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Research Article

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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Keywords

- Post-cholecystectomy
- ERCP
- PTC
- PTD
- Bilio-enteric anastomosis

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 280males) 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 in1 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

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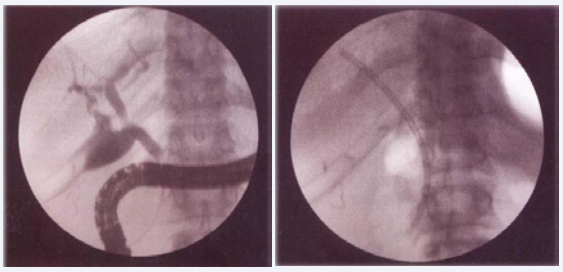

Figure 1 ERCP showing biliary leakage, treated by sphincterotomy and stenting.

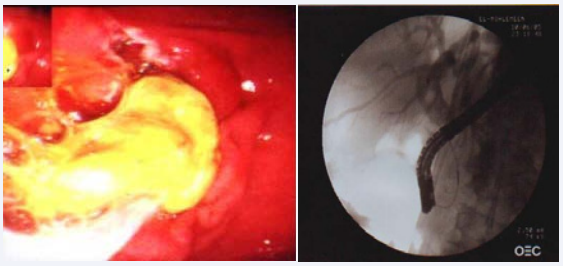

Figure 2 ERCP showing biliary stone, sledges, and their extraction by basket.

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 corner stone of treatment; it involves an astomosing 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.

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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.

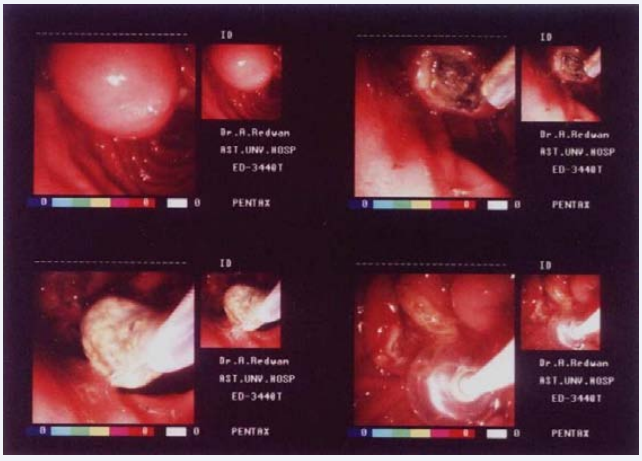

Figure 3 ERCP showing missed stone and its extraction by basket, and balloon.

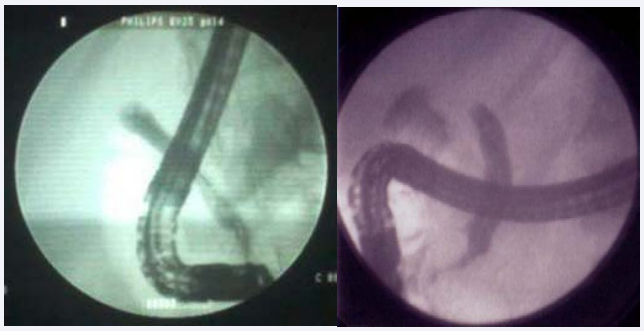

Figure 4 ERCP showing ligated CBD, and transected CBD with major leakage.

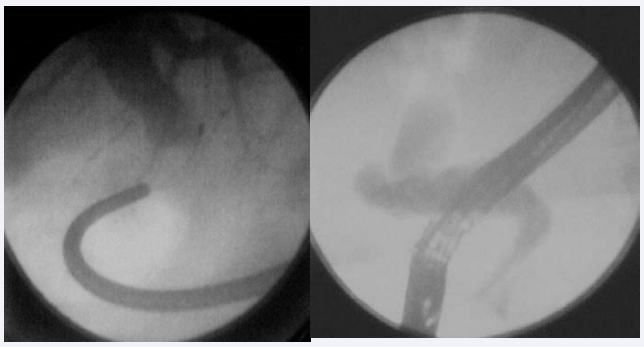

Figure 5 ERCP showing mechanical external lithotripsy of big CBD stone.

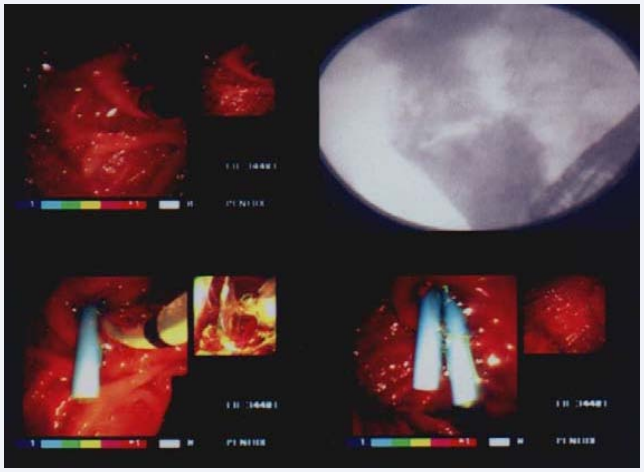

Figure 6 ERCP showing many CBD sludge, gravels, and muds treated by stenting.

Surgical approaches

Surgical approaches were attempted in 143 of patients aiming

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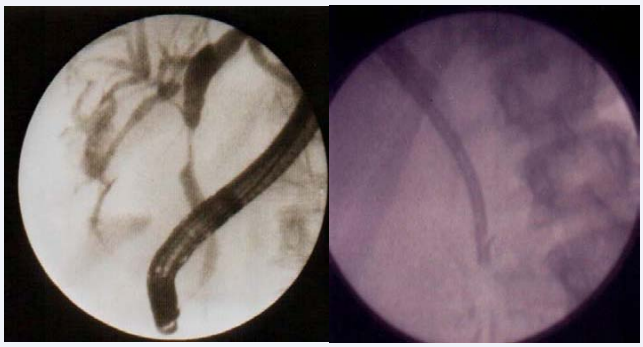

Figure 7 ERCP showing CBD stricture treated by dilation and senting.

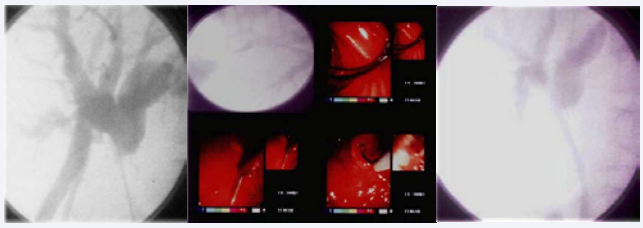

Figure 8 Rendez-Vous Techniques with endoscopic stenting for CBD stricture.

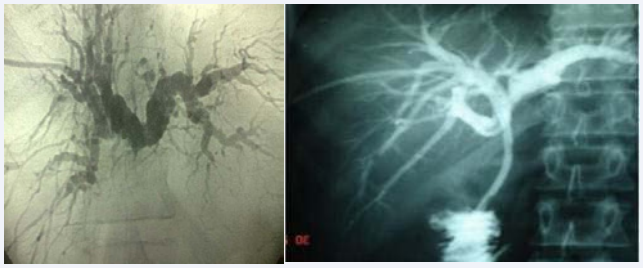

Figure 9 PTC for ligated CBD, and PT stenting for post op. anastomotic stricture.

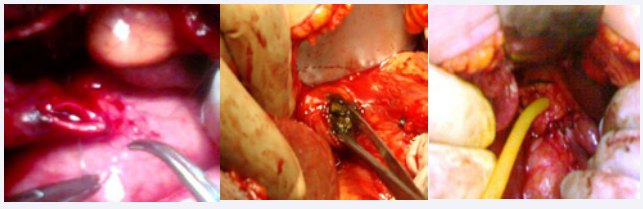

Figure 10 Op. photo of biliary injury, leakage, with CBD stone, and repair over T-tube.

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.

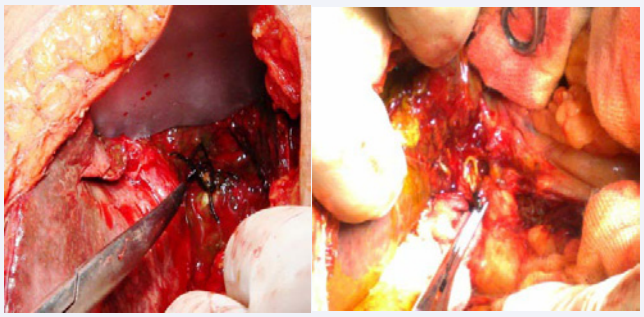

Figure 11 Op. field showing ligated, excised CBD, and field with many stitches in porta hepatis.

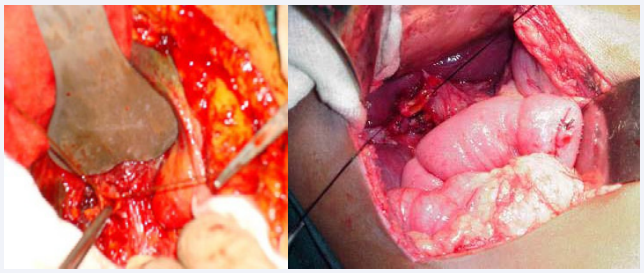

Figure 12 Operative dissection of hepatic ducts with Roux-en Y loop hepatico-jejunostomy anastomosis.

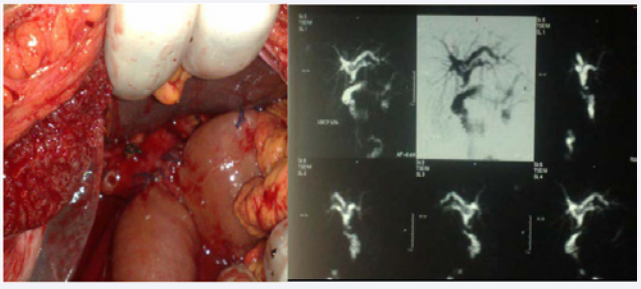

Figure 13 Roux-en Y hepatico-jejunostomy completed with post-operative MRCP assurance.

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 casesof 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 in120 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 rout 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.

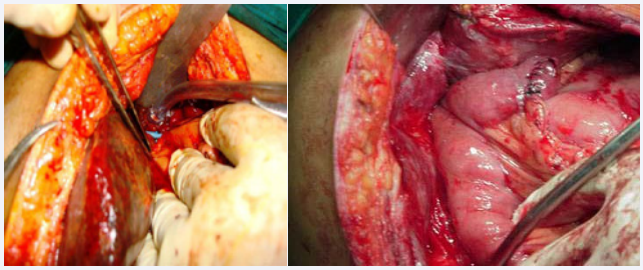

Figure 14 Roux-en Y loop splinted by trans anastomotic stents hepatico-jejunostomy.

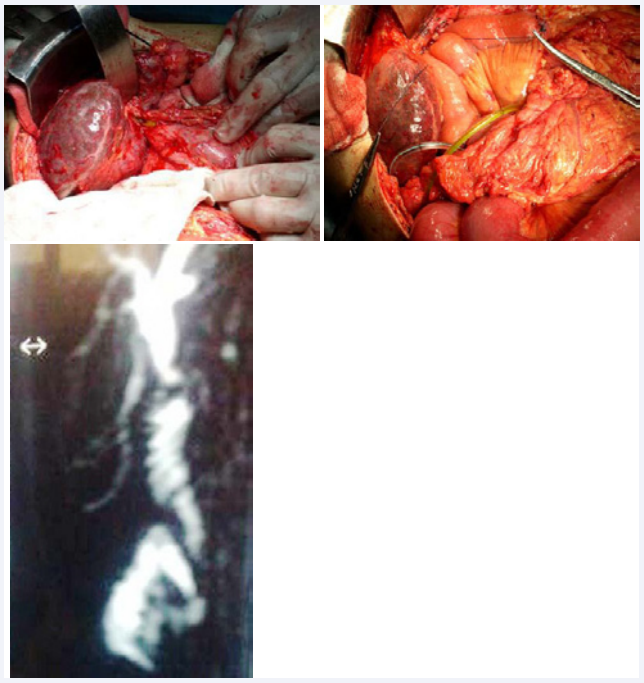

Figure 15 Operative picture for anastomotic stricture treated by redo anastomosis, and post op. MRCP.

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 transection 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.

Duration► & Item▼	1-5 days		6-10 days		11-15 days		16-20 days		21-25 days		21-25 days		Total ▼	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Leakage	33	5.2	57	9	15	2.4	-	-	6	1	3	0.5	114	18.1
Cholangio-Abnormality	-	-	15	2.4	51	8.1	-	-	-	-	3	0.5	69	11
Jaundice	30	4.8	15	2.4	6	1	3	0.5	9	1.4	6	1	69	11
Leakage, and jaundice	-	-	3	0.5	6	1	6	1	6	1	-	-	21	3.3
Colic, and infection	-	-	-	-	6	1	3	0.5	-	-	6	1	15	2.4
Total	63	10	90	14.3	84	13.3	12	2	21	14.7	18	2.9	288	45.8

Table 2: Showed late presentations and their incidence.

Duration► Item▼	6 months		1year		2years		5yrears		10years		↑10years		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Jaundice	60	9.5	24	3.9	42	6.7	39	6.2	24	3.9	45	7.1	234	37.1
Colic	24	3.9	12	2	24	3.9	6	1	6	1	9	1.4	81	12.9
Cholangitis	-	-	3	0.5	6	1	6	1	3	0.5	3	0.5	21	3.3
Fistula	6	1	-	-	-	-	-	-	-	-	-	-	6	1
Total	90	11.4	39	6.2	72	11.4	51	8.1	33	4.8	57	9	342	54.3

Table 3: Showed cholangiographic finding.

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

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)

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Table 4: Showed stone treatment techniques.

Treatment of stone	No	%
Endoscopic stone retrieval:		
• Stone retrieval by basket	83	13.2
• Stone retrieval by balloon	31	5
• Combined basket & balloon	38	6
• Mechanical internal lithotripsy	9	1.4
• Mechanical external lithotripsy	20	3.2
Bad general condition & stenting with re-do ERCP after a weak	7	1.1
Rendez-Vous technique and endoscopic stone extraction.	9	1.4
Failed endoscopic retrieval and stenting prior surgery	16	2.5
Surgical treatment by Choledocho-lithotomy with T tube drainage of CBD	16	2.5

Table 5: Showed biliary leakage treatment techniques.

Leakage treatment	No.	%
Sphincterotomy for clinical leakage with free cholangiogram (19)	19	3
Sphincterotomy and stenting for mild leakage(typeA), (80)	75	12
Sphincterotomy and stenting for marked leakage (B,C,D,E), (46)	27	4.3
Rendez-vous techniques and endoscopic stenting (46)	4	0.6
Surgery for failed cases (20), and bad compliance to endoscopy (2):		
• CBD repair over T tube	7	1.1
• Bilio-enteric anastomosis	15	2.4

Table 6: Showed stricture treatment techniques.

Stricture treatment	No	%
Endoscopic sphincterotomy and dilatation of ampullary stricture	15	2.4
Endoscopic dilatation, stenting (80/121):		
• 8 fr. Stent.	5	0.7
• 10fr. Stent.	32	5.1
• 11.5 fr. Stent.	18	2.9
• 12 fr. Stent.	14	2.2
• Double stents	11	1.7
Rendez-vous technique &endoscopic stenting	10	1.6
Failed endoscopy, for surgery	16	2.5
Bad patient compliance, for surgery	5	0.7
Bilio-enteric shunt (Choledocho-jujenostomy)	21	3.3

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

The learning curve of experience of surgical treatment also passed in a similar fashion with a cumulative manner for 10 years with treatment of such problems, with more than 86 operations of bilio-enteric shunt procedures in these challenging cases of relatively non-dilated biliary channels, with sepsis and fibrous scarring of the field. Variable techniques was practiced including end to side, versus side to side procedures, splinted versus non splinted anastomotic stoma, inside stent versus trans hepatic percutaneous catheter splint, interrupted versus continuous sutures anastomosis, depending on patient circumstances, but generally anastomosis is done as Roux-en-Y loop Choledocho-jujenostomy end to side, single interrupted layer of 3/0, or 4/0Vicryl sutures, tension free, mucosa to mucosa, 2-3 cm stoma, splinted in very small ducts by biliary stent.

Table 7: Showed endoscopic treatment of complex biliary problems.

Endoscopic treatment of complex problems	N0.	%
Stenting for leakage after surgical drainage (30/151)	25	4
Stenting for CBD transection (18/151)	2	0.3
Stone retrieval and stenting for leakage with stones (20/151)	15	2.4
Dilation and stenting for stricture with leakage (17/151)	12	2
Stone retrieval and stenting for stone with stricture (14/151)	6	0.9
Rendez-vous technique plus endoscopic stone retrieval and stenting for stone with stricture (14/151)	2	0.3
Failed endoscopic techniques in complex problems (151)	66	10.5

Table 8: Showed percutaneous treatment of complex biliary problems.

PTC in complex problems	No.	%
P.T.C. and stenting for stricture and leakage (17/151)	1	0.2
Rendez-vous techniques plus endoscopy for stone with stricture (14/151)	2	0.3
P.T.D. for ligated CBD in bad patient condition prior surgery (29/151)	5	0.8
P.T.C. and percutaneous dilation and stenting for post-operative anastomotic stricture (5/151)	4	0.6
Total attempts by percutaneous rout	12	2

Table 9: showed surgical treatment of complex biliary problems.

Surgery of complex problems	No.	%
Leakage with biliary peritonitis (48/151):		
• Just drainage, and peritoneal toileting	30	4.8
• Drainage, choledocholithotomy plus T.tube	3	0.5
• Drainage, CBD repair over T tube splint	8	1.3
• Drainage, CBD undo ligation, T tube splint	7	1.1
• Bilio-enteric anastomosis for failed endoscopic treatment (30/48)	5	0.8
Bilio-enteric anastomosis for ligated CBD (29/151)	29	4.6
Bilio-enteric anastomosis for transected CBD (18/151)	16	2.5
Choledocholithotomy, and CBD repair over T tube for stone with leakage (20/151)	5	0.8
Bilio-enteric anastomosis for stricture with leakage (17/151)	4	0.6
Choledocholithotomy, stricturoplasty, and T tube splint for stone with stricture (14/151)	5	0.8
Bilio-enteric anastomosis for stone with stricture (14/151)	1	0.2
Re-do anastomosis of roux loop Choledocho-jejunostomy for post op. stricture (5cases out of 86 bilio-enteric anastomosis in this work)	1	0.2
Total surgical attempts in treatment of complex biliary problems (151)	114	18.1

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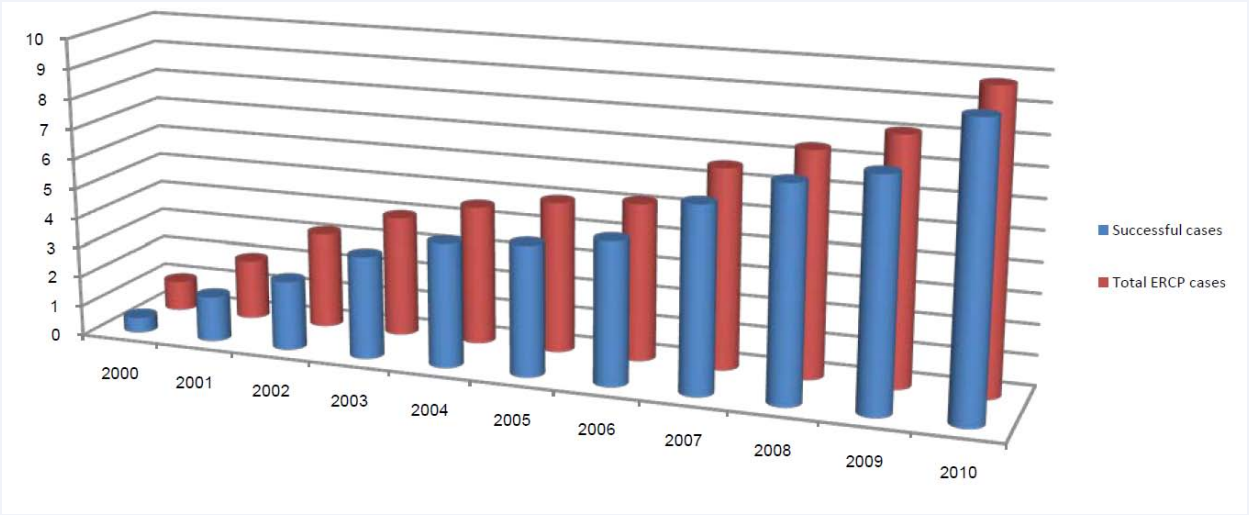
Table 10: Showed the definitive treatment of post cholecystectomy problems.

The Item	Endoscopic treatment		Endoscopy + percutaneous treatment		Percutaneous treatment		Surgical treatment		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Missed stone(s)	188	88%	9	4%	-	-	16	7.5%	213	34%
Biliary leakage	119	82%	4	2.8%	-	-	22	15%	145	23%
Biliary stricture	90	74%	10	8.3%	-	-	21	17%	121	19%
Complex biliary problems	60	40%	2	1.3%	5	3.3%	84	56%	151	24%
Total	457	73%	25	4%	5	0.8%	143	23%	630	100%



Ghraph 1 Showed the endoscopic learning curve along 10 years' experience.

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 coasty, 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

not evident by contrast injection in 19 cases, such mild cases of biliary leak may resolve spontaneously [27].

Endoscopic treatment was based on the degree of leakage. Patients with mild degree leakage (Cystic duct stump leak, IHBD, lateral section of CBD/RHD, gall bladder bed) was treated efficiently by endoscopic sphincterotomy and stenting for at least a month [11,28-31], subsequently leakage ceased within 3-5 days in almost all cases(19/19, and 75/80) with success rate of 100%, 94% respectively, as endoscopic treatment accelerates the healing period by decompressing the biliary system in addition, close the defect physically and act as a bridge at the site of extravasation for major leakages. Stenting also acts as a mold and prevents stricture formation during the recovery period, and should be the preferred treatment [31].

In major leakage *(type B, C, D, and E Strasberg & Soper classification*), endoscopic treatment with sphincterotomy and stenting was successful in only 67% of cases (31/46) [28,32-34], moreover another session of ERCP and stenting were needed to dilate a resulting stricture and upgrade stenting at a later date in 12 out of 31 patients treated, this results is comparable with literature results [31].

Surgery was done in 22 cases (15.2%), 5 mild, 15 severe cases, and 2 patients with bad compliance to endoscopy, by CBD repair over a T- tube splint in 7 cases, and bilio enteric anastomosis in 15 cases splinted with biliary stent in 5 cases and trans-hepatic pigtail catheter in 2 cases. *So, endoscopic treatment substituted surgery in all mild leakage cases as a competitive definitive treatment (19/19& 75/80), with 100%, and 94% success rates respectively. Unfortunately endoscopic approaches failed to substitutes surgery as a definitive treatment in cases of major leakage (31/46 cases) with only 67% success rate, and play a major complementary role with other additional tools.* Thus surgery was resold to as the treatment of choice in spite of being used in only 15.2% of cases; without doubt it has its associated morbidity and mortality, pre-requisites, and necessary facilities.

Biliary stricture {121 cases}

Endoscopic treatment was successful in 105 patients (87%) with dilation and stenting, withmultiple sessions ERCP to substitute or upgrade stent then after, in agreement with literatures that ERCP and stenting has comparable efficacy with surgery with lower rates of morbidity and mortality [32-34], so endoscopy is the preferable initial therapy [35,36], but it needs a long period (About 24 months), and repeated endoscopic sessions [28], moreover Davis et al., reported equal relapses of 17% for both treatment [37]. Surgery was resold to in 21 cases (17.4 %), by Choledocho-jejunostomy preceded by P.T.C. in 6 cases, MRCP in 10 cases, or endoscopic treatment in 5 cases with bad compliance,

*So Endoscopic treatment can substitute's surgery as competitive treatment in initial stricture management in most of cases (87%), h*owever it should be performed with progressive increment in the number of stents to better calibrates the stricture, stents should be replaced every 3 months before possible clogging could cause cholangitis, and inform the patient about the risk of stenting and the duration of treatment [38-40]. Otherwise surgery is indicated as the treatment of choice especially in surgically suitable patient [28].

Complex biliary problems {151 cases}

The definitive treatment of such problems was mainly by surgical interference (56%), however endoscopy was a mandatory complementary tool in initial management either alone (40%), or with addition of percutaneous techniques (4.5%). So management of such problematic cases must be individualized [15], when the need for surgery becomes essential due to the nature of injury or to nonresponse to other forms of treatment, it should be undertaken in a specialized unit with expert surgeons as the results is affected greatly by the learning curve [14], and this was evident in this work by improvement of the results with time and experience accumulation in both endoscopy and surgery.

Endoscopy is the preferable initial treatment [18,35,36] that effectively managed most bile duct injuries [41], however its use is limited to incomplete biliary strictures [28], biliary leakage [31,32,34], and for surgically unsuitable patients [28], and if successfully done, its results are similar to surgical results [40], with less mortality [16]. But surgery remain the gold standard treatment especially in leakage with biliary peritonitis, ligated bile duct, complete biliary stricture, bile duct transection, 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 donewith mucosa to mucosa, tension free, 2cm stoma, single layer tecniques 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 10-30% of cases [20,37,43,47,49,50].

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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