Common Bile Duct Injury in Laparoscopic Cholecystectomy: A Comparative Audit

Background: Common Bile Duct injury (CBDI) is one of the serious complications of Laparoscopic cholecystectomy (LC). Although Common Bile Duct injury occurs more commonly in the early portion of a surgeon's learning curve, recent reports suggest that even surgeons with a great deal of experience with LC have high rates of CBD injury.

Objectives: To compare the incidence of CBD injury and its management in three groups of patients undergoing LC.

Study Design: Prospective Cohort study.


Materials & Methods: Total 3000 patients of Laparoscopy Cholecystectomy were divided into 3 groups. First 1000 cases operated in Group A, next 1000 in Group B and last 1000 in Group C. Intraoperative findings with Incidence of CBD injuries and there management were compared. Parameters, including conversion rate, operative time, and complications, were also evaluated.

Results: Out of 3000 patients 18 (0.6%) cases had CBD injury during LC. 14(1.4%) cases were in group A which decreased significantly to 0.3% (3 cases) and 0.1% (1 case) in Group B and Group C respectively. In 14 out of 15 (83.3%) cases identified intraoperatively repair with T-Tube was done, whereas 3 (16.7%) cases identified postoperatively were managed with choledochojejunostomy.

Conclusion: In our setup incidence of CBD injury in LC is less than 1%. It has significantly decreased over period of 16 years mainly due to improved surgical skills.

Key Words: Laparoscopic Cholecystectomy (LC), Common Bile Duct Injury (CBDI).

Introduction
Gallstones are the most common cause of hospitalization and the most costly digestive tract disease, with an annual estimated overall cost of more than five billion US dollars. In early eighties open cholecystectomy was considered to be the ideal operation for gall stones. Today more than 83.3% of cholecystectomies are carried out laparoscopically and LC has become standard surgical treatment of gallstone disease. The major benefit of laparoscopy in upper gastrointestinal surgery results from avoidance of an upper abdominal incision, resulting less pain and improved pulmonary function tests compared to small incision cholecystectomy.

LC is associated with low incidence of complications. However there is still concern regarding the most serious complication of procedure i.e., the iatrogenic injury of common bile duct (CBD). Three times higher incidence of bile duct injuries in LC (0.3% vs. 0.1%) is reported as compared to the conventional open approach which twenty years ago was 0.7% vs. 0.1% respectively.

The main objective of our study was to see the incidence of CBD injuries in LC in our setup including the main factors associated with these injuries and its management.

Materials and Methods
A prospective cohort of 3000 patients undergoing LC between January 1998 to October 2015 in Surgical
Department, Rawalpindi Medical College and the author’s surgical clinics were included in the study. First thousand cases operated were included in group A, second thousand cases in group B and third thousand in group C.

Patients of any age and gender with clinical diagnosis of acute and chronic cholecystitis were included in study whereas exclusion criteria include patients who were Immunosuppressed, receiving radiotherapy, patients with evidence of CBD pathology on clinical, biochemical, ultrasonological or MRCP basis and patients with bleeding disorders.

Standard four port technique was used. If there was leaking of bile in the peritoneal cavity, it was sucked up and peritoneal cavity lavage with normal saline was done at end of procedure. Similarly in case of spillage of stones, smaller stones were sucked with help of normal saline using 10mm sucker whereas large stones were individually picked up and removed one by one or a basket made up of surgical glove was used .In all cases, a drain was placed.

Port site wounds were approximated with silk. If rectus sheath defect was enlarged to >10 mm for gall bladder removal it was also repaired.

All findings were noted on predesigned Performa and data was analyzed by IBM® SPSS® version 19.0.

**Results**

In Group A 883 (88.3%) patients were females and 117 (11.7%) were males. In group B 840 (84%) were female and 160 (16%) were males whereas in Group C 862 (86.2%) were females and 138 (13.8%) were males. Female to male ratio in three groups were 7.5:1, 5.5:1 and 6.2:1 respectively. Table I shows the mode of admission of patients in three groups. Table II shows the intraoperative findings of Gall Bladder.

### Table I. Mode of Admission

<table>
<thead>
<tr>
<th>Condition of GB</th>
<th>Group A (n=1000)</th>
<th>Group B (n=1000)</th>
<th>Group C (n=1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPD;chronic cholecystitis</td>
<td>666 (66.6%)</td>
<td>690 (69.0%)</td>
<td>687 (68.7%)</td>
</tr>
<tr>
<td>A&amp;E; acute cholecystitis</td>
<td>334 (33.4%)</td>
<td>310 (31.0%)</td>
<td>313 (31.3%)</td>
</tr>
</tbody>
</table>

In our study, 18 out of 3000 patients (0.6%) had CBD injury. 14 in Group A (1.4%) 03 in Group B (0.3%) and 01 in Group C (0.1%). All 18 cases were females. The age ranged from 23 year to 55 year. 15 (83.3%) cases were diagnosed intraoperatively whereas in 03 (16.7%) cases CBD injury was identified in postoperative period. The cause of injury to CBD in 17 (94.4%) cases was lack of identification of anatomy whereas in 01 (5.6%) case it was due to Harmonic Scalpel. Out of total 18 patients 15 (83.3%) were cases of Chronic cholecystitis while three (16.7%) were cases of Acute cholecystitis.

Out of 15 cases diagnosed intra operatively in 14 (93.3%) cases CBD repair using T-tube was done whereas in 01 (6.7%) case Choledochoduodenostomy was done. Patients diagnosed postoperatively, initial drainage followed by Choledochojejunostomy was done. Mean postoperative stay was 7 day.

Two cases presented in follow up with stricture of CBD, and were treated by Choledochojejunostomy. Both were intra operatively diagnosed cases, one case in which choledochoduodenostomy was done, presented about 4 months after initial surgery and in second case in which CBD was repaired over T-tube, presented after 6 year. Postoperative complications and length of hospital stay in our study is shown in Figure 1 and 2 respectively.

### Table II. Intraoperative Findings

<table>
<thead>
<tr>
<th>Condition of GB</th>
<th>Group A (n=1000)</th>
<th>Group B (n=1000)</th>
<th>Group C (n=1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>417 (41.7%)</td>
<td>314 (31.4%)</td>
<td>286 (28.6%)</td>
</tr>
<tr>
<td>Moderately distended</td>
<td>145 (14.5%)</td>
<td>142 (14.2%)</td>
<td>181 (18.1%)</td>
</tr>
<tr>
<td>Severely distended</td>
<td>203 (20.3%)</td>
<td>120 (12.2%)</td>
<td>153 (15.3%)</td>
</tr>
<tr>
<td>Shrunken</td>
<td>80 (8.0%)</td>
<td>64 (6.4%)</td>
<td>69 (6.9%)</td>
</tr>
<tr>
<td>Mucocele</td>
<td>95 (9.5%)</td>
<td>175 (17.5%)</td>
<td>160 (16.0%)</td>
</tr>
<tr>
<td>Empyema</td>
<td>60 (6.0%)</td>
<td>185 (18.5%)</td>
<td>151 (15.1%)</td>
</tr>
</tbody>
</table>

In Figure 1: Post-operative complications in three groups
Discussion

The beneficial effects of LC like shorter postoperative hospital stay, more rapid overall recovery time and better cosmesis have been well established and documented and is preferred by patients of both gender and all age groups. In our study the female to male ratio was 6.2:1 which is higher than that reported in literature. Age range in our study was comparable to the published literature.

The most feared complication of LC is CBD injury. In a national survey of Italy 56,591 Laparoscopic Cholecystectomies done in 187 centers and the overall incidence of CBD injury was 0.42%. From the early days of LC, a higher incidence of injuries has been related to the surgeon’s learning curve, it was found that the incidence increases significantly with decreasing volume of LCs performed. Boddy in a series of 4139 LCs done over ten years, reported lower rates of CBDI for hepatopancreaticobiliary surgeons (0.1%) in comparison to general surgery consultants (0.9%). The complication rate of our study is comparable to rate of 0.8% and 1.6% reported in two studies but in other two series, it was found to be 0.16% and 0.35%. A study showed that incidence of CBDI significantly decreased with increasing number of LCs performed. Teams who performed less than 150 LCs in three years had incidence of CBDI of approx. 0.9% compared to 0.3% for those who had performed more than 450 LCs (14).

Hobbs in 2006 after reviewing 22,789 cases reported a decrease of iatrogenic CBD injuries from 1994 to 1998 (from 0.35% to 0.13%), ascribing 1/3 of CBD injuries of his center to surgeons with less than two hundred operations in the previous five years. In contrast to other series of LCs Harrison in 2011 after analyzing a 234280 LCs does not report any difference in Bile Duct injuries (0.24% vs. 0.26%) between rates of experienced surgeons compared to residents. However in our study there is a significant impact of experience in LCs on incidence of iatrogenic Bile Duct Injury.

Early diagnosis of CBD injury is the corner stone of its management. It allows lower morbidity and mortality rates, prevents serious post-operative complications, such as cholangitis, bilomas and biliary peritonitis. In a study done by Hamad et al showed that intraoperative recognition of bile duct injuries and its immediate repair is highly advantageous in preventing serious complications (sepsis) and increase repair success rates. In our study 83.3% cases of CBD injuries were diagnosed intra operatively in contrast to only 46% cases in an Italian study of 187 centers.

The overall incidence of CBD injuries and intraoperative diagnosis of CBD injuries were not significantly different in units using routine vs. selective cholangiography. In our setup we did not use routine or selective cholangiography in LC. The success of management of CBD injury depends upon timing and technique of repair. The Reuver in his study reported results of 151 patients who underwent repair for LC-CBD injury. They determined that patients who underwent repair within 6 weeks after LC-BDI had higher rate of postoperative strictures compared with repair done immediately (within 24 hours) or after 6 weeks of injury. The most common method employed in our study for repair of injured CBD was repair of CBD over T. tube (76.5%) as recommended. In 2009 Jarnagin found that in cases of complete transection of CBD, an end-to-end anastomosis on T-tube is not beneficial because in almost 50% of cases it results in biliary stricture within 3 years. Studies have shown that in case of complete transection of CBD or postoperatively diagnosed CBD injury, end-to-side Roux-en-Y hepaticojejunostomy was the best procedure. Gupta et al proved that in comparison to Hepatojejununal anastomosis, Hepatoduodenal anastomosis has an increased anastomotic tension and reflux, and a higher rate of developing high output biliary fistula.

While dealing with iatrogenic CBD injury, a different surgeon than the one injuring the bile ducts should perform the repair, a key factor in cases where the original surgeon does not have expertise in the area. However in our set up, most of the injuries were repaired by same surgeon.

Conversion to open cholecystectomy rate was 4.8% in group A which reduced to 1.5% in group B and decreased up to 1% in group C. It is lower than that

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Figure 2: Length of Hospital Stay in Three Groups
published in literature 4.9%-12% (23). Our incidence of wound infection was 2.8% in group A, 2.2% in group B and 0.5 % in Group C which is lower than what reported in other studies 0.5-7%.29, 30

The main short coming of the study was a poor follow of CBD injury patients. Only two patients presented in follow up with stricture of CBD while outcome in remaining patients was unknown.

Conclusion

Our audit shows marked decrease in the incidence of CBD injuries over the last 18 years. Like in other surgeries experience of operating surgeon in Laparoscopic Cholecystectomy have significant impact on intraoperative and postoperative complications especially iatrogenic CBD injury.

References