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LAPAROSCOPIC PORT SITE INFECTION WITH SALMONELLA – REVIEW OF LITERATURE

Rudresh H. K¹, Banashankari. G. S², Harsha. A. Hulyappa¹, Arvind Nayak¹, Prasannakmar Kabmle¹

¹Department of General Surgery, M.S.Ramaiah medical college and hospitals, Bangalore

²Department of Microbiology, M.S.Ramaiah medical college and hospitals, Bangalore

E-mail of Corresponding Author: harsha_hulyappa@yahoo.com

ABSTRACT

Background – salmonella infection of the port site is rare and almost all the cases are secondary to organisms in the bile or the bilestones. **Methods** – 3 cases of laparoscopic and 1 case of lap converted open cholecystectomy had port and laparotomy site infection with salmonella alone or with bowel contaminants. **Results** – all cases had evidences of breach in the extraction protocols of gall bladder and would be attributed for same. **Conclusion** :- adequate antibiotic prophylaxis is just not sufficient for prevention of salmonella infection of the port in chronically infected gall bladder extraction . every gallbladder should be extracted with an endobag especially in developed countries, where the chances of chronic salmonella infections are common.

Keywords:- port site salmonella infection, gallstone disease, laparoscopic cholecystectomy.

INTRODUCTION

Laparoscopic cholecystectomy is by far the most commonly performed procedure and is indeed the gold standard in the treatment of symptomatic gall stone disease. The risk and complications of the procedure are more or less directly related to the extent of inflammatory process and comorbid factors preexisting in the patients. Avoiding the spillage of the gallstones or of the infected bile with extraction of an intact gall bladder specimen is a testament to the surgical proficiency of operating surgeon. Several standard operating protocols and methods have evolved over years to prevent the same, though they are not absolute foolproof methods.

Overall rate of port site infection/surgical site infection following lap (laparoscopic) cholecystectomy is extremely low <1% ⁽¹⁾. The

common causes of port site infection are duration of surgery >2hrs ⁽²⁾, Acute cholecystitis ⁽³⁾, empyema gall bladder and bile spillage and bacteribilia ^(4,5). Most of the port site infections are caused by gram negative enteric bacteria such as E.coli and Klebsiella. Many cases of unusual infection with Candida, Actinomyces ⁽⁶⁾, Atypical Mycobacterium ⁽⁷⁾ have also been reported.

We present here an unusual series of 4 cases of port site infection with Salmonella with evidence of gall stones at the port site in two cases.

REVIEW METHODOLOGY

Case 1

A 56 year old man with symptomatic cholelithiasis underwent lap cholecystectomy in Jan 2008. Gallbladder was extracted from the umbilical port

site. Patient had received ceftriaxone 1 gm as prophylaxis. About 2 months later he presented with fever, malaise, pain and swelling of umbilicus. He was diagnosed to have omphalitis and hence was started on a combination of amoxicillin+clavulanic acid for possible infection by umbilical colonizing bacteria. With no evidence of responsiveness and with an evidence of early abscess on day 4 of antibiotic therapy, incision and drainage was performed during which a small subcentimetric gallstone was seen. It was retrieved and the cavity was thoroughly washed with saline and left for healing. Pus showed gram negative rods and grew Salmonella sp. (species) on culture. It was sensitive to ceftriaxone and the same was started. Wound healed in 3 weeks and no recurrence was noted after 6 months follow up and no evidence of incisional hernia at 2 years follow up.

Case 2

A 39 year old female with symptomatic cholelithiasis (multiple, largest ~ 2 cms), was operated by lap cholecystectomy in Dec 2009. During extraction the gallbladder was brought out partially through the epigastric port site and was opened to extract the stones. With sponge holding forceps, the gallstones were manually picked out under direct vision, followed by uneventful extraction of the gallbladder. Port site was inspected on both sides for any evidence of spillage. Patient was discharged on POD5. Patient returned after 1 month with abscess at port site without systemic symptoms. Pus was sent for culture, which grew Salmonella sp. and with further analysis it was determined to be Salmonella typhi and hence patient was started on ciprofloxacin 500mg bid for 14 days. The wound on exploration showed a 0.5cm partially cut gallstone with exposed core of the stone (Figure 1). The same was sent for analysis, which grew Salmonella typhi on culture. Patient's recovery was uneventful.

Case 3

A 58 year male patient with chronic calculus cholecystitis was operated in Nov 2009. Specimen was extracted through epigastric port. However, the port site infection was noted on POD8. Pus sample yielded growth of E.coli and Salmonella species. Patient treated with ciprofloxacin for 14 days. On wound exploration there was no evident stone. Wound was closed primarily. Patient recovered uneventfully.

Case 4

A 44 year old male patient, admitted for empyema gallbladder was operated upon in Dec 2009. In view of dense adhesions in the Calot's triangle, the procedure was completed by open cholecystectomy. During dissection, a small quantity of bile leak was noted from the body. Empyema fluid grew E.coli with sensitivity to piperacillin + tazobactam. The general well being of the patient however did not improve with evidence of low grade fever from POD3. The laparotomy site was probed and purulent discharge was evacuated (figure 2). Pus showed polymicrobial infection of E.coli, Klebsiella, and Proteus. With our previous experience of Salmonella infection, pus was also sent for special culture which grew Salmonella sp. Combination of cephalosporins and quinolones was started. Subsequently the infection subsided and the wound healed by 12th day.

RESULTS

In case1, multiple tiny calculi in gall bladder, neck and in the cystic duct were noted on USG. Though there was no gross contamination during the procedure, there might have been contamination of the port site from the exposed cystic duct of the specimen during the extraction. Spilled Gall bladder stones from the cystic duct of the specimen may cause port site infection, if the bile or the stone are infected.

In case 2, during the decompression procedure, the delivery of the stones by the forceps might have

crushed and cut the stones into pieces, thus exposing the core of the gallstone to the port site in which it was found. The non usage of Endobag in both these cases might have resulted in spillage of stone.

In case 3, Salmonella is known to be an uncommon inhabitant of the gallbladder in chronic cholecystitis. Manipulation of the gall bladder during the negotiating of the 10mm epigastric port site would have resulted in dislodgement of the bacteria from the chronically fibrosed gallbladder wall into the bile and hence a minute spillage might have resulted in the infection.

In case 4, Empyema gall bladder is known to be polymicrobial usually sensitive to cefuroxime and Cefoperazone. When choosing the antibiotic for biliary infection, the drug and the dosage used should reach MIC (maximum inhibitory concentration) within the blood, biliary tract, bile, peritoneum, GIT, and the surgical site at the time of surgery. It would be prudent if the antibiotics sensitive to Salmonella based on the prevalent culture pattern in the locality, are used, along with coverage for common biliary pathogens in developed countries as the risk of the chronic Salmonella carrier states are more. A study of 100 focal pyogenic abscess by Salmonella showed 15 % to have soft tissue infection including skin, parotid, thyroid, breast and injection site. Salmonella typhi, typhimurium and paratyphi A were isolated in the cultures.

DISCUSSION AND REVIEW OF LITERATURE

Port site infection after an elective video- assisted lap cholecystectomy is reported in about 1 – 9% cases in different series including difficult cholecystectomies.⁸⁻¹¹ Most of such post procedure site infection are treated on OPD basis with oral antibiotics which has shown over the years to offer a cure.

Several studies report the use of different methods to reduce the incidence of port site infection. Most

common mode of such preventive approach is the prophylactic administration of systemic antibiotics. Though many studies recommend and regard it as one of the most essential predictor of wound infection and hence encourage its usage, others have not shown any statistically significant difference in the outcome between the two groups¹²⁻¹⁶.

Vincenzo et al¹⁷ used topical application of Rifamycin over the port site and showed lower infection rates especially in those with varying degree of immunosuppression (Diabetics, patients on steroids/immunosuppressants). Specimen extraction by using endobag, has the least wound infection rates of 1%.¹⁸ With surgery duration exceeding > 2 hrs, the risk of Surgical Site Infections is seen to increase proportionately and is well evident in the study by Waqar et al, where 82.3% of SSIs occurs in procedure lasting more than 1 hr.¹⁹

Although, the general opinion points towards the role of umbilical flora in the development of port site infection, such association has not yet been proven with significant results. The fact that the port site infections are commoner in the port through which the gall bladder is delivered out, indicates that the nature of the gallbladder infection is more implicated in port site infection.^{15,18} Thus, Acute cholecystitis and Empyema gall carry the highest chances of port site infection in view of higher probability of bacterial translocation through an intact bladder wall.^{20,21}

The direct relationship of Bactibilia and bile cultures to the port site infection has been studied extensively. Hamzaoglu I et al⁹ rejected both the skin flora and the bile as sources of port site infection. Study by Abassi AA et al on 82 infected gall bladder cases found no significant correlation between infective complications of the procedure and bacteria in the bile or gallbladder wall.²¹

Positive bile culture and cholelithiasis ranges from 10%-42.5% .^{12,15} Spillage of bile or the stone which occurs in 11% - 35% of Lap

cholecystectomy due to rupture of the gall bladder wall, is the strongest predictor of development of port site infection^{22, 23}. However many studies have found no correlation between the bile culture, rupture of GB, spillage of gallbladder stones as a significant casual relationship for the port site infection.^{7, 13, 15}

The bacteriology of infected bile is most frequently *E.coli*, followed by *Proteus*, *Klebsiella*, gram positive organisms like *Streptococcus viridians*, *Staphylococcus*, anaerobes (*Bacteroides* sp., *Clostridium* sp.) and *Candida* sp.^{1,24,25} However there is no study which has isolated *Salmonella* from the infected bile of calculus cholecystitis/ cholelithiasis. Inhabitation of *Salmonella* sp. in Gallbladder is frequently seen in the developing countries as a part of chronic typhoid infection due to lack of adequate primary treatment. *Salmonella* sp. and other bacteria are specifically isolated from the neck of gall bladder (than from the body or fundus), the bile and both the core and the surface of the gall stones.²⁵ The Rokitansky-Aschoff sinuses in the neck host the organisms.²⁷

Development of chronic typhoid carriage is frequently associated with the presence of gallbladder abnormalities, especially gallstones, yet the progression from infection to the carrier state remains undefined.²⁸ The primary constituent of gallbladder stones is cholesterol, whereas calcium bilirubinate predominates in bile duct stones.³¹ In patients carrying both *S. Typhi* and cholesterol gallstones in the gallbladder, clinically administered antibiotics are typically ineffective against infection and hence such chronic indolent inflammation has a high risk of developing gall bladder carcinomas.^{32, 33} The Widal test is of little help in detection of carriers in endemic areas and is always associated with significant false positivity and negativity^{29,30}. Culture is often sterile, especially in endemic zones with inappropriate antibiotic therapy.³⁴ Sometimes even patients with positive titers are negative on

culture. Similarly in our study, no positive bile culture was obtained for *Salmonella*. Hence, the accuracy of these tests in categorically documenting the presence of *Salmonella typhi* is debatable. Song et al showed PCR to be helpful in detecting amplification products in blood specimens of suspected blood culture-negative patients with typhoid fever. Since then, several reports have appeared in the literature suggesting PCR be made the gold standard for the diagnosis of typhoid fever.³⁴ To date, removal of the gallbladder (cholecystectomy) remains the most effective treatment option for chronic typhoid carriers with gallstones.

Calculi lost in the peritoneum are known to cause intraperitoneal abscess, empyema thoracis, migration to hernia sac, intraperitoneal granuloma, wound infection, small bowel obstruction and abdominal wall sinus.³⁵⁻³⁸ As the aphorism of Lord Moynihan states "Tomb stone erected to the memory of organisms which lie dead within them", the bacteria inside the gallstones have long been thought to be dead.³⁹ A study conducted by P Hazrah et al, on the frequency of live bacteria in gallstones, have found 81% of stones to harbor enteric and nonenteric organisms(46% and 16%).²⁶ With *Klebsiella* being the most common organism (17.5%), *Salmonella* sp. were isolated in 1.5% of cases. Wetter et al. showed culture positive rates in pigment stone to be of 100% whereas no *Salmonella* was cultured in 100 gallstone cultures in another study.⁴⁰ A study by Roa et al on 608 patients isolated *Salmonella* sp. in only 4 cases with chronic cholecystitis.⁴¹ Medline search for *Salmonella* surgical site infection yielded only one report of Postcholecystectomy surgical site infection by chronic *Salmonella enterica* var. *Weltevreden* requiring carbapenem for treatment.⁴²

CONCLUSION

1. *Salmonella* is a causative organism of port site infection, following biliary surgery, especially cholecystectomy in developing countries and

usually are located within the stones and in the fibrosed walls of the gallbladder.

2. Utmost care taken during handling of the specimen while being dissected, grasped, clipped and delivered out would prevent bile spillage. Care must be taken as the cystic duct and the ruptured gallbladder during extraction are the commonest causes of port site infection.
3. Any attempt at extraction of large stone through the same port should always be done with Gall bladder inside an endobag, so that the cuff covering the port site would prevent spillage into the wound.
4. It is more prudent to leave the port site to heal by secondary intention when there is suspicion of abscess, so that a missed stone usually get expelled out during dressing and healing.
5. Antibiotic coverage for both common biliary organisms and also Salmonella sp. would appear essential and needs further studies for validation.

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Figure 1 :- Epigastric port site on exploration showed a 0.5cm partially cut gallstone with exposed core of the stone



Figure 2 :- The laparotomy site on probing showed purulent discharge with polymicrobial infection of E.coli, Klebsiella, Proteus and Salmonella