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SURGICAL SITE INFECTIONS AFTER LAPAROSCOPIC CHOLECYSTECTOMY.

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Abstract
This study aimed to assess the impact of laparoscopy on surgical site infections (SSIs) following laparoscopic cholecystectomy. Previous investigations have demonstrated that laparoscopic cholecystectomy is associated with a shorter postoperative stay and fewer overall complications. Less is known about the impact of laparoscopy on the risk for SSIs.
A prospective study was performed in Basrah General Hospital on patients undergoing laparoscopic cholecystectomy (LC) for three years period (2006-2008) to identify the Surgical Site Infections (SSIs) based on definition of the National Nosocomial Infections Surveillance (NNIS) System.
For 369 patients with laparoscopic cholecystectomy, the overall percentage of SSI was 2.4%. Infecting organisms were similar for superficial, deep and organ/space infection. The overall risk of SSI rates were higher in patients with a contaminated or dirty wound (gall bladder retrieval wound), with open first access technique, following emergency procedures, in males, in patient's age 60 years or more, and with an American Society of Anesthesiologist (ASA) class III and more. In conclusion, Laparoscopic cholecystectomy is associated with a lower risk For SSI.

Introduction
Laparoscopic cholecystectomy is the flag ship of laparoscopic surgery and the bench mark for all laparoscopic surgery in terms of efficacy, safety, patient acceptance and market penetration[1-3]. It is the foundation of laparoscopic surgery. laparoscopic cholecystectomy has become the preferred technique for the 770,000 cholecystectomy procedures performed in the United state each year[3-5]. Laparoscopic cholecystectomy have advantages like, its minimal access, shorter length of stay in hospital, less pain and scarring, a faster recovery time and rapid convalescence. The impact of laparoscopic cholecystectomy on the risk for surgical site infections is little known.
The aim of this study was to asses the impact of laparoscopy on surgical site infections following cholecystectomy.

Material and Methods
A Prospective study carried in Basrah General Hospital, Surgical Ward 1 between January 2006 and December 2008. The following parameters were evaluated:

1. Age
2. Gender
3. American Society of Anesthesiologists (ASA) pre-operative risk score.
4. Body Mass Index (BMI).
5. Operation duration.
6. Surgical wound class.
7. Emergency (for acute cholecystitis) or elective surgery.
8. Open or closed first access technique.
9. Gall bladder perforation during liver bed dissection
10. Gall bladder retrieval port (epigastric vs. umbilicus).

11. A Type of SSIs (superficial, deep or organ space).
12. Type of pathogen associated with SSIs.
13. Period of detection of SSIs.
14. Prophylactic antibiotic given or ignored.
15. Sub hepatic drain tube used or not.

Risks factors for the SSIs were assessed in unvaried analysis (categorical variable) using the Chi-square test. Statistical significant was set at the 0.05 level. All patients undergoing cholecystectomy were monitored for SSIs before hospital discharge, one week after discharge and one month after discharge using National Nosocomial Infection Surveillance (NNIS) definition table (I)[6,7].

Table I: Definitions of surgical site infections, NNIS system

Superficial surgical site infection
● Infection occurs within 30 days after the operative procedure and involves only skin and subcutaneous tissue of the incision and patient has at least one of the following:
- Purulent drainage from the superficial incision
- Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision at least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness or heat and the superficial incision is deliberately opened by surgeon unless Incision is culture-negative. Diagnosis of superficial incisional SSI by the surgeon or attending physician.
Deep surgical site infection
● Infection occurs within 30 days after the operative procedure and involves deep soft tissues (e.g., fascia and muscle layers) of the incision and the patient have at least one of the following:
- Purulent drainage from the deep incision but not from the organ/space component of the surgical site
- A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (38), or localized pain or tenderness, unless incision is culture-negative
- An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathology or radiologic examination. Diagnosis of a deep incisional SSI by a surgeon or attending physician.
Organ/Space surgical site infection
● Infection occurs within 30 days after the operative procedure and the infection appears to be related to the operative procedure and;
● Infection involves any part of the body, excluding the skin Incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure
● And at least one of the following
- Purulent drainage from a drain that is placed through a stab wound into the organ/space
- Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space
- An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathology or radiologic examination.
- Diagnosis of an organ/space SSI by a surgeon or attending Physician.

Horan TC, Gayness RP, Martone WJ, et al. CDC definitions of Nasocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. Infect Control Hosp Epidemiology 1992; 13:606.

All operations were done by same surgical team. Four ports technique, first port access was either at supra umbilical skin crease using open Fielding technique (mini lapartomy), or closed supraumblical port (3-4 cm above the umbilicus and just right to linea alba). Thirty degrees 10 mm telescope was used in all cases, epigastric port was also 10 mm in all, other two ports were 5 mm. Dissection of Calot's triangle was done by grip and strip blunt methods using dissecting forceps (Maryland), or by electrocautery using surgical hock. Dissection of gall bladder from liver bed was done in majority of cases by energized hock, and in some cases was done by blunt way using suction irrigation tube sucker. Five mm ports did not need closure,10 mm port in epigastric and in closed supra umbilical were need only skin closed to make it 5mm size, facial closure was done for all open first access technique

Results

Between January 2006 and December 2008, we were doing a prospective study on 369 in patient underwent laparoscopic cholecystectomy procedures. Majority of patients undergoing the Laparoscopic technique were middle aged, female and less likely to have ASA scores of 3 or more dirty or contaminated wounds.

Emergency procedures (Table II).

Virtually all patients underwent general anesthesia. Laparoscopic procedures were took (30-65) minutes in duration.

Table II: Characteristics of patients underwent laparoscopic cholecystectomy.

●Age: range (27-71) median =41.
●Sex: female=301 male=68.
●ASA: ClassI=162 ClassII=159 ClassIII=48 ClassIV=0 ClassV=0.
●Operation duration: range (30-65) min. Median=40 min.
●Elective LC=298 Emergency LC=71.
●BMI=198 patients= (20-24). 117patients= (25-29). 54 patients= (30and >).
●Diabetic patients=107 Corticosteroid dependent patients=23 Immuno-suppresant drugs used patients=5.
●First access technique: open in 198 patients, closed in 171 patients.
●Gall bladder was perforate during liver bed dissection in 27 patients.
●Gall bladder retrieval port: epigastric port=276 umbilical port=93.
● Wound class: class 2 in 294 patient class 3 in 58 class 4 in 17 patients.
●Prophylactic antibiotic: given to 181 patients and ignored in 188 patients.
●Sub hepatic drain tube: were put to 75 patients and ignored in other 294 patients.

Overall, 11 (2.4%) SSIs were reported during the study Period. The most common primary pathogens associated with surgical site infections were similar for both the superficial, deep and organ space SSIs (Table III). The majority of surgical site infections were due to gram negative bacteria. For both the superficial and deep SSIs, SSIs were most likely to occur at superficial sites (Table IV). Most SSIs following laparoscopic technique were detected during post discharge follow-up (89%) or on readmission (Table IV).

Table III: Primary pathogens associated in surgical site infections after lap. Chole.

Gram-negative bacteria	
●Enterobacter spp	4 (36.8%)
●Escherichia coli	3 (27.5%)
Gram-positive bacteria	
●Staphylococcus aureus	3 (27.5%)
●Enterococcus spp	1 (9.2%)

Table IV. Period of detection and SSI site following lap. Chole.

●SSI, period of detection	
▪ During hospitalization	0
▪ Readmission	4
▪ Post discharge	7
●SSI site†	
▪ Superficial	5
▪ Deep incisional	2
▪ Organ space	4

Risk of SSI rates were higher in patients with a contaminated or dirty wound (gall bladder retrieval wound), with open first access technique, in emergency, in males, in patient's age 60 years or more and with an ASA score of 3 (Table V).

Table V: SSIs Rates by potential risk factors

Potential Risk	SSIs Rates	P value
1-Contaminated wound	7 from 11	<.oo1
(Class 2 in 294 patient	SSIs=1/11	
Class 3 in 58	SSIs=4/11	
Class 4 in 17 patients	SSIs =2/11.	
2-Open first access	6 from 11	
Open in 198 patients	SSIs=5/11	
Closed in 171 patients	SSIs=1/11	<.001
3-Emergency procedures	4 from 11	
Elective LC=298	SSIs=1/11	
Emergency LC=71	SSIs=3/11	< .001
4-Male sex	4 from 11	
Female=301	SSIs=2/11	
Male=68	SSIs=2/11	< .001
5-Age >60	3 from 11	
<60=308	SSIs=1/11	
60 &>=61	SSIs=2/11	<.001
6-ASA>2	2 from 11	
ASA: group1=162	SSIs=0/11	
group2=159	SIs=0/11	<.001
group3=48 S	SSIs=2/11	

Discussion

Laparoscopic cholecystectomy has gained a lot of attention around the world. The role of laparoscopy in lowering the risks of surgical site infections remains controversial. Several controlled trial have been conducted, most are in favor that laparoscopy is superior to conventional surgery in reducing the rates of surgical site infections. Because in modern practice the majority of open cholecystectomy have been converted from attempted laparoscopic procedures immediately after they are determined to have been unsuccessful, the risk of complications following open cholecystectomy is likely to be quite different than was observed in the past and the comparison between two techniques prospectively was difficult, So, we compared our results of SSIs after laparoscopic cholecystectomy with results of SSIs after open cholecystectomy in literature. Laparo-scopic cholecystectomy results in fewer overall complications, shorter hospital stays, and shorter recovery time. In addition, laparoscopic procedures may have less impact on immune function than the open technique[8]. Our study Identified a number of other risk factors for SSI following laparoscopic Cholecystectomy procedures: conta-minated or dirty wound class (when emphysema, mucocele or ruptured gall bladder was retrieved from wound), high ASA score, emergent procedures and older age. Performing open first access technique increased the risk of SSI. Finally, our data suggested that male gender carried an increase in SSI risk. This finding remains unexplained, and previous studies have inconsistently reported gender as risk factor. Females have been reported to be at increased risk for SSIs following coronary artery bypass graft surgery and for mortality from sepsis following surgery[9,10]. In contrast, males are at increased risk of post-operative SSI following colorectal surgery[11]. Prolong duration of surgery have been previously described as risk factor of SSIs in open surgery[12]. However, in our study, duration of surgery has no impact on increasing the rate of SSIs post laparoscopic cholecystectomy.Obesity, prophylactic antibiotic, and sub hepatic drain tube also had no effect on increasing or decreasing the rate of SSIs following laparoscopic cholecystectomy as compare to open cholecystectomy[13,14]. The primary pathogens associated with surgical site infections were similar for superficial, deep and organ/space infections. The gram negative bacteria were causative pathogen in majority. SSIs were most likely to occur at superficial sites. The organ/space infections following laparoscopy were easily treated by percataneous drainage under ultrasonic guide in 3 patients were collection was mainly in right sub hepatic space, and laparoscopically in one patient in whom collection was in right sub hepatic and left sub phrenic space. Biscione and colleagues[15] examined 5,848 procedures and reported a total of 39 deep incisional /organ space infections after laparo-scopic cholecystectomy. In contrast, Richards et al[16] showed a decreased rate of deep incisional / organ space infection following laparoscopic surgery examined 10 times that number of procedures (54,504) and observed almost 7 times as many deep incisional/organ space infections (294). We thing that, the high overall SSI rate in the study by Biscione et al[15]. Restricted the generalizability of their findings. Biscione et al[15]. Reported 3.57 infections per 100 procedures, while the 2004 National Nosocomial Infection Surveillance (NNIS) system data showed 3.23 infections per 100 cholecystectomy in US hospitals for patients with the highest NNIS risk index score[17]. Data collected by the Duke Infection Control on the risk of SSI were prospectively collected from 38,232 patients for whom cholecystectomy was done in 31 community hospitals in the southeastern United States during the period from 1991to 2007[18]. A total of 145 SSIs were identified following 38,232 cholecystectomies (i.e., 0.38 infections per 100 procedures) during the 15-year study period; 35,316 (94%) of these cholecystectomy were done laparoscopically. Romy et al[19].

Compared surgical site infections (SSI) rates following digestive operations performed by laparoscopy or open surgery. In their prospective study reported that 3096 cholecystectomy (CCY) performed in 9 hospitals between March 1998 and December 2004 were analyzed. Crude SSI rates in operations done with a laparoscope and open operations were 46/2652 (1.7%) vs. 35/444(7.9%) for CCY. They concluded that irrespective of differences in the length of hospital stay, the use of a laparoscope appears independently associated with lower SSI rates in cholecystectomy, appendectomy, and colon surgery. Luke F. Chen[20]. Review the risk of SSI in a cohort of 38,232 patients who underwent cholecystectomy supports the findings of other investigators who have concluded that laparoscopic cholecystectomy is associated with significantly lower rate of SSI, compared with open procedures[2,3,13-16]. Laparoscopic cholecystectomy is associated with a lower risk for surgical site infections. The results add to and are consistent with growing body of literatures demonstrating the benefits of surgery using laparoscopy.

Conclusion

The advent of minimally access surgery and laparoscopy actually is associated with a reduced surgical site infection rate. Laparoscopic approach should be preferred, when feasible, over open surgery to lower the risks of SSIs for cholecystectomy.

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