A Hospital Based Study on the Frequency of Bile and Gall Stone Spill during Laparoscopic Cholecystectomy and Its Significance in the Postoperative Period

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Abstract: Laparoscopic surgery is now the gold standard in the management of gallbladder diseases as for many other surgical conditions.[3] The advantages of laparoscopic over open cholecystectomy are many as reported throughout the world and includes less post-operative pain, earlier return of bowel function, shorter length of hospital stay, earlier return to full activity, improved cosmesis and decrease in overall cost.[3-7] Laparoscopic cholecystectomy is however not without drawbacks. Two operative complications, namely bile duct injury and complications due to spillage of stone/bile within the peritoneal cavity are reported to occur with greater frequency during laparoscopic cholecystectomy.[8-10] Several studies have shown that the incidence of spilled gallstones during laparoscopic cholecystectomy is about 3-40% of the surgeries performed, while incidence of stone loss is unknown.[11] In our study we have compared the demographic profile, preoperative and postoperative clinical, hematological, biochemical, radiological and intraoperative parameters in patients with spillage of bile and/or gallstone with those not having any spillage.

Aims and Objectives –
1. To study the frequency of bile and gall stone spillage during laparoscopic cholecystectomy in our setup in so called simple & difficult gall bladder.
2. To assess the significance of gall stone and bile spillage in post-operative patients after laparoscopic cholecystectomy.

Material and Methods – The study was conducted in two years on a total of 300 patients of gall bladder disease admitted for laparoscopic cholecystectomy throughout patient department/Emergency in Subharti medical college in whom laparoscopic cholecystectomy was attempted.

Result - This prospective study was conducted in the Department of General Surgery Subharti Medical College, Meerut (U.P) over a period of three years. 300 patients satisfying the inclusion and exclusion criteria that underwent laparoscopic cholecystectomy were analyzed. Our efforts have been directed towards evaluating the frequency of bile and gallstone spill during laparoscopic cholecystectomy and its significance in the postoperative period of these patients for better management. Our study also reveals that there is extra time lag between simple and difficult laparoscopic cholecystectomy.

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I. Introduction

Biliary tract disorders are one of the commonest abdominal conditions that the surgeons, gastroenterologists and radiologists come across, complications like bile duct injury and complications due to spillage of stone/bile within the peritoneal cavity are reported to occur with greater frequency during laparoscopic cholecystectomy. The sequelae of spilled gallstones after Laparoscopic cholecystectomy (LC) and the occurring complications may go unnoticed for a long time and can be a diagnostic challenge. The aim of this survey was to study the knowledge, attitude, and practices of surgeons regarding spilled gallstones during LC. Bile leakages can be diagnosed soon after operation, but intra-peritoneal gallstone spillage may be manifested months to years after operation, and has a confusing preservation, leading to further diagnostic
examinations. Most such diagnostic tests are time consuming and expensive because gallstone spillage can have long-term unwanted consequences, conversion to laparotomy as an instant management tool is one of the topics under discussion in laparoscopic cholecystectomy. we discuss the option of not converting to laparotomy after intra-peritoneal gallstone spillage as an acceptable approach to management and proper management of various complications due to spillage. Laparoscopic Cholecystectomy is preferred both by surgeons and patients. After this operation patients are usually ambulatory on the following day. They can be given normal diet and can be discharged in 24-48 hrs or even on the same day [47] the mortality rate in Laparoscopic Cholecystectomy is 1.9% versus 7.7% and overall complication rate is 1% versus 5% when compared to Open Cholecystectomy [48]. Conversion to Open Cholecystectomy is required in 7% of patients undergoing Laparoscopic Cholecystectomy [49]. Laparoscopic Cholecystectomy may be rendered difficult by various problems encountered during surgery such as difficulties in accessing the peritoneal cavity, creating a pneumoperitoneum, bleeding, dissection of Calot’s triangle, dissection of gallbladder wall, spillage of bile, spillage of stone, and difficulty of gallbladder extraction which may require conversion to open cholecystectomy. These may be due to acute inflammation, aberrant anatomy, adhesions, unexpected operative abnormal findings, iatrogenic injuries, obesity and equipment failure.

II. Material and Methods

The present study was conducted in two years on patients of gall bladder disease admitted for laparoscopic cholecystectomy throughout patient department /Emergency in CSSH, SMC in whom laparoscopic cholecystectomy was attempted. Data was entered in Excel Sheets, master chart prepared and multivariate statistical analysis was performed using Chi-Square test via SPSS 25.0 software.

INCLUSION CRITERIA

Patients with cholelithiasis proven by USG with at least one attack of upper abdominal pain and considered fit for laparoscopic cholecystectomy were included in the study

EXCLUSION CRITERIA:

The patient with suspected CBD stones on USG
The patient had clinical or USG suspected diagnosis of CA gall bladder
Pregnancy
The patients not fit for general anesthesiadue to various medical illness and bleeding disorders.
Peritonitis
Converted to open surgery

PRE-OPERATIVE SCANNING:

The patients were worked up thoroughly and subjected to:
Detailed history and clinical examination.
Routine hematological investigation: Hb, TLC, DLC, PT, APTT, INR
Biochemical investigation: RFT, RBS
Viral markers: HCV, HBsAg, HIV 1&2
Liver function test: S. Bilirubin, SGOT, SGPT, S. Alkaline phosphatase
Abdominal USG Features
GB distended / contracted
GB Wall thickness
USG Murphy’s sign
Pericholecystic fluid
Stone:
single or multiple
Size of largest stone
Impacted stone at Hartmann’s pouch
ECG
Peanesthetic check-up.

PRE-OPERATIVE PREPARATION:

Case of Acute and chronic cholecystitis with cholelithiasis were included in the study. Viral marker for HBsAg and HCV were tested prior to surgery and informed consent for HIV testing was taken prior to HIV test. Informed consent for surgery was obtained. On pre-operative night tablet alprazolam 0.25mg, tab ranitidine
and bisacodyl (dulcolax) was given. The patients were kept fasting after mid night. On next morning in ceftriaxone 1gm i.v.as prophylactic antibiotic 1 hr. before induction of anesthesia was given, and patient being asked to void urine immediately before being shifted in OT.

OPERATIVE PROCEDURE:
Laparoscopic/open cholecystectomy was performed under general anesthesia with intubation and controlled ventilation with four port technique.

INTRA-OPERATIVE ANALYSIS:
During the procedure careful notes were made of:
1. Anaesthesia time
2. Laproscopic Cholecystectomy
   a. Simple
   b. Difficult-
      □ □ Comorbidities
      □ □ Previous abdominal surgery
      □ □ Hematological abnormality
      □ □ Significant USG findings

Intra-op findings
□ □ GB visualization
GB visualization out of liver margin>4cm.
GB adhered with omentum, intestine and stomach.
Difficult grasping of GB fundus.
□ □ Calot’s triangle dissection
Impacted stone in neck of gall bladder.
Excessive fat over calot’s triangle.
Posterior fold visualization.
□ □ GB dissection from liver bed
  o GB distended
  o GB inflamed
  o Obesity
  o Mirizzi syndrome
□ □ GB extraction from the port
Single large stone.
Multiple stones.
Inflamed GB
3. a. Rupture of gall bladder with spillage of stone/bile
   b. Step of operation at which spillage occurred
      o Calot’s triangle dissection
      o GB dissection from liver bed
      o GB extraction from the port
4. If spill present then the method of cleaning used and if cleaning was complete or incomplete
5. Other findings if any.

POST OPERATIVE ANALYSIS
□ □ Gall bladder Mucosa after operation
□ □ Number of Stone/Type of stone/site of stone in the gall bladder.
□ □ Postoperative clinical course of patient
□ □ Period after which oral intake was allowed
□ □ Postoperative problems such as nausea, vomiting
□ □ Antibiotic coverage, painkiller and Proton pump inhibitor will be given.
□ □ How many hours after surgery was patient mobilized.
□ □ Any postoperative complications such as bile leak, jaundice, diarrhea, fever, incision site pain, infection and drain content
□ □ Day of drain removal
FOLLOW UP
Patient were called for follow up on weekly basis for next two weeks and surgical site were assessed. The data collected was tabulated and the same were subjected to suitable statistical analysis as per Performa attached.

III. Results
The study was performed with a total of 300 patients out of which 227 patients underwent simple laparoscopic cholecystectomy and 73 underwent difficult laparoscopic cholecystectomy. This has been defined based on the following parameters i.e. Pre-operative scanning, Intra-operative Analysis and Post-operative analysis.

<table>
<thead>
<tr>
<th>LAP CHOLECYSTECTOMY</th>
<th>NO OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIMPLE</td>
<td>227</td>
<td>75.66%</td>
</tr>
<tr>
<td>DIFFICULT</td>
<td>73</td>
<td>24.34%</td>
</tr>
</tbody>
</table>

Simple and difficult laparoscopic cholecystectomy was categorized due to various factors but our study is emphasized on the intra-op analysis which revealed the following data.

<table>
<thead>
<tr>
<th>Intra-Op Findings</th>
<th>Patient Distribution</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calot’s triangle dissection</td>
<td>Simple</td>
<td>284</td>
</tr>
<tr>
<td></td>
<td>Difficult</td>
<td>16</td>
</tr>
<tr>
<td>GB Dissection From Liver bed</td>
<td>Simple</td>
<td>274</td>
</tr>
<tr>
<td></td>
<td>Difficult</td>
<td>26</td>
</tr>
<tr>
<td>GB Extraction From port</td>
<td>Simple</td>
<td>277</td>
</tr>
<tr>
<td></td>
<td>Difficult</td>
<td>23</td>
</tr>
</tbody>
</table>

These intra-op findings lead to gall bladder rupture and show the frequency of spillage of bile and spillage of gall stone.

<table>
<thead>
<tr>
<th>INTRA-OP</th>
<th>Patient Distribution</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB Rupture</td>
<td>Present</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>237</td>
</tr>
<tr>
<td>Bile spillage</td>
<td>Present</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>237</td>
</tr>
<tr>
<td>Gall stone spillage</td>
<td>Present</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>244</td>
</tr>
</tbody>
</table>
Furthermore this study also revealed the stage of spillage of bile and gall bladder stone.

<table>
<thead>
<tr>
<th>Stage of spillage</th>
<th>Bile spillage</th>
<th>Percentage</th>
<th>Gb stone spillage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calot’s dissection</td>
<td>2</td>
<td>3.17%</td>
<td>1</td>
<td>1.78%</td>
</tr>
<tr>
<td>Gb dissection from liver</td>
<td>55</td>
<td>87.30%</td>
<td>40</td>
<td>71.42%</td>
</tr>
<tr>
<td>Gb extraction from the port</td>
<td>6</td>
<td>9.52%</td>
<td>15</td>
<td>26.78%</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>100%</td>
<td>56%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Now our study is directed towards the post-op complications of laparoscopic cholecystectomy and also reveal the data that how bile spillage and gall bladder stone spillage are directly proportional to post-op complications which are categorized in the following table.

<table>
<thead>
<tr>
<th>POST-OP COMPLICATIONS</th>
<th>Patient Distribution</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incision site pain</td>
<td>Present: 23 Absent: 277</td>
<td>7.67% 92.33%</td>
</tr>
<tr>
<td>Fever</td>
<td>Present: 24 Absent: 276</td>
<td>8.0% 92%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Present: 28 Absent: 272</td>
<td>9.33% 90.66%</td>
</tr>
<tr>
<td>Jaundice</td>
<td>Present: 12 Absent: 288</td>
<td>4.0% 96%</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>Present: 31 Absent: 269</td>
<td>10.33% 89.67%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-Op Complications</th>
<th>Bile Spillage</th>
<th>Chi-Square Test</th>
<th>p - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incision Site Pain</td>
<td>Present: 18% Absent: 5%</td>
<td>49.231</td>
<td>0.0000</td>
</tr>
<tr>
<td>Fever</td>
<td>Present: 17% Absent: 7%</td>
<td>39.050</td>
<td>0.0000</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Present: 18% Absent: 10%</td>
<td>34.878</td>
<td>0.0000</td>
</tr>
<tr>
<td>Jaundice</td>
<td>Present: 3% Absent: 19%</td>
<td>0.0776</td>
<td>0.378</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>Present: 19% Absent: 12%</td>
<td>33.829</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
A Hospital Based Study on The Frequency of Bile and Gall Stone Spill during Laparoscopic Cholecystectomy...

<table>
<thead>
<tr>
<th>Post-Op Complications</th>
<th>Gall Stone Spillage</th>
<th>Chi-Square Test</th>
<th>p - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Present</td>
<td>%</td>
<td>Absent</td>
</tr>
<tr>
<td>Incision Site Pain</td>
<td>16</td>
<td>59.25%</td>
<td>7</td>
</tr>
<tr>
<td>Fever</td>
<td>16</td>
<td>66.66%</td>
<td>8</td>
</tr>
<tr>
<td>Vomiting</td>
<td>17</td>
<td>60.71%</td>
<td>11</td>
</tr>
<tr>
<td>Jaundice</td>
<td>3</td>
<td>25.00%</td>
<td>9</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>17</td>
<td>54.83%</td>
<td>14</td>
</tr>
</tbody>
</table>

STATISTICAL ANALYSIS

The Association between Post-op findings i.e. Incision Site Pain, Fever, Vomiting and Tachycardia and Intra-op findings Gall Stone Spillage and Bile Spillage is statistically significant since the p – Value is less than ‘α’ (α = 0.05). It shows that the occurrence of Gall Stone Spillage and Bile Spillage in a patient (Intra-op) highly effects the occurrence of Incision Site Pain, Fever, Vomiting and Tachycardia in the patient Post-operatively. It also Shows that the Post-op Finding i.e. Jaundice and Intra-op Finding i.e. GallStone Spillage and Bile Spillageare not statistically significant since the p – Value is more than ‘α’ (α = 0.05). It shows that the occurrence of Gall Stone Spillage and Bile Spillage in a patient Intra-operatively doesnot affect the occurrence of jaundice in the patient Post-operatively.

On broad spectrum if we compare the difficulty of laparoscopic cholecystectomy and the post-op complications we get the following data.

<table>
<thead>
<tr>
<th>Post-Op Complications</th>
<th>Laparoscopic Cholecystectomy</th>
<th>Chi-Square Test</th>
<th>P – Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Simple</td>
<td>%</td>
<td>Difficult</td>
</tr>
<tr>
<td>Incision Site Pain</td>
<td>0</td>
<td>0%</td>
<td>23</td>
</tr>
<tr>
<td>Fever</td>
<td>7</td>
<td>29.17%</td>
<td>17</td>
</tr>
<tr>
<td>Vomiting</td>
<td>10</td>
<td>35.71%</td>
<td>18</td>
</tr>
<tr>
<td>Jaundice</td>
<td>8</td>
<td>66.66%</td>
<td>4</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>7</td>
<td>22.25%</td>
<td>24</td>
</tr>
</tbody>
</table>

STATISTICAL ANALYSIS

The Association between Post-op findings i.e. Incision Site Pain, Fever, Vomiting and Tachycardia and the Difficulty Level of Laparoscopic Cholecystectomy is highlsignificant since the p – Value is less than ‘α’ (α = 0.05). It shows that Difficulty Level of Laparoscopic Cholecystectomy highly effects the occurrence of Incision Site Pain, Fever, Vomiting and Tachycardia in the patient Post-operatively. It also Shows that the Post-op Finding i.e. Jaundice and the Difficulty Level of Laparoscopic Cholecystectomy is not significant since the p – Value is more than ‘α’ (α = 0.05). It shows that Difficulty Level of Laparoscopic Cholecystectomy does not effect the occurrence of Jaundice in the patient Post-operatively.

Our study also revealed that there is an extra time lag between simple and difficult laparoscopic cholecystectomy.
Thus this study is helpful giving data about frequency of bile spillage and gall stone spillage and its post-operative complications and the time lag between simple and difficult laparoscopic cholecystectomy. This study reflects that during surgery and after the surgery surgeon has to look for the complications followed by its corrective management.

IV. Discussion

Several factors have been found to categorize simple and difficult laparoscopic cholecystectomy, criteria include on pre-operative findings, intra-op findings and post-op complications. This prospective study was conducted in the department of general surgery of Subharti Medical College. 300 patients who satisfied the selection and exclusion criteria underwent laparoscopic cholecystectomy and factors that predict simple and difficult laparoscopic cholecystectomy were analysed also, such prediction may allow a surgeon to be better prepared, to take extra precautions to reduce intra-operative complications, post-op complications and reduced time period of surgery.

Presenting sign/symptoms and blood investigations:

In present study patient presenting with upper abdominal pain (100%), flatulence in 48.33%, vomiting in 19% and fever (10.33%), positive murphy’s sign (25.33%), Abdominal Fullness in 41.33% with abnormal CBC count (13.67%) and deranged LFT (10.67%). This might be due to firmly adhesions that made dissections difficult and lack of plane of cleavage between gall bladder and liver bed.

Nanchang and supe et al (2005) \[83\]

Analyzed and correlate the relation between prior attacks of acute cholecystitis and acute pancreatitis with difficulty in laparoscopic dissection due to dense adhesions and fibrotic gall bladder

Gabriel R et al (2009)\[95\] correlate duration of biliary colic and positive Murphy’s sign with difficult dissection and poor visualizing the proper anatomy.

Ultrasonographical Findings:

In present study gall bladder distension was seen in 68 patients (22.67%) and GB contraction was seen in 232 patients (77.33%), thickened wall of the gallbladder>3mm seen in 299 patients (99.67%), pericholecystic fluid present in 41 patients (13.67%), mucocele in 2% patients, empyema in 13%, and impacted stone in 6.33% measured pre-operatively by ultrasound associated with bleeding, difficult dissection, difficult extraction of gallbladder with more operative time.

Gupta G et al (2015)\[110\] proved significantly association between gallbladder wall thickness, gallbladder stone size, impacted stone with difficult laparoscopic cholecystectomy and conversion.

Nanchang and supe (2005) \[83\] reported significant relation between difficult in gallbladder dissection, extraction of stone with gallbladder wall thickness and stone size>10mm and not with number of stones.

Nabil A. Abdelbaki (2006) \[84\] statically proved significance between solitary large stone, gallbladder wall thickness >3mm with prolonged operative time due to difficulty during grasping of gallbladder and gallbladder dissection.

Sharma SK et al (2007) \[90\] analysed that thickened wall of the gallbladder>3mm, size of the stone>10mm, and impacted stone measured pre-operatively by ultrasound associated with difficult laparoscopic cholecystectomy.

<table>
<thead>
<tr>
<th>INTRAOP FINDING</th>
<th>Min Time</th>
<th>Max Time</th>
<th>Avg Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple cholecystectomy</td>
<td>20 mins</td>
<td>42 mins</td>
<td>28.52 mins</td>
</tr>
<tr>
<td>Difficult Cholecystectomy with bile/stone spillage</td>
<td>30 mins</td>
<td>68 mins</td>
<td>49.00 mins</td>
</tr>
</tbody>
</table>
FIG 15: ULTRASOUND SHOWING IMPACTED GALLSTONE.

FIG 16: ULTRASOUND SHOWING PERI CHOLECYSTIC FLUID AND THICK G B WALL.
In present study of 300 patients, number of cases of gall bladder rupture was 63(21%), occurrence of bile spillage was 63(21%) and gall stone spillage was 56(18.66%).

Rice DC, et al (1997). Dense adhesions around the gallbladder make dissection potentially more difficult, and a tense, distended gallbladder that has not been decompressed is at risk of perforation. This may occur when the gallbladder is manipulated by laparoscopic instruments or during dissection from the liver bed.
Spilled stones may also be caused by the slipping of the cystic duct clip or the tearing of the gallbladder when it is being retrieved from the port site.

Jasim D Saud (2011) If spillage occurs, first and foremost thing to do is to do normal saline irrigation of peritoneal cavity and aspiration. All attempts should be made to retrieve all gall stones laparoscopically. It should not be considered as an indication to convert the procedure to open one. Following steps are recommended during laparoscopic cholecystectomy in case of spillage: Informed consent from patient and family should be obtained. They should be told that dropped stones are common depending on the size of stones and condition of the gallbladder wall and liver bed.

\[\text{FIG 21: SPILLAGE OF BILE}\]

\[\text{FIG 22: SPILLAGE OF GALL STONE IN PERITONAL CAVITY}\]

**POST OPERATIVE COMPLICATION**

In present study of 300 patients, incision site pain occurred in 7.67%, fever occurred in 8.0%, vomiting occurred in 9.33%, jaundice occurred in 4.0% and tachycardia occurred in 10.33%.
Statistical analysis was done to find out the association between the Post-Op Complications and the Intra-Op Findings. Chi-Square Test and Automated Computer Software SPSS (ver 25.0) was used to calculate the p-value. ‘α’ was taken as 0.05.

On analysis the Post-op Complications Incision Site pain, Fever, Vomiting and Tachycardia showed strong Association with the Intra-Op Findings Bile Spillage, Gall Stone Spillage and a Difficult Laparoscopic Cholecystectomy. On the other hand, the Intra-Op Complication of Jaundice showed no association with Bile spillage and Gall Stone Spillage Intra-operatively or Difficult Laparoscopic Cholecystectomy.

V. Conclusion

In conclusion, gallstones are still a major cause of undergoing surgery worldwide. Gallstones can be classified according to their composition into cholesterol, mixed, or pigment gallstones. Symptomatic cases usually present with right upper quadrant pain that is associated with fatty meals and more common at night. Biliary colic and the presence of stones on imaging confirm the diagnosis of chronic cholecystitis. Complications of gallstones can include choledocholithiasis, gallstone ileus, and acute gallstone pancreatitis.

Normally, treatment is only indicated for symptomatic patients, unless other risk factors for disease progression are present. The general management and treatment of gallstones have not changed much recently. However, the methods and techniques have improved dramatically. Laparoscopic cholecystectomy is considered today as one of the most important interventions in treating gallstones.

Our study has shown that frequency of bile spillage is 21% and gall stone spillage 18.66% during laparoscopic cholecystectomy. Study also reveals that gall bladder rupture leads to bile spillage in every patient, but it isn’t essential that gall bladder rupture will always show gall stone spillage. Hence incidence of bile spillage will always be more than gall bladder stone spillage.

Intra operative analysis like calot’s triangle dissection, gall bladder from liver bed and gall bladder extraction from the port with other co-factors like co-morbidities, previous abdominal surgery, raised ALP, abnormal USG findings etc help us to determine whether laparoscopic cholecystectomy is simple or difficult. Bile spillage and gall stone spillage during laparoscopic cholecystectomy commonly give rise to post-operative complications like pain at the port site, fever, port site injection. Occasionally vomiting, jaundice and tachycardia may also be seen. Our study also reveals that there is an extra 41%-time lag between simple and difficult laparoscopic cholecystectomy (bile/stone spillage). This study also reflects that after surgery, surgeon must look for post-operative complication followed by its corrective management.