

## Port Site Infection following Laparoscopic Cholecystectomy: A Clinicopathological Evaluation

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### Abstract

**Introduction:** Gallbladder disease is one of the commonest surgical problems. Laparoscopic cholecystectomy (LC) has been established as the gold standard for the symptomatic gallstone disease since 1996. This study evaluated the port site infection in laparoscopic cholecystectomy, method of their identification and appropriate measures to be taken to combat this complication.

**Methods:** This prospective type observational study was conducted in the Department of Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU). In this study we presented 100 cases of laparoscopic cholecystectomy from January 2011 to December 2011. The patients were selected on the basis of clinical and sonological criteria of being gallstone disease who subsequently underwent Laparoscopic cholecystectomy.

**Results:** Among 100 patients, 80 patients were female and 20 patients were male with maximum age group was in the 21 to 40 years group. None of the patients developed major post-operative complication. Out of 100 cases, 7 (7%) patients developed port site infection (PSI). Umbilical port site was infected in 6 cases, followed by epigastric port site in 1 case through which gall bladder was delivered. Duration of operation in one patient with port site infection was <1 hour while in 6 cases the duration were >1 hour. Perioperative difficulties faced in 41 (41%) patients, among them 5% cases had dense adhesion, 14 % cases had distended gallbladder and 6% cases have difficult gallbladder retrieval and 10% cases have small fibrosed gallbladder. The dominant microbes identified in infection was Enterococcus sp(50%), Klebsiella sp, Escherichia coli and Staphylococcus aureus. **Conclusion:** Laparoscopic cholecystectomy is associated with a low risk of port site infection. In this study the most cases were only superficial and responded to local measures. The most commonly infected ports were the ports through which gall bladder was extracted. So, careful measures during gall bladder extraction can be reduced port site infection.

**Key words:** Laparoscopic cholecystectomy, port site infection(PSI).

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**Introduction:** Gallbladder disease is one of the commonest surgical problems worldwide and gallstones are the most common biliary pathology. Cholecystectomy is the commonest surgical procedure in the abdomen. On the 15<sup>th</sup> June, 1882 Dr. Carl Johan Langenbuch, a German Surgeon performed the first

Cholecystectomy on a 42- year-old man. Then open cholecystectomy has been performed for more than 100 years throughout the world as a standard treatment modality of symptomatic gall bladder disease. Laparoscopic cholecystectomy was first performed in Franch by Mouret, Qubois and Pasat in 1987<sup>1</sup>.

After introduction of laparoscopic cholecystectomy (LC) procedure, it has become increasingly popular among surgeons and patients. Now laparoscopic cholecystectomy is the gold standard for the treatment of symptomatic cholelithiasis<sup>2,3,4,5</sup>.

In 1991 a group of surgeon, led by Dr. Hasimoto of Japan at Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders (BIRDEM) hospital and subsequently at Bangabandhu Sheikh Mujib Medical University (BSMMU) perform first laparoscopic cholecystectomy in Bangladesh. Though it is being associated with several advantages like minimal wound pain, short hospital stay, early return to work, less wound related complications as seen in open

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cholecystectomy, like many other surgical procedures, laparoscopic cholecystectomy is not without complications and it may be dangerous if improperly performed. However with increasing experience and introduction of new technology in laparoscopic cholecystectomy, operative as well as post-operative complications are declining. Biliary complications of laparoscopic cholecystectomy are reported in many studies<sup>6</sup>. The extra-biliary complications do occur with almost same frequency and severity but tend to be under-reported in the literature<sup>7</sup>. Also the extra-biliary complications of laparoscopic cholecystectomy can prove to be fatal if not identified and managed during operation. Laparoscopic cholecystectomy is gradually being popularized in our country. Port site infection (PSI) is one of the complications of laparoscopic cholecystectomy not seen infrequently and sometime causes significant distress to the patient. In an European study of 637 patients in two hospitals port site infection following laparoscopic cholecystectomy was 5.3%<sup>8</sup>. But in some studies of our subcontinent country like India, Pakistan port site infection rate following LC was 1.8 to 6.7%<sup>9,10,11</sup>. In a study of Bangladesh PSI rate was 3.92%<sup>12</sup>. So we aim to conduct a study to evaluate the incidence and etiological factors responsible for port site infection following laparoscopic cholecystectomy and to develop a strategy to prevent it.

**Objectives of the study:**

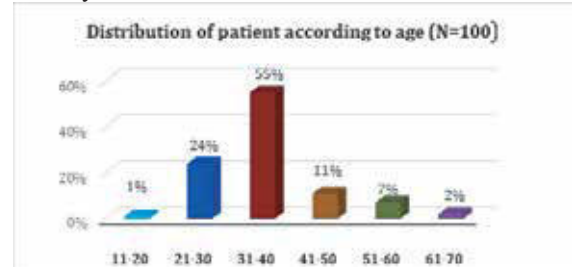
To see the incidence and etiological factors responsible for port site infection in laparoscopic cholecystectomy.

**Materials and Methods:**

A prospective type observational study of 100 cases with non-randomize purposive sampling was carried out from May 2011 to September 2011 in department of Surgery, BSMMU, Dhaka, Bangladesh. Study population was the patients of gallstone disease admitted into the department of surgery, BSMMU, during the study period. Inclusion criteria was the Patients of acute or chronic cholecystitis who were treated by laparoscopic cholecystectomy. And those Laparoscopic procedures which were converted to open cholecystectomy, Patients having evidence

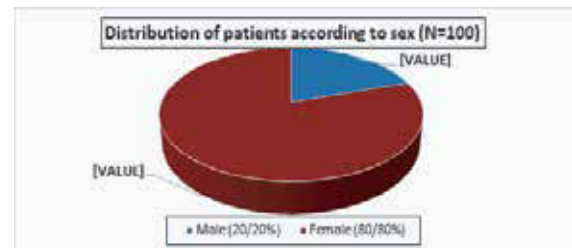
of cholangitis, pancreatitis, and previous biliary tract surgeries, and having immunocompromised state other than diabetes mellitus, patient not willing to participate in this study were excluded. Laparoscopic cholecystectomy was done under general anaesthesia by creating pneumoperitoneum with CO<sub>2</sub> (carbon dioxide) with gas pressure of 10-12 mm of Hg in all patients. We administered prophylactic antibiotics (ceftriaxone) to all patients at the time of induction and then two doses subsequently. Four trochars were used in all the patients. Average time required for laparoscopic cholecystectomy was 46 minutes with a range of 35-120 minutes. Data were collected by data sheet containing all the variables of interest. Study variables were age of patient, sex, body weight, H/O abdominal operation, elective/emergency operation, diagnosis-cholelithiasis/acute calculus cholecystitis, co-morbid ailment- DM/hypertension/COPD, prophylactic antibiotic, difficult gall bladder, type of organisms involved in infection. All collected data were compiled, processed and analyzed and presented in different tables and graphs in result section.

**Results Age Distribution:** Among 100 cases of LC affected age group in our study was ranged from 15 to 65 years with highest number of patients was observed in third and fourth decade the age range from 15 to 65 years mean age was 38.84 years.



**Figure-1: Distribution of patients by age (N=100)**

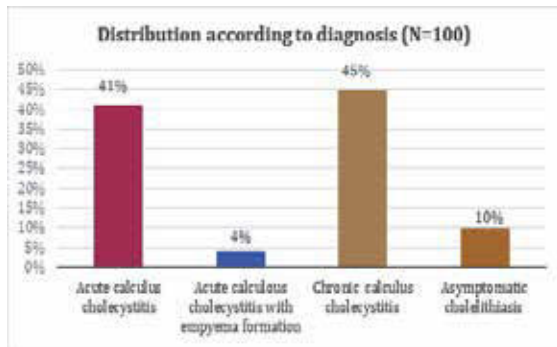
**Sex distribution:**



**Figure-2 Distribution of patients by sex (N=100)**

Figure-2 Shows that female were 4 times more like to suffer from gallstone disease than male

**Diagnosis based on clinical examination and USG findings**



**Figure 3: Clinical presentation of the patients (N=100)**

Figure 3 shows Most (45%) of the patients were presented with chronic calculus cholecystitis. Other common diagnosis were acute calculus cholecystitis (41%), asymptomatic cholelithiasis (10%) and Empyema gall bladder (4%).

**Co- morbid condition:**

**Table-I Associated medical disease (N=100)**

Disease	Number of patients	Percentage (%)
Diabetes mellitus	10	10
Hypertension	13	13
COPD	0	0

Table-I showed that 10% of patients had associated diabetes mellitus, 13% had hypertension and rest 77% patients had no notable medical problems.

**Per operative findings:**



**Figure-4: Per operative findings (N=100)**

Figure-4 shows that out of 100 patients' peroperative problems had in 41 (41%) patients, 5(5%) cases have dense adhesion, 14 cases had distended gallbladder and 6(6%) cases have difficult gallbladder retrieval and 10(10%) cases have small fibrosed gallbladder.

**Port through which gall bladder was delivered: Table-II Port through which gall bladder was delivered**

Port site	Number of Patients	Percentage
Umbilical port	85	85%
Epigastric port	15	15%

Table-II shows that there was SSI occur in umbilical port through which gall bladder was delivered.

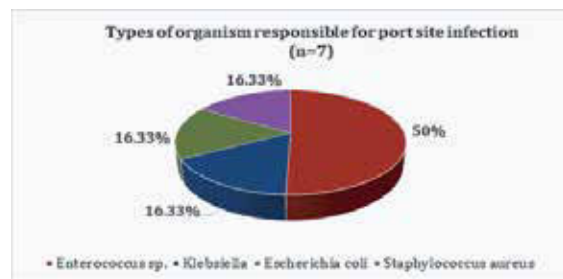
**Incidence of port site infection:**

**Table-III Incidence of port site infection (N=100)**

Port Site	Number of Patients	Incidence of port site infection	Total port site infection rate
Umbilical Port	6	6 %	7%
Epigastric Port	1	1%	
Other	0	0	

Table-III shows that total incidence of port site infection rate 7%. Among them 6% was the umbilical port and reminder 1% was epigastric port.

**Types of organism responsible for port site infection:**



**Figure-5: Types of organism responsible for port site infection (n=7)**

Figure-5: shows that Gram negative organisms are responsible for port site infection. Enterococcus sp. was the main responsible organism (50%) for port site infection.

**Discussion:**

The prevalence of gall stone disease in Bangladesh is not known but a large population having silent cholelithiasis present as acute cholecystitis every year. Laparoscopic cholecystectomy has rapidly become the procedure of choice for routine gallbladder removal and has become the most common major abdominal procedure performed around the world.

In our study we tried to evaluate the incidence of port site infection, risk factors, causative organisms and their management.

Regarding affected age group in our study was ranged from 15 to 65 years with highest number of patients was observed in 21 to 40 years age group. Similarly, in the study of ABMK Alam et al<sup>13</sup> majority (92.3%) of the patients were aged between 21-50 years. Females were 4 times more commonly affected than males in our study. In the study of ABMK Alam et al<sup>13</sup> females were 2 times more commonly affected than males. Similarity was also seen in the study of Gold-Deutch R et al<sup>8</sup>.

Clinical evaluation along with ultrasonography findings reveals in our study that most (45%) of the patients were presented with chronic calculus cholecystitis. Other common diagnosis were acute calculus cholecystitis (41%), asymptomatic cholelithiasis (10%) and empyema gall bladder (4%). In this study we also observed that more the number of acute attacks more the incidence of complication. This may be due to repeated acute inflammation which may leads to more fibrosis resulting difficulties in surgery that prone to more complication. On the other hand, Acute cholecystitis and/or empyema gallbladder are another cause of difficult surgery that also more prone to develop PSI. In the study of Siddiqua SS et al<sup>12</sup> PSI was more common in acute cholecystitis (13.64%) than in chronic cholecystitis (3.28%). Regarding co-morbidity, 23% patients in our study had other systemic illness e.g; diabetes mellitus 10% (10 patients) and hypertension 13% (13 patients) but none of them was suffered from any post-operative complication. Though systemic illness especially diabetes may leads to more chance of infective complication, it was not happened in our series because of our cautiousness. Laparoscopic cholecystectomy (LC) was done by creating pneumoperitoneum (by carbon dioxide) in all patients and four trochars were introduced in all patients. Average time required for laparoscopic cholecystectomy was 46 minutes with a range of 35-120 minutes. Longer time was required in cases having strong adhesion and due to cautious dissection in Calot's triangle and gallbladder bed. Any surgical procedure conducted has some risks and complications. Abdominal surgical site

infections are among the most common complications of inpatient admissions and have serious consequences for outcomes and costs.

Regarding the port was more frequently infected was umbilical port. In our study, total incidence of port site infection rate 7%. Among them 6% was the umbilical port and remainder 1% was epigastric port. In the study of Siddiqua SS et al<sup>12</sup> umbilical port was about 3 times more commonly infected than epigastric port. This may be due to umbilical hygiene is most of time ignored in our country.

In this study we found the incidence of port site infection in LC was 7%. Our results are comparable with many other studies.

In an European study of Den Hoed PT et al<sup>8</sup> of 637 patients in two hospitals port site infection following laparoscopic cholecystectomy was 5.3%. But in some studies of our subcontinent country like India, Pakistan port site infection rate following LC was 1.8 to 6.7%<sup>9,10,11</sup>. In a study of Siddiqua SS et al in Bangladesh PSI rate was 3.92%<sup>12</sup>.

While it was found be as high as 6.7% by Mir MA<sup>10</sup>. There are some other studies that show the incidence to be much lower than these figures. Chuang SC et al<sup>14</sup> was found the PSI rate was only 1.4%.

In a recent national study an incidence of 2.23% has been reported<sup>15</sup>. One of the reason that can explain the incidence to be higher in comparison to other studies probably is that we are reusing disposable ports after sterilization since the cost of new ports for each case is not affordable by both the patient and the hospital.

We administered antibiotics (ceftriaxone) to all patients at the time of induction and then two doses subsequently but the role of antibiotic prophylaxis in LC is still controversial in literature. While its use has been regarded as one of the most significant predictor of wound infection has been encouraged by some studies, there are others that regards its use being questionable<sup>16,17</sup>.

Out of 7 cases of port site infection mostly (71.42%) was superficial, involving only skin and subcutaneous tissue while it involve deeper fascia and muscle layer in 29.4%. The

findings that superficial skin infection is far more common than deeper ones has also been appreciated by a study published from the Centers for Disease Control and Prevention, Atlanta, Georgia in 2003<sup>18</sup>. Various factors can be involved in the direct contamination of the port site and thus leading to infection. We did not get any cases of chronic discharging sinuses.

Regarding microbiological study in our series the most responsible organism of PSI was *Enterococcus sp.* (50%). Whereas it was varied from study to study. In study of Siddiqua SS et al<sup>12</sup> in Bangladesh it was *Staphylococcus aureus* (48.27%). In a study of Jain N et al<sup>19</sup> in India the mostly causative organism of PSI was *Staphylococcus aureus* (58%).

The direct relationship of bactibilia and bile cultures has been studied in relationship to port site infection by many workers. Hamzaoglu I et al<sup>20</sup> in their study conducted in 2004 rejected both the flora and the bile to be the source of SSI. Similarly infective complications are not found to correlate with the presence of bacteria in the bile or gall bladder wall by Al Abassi AA et al<sup>21</sup>. Contrary to these workers bactibilia has been regarded as a significant predictor of wound infection in other studies where positive culture have been shown to be related with infective complications<sup>22</sup>.

Based on our experience we have found that the trocar site of gall bladder extraction is more commonly infected. Furthermore with the use of prophylactic antibiotics the removal gall bladder may be attempted with retrieval bag and in case of wound soiling it should be left open.

#### Limitations of the study

The study was conducted in a short period of time and included limited number of patients in Department of Surgery of Bangabandhu Shikh Mujib Medical University. This study may not reflect the actual picture of whole country, though findings of the present study are consistent with the findings of the different published studies till now.

#### Conclusion and Recommendation

Laparoscopic cholecystectomy has been established as the gold standard for the symptomatic gallstone disease. It offers the patient less postoperative pain, significant shorter hospital stay, faster return to work and small acceptable scar comparable to open

procedure. Now a days with advancement of techniques, instruments and training almost any pathological gallbladder can be managed by laparoscopic method. A sound knowledge of the risk factors, problems, peroperative complications and their immediate management are important for laparoscopic cholecystectomy. This study evaluated the incidence of port site infection in laparoscopic cholecystectomy, risk factors, causative organism identification and their management. Appropriate measures should be taken to prevent port site infection as well as other complications in laparoscopic cholecystectomy.

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