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Research Article

A Critical Appraisal of Port Site Infections: Meta-Analysis of Existing Contemporary Data

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Abstract

Port site infections have emerged to become an important post laparoscopic morbidity. Several studies have been conducted till now related to port site infections and revealed that the most common bacteria isolated from those port-site infection were Non-tuberculous mycobacterium. However the treatment protocol, including the drug regimen and duration of therapy varied from clinician to clinician and from hospital to hospital. Hence this meta-analysis, to review the results of contemporary literature. Source of the organism was water used for washing instruments and an important factor of ineffectiveness of 2% glutaraldehyde with a short contact period against non-tuberculous mycobacteria.

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- Non-tuberculous mycobacterium
- PSI treatment
- Sterillisation of laparoscopic instruments

INTRODUCTION

In view of shorter post-operative hospital stay, lesser post-op pain, early return to activities and minimal incision and scar, laparoscopic surgeries has rapidly gained trust of both patients and surgeons over the past few decades. With increasing laparoscopic intervention, there is increasing complications as well. Port-site infection, a common post-laparoscopic complication has become a major cause of morbidity.

The rationale of our study is to review the contemporary literature on port site infections and to suggest appropriate drug regimen for it.

The objectives of our study are:

1. To find out the contemporary data on port site infections.

2. To find out the clinical profiles of port site infections.

3. To find out the treatment of port site infections.

4. To find out the source of organism and sterilization method to prevent port site infections.

METHODOLOGY

The studies were selected using keywords "port-site infections", "non-tuberculous mycobacterium", "mycobacterial infections", "complications of laparoscopic surgeries", "laparoscopic cholecystectomy", "rapid growers", "scotochromogens" from articles available on pubmed which had free full text and free abstract, the timeline ranging from 1980 to July, 2017. The data from them were segregated and analysed using PRISMA. Nineteen such articles were available.

RESULTS

We have a total number of 624 patients from 19 studies with the timeline of 1980-2017 July, as available on pubmed with free full text and free abstract. The case wise and port wise distribution of port site infections are shown in Table 1 which shows a clear predominance of umbilical port (82%) as the site of the PSI. The results of our meta-analysis revealed that Laparoscopic cholecystectomy (77%) was the commonest Laparoscopic operation among the reported ones in which PSI occurred.

Among the total included PSI of 624 cases, microorganisms were specified in 50%. The etiologic organisms are shown in Table 2,3 which showed a predominance of Mycobacteriumchelonae (47%) and Mycobacterium massilinese (23.5%). Overall infections by Mycobacterium were 287 in number among which rapid growers were majority (91%). Among all isolates of Mycobacterium, in 13 cases (5%) Mycobacterium tuberculosis was found. Gram positive and Gram negative organisms were also found as a cause of port site infection and were included in study as a part of surgical site infections. However more than half of the studies did not specify and organism and thus treatment was started empirically.

For treatment 98 out of 624(15.7%) cases only had a drug regimen mentioned as a part of published literature. Literature search revealed different drug regimens were used based on clinicians' choice and in few instances based on drug sensitivity. Overall, Clarithromycin was the most widely used and effective drug (in 64% cases) for NTM (63 cases) used singly in 35 cases (33%) and in combination with other drugs in 28 cases. Treatment duration was >6 months (53%) for all NTM cases.

Table 1: Case wise and port wise distribution of port site infections.

		Laparoscopic cholecystectomy	Laparoscopic appendicectomy	Others/not specified
No. of cases		293*	28	303 (10 lap. Tubal ligation)
Site of port infected	**Umbilical**	126	16	
	Epigastric	29		
	Lateral	3		
	Not specified	137	12	

Footnote: *3 cases involved multiple sites

Table 2: Distribution of cases according to the micro-organisms isolated.

Micro-organisms		Number	Name of organism not specified/found
Mycobacterium	*tuberculosis*	13	325
	chelonae	147	
	fortuitum	21	
	flavescens	6	
	abscessus	20	
	massiliense	74	
	wolinskyi	1	
	neoaurum	2	
Gram positive – Staphylococcus aureus		7	
Gram negative	Pseudomonas	19	
	Not specifed	2	

Table 3: Distribution of cases according to anti-microbial drugs used.

Antibiotics	Duration	Number
Anti-tubercular therapy	<6months	0
	≥6 months	15
Clarithromycin	≥6 months	35
Clarithromycin + Ciprofloxacin	≤4 weeks	17
	>4 weeks	8 (2 were given 1 week of IV amikacin followed by oral therapy)
Clarithromycin + Cotrimoxazole	>6 months	1
Clarithromycin + Doxicycline	≤4 weeks	1
	>4 weeks	1
Amikacin (IV), then oral Ofloxacin/Ciprofloxacin	2 weeks, followed by oral therapy of 6 moths	8
Amikacin + Cefoxitin/Imipenem	3 weeks	12 (10 Cefoxitin, 2 Imipenem)

Practically all the isolated NTM in our meta-analysis were resistant to first line anti-tubercular drugs and flouroquinolones but all were susceptible to Clarithromycin and Amikacin. 15 cases were given 6 months of anti-tubercular drugs of which 13 were microbiologically proven to be Mycobacterium tuberculosis. For the Gram positive and negative isolates, empirical therapy was given (drugs not specified).

Among all the cases in which source was defined the cause of infection was found to be ineffective disinfection of laparoscopic instruments with 2% glutaraldehyde resulting in 525 PSI (84%). In 196 cases out of 624 (31.5%), the cleaning water was proposed to harbour the NTM. Contact period was of 20-30 mins in all the cases. In 5 cases disinfection was done using activated dialdehyde which was found to be ineffective for killing NTM.

DISCUSSION

Laparoscopic surgeries have become a preferred mode, due to less cosmetic problems and lesser duration of hospital stay. In our study we have focused on one of the complications of Laparoscopic surgeries, i.e., port-site infections. Port-site infections (PSI) are broadly classified as “early type” which are usually caused by Gram positive or negative bacteria, and “delayed type” which is mostly due to Non-tuberculous mycobacterium [1].

Our meta-analysis includes 19 studies, of which 3 studies reported on more than 100 cases of PSI [2-4]. 13 of the 19

studies were conducted at various hospitals in India. One study conducted in Brazil reported about 172 confirmed cases, which was an epidemic of port-site infections by Mycobacterium massiliense [2]. Another study, in India reported about a series of 145 infections by Mycobacterium chelonae [4].

Two studies reported about PSI in 27 patients who had undergone laparoscopic cholecystectomy, and all of their gall bladders were extracted from epigastric port [5,6] although all the infections were not at the epigastric port site. It was thought that due to extraction of the gall bladder through a port, there is seeding of microorganisms in the tract. But it may not be completely true in most cases because in our study highest incidence of PSI was in the umbilical port, whereas extraction of gall bladder was from epigastric port. Probably umbilical port is the most commonly affected port due to huge load of local microbes harbouring in the umbilicus which was not removed properly by antiseptic cleaning. However using an endobag or extraction could be helpful in preventing PSI further, which was shown in one study that had higher incidence of PSI when endobags were not used (5.28%) compared to when endobags were used (0.2%) [7]. However recently sterile disposable ports are being introduced which can greatly help in reducing PSI.

Current study revealed that Non-Tuberculous mycobacterium were the most common agent causing port site infections, incidence of which is more or less uniformly distributed throughout the world. Almost all of these bacteria are susceptible to clarithromycin and amikacin. In our meta-analysis, many of the studies reported of using multi-drug regimen for NTM and a few used clarithromycin alone. Most of NTM were resistant to fluoroquinolones and anti-tubercular drugs, though a few studies used fluoroquinolones in combination. Our study shows that using combination of clarithromycin with doxycycline, cotrimoxazole or fluoroquinolones did not yield much different result than using clarithromycin alone, the duration of both being 6 months. Possibly clarithromycin for 6 months would be sufficient to treat PSI if the organism is NTM. A few studies reported infection by Mycobacterium tuberculosis, which were treated by standard ATD for 6 months [8-11].

Among the 19 studies included, 7 studies commented about the source of infection out of which 2 studies had more than 100 patients. The 4 studies stated that sterilization of the laparoscopic instruments with 2% glutaraldehyde for 30 mins was not adequate [2,8-10] as well as the source of bacteria came from water that was used to clean the instruments after sterilization [2,4,11,12]. That 2% glutaraldehyde is not effective in killing spores of NTM which resulted in PSI were stated in one study [10]. Four studies specified that 2% glutaraldehyde was not effective and 30 mins of contact time was not sufficient for sterilization [2,8-10]. Rather 3-4% glutaraldehyde over 8-12 hours could be effective, as specified in one study by in vitro experiment [8]. Ethylene oxide is a better alternative to glutaraldehyde for sterilization, especially against mycobacteria [4,8].

The limitation of our study was that we could include only include free full text and free abstract articles from pubmed [13-20]. Non indexed articles were not considered but the present study at the end of this decade will suggest an epidemiologic pattern of PSI. Further studies considering specific organisms with growth patterns, drug susceptibility should be considered but present experience shows difficulty in isolation and culture of such organisms. A large patient database with proper enrolment and demonstration of PSI will provide a consensus for drug use.

Finally the alarm of port site infection reaching epidemic proportion should be considered and proper epidemiological, microbiological and clinical research needs to be undertaken for a disease which appears to be more common in developing countries rather than developed countries.

CONCLUSION

Port site infections are a rare complication in laparoscopy but present experiences suggest otherwise. Non-tuberculous mycobacterium is the most common organism causing PSI, in which rapid growers is the majority. These organisms are susceptible to clarithromycin, amikacin, but resistant to fluoroquinolones and first line anti-tubercular drugs. Long course monotherapy using clarithromycin for 6 months could be the adequate regimen for PSI by NTM. Addition of multiple drugs to clarithromycin may not be beneficial. The probable source is colonisation of 2% glutaraldehyde but the contaminant culprit appears to be cleaning water. Sterilization duration and strength of glutaraldehyde needs a rethinking as well as high end sterilization devices for laparoscopic instruments should be considered for advanced laparoscopic surgeries like ETO. Using disposable ports could rather be a big step in reducing PSI. Finally, much research waits before a consensus can be made into eradication of port-site infection by NTM. From current study, it can be concluded that ETO can be a better alternative to glutaraldehyde for rapid disinfection. If glutaraldehyde is used it should be in 3-4% concentration with an 8-12 hours contact period. Using of endobag for specimen extraction is always preferable, though it is only an add-on to proper aseptic method.

REFERENCES

1. Sasmal PK, Mishra TS, Rath S, Meher S, Mohapatra D. Port site infection in laparoscopic surgery: A review of its management. World J Clin Cases. 2015; 3: 864-871.
2. Duarte RS, Lourenço MC, Fonseca Lde S, Leão SC, Amorim Ede L, Rocha IL, et al. Epidemic of postsurgical infections caused by Mycobacterium massiliense. J Clin Microbiol. 2009; 47: 2149-2155.
3. Hamzaoglu I, Baca B, Böler DE, Polat E, Ozer Y. Is umbilical flora responsible for wound infection after laparoscopic surgery? Surg Laparosc Endosc Percutan Tech. 2004; 14: 263-267.
4. Vijayaraghavan R, Chandrashekhar R, Sujatha Y, Belagavi CS. Hospital outbreak of atypical mycobacterial infection of port sites after laparoscopic surgery. J Hosp Infect. 2006; 64: 344-347.
5. Karthik S, Augustine AJ, Shibumon MM, Pai MV. Analysis of laparoscopic port site complications: A descriptive study. J Minim Access Surg. 2013; 9: 59-64.
6. Jan WA, Ali IS, Nadeem AS, Azra G, Mumtaz K, Abdus SK. The frequency of port site infection in laparoscopic cholecystectomies. JPMI. 2008; 22: 66-70.
7. Taj MN, Ikbal Y, Akbar Z. Frequency and prevention of laparoscopic port site infections. J Ayub Med Coll Abbottabad. 2012; 24: 197-199.
8. Kumar SS, Babu KD, Grace RD, Anapian JC, bhaskar M. A study of port site infections in laparoscopic surgeries IOSR-JDMS. 2015; 14: 20-22.

9. Ramesh H, Prakash K, Lekha V, Jacob G, Venugopal A, Venugopal B. Port-site tuberculosis after laparoscopy: report of eight cases. Surg Endosc. 2003; 17: 930-932.

10. Chaudhuri S, Sarkar D, Mukerji R. Diagnosis and management of atypical mycobacterial infection after laparoscopic surgery. Indian J Surg. 2010; 72: 438-442.

11. Sharma AK, Sharma R, Sharma S. Port site infection in laparoscopic surgeries. Ind Med Gaz. 2013; 224-229.

12. Rajini M, Prasad SR, Reddy RR, Bhat RV, Vimala KR. Post operative infection of laparoscopic surgery wound due to Mycobateriumchelonae. Indian J Med Microbiol. 2007; 25: 163-165.

13. Ghosh R, Das S, De A, Kela H, Saha ML, Maiti PK. Port site infections by non-tuberculous mycobacterium: A retrospective clinico-microbiological study. Int J Mycobacteriol. 2017; 6: 34-37.

14. Sethi S, Gupta V, Bhattacharyya S, Sharma M. Post-laparoscopic wound infection caused by scotochromogenic Non-tuberculous mycobacterium. Jpn J Infect Dis. 2011; 64: 426-427.

15. Wright HL, Thomson RM, Reid AB, Carter R, Bartley PB, Newton P, et al. Rapidly growing mycobacteria associated with laparoscopic gastric banding. Emerg Infect Dis. 2014; 20: 1612-1619.

16. Mir MA, Malik UY, Wani H, Bali BS. Prevalence, pattern, 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.

17. Francis TL, Rao S, Martis John JS, Shenoy Divakar H. Port-site tuberculosis: A rare complication following laparoscopic cholecystectomy. Indian J Surg. 2005; 67: 104-105.

18. Bhandarkar DS, Bhagwat S, Punjani R. Port-site infection with Mycobacterium chelonei following laparoscopic appendicectomy. Indian J Gastroenterol. 2001; 20: 247-248.

19. Sethi S, Sharma M, Ray P, Singh M, Gupta A. Mycobacterium fortuitum wound infection following laparoscopy. Indian J Med Res. 2001; 113: 83-84.

20. Das N, Debbarman A, Saha AK. A study of port site infection following laparoscopic cholecystectomy in a teaching hospital. IOSR JDMS. 2016; 15: 61-63.

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