy. A recent study has shown that atypical mycobacteria are showing increased resistance to these chemicals due to defects in porin expression in the bacterial cell walls.

When liquid chemical sterilant are used, higher concentrations (3-4%) must be used and the exposure time should be increased to 8–12 hours to activate sporicidal activity. Furthermore, the water used to rinse the instruments should be autoclaved to prevent recontamination with spore's post sterilization or use disposable laparoscopic instruments. Finally, the practice of rinsing the instruments with boiled tap water to rinse off the glutaraldehyde, further limits the efficacy of use of this system of sterilization as it causes the re-introduction of mycobacterial spores on the instruments that are then deposited at the ports.

Conventional autoclave can be used for sterilization of the metallic cannula of the ports. Instruments that enter sterile tissue, such as laparoscopes and hand instruments, are critical devices for which sterilization is an absolute requirement. High level disinfection that kills all microorganisms except bacterial endospores, is appropriate for only semi-critical devices, such as endoscopes which are used for GI endoscopy, and touch only the mucosa.

The use of disposable laparoscopic instruments is the gold standard for prevention of infection. Thus, proper sterilization of the laparoscope and instruments is of utmost importance inpreventing infectious complications. Port site infection is a point of concern especially in developing countries which is preventable through proper sterilization of instruments and early clinical diagnosis and treatment.

Laparoscopic surgery is the gold standard for many surgical diseases. Even many patients demanding laparoscopic surgery because of their advantages like smaller incision and minimal pain. All laparoscopic surgeries should be done by experienced surgeons to avoid major complications.

In Atul et al studies, 5 patients presented with PSI and the same patients were treated. They concluded that proper sterilization of instruments is the most crucial step in prevention of PSI. Mir et al studied PSI after elective laparoscopic cholecystectomy, incidence of PSI was 6.7% and the cause of PSI could be due to reusable trocars.[10,11]

Port site infections in our study is 5.7%, similar type of results obtained in other studies like Shindholimath et al 6.3%, colizza et al <2% and Hoed et al 5.3%.[12-14]

Port site infections can be prevented in the following ways. All the laparoscopic instruments should be dismantled in to parts and each part should be cleaned completely. Apart from this mechanical cleaning best cleaning can be done by ultrasonic technology. Use of ethylene oxide sterilization gives better results when compared with glutaraldehyde sterilization. Svetlikova et al studies showed that atypical mycobacteria were showing increased resistance to these chemicals due to defects in porin expression in the bacterial cell walls.[15,16]

CONCLUSION

This study is likely to aid in understanding the relevant studies regarding the appropriate management of PSIs in LS. All the cases of PSI, especially of the atypical mycobacterium should be notified to know the exact incidence, etiology and the sensitivity pattern to various antibiotics. Macrolides, quinolones and aminoglycosides do show promising activity against the atypical mycobacterium. Further research is needed to find out appropriate guidelines for the diagnosis and treatment of this emerging problem.

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