The Challenging Dilemma of Post Cholecystectomy Problems: Time to be settled. Tactics of Management with 15 Years’ Experience in a Major Referral Center

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Abstract

Purpose: Study and evaluation of all techniques used in management of post cholecystectomy problems.

Patients & methods: A random sample of 630 patients (350 females and 280 males) from surgery department, and gastro-intestinal endoscopy unit, Assuit and Sohag Universities were enrolled in the study; diagnosis passed into a stepwise fashion till definitive one is reached. Management was resold to using all needed techniques as surgical treatment in 143 patients, endoscopic treatment in 457 patients, added percutaneous manipulation techniques in 25 patients, and also conservative treatment in small percentage of cases (30 cases only).

Results: Endoscopy was very successful as diagnostic and initial treatment modality of 457 patients (73%), as being less invasive, low morbidity and mortality, substituting surgery in treatment of missed stone (88%), mild to moderate biliary leakage (82%), and biliary stricture (74%). Its success increased by addition of percutaneous techniques in 4%, 2.8% & 8.3% for missed stone, leakage, and stricture respectively. But endoscopy was somewhat complementary to surgery in major leakage, and massive stricture. Surgery was the gold standard treatment of such conditions and was resold to in 15%, and 17% of cases.

Surgery remains the treatment of choice for complex problems as CBD transection, CBD ligation or clipping, combined problems of stones, stricture, and leakage with good success rate of about 60% for surgical treatment compared to < 40% for endoscopic treatment that also play a minor role in diagnosis. Bilio-enteric anastomosis was the procedure of choice, done in 86 cases, with stent splintage in unhealthy, or small sized ducts. And stricture complication was encountered in 6% of cases treated by percutaneous rout in 4, and redo surgery in 1 case. The learning curve seems influential in management of such challenging conditions either by endoscopy or surgery. The cumulative experience increase the success rate of endoscopy from 50% in initial cases to 95% nowadays, also surgery and its techniques improved by experience with lower morbidity and mortality.

Conclusion: Management of post cholecystectomy problems is a challenging surgical condition, necessitates experienced multidisciplinary team. Tactics of treatment passed in a stepwise manner starting by endoscopy that was the definitive treatment in simple problems and advised to be the initial treatment choice, however in major leak, ligation, transection, and complex problems, surgery plays the main role in treatment. Cumulative experience influence endoscopic and surgical treatment of such problems.

INTRODUCTION

Cholecystectomy has been the treatment of choice for symptomatic gallstones. Laparoscopic cholecystectomy (LC) has recently become the more preferred operation over open cholecystectomy (OC). However, several studies report [1-4]. That complications to the biliary tract are more common with LC (0.6% vs. 0.3%) [3] and leakage incidence of 1.1% [5]. Several authors [1,2] impute it to a “learning curve phenomenon”, which frequently occurs after the introduction of any new procedure or technology, thus this is still a controversial data.

Post cholecystectomy problems are seen in as many as 20% of cases and manifested by symptoms of right hypochondrial pain, vomiting, or jaundice, otherwise biliary leakage and major biliary injuries [6] (Figure 1).

Biliary injuries continue to be a significant problem following cholecystectomy [5], liver transplant [7], trauma [8], or infection [9]. Traditionally, surgery has been the gold standard for the management of biliary injuries. Recently, various endoscopic methods have been used as the preferred modalities of these patients [8,10], as it permitted a less invasive approach, with similar or reduced morbidity rates at surgical treatment [11,12], and since 1990s these endoscopic approaches nearly replaced surgical treatment [13] (Figure 2).

Endoscopic intervention is a safe and effective method of
treatment of post cholecystectomy biliary injuries as it can combine both the investigative and therapeutic arms in one common procedure [14]. However, management should be individualized based on factors such as outpatients or inpatients, presence of stone, stricture, ligature, or coagulopathy [15]. However, New endoscopic approaches allow less invasive treatment [16]; therefore, postponing or even avoiding surgical treatment [17], and should be the initial management of choice [18].

Surgical treatment still is the cornerstone of treatment; it involves an anastomosing an isolated loop of jejunum to the healthy, vascularized and unscarred part of the bile duct, as conventional surgical wisdom dictates avoiding the scarred and unhealthy part of the stricture for anastomosis. Roux-en-Y hepatico-jejunostomy is a one-time, proven effective and durable method of treating postoperative bile duct injuries, even for recurrent strictures, and has been shown to give good long-term results [19], sometimes with the use of trans-anastomotic stents according to the individual characteristics of each patient and the experience of each surgeon. But its use is recommended when unhealthy (ischemic, or scarred) and small ducts (<4mm) are found [20].

As compared to surgery, endoscopic treatment has the advantage of being less ‘invasive’ but it is less effective, sometime needs multiple sessions, and is certainly not suitable for all patients. In patients with strictures affecting the region of biliary bifurcation and in those with significant loss of length of bile duct, endoscopic stenting has a high chance of failure [21].

The aim of this work to emphasize, and evaluates the role of both endoscopy and surgery, whether it is competitive or complementary in management of each aspect of post cholecystectomy problems, respecting the experience curve for more than 10 years in this field in a major referral center in upper Egypt.

PATIENTS AND METHODS

Study design

This prospective observational study was consisted of all consecutive patients who were referred for management of post cholecystectomy problems to surgery department, or endoscopy units, Assuit and Sohag University hospitals (two major tertiary referral centers in Upper Egypt). The study protocol was approved by the local ethical committee of our hospitals. Also, a written informed consent was obtained from all patients’ prior recruitment to study.

The patients

From Jun 2000 to July 2015, patients with symptomatic post cholecystectomy problems at general surgery department, Assuit and Sohag University hospitals were enrolled in this study. The inclusion criteria were patients with a diagnosis of symptomatic post cholecystectomy problems aged from 20 to 60 years, American Society of Anesthesiologists (ASA) grade I, II or III, and agreement to complete the study requirement. Exclusion criteria were patients with non-biliary problems, associated vascular injuries, associated contraindication to laparoscopy, endoscopy, or surgery, long-term anticoagulant treatment, and pregnant female. Sex hundred and thirty patients who fulfill all the criteria of the study were enrolled in the study protocols and thoroughly investigated and studied.

Operative techniques

All procedures either endoscopy or surgery were done by the same experienced team, under general anesthesia with standardized techniques.

Patients was encountered with variable presentation, and timing from the surgical insult till referred to our centers for management.

Cases were subjected to:

- Thorough detailed history taking.
- Meticulous clinical examination.
- Investigation needed to diagnose the problem as: Liver function tests and abdominal ultrasonography were done to all cases.
- CT or MRI was done in some cases.
- Cholangiogram was done in all cases (the gold standard evaluation of biliary injuries [14]) astrans-tube cholangiogram (with aT tube in place), endoscopic cholangiogram (ERCP) in most of cases, or percutaneous trans-hepatic cholangiogram (PTC) in some selected cases in which endoscopic approaches failed.

Patients were categorized according to the problem diagnosed by the previous tools into 4 categories:

1) Missed stone(s) group.
2) Biliary leakage group.
3) Biliary stricture group.
4) Complex biliary problems group includes a combination of problems.

Each group was managed according to its circumstances by a stepwise manner of treatment starting with minimally invasive tools (endoscopic treatment, alone or in addition to percutaneous manipulation in difficult cases), to more invasive tools (surgical approaches).

**Endoscopic approaches**

Endoscopic approaches was done for most of our cases (510 attempted endoscopic procedures) using side viewing Pentax video scope, regular instruments, and blended current was used in sphincterotomy; however balloon sphincteroplasty was also used in some cases (Figure 3).

CBD stone(s) were treated by sphincterotomy and retrieval using basket, balloon extractor, or manual mechanical lithotripsy. However, Drainage was done in some cases with suspected cholangitis, or after failure of endoscopic techniques prior surgery by stents or nasal biliary catheter (Figure 4).

Biliary leakage was classified according to Strasburg, and Soper classification [22], and treated endoscopically by sphincterotomy in mild cases and/or stenting in moderate to major leakage, but endoscopic maneuvers failed in CBD transection injuries (Figure 5-7).

CBD stricture was categorized according to the Strasberg classification [22], and treated endoscopically by dilatation and stenting in repeated endoscopic sessions with upgrading of stents till reaching cure (after full dilatation of the stricture segment as evident by loss of the waist in cholangiogram, or after full dilation for 2 years from initial session), but endoscopic maneuvers failed in CBD ligation or clipping injuries (Figure 8-10).

Complex biliary injuries were treated accordingly with special attention to the learning curve and cumulative experience for about 15 years in management of such problems (Figure 11).

**Percutaneous manipulation**

Percutaneous Manipulation was done in cases of endoscopic failure to opacify the proximal biliary tree as in major CBD injuries, transection, clipping or ligation through percutaneous transhepatic cholangiogram (PTC) prior surgery, percutaneous manipulations and guide wire deployment through the CBD prior combined procedures (Rendezvous technique), or percutaneous dilatation, and stenting for stricture, or injury.

**Surgical approaches**

Surgical approaches were attempted in 143 of patients aiming...
for the following indications:

- Peritoneal lavage and drainage for biliary peritonitis.
- Choledocho-lithotomy procedure to extract CBD stone(s), followed by T tube drain placement.
- CBD repair on a T tube splint in minor laceration injury of CBD.
- Undo ligation with T-tube splint if CBD ligation was discovered very shortly after operation.
- Bilio-enteric shunt operation (with the use of Roux-en Y loop technique and choledocho-jejunostomy as the operation of choice), for CBD injury, massive stricture fibrosis, or bad patient compliance with repeated endoscopic session and stenting. The anastomotic line was splinted by stents in small, unhealthy ducts (Figure 12-14).

**Follow up**

Parenteral antibiotics were prescribed for all cases (Ciprofloxacin).

Surgically treated cases were followed up for a variable period prior discharge (3-10 Days) with the appropriate treatment and follow up.
Endoscopically and percutaneously treated cases were discharged at the same day after assurance of the stable condition of the patient.

Data of all patients were collected, and categorized, with thorough discussion of the detailed results of treatment was done for each category to reach a consensus either endoscopic maneuvers can substitute surgery as a definitive treatment of such problem (a competitive treatment), or surgery still is needed for definitive treatment and these maneuvers are just a complementary tools prior surgery.

Statistical analysis

Descriptive data will be expressed as mean & standard error of the mean, or as median and ranges for continuous variables and proportions for categorical variables. Statistical analysis will be performed using the Fisher’s and chi-square tests. A p-value <0.05 was considered statistically significant. Statistical Package for Social Sciences (SPSS inc., version 16, Chicago, US) was used for statistical analysis (Figure 15).

RESULTS

Patients demographic data

A total number of 630 cases of post cholecystectomy problems were incorporated in this study, the mean age was 45.3 years with a range of 18-68 years, 350/630 were females, and only 50 cases (8%) of them were operated in our center. Cases included either presented early (within a month post operatively) in 288 cases, or late in 342 cases as shown in Table (1) and Table (2).

Presentation of our cases

Most of our cases (490 cases about 78%) presented after open access approaches (cholecystectomy alone in 370 cases, and with CBD exploration in 120 cases), versus 140 cases presented after laparoscopic approaches (22%).

Investigations used in the study

Cholangiogram was the main step of diagnosis in these cases, and was done for nearly all patients (582/630 about 92% of cases), by endoscopy in 510 patients (81%), complemented by percutaneous trans hepatic route in 41 patients (6.5%), and MRCP in 95 patients (15%), as shown in Table (3).

Patients’ stratification

Cases were categorized into the following four groups and managed accordingly.

Missed stone(s) group (213 cases): All of those patients were diagnosed preliminary by abdominal sonography, CT scan, MRCP, and endoscopic cholangiogram, and managed as shown in Table (4).

Biliary leakage group (145 cases): Cholangiogram demonstrated leakage as minor degree in 80 cases (55%), major leakage in 46 cases (32%), but in 19 patients leakage evident clinically failed to be demonstrated by cholangiogram (13%), probably from minor ductules or from gall bladder bed as shown in Table (5).

Biliary stricture group (121 cases): Management of strictures by either endoscopy or surgery was shown in Table (6).

A. 5.4.3. Complex biliary problems (151 cases): This group includes the following subgroups: Leakage with biliary peritonitis (48/151)
B. CBD ligation/clipping injury (29/151)
C. CBD transaction injury (18/151)
D. CBD stone, with leakage (20/151)
E. CBD stricture, with leakage (17/151)
F. CBD stone, with stricture (14/151)
G. Post-operative anastomotic stricture after choledocho-jejunostomy (5/151)

Endoscopic treatment of complex problems was shown in Table (7).

Percutaneous manipulations

Percutaneous manipulation techniques was done in 12
Table 1: Showed early presentations and their incidence.

<table>
<thead>
<tr>
<th>Duration &amp; Item ▼</th>
<th>1-5 days</th>
<th>6-10 days</th>
<th>11-15 days</th>
<th>16-20 days</th>
<th>21-25 days</th>
<th>21-25 days</th>
<th>Total ▲</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage</td>
<td>33 5.2</td>
<td>57 9</td>
<td>15 2.4</td>
<td>-</td>
<td>6 1</td>
<td>3 0.5</td>
<td>114 18.1</td>
</tr>
<tr>
<td>Cholangio-</td>
<td>- -</td>
<td>15 2.4</td>
<td>51 8.1</td>
<td>- -</td>
<td>- -</td>
<td>3 0.5</td>
<td>69 11</td>
</tr>
<tr>
<td>Abnormality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jaundice</td>
<td>30 4.8</td>
<td>-</td>
<td>6 1</td>
<td>3 0.5</td>
<td>9 1.4</td>
<td>6 1</td>
<td>69 11</td>
</tr>
<tr>
<td>Leakage, and</td>
<td>- -</td>
<td>3 0.5</td>
<td>6 1</td>
<td>6 1</td>
<td>6 1</td>
<td>-</td>
<td>21 3.3</td>
</tr>
<tr>
<td>Jaundice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colic, and infection</td>
<td>- -</td>
<td>6 1</td>
<td>3 0.5</td>
<td>- -</td>
<td>6 1</td>
<td>-</td>
<td>15 2.4</td>
</tr>
<tr>
<td>Total</td>
<td>63 10</td>
<td>90 14.3</td>
<td>84 13.3</td>
<td>12 2</td>
<td>21 14.7</td>
<td>18 2.9</td>
<td>288 45.8</td>
</tr>
</tbody>
</table>

Table 2: Showed late presentations and their incidence.

<table>
<thead>
<tr>
<th>Duration &amp; Item ▼</th>
<th>6 months</th>
<th>1year</th>
<th>2years</th>
<th>5years</th>
<th>10years</th>
<th>110years</th>
<th>Total ▲</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaundice</td>
<td>60 9.5</td>
<td>24 3.9</td>
<td>42 6.7</td>
<td>39 6.2</td>
<td>24 3.9</td>
<td>45 7.1</td>
<td>234 37.1</td>
</tr>
<tr>
<td>Colic</td>
<td>24 3.9</td>
<td>12 2</td>
<td>24 3.9</td>
<td>6 1</td>
<td>6 1</td>
<td>9 1.4</td>
<td>81 12.9</td>
</tr>
<tr>
<td>Cholangitis</td>
<td>- -</td>
<td>3 0.5</td>
<td>6 1</td>
<td>3 0.5</td>
<td>3 0.5</td>
<td>21 3.3</td>
<td></td>
</tr>
<tr>
<td>Fistula</td>
<td>6 1</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
<td>6 1</td>
</tr>
<tr>
<td>Total</td>
<td>90 11.4</td>
<td>39 6.2</td>
<td>72 11.4</td>
<td>51 8.1</td>
<td>33 4.8</td>
<td>57 9</td>
<td>342 54.3</td>
</tr>
</tbody>
</table>

Table 3: Showed cholangiographic finding.

<table>
<thead>
<tr>
<th>Cholangiogram findings</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Dilatation of biliary channels</td>
<td>310</td>
<td>49.2</td>
</tr>
<tr>
<td>*Stone:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Single stone</td>
<td>168</td>
<td>27</td>
</tr>
<tr>
<td>➢ Multiple stones (2-13)</td>
<td>45</td>
<td>7.1</td>
</tr>
<tr>
<td>*Leakage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Minor leakage</td>
<td>80</td>
<td>12.7</td>
</tr>
<tr>
<td>➢ Major leakage</td>
<td>46</td>
<td>7.3</td>
</tr>
<tr>
<td>*Stricture:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Mid CBD</td>
<td>68</td>
<td>10.8</td>
</tr>
<tr>
<td>➢ High CBD</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>➢ Low CBD</td>
<td>28</td>
<td>4.4</td>
</tr>
<tr>
<td>*Complex problems:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Arrest of the dye (?? ligated CBD)</td>
<td>29</td>
<td>4.6</td>
</tr>
<tr>
<td>➢ Transsection of CBD</td>
<td>18</td>
<td>2.9</td>
</tr>
<tr>
<td>➢ Stone, and leakage</td>
<td>20</td>
<td>3.2</td>
</tr>
<tr>
<td>➢ Stricture, and leakage</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>➢ Stone and stricture</td>
<td>14</td>
<td>2.2</td>
</tr>
<tr>
<td>➢ Post-operative anastomotic stricture</td>
<td>5</td>
<td>0.8</td>
</tr>
<tr>
<td>* No detected abnormality.</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>582</td>
<td>92.4</td>
</tr>
</tbody>
</table>

patients either in addition to endoscopy in 2 patients, or as a separate technique in 10 cases, it was therapeutic in 5, and investigatory road mapping prior surgery in the other 5 patients, as shown in Table (8).

Surgical treatment

This approach was done with 114 surgical attempts, and it was urgently done in 48 patients with biliary peritonitis, or electively in the rest. In 30 cases, it was done as peritoneal drainage only prior further tools for treatment; however it was a definitive treatment in 89 cases, preceded by MRCP in 61 cases, or P.T.C. in 5 cases as shown in Table (9).

Comparison between the three maneuvers used in treatment of such problems; either surgery, endoscopy or percutaneous techniques was shown in Table (10).

The learning experience curve of ERCP

The learning curve of the cumulative experience appeared to be crescendo in manner progressively in direct proportion to increasing number of referral cases to the center (10-20 cases for ERCP /monthly in 2000 to 20-30 cases for ERCP/weekly in 2010)
The learning experience of surgical treatment

The learning curve of experience of surgical treatment also showed a gradual increase in the percentage of successful cases, with increasing number of successful cases (with an incidence of 50% at initial attempts of ERCP at 2000, reaching about 90-95% in 2010), as shown in Graph (1).

The learning experience of surgical treatment
Table 10: Showed the definitive treatment of post cholecystectomy problems.

<table>
<thead>
<tr>
<th>The Item</th>
<th>Endoscopic treatment</th>
<th>Endoscopy + percutaneous treatment</th>
<th>Percutaneous treatment</th>
<th>Surgical treatment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
</tr>
<tr>
<td>Missed stone(s)</td>
<td>188</td>
<td>88%</td>
<td>9</td>
<td>4%</td>
<td>-</td>
</tr>
<tr>
<td>Biliary leakage</td>
<td>119</td>
<td>82%</td>
<td>4</td>
<td>2.8%</td>
<td>-</td>
</tr>
<tr>
<td>Biliary stricture</td>
<td>90</td>
<td>74%</td>
<td>10</td>
<td>8.3%</td>
<td>-</td>
</tr>
<tr>
<td>Complex biliary problems</td>
<td>60</td>
<td>40%</td>
<td>2</td>
<td>1.3%</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>457</td>
<td>73%</td>
<td>25</td>
<td>4%</td>
<td>5</td>
</tr>
</tbody>
</table>

These cumulative experience was revealed as decreasing number of morbidity following these major surgeries, and also the resulting complications especially stricture at the anastomotic line. 5 out of 86 cases suffers from stricture of the stoma (5.8%), most of them belongs to early cases in initial experience, and due to cumulative experience in treatment of such cases percutaneous treatment was adopted and only 1/5 cases needed redo-surgery for refashioning of the anastomosis.

**DISCUSSION**

The incidence of post cholecystectomy problems in this work was higher after conventional open cholecystectomy (490 cases) more than laparoscopic cholecystectomy (140 cases). In contrary to the generally accepted higher incidence after laparoscopic cholecystectomy (0.6%) more than open cholecystectomy (0.3%) [3], and this may be attributed to the low incidence and affinity for laparoscopic procedures in Upper Egypt locality.

**Choledocholithiasis (213 patients)**

Choledocholithiasis (213 patients) were successfully treated endoscopically in 88% of cases to extract the stone(s) that increased to 92% with the addition of rendez-vous techniques (197/213). The failure rate of endoscopic treatment detected was 12% (25/213), but it was reduced by addition of rendezvous technique to become 7.5% (16/213), in contrary to other authors incidence that increased up to 20% failure rate [23] and this may be explained by the fact that most of the stones encountered in this work was soft, or easily crushed improving the success rate. For those cases with endoscopic failure, drainage by biliary stenting was done prior surgery [24]. Moreover endoscopic CBD clearance rate of stone(s) in those patients reached 100% as evident by post ERCP follow up diagnostic tools.

Only 7.5% of cases (16/213) underwent surgical treatment by choledocholithotomy procedure, preceded by MRCP in 5 cases, and other pre requisites and preoperative assessment as surgery is invasive tool, with long hospital admission period, higher coast, and high morbidity and mortality rates, So, endoscopic treatment substituted surgery in all those 197 cases (92%) as a competitive definitive treatment for missed stone(s)[14,17], moreover it has the superiority as regard less invasiveness [8,11,16], less costly, without hospital admission (outpatient techniques), with a very low if absent morbidity and mortality rates [12,13].

**Bile leakage**

Bile leakage was common among our patients (145 cases=23%) seen as bile leakage in 139 patients, or bile fistula in 6 patients [5], usually leakage originated from the liver bed or biliary injury [25], as the sphincter of Oddi creates a pressure gradient that result in bile spillage to outside rather than into the duodenum [26]. Leakage was demonstrated by cholangiogram in most of cases (126/145), however the spillage was very mild and...
surgery is indicated as the treatment of choice especially in leakage with biliary peritonitis, ligated bile duct, complete biliary stricture, bile duct transaction, or stricture after bilio-enteric anastomosis [15,42], as patients with total obstruction are not amenable to endoscopic approaches [16].

Good long-term surgical results are obtained with Roux-en-Y hepatico-jejunostomy [20,43-46]. In this work, it was done with mucosa to mucosa, tension free, 2 cm stoma, single layer techniques using Vicryl 2/0 or 3/0. Transanastomotic stents are selectively used with unhealthy (ischemic, or scarred), and small ducts (<4mm) [20,47,48], to guard against post-operative stricture complications that was encountered in 5/86 cases (5.8%) in our patients, as documented in literatures that stenosis can occurs in 1-3.5% [20,47,48].

Post-operative anastomotic stricture was treated by percutaneous dilation and stenting in 4/5 cases as it is very beneficial in such cases [51,52], and redo surgery was resold to in only one patient.

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Disclosure

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