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RESEARCH ARTICLE

Gallbladder Wall Culture Positivity and its Impact on Surgical Site Infection after Elective Laparoscopic Cholecystectomy

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ABSTRACT

Cholecystectomy is one of the most common operations performed in general surgical practice. In case of cholecystectomy, inflamed gall bladder (Acute cholecystitis, empyema gall bladder or perforated gall bladder) resulting in contamination of wound increases the risk of surgical site infection. Though cholecystectomy in patients with non-inflamed gall bladder (biliary colic, flatulent dyspepsia) is considered to be clean contaminated surgery due to growth of bacteria from cultures taken from bile of these patients, its impact on wound infection and microbiology of infected wounds is not known.

Objective of our study was to determine microbiology of gall bladder wall specimens from patients operated for non-inflamed gall bladder, and to determine its association with organisms in patients having post-cholecystectomy wound infection.

Study was conducted in the Department of General Surgery at Liaquat National Hospital Karachi. All patients more than 16 years of age who underwent cholecystectomy for cholelithiasis met the selection criteria were eligible to be included in the study.

A total of 156 patients were included in the study out of which 60 (38.5%) were males and 96 (61.5%) females. Gall bladder wall culture was positive in 91 (58.3%) patients. Out of 91 patients who had positive culture, 5 (5.5%) patients suffered from surgical site infection while 4 (6.2%) patients developed surgical site infection out of 65 who cultured negative in gall bladder wall specimen. This difference was not statistically significant ($p > 0.05$).

Introduction

Surgical Site Infections (SSIs) are one of the most common causes of Hospital Acquired Infections and are responsible for significant economic burden [1]. They account for considerable morbidity for the patients in terms of increased length of hospital stay, organ dysfunction and even mortality. On average SSIs increase hospital stay by 3 to 9.7 days and cost of care up to 30000 dollars per admission [2,3]. It is also associated with indirect cost in the form of abstinence from work and mental and social disturbance. In its guidelines to prevent SSIs, Centre for Disease Control and Prevention (CDC) has developed standardized criteria for defining and classifying SSIs [4]. According to these definitions SSIs have been divided into superficial incisional SSI, deep incisional SSI and organ/space SSI.

Cholecystectomy is one of the most common operations performed in general surgical practice. Laparoscopic approach to cholecystectomy is the standard of care as opposed to open surgical approach. Though laparoscopic approach has the advantage of reduced risk of surgical site infection as compared to open surgical approach, up to 2.4% patients are reported to suffer from wound infection even after laparoscopic cholecystectomy [5]. In addition to other risk factors, clean contaminated or contaminated surgery increases the risk of surgical site infection.

Micro-organisms from gastrointestinal tract are responsible for majority of surgical site infections after laparotomy [6]. Though protecting the surgical wound with custom made wound protector is demonstrated to reduce surgical site infection in multiple studies but this finding is not consistent [7]. In case of cholecystectomy, inflamed gall bladder (Acute cholecystitis, empyema gall bladder or perforated gall bladder) resulting in contamination of wound increases the risk of surgical site infection.

Though cholecystectomy in patients with non-inflamed gall bladder (biliary colic, flatulent dyspepsia) is considered to be clean contaminated surgery due to growth of bacteria from cultures taken from bile of these patients, its impact on wound infection and microbiology of infected wounds is not known.

Objective

To determine microbiology of gall bladder wall specimens from patients operated for non-inflamed gall bladder, and to determine its association with organisms in patients having post-cholecystectomy wound infection.

Methods

1. Criteria for defining surgical site infection (SSI)

Surgical site infection was defined using criteria laid down by Centre for Disease Control and Prevention [4]. Salient features of these criteria are given below and outcome was considered positive if any one of both criteria was fulfilled.

1.1. Superficial incisional SSI: Infection that occurs within 30 days after the operation and infection involves only skin or subcutaneous tissue of the incision and at least one of the following:

1. Purulent drainage.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
3. At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, or redness

1.2. Deep incisional SSI: Infection occurs within 30 days after the operation if no implant is left in place and the infection appears to be related to the operation and infection involves deep soft tissues (e.g., fascial and muscle layers) of the incision and at least one of the following:

1. Purulent drainage
2. Wound dehiscence with fever (>38°C), localized pain, or tenderness.
3. An abscess involving deep incision

2. Settings

Study was conducted in the Department of General Surgery at Liaquat National Hospital Karachi.

3. Sample size

Sample size was calculated using World Health Organization (WHO) software for sample size calculation. Considering study by Parekh PM et al [8] for known prevalence of positivity of bile culture as 24%, keeping level of significance as 95% and required precision of 7%, we needed at least 143 patients to be included in our study.

4. Sampling technique

Non probability consecutive sampling.

5. Selection criteria

All patients more than 16 years of age, both males and females, who underwent cholecystectomy for cholelithiasis were eligible to be included in the study. Cholelithiasis was confirmed by pre-operative ultrasound scan.

6. Exclusion criteria

- Patient having clinical or radiological features suggestive of cholecystitis or empyema gall bladder.
- History of jaundice, choledocholithiasis and/or dilated common bile duct (>6mm).
- Intraoperative findings consistent with cholecystitis or gangrenous gall bladder.
- Known to have diabetes mellitus.
- Those on steroids for any reason.
- Refusal to grant informed consent

7. Data collection procedure

All patients who were admitted for elective cholecystectomy in General Surgery department and who fulfilled the inclusion criteria were included in the study after taking informed consent. Data regarding basic demographics and surgical details was recorded on specifically designed questionnaire. Tissue samples was obtained immediately after the surgery from the mucosa of neck of each gallbladder and sent for culture in microbiology laboratory. Postoperatively dressing was removed after 48 hours and surgical site was assessed for wound infection.

8. Data analysis procedure

Data was entered and analyzed by using SPSS version 19. Qualitative variables have been reported as numbers, proportions and percentages while quantitative variables have been reported as either means +/- standard deviations or medians with interquartile ranges depending upon distribution of data. Association between positivity of culture and wound infection is checked using chi-square test. P value less than 0.05 was considered as statistically significant.

Results

A total of 156 patients were included in the study out of which 60 (38.5%) were males and 96 (61.5%) females. Mean age of the patients was 48.8 +/- 8 years. Gall bladder wall culture was positive in 91 (58.3%) patients. E. Coli was the most common organism reported (37, 40.7%) followed by Pseudomonas (24, 26.4%) and Klebsiella (14, 15.4%) species respectively. Details of other organism cultured from gall bladder wall are given in Table 1.

Table 1: Organisms Reported in Gall Bladder Wall Culture.

Organisms	Number (Percentage of Total +ve)
E. Coli	37 (40.7)
Morganella	24 (26.4)
Klebsiella	14 (15.4)
Salmonella	5 (5.5)
Pseudomonas	4 (4.4)
Others	7 (7.7)

Out of 91 patients who had positive culture, 5 (5.5%) patients suffered from surgical site infection while 4 (6.2%) patients developed surgical site infection out of 65 who cultured negative in gall bladder wall specimen. This difference was not statistically significant ($p > 0.05$).

Discussion

Laparoscopic approach to cholecystectomy is now the standard of care [9]. It is one of the most common procedures performed by general surgeons. Though minimally invasive approach to cholecystectomy has the advantage of reduced risk of surgical site infection due to small wound size [10], up to 2% patients still suffer from it after surgery [11]. Organisms from within the abdominal cavity are known to infect the wound in patients who suffer from wound infection after emergency laparotomy [12]. Source of infection after elective laparoscopic cholecystectomy remains a matter of debate [13].

In our study we measured the gall bladder wall cultures positivity and its association with Surgical Site Infection (SSI).

Our study showed that up to 58% of patients who had elective cholecystectomy grew bacteria in their gall bladder wall cultures. Though this is higher than reported literature [14,15], it points towards the possible mechanisms of stone formation in gall bladder though whether bacteria are the cause or infect the stones later is not certain [16]. Most common organism isolated was E Coli followed by pseudomonas species. Role of enzymatic degradation by these bacteria in stone formation needs to be further explored [17].

Our data failed to show any significant association of culture positivity to wound infection which is consistent to the previous findings [18]. A possible reason for this could be that we cultured all the gall bladder wall specimens irrespective of the bile spillage which is a known risk factor of surgical site infection [19]. Furthermore, it also points towards the fact that culture positivity of gall bladder wall may not translate into increased wound infection in patients who did not have bile spillage and direct contact of gall bladder to the wound is avoided.

Conclusion

Gall bladder wall culture positivity does not correlate with surgical site infection.

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