

Can We Prevent Port Site Infections? Our Experience at a Tertiary Care Centre

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Abstract

Background: In the era of minimal access surgery laparoscopic cholecystectomy is the gold standard of treatment for calculous cholecystitis. But laparoscopic surgery comes with its fresh set of complications. Port Site Infections (PSI) is one of the most bothersome complications that overshadow the benefits of a minimal invasive procedure and delays recovery. Atypical mycobacterial infection complicates the situation as it is difficult to diagnose and is resistant to treatment. In our institute (a tertiary level centre) the incidence of PSI was very high and we were in search of alternate methods of sterilisation for laparoscopic instruments as well as any prophylactic treatment that would prevent the development of PSI.

Aims and Objectives: The aim was to study the role of low temperature gas plasma technology (STERRAD) as an appropriate method of sterilisation for laparoscopic instruments to reduce the incidence of PSI and to study the role of prophylactic port site Amikacin in preventing PSI.

Methodology: This is a prospective non randomized study which was done over 15 months. During this study period patients admitted in general surgery wards of IPGME & R and SSKM Hospital with cholelithiasis were included in the study. After

undergoing laparoscopic cholecystectomy they were followed up for 3 months.

Results: Among the 220 cases of laparoscopic cholecystectomy done during this period a total of 30 cases of PSI were noted. There was a drastic reduction in the incidence of PSI when patients were operated using instruments sterilised by the low temperature gas plasma technology (STERRAD). In patients where surgery was done with instruments using the usual 2% glutaraldehyde sterilisation technique, prophylactic port site amikacin injection therapy reduced the incidence of PSI.

Conclusion: The use of low temperature gas plasma technology (STERRAD) is an appropriate method of sterilisation of laparoscopic instruments to reduce the incidence of PSI. Prophylactic use of port site Amikacin might be another cost effective solution in preventing PSI.

Keywords: Port site infection; Sterrad; Low temperature gas plasma technology; Sterilisation of laparoscopic instruments; Port site amikacin.

Introduction

Rapid progress in the field of health care technology has not only improved the capability of treating diseases surgically but has also limited its invasiveness. It was since the 8th decade of the 20th century that laparoscopic surgery became eminent and thereafter gradually became the procedure of choice of various surgical manoeuvres.¹ Less pain, early post-operative recovery, improved aesthetics, minimal scar and ability to return to work early were the major advantages of laparoscopic surgery.

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Despite being a popular choice, laparoscopic surgery comes with its fresh set of complications. Among those, Port Site Infections (PSI) is one of the most bothersome complications that sometimes overshadow the benefits of a minimal invasive procedure.² It often delays the recovery and tests the patience of the patient as well as that of the surgeon. Patient becomes worried of this nagging infection affecting the quality of life. Despite performing a successful surgery PSI might hamper the reputation of the surgeon.

Infections at the port site are mostly of two types. The first variety occurs within the first week of recovery and is due to gram positive or gram negative infections acquired during the surgery from local skin flora, infected gall bladder or contaminated surgical field. It can be easily treated by common antibiotics and wound dressings. The second variety is caused by atypical mycobacteria like *M.chelonae* and *M.fortuitum*, which has a long incubation period of 3–4 weeks. Such organisms can contaminate tap water and liquid disinfectants used in the operation theatres and gains its way into the host tissues.^{3,4} These organisms have a high affinity for the dermis and subcutaneous tissues and protective factors within the peritoneum prevent its deeper invasion. These are resistant to treatment by the common antibiotics.⁵ Diagnosis is primarily made by clinical examination as the organisms are very difficult to culture.

Infections caused by atypical mycobacteria are primarily limited to the laparoscopic surgery because these instruments have a protective insulation because of which they can't be autoclaved. Therefore we are dependent on other sterilisation procedures which are often incompetent to kill the resistant spores. Improper cleaning leaves residues of blood and charred tissue within the crevices. Contaminated instruments deposit the endospores in the subcutaneous tissues and eventually lead to infections by atypical mycobacteria.⁶ Using boiled tap water to clean the instruments after being immersed in 2% glutaraldehyde for 20 mins is thought to be a major culprit. Repeatedly using the same sterilising solution over 100 cycles is another point of concern.⁷

Therefore improper cleaning and using erroneous methods of sterilisation of laparoscopic instruments seems to be the major cause of these infections. Major efforts are underway to improve the methods to prevent and treat this Port Site Infections (PSI).

Our work focussed on prevention of PSI in laparoscopic cholecystectomies which is the Gold standard treatment for Gallstone disease.

Aims and Objectives

A. To study the role of low temperature gas plasma technology (STERRAD) as an appropriate method of sterilisation of laparoscopic instruments to reduce the incidence of PSI.

B. To study the role of prophylactic port site Amikacin in preventing PSI.

Materials and Methods

This is a prospective non randomized study which was done over 15 months. During this study period patients admitted in general surgery wards of IPGME & R and SSKM Hospital with cholelithiasis were included in the study. After undergoing laparoscopic cholecystectomy they were followed up for 3 months.

A. *Study area:* IPGME & R AND SSKM Hospital, Kolkata (a Tertiary care Centre).

B. *Study population:* Patients admitted in general surgery wards of IPGME & R and SSKM Hospital with diagnosis of cholelithiasis.

C. *Sample size:* 220.

D. *Sample design:* Non randomized.

E. *Study design:* Prospective and observational study.

F. *Parameters to be studied:* Role of STERRAD as an appropriate sterilising equipment for laparoscopic instruments, role of prophylactic port site Amikacin therapy and subsequent incidence of PSI following laparoscopic cholecystectomy.

G. *Study tools:* Pre designed and pretested proforma.

H. *Data collection procedure:*

- Clinical examination
- Review of investigations
- Follow up data

I. *Data analysis procedure:* Relevant analytical statistical methods.

Inclusion Criteria

Patients of all age group with a working diagnosis of cholelithiasis, who were planned to undergo laparoscopic cholecystectomy.

Exclusion Criteria

Patients in whom conversion to an open procedure was needed.

Results

During the period between June 2017 and May 2018, a total of 220 laparoscopic cholecystectomies were done under our care. The patients were followed up for a minimum duration of 3 months to look for development of any Port Site Infection (PSI).

A) The distribution of cases among male and females were as follows; (Fig. 1)

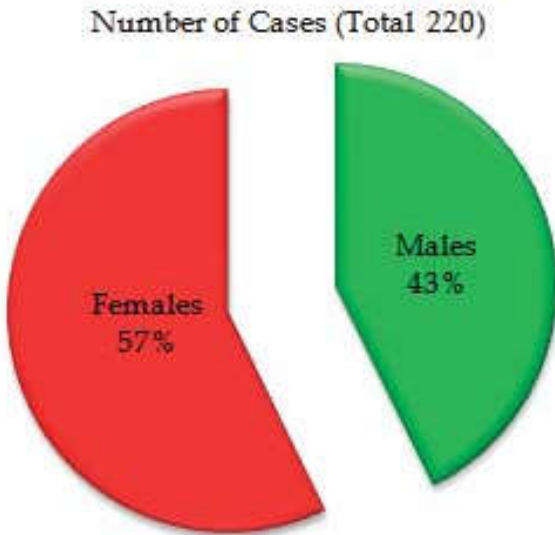


Fig. 1:

Total numbers of male patients were 94 and females were 126.

B) There were 30 patients who developed PSI following laparoscopic cholecystectomy. Majority of them were females. (Fig. 2)

C) We tried to assess whether there were any relationship between sex of the patient and development of PSI. (Table 3)

Table 3:

	Yes	No	Total
PSI in Males	9	85	94
PSI in Females	21	105	126
Total	30	190	220

Using the Fisher exact test;

The 2 tailed p value was 0.1650

The association was considered to be not statistically significant.

Therefore no significance of sex of the patient was found in the development of PSI.

D) Patients were randomly assigned to surgeries using instruments sterilised by the low temperature gas plasma technology (STERRAD) and the usual 2% glutaraldehyde sterilisation technique followed at our institute. The incidences of PSI in these patients were noted during the 3 month follow up period. The aim was to note any change in the incidence of PSI using the STERRAD technique when compared to the regular methods. (Table 4)

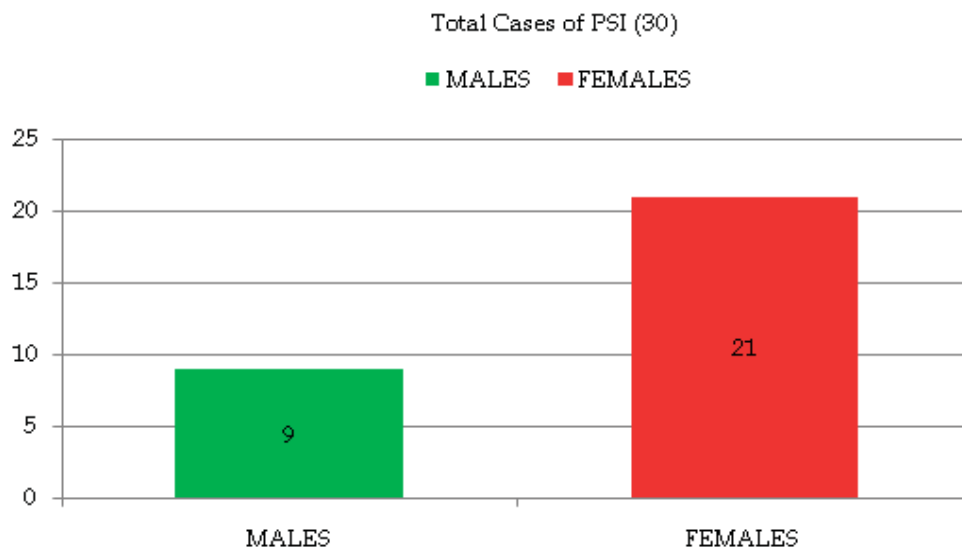


Fig. 2:

Table 4:

	PSI	No PSI	Total
STERRAD cases	1	82	83
NON STERRAD cases	29	108	137

Using the Fisher exact test; The 2 tailed p value was less than 0.0001. The association was considered extremely statistically significant.

Therefore the finding of such drastic reduction in cases of PSI using low temperature gas plasma technology (STERRAD) was found to be statistically significant indicating that it might be the better way to provide an uneventful post-operative PSI free recovery.

E) Among the patients who were not operated using the STERRAD sterilised instruments were randomly considered for prophylactic port site Amikacin after skin incision closure to note whether it had any impact on the prevention of PSI. The results were as follows; (Table 5).

Table 5:

	PSI	No PSI	Total
With AMIKACIN	11	108	119
Without AMIKACIN	18	0	18

Using the Fisher exact test;

The 2 tailed p value was less than 0.0001.

The association was considered extremely statistically significant.

Therefore using prophylactic Amikacin at the port sites could be an effective way to prevent PSI.

Discussion

Port site infections following laparoscopic cholecystectomies has been reported in all age groups and gender. Most laparoscopy wounds are either clean or clean contaminated in variety. The reported incidence of PSI is around 21 cases per 1,00,000 patients.⁸ The commonest site is the umbilical port followed by the epigastric port.⁹ Some of the notable risk factors for PSI were post-operative hospital stay for >2 days¹⁰, operative duration more than 2 hours¹⁰ and immunocompromised state.¹¹ Sex of the patient was not found to be a risk factor for developing PSI.¹¹

PSI can be early or delayed. Early infections are caused by gram positive and negative organisms acquired during surgery from the colonised skin surface or the infected gall bladder contents. The

main point of concern is the delayed PSI caused by the atypical mycobacteria like *M.fortuitum* and *M.chelonae*. They have an incubation period of 3-4 weeks and do not respond to the commonly prescribed antibiotics.³ Diagnosis is primarily clinical as isolation of the organisms from the wound is often not possible by culture or demonstration by the AFB stain.

Thus prevention of such atypical mycobacterial infection is the top priority. Routine sterilisation procedure of using boiled tap water to clean the laparoscopic instruments after being immersed in 2% glutaraldehyde for 20 mins was thought to be a major culprit. This procedure was unable to kill the spores. Also repeatedly using the same solution was that of a concern.

Thus to reduce the burden of Port site infections, use of low temperature gas plasma technology (STERRAD) was introduced. The laparoscopic instruments were dismantled and cleaned by the surgical residents. The parts were thoroughly dried and then put into the STERRAD sterilisation system for a standard cycle time of 47 minutes. As shown by our study there was a drastic reduction in the number of PSI. Recent studies have shown similar results.

Once there is development of PSI, injection of Amikacin directly to the nodules for 5 consecutive days is one of the well-known treatment regimens. We used prophylactic port site Amikacin injection in the intra-operative period just after closing the skin incisions. 1 gram of undiluted amikacin was utilised for all the 4 ports. It was done for the NON-STERRAD cases and the aim was to achieve a cheap alternative to prevent PSI. It was noted that without using the STERRAD and prophylactic port site Amikacin, PSI was inevitable. Whereas using a prophylactic Amikacin therapy leads to a significant reduction of PSI. These findings were corroborative to other studies which showed that prophylactic port site Amikacin was a better option than intravenous Amikacin to prevent PSI.¹²

Other options to prevent PSI are to use disposable instruments and ports for every case as done in the western world. The cost would increase significantly making it a less preferable choice in our country.

Conclusion

Though PSI is an infrequent complication following laparoscopic surgeries yet it can be bothersome and affect the quality of life. Strictly

abiding by the methods of cleaning and sterilising of the laparoscopic instruments can prevent the development of PSI. The use of low temperature gas plasma technology (STERRAD) is an appropriate method of sterilisation of laparoscopic instruments to reduce the incidence of PSI. Prophylactic use of port site Amikacin might be another cost effective solution in preventing PSI.

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