Endoscopic Management Of Common Bile Duct Stones

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Summary:

Back ground: *management of common bile duct stones CBD by endoscopic technique has become the first choice as compared to surgical exploration with very good results.*

Patients and methods *A prospective study of one hundred patients who were subjected for trial of endoscopic clearance of CBD stones in the Gastrointestinal Diseases (GIT) and Liver center in Baghdad from October 2001 to December 2002. Their ages ranged between 23 – 90 years with mean age of 56.5 years; they were 60 females and 40 males.*

They were classified into three groups: group I (50) patients, who had CBD stones with gallbladder in situ; group II (32) patients with previous cholecystectomy only; group III (18) patients with previous cholecystectomy and CBD exploration (13 patients of them with T-tube in situ while the others were without T-tube).

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Results: *We assessed the results and the success of endoscopic sphincterotomy E.S. and stone clearance and also we made a comparison between the results of the three groups.*

The overall successful rate of E.S. was 84%, and CBD clearance was achieved in 86.9%. Immediate complications occurred in 15 patients (17.8%), and mortality rate was 1%.

Group I achieved 82% duct clearance, 18% morbidity and no mortality.

Group II achieved 89.3% duct clearance, 17.9% morbidity and no mortality.

Group III achieved 94.1% duct clearance, 16.7% morbidity and 5.8% mortality.

Conclusion*: There were no statistically significant differences between the three groups regarding success of E.S. or CBD clearance.*

Keywords: CBD stones, management, endoscopic, ERCP

Introduction:

Common bile duct (CBD) stones are classified both by their point of origin and by the time at which they are discovered relative to cholecystectomy (CCE). The vast majority of CBD stones initially formed in the gallbladder and migrates through the cystic duct into the CBD. These stones are identified as secondary stones to distinguish them from primary CBD stones, which are formed within the biliary tract. CBD stones are also defined as retained stones, if they are discovered within two years of cholecystectomy , or recurrent stones, if they are detected more than two years after CCE [1, 2, 3, 4]

Clinical features suspicious of biliary obstruction due to CBD stones include biliary colic, jaundice, lightening of stool and darkening of urine. In addition, fever and chills may present in patients with CBD stones and cholangitis. [1]

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Endoscopic CholangioPancreatography (ERCP) has become the gold standard for diagnosis and treatment of CBD stones before surgical treatment. The relevance of
ERCP in diagnosis and treatment of CBD stones has increased since the introduction of laparoscopic cholecystectomy (L.C) [1, 5].

Logically decision making about the management of CBD stones in individual patients should depend on the knowledge of the natural history of the stones, the composition of the stones, the number and size of the stones and the risks and benefits of different options [6].

Carl Langenbuch performed the first cholecystectomy in 1882[7] and for the first 90 years thereafter, operation formed the mainstay of therapy for benign biliary tract diseases. In early 1970s, however, techniques were developed in the fields of radiology and gastroenterology that would provide alternative therapeutic options and radically changed management of biliary lithiasis. In 1973 Burhenne reported fluoroscopically guided basket retrieval of CBD stones via the T-tube tact [8]. In 1974 Classen and Demling from Germany and Kawai from Japan independently described endoscopc sphincterotomy (ES). [9, 10]

Initially the main indication for E.S was retained or recurrent stones following cholecystectomy, particularly in elderly or high risk group [2].

Recently endoscopic approach is being used with increasing frequency in patients with intact gallbladder and CBD stones; it is used for patients with CBD stones before CCE particularly if laparoscopic CBD exploration is not available [1]. Furthermore if endoscopic stone extraction is not possible due to multiple stones, intrahepatic stones, large stones, impacted stones, or bile duct strictures, these informations are known before CCE and open CBD exploration or drainage procedure can be performed[1,11,12,13,14].

In our study we reported the short term results of endoscopic treatment in the GIT center of CBD stones in 3 groups of patients with gall bladder in situ, GB removed and with retained stones after CBD exploration (T-tube in situ or removed) and to do a comparison between these three groups.

Patients & Methods

Between October 2001 and December 2002, one hundred patients with CBD stones who were referred to GIT center in Baghdad from other hospitals inside and outside Baghdad especially for endoscopic sphincterotomy were studied prospectively. They were 60 female and 40 males. Their age ranged between 23-90 years with a mean of 56.5 years. They were divided into three groups: group I (GI) 50 patients with CBD stones without previous CCE (GB in situ), group II (GII) 32 patients with CBD stones with previous CCE, and group III (GIII) 18 patients with CBD stones with previous CCE and CBD exploration (13 patients with T-tube in situ and 5 patients without T-tube).

All patients were hospitalized 24 hours before ERCP, full history was taken and a thorough physical examination performed.

Sixty percent of patients presented with biliary colic and jaundice, 13% presented with only jaundice, 24% presented with acute cholangitis, while 3 % presented with biliary colic only (table 2).

In GII the time interval between previous CCE and ERCP in 11 patients was within 2 years and in 21 patients the interval was more than 2 years.

While in GIII the interval between previous biliary surgery and ERCP was less than 2 years in 14 patients and more than 2 years in 4 patients .

The diagnostic work up of our patients included complete blood picture(CBP),and liver function tests with PT and PTT. Abdominal U/S was performed for all patients; MRCP was done in only 30% of the patients (because it was not available all the time); T-tube cholangiogram was performed in 13 patients in GIII for those with T-tube in situ and finally ERCP was performed in 90% of patients.

Prophylactic antibiotics were used in all patients before ERCP. We used cefotaxime 1 gm/every 8 hours i.v. Jaundiced patients had their coagulation status checked and were given intramuscular vitamin-k 10mg daily if PT was prolonged.

ERCP was attempted in all patients by using lateral viewing doudenoscope (Olympus JFIT-20 or TFJ-20 type).The ERCP was done by different gastroenterologist in the GIT centre.

Patients were lightly sedated by using diazepam 10 mg i.v and duodenal relaxation was achieved by i.v buscopan(R) 20 mg. Ampulla of Vater was cannulated first with a diagnostic catheter, and a cholangiogram confirmed the presence of stones and defined their size, number and site .The diagnostic catheter was then replaced with sphincterotome, a diathermy wire attached to a Teflon catheter. The papilla was cannulated to a variable depth, and the diathermy wire was oriented away from pancreatic sphincter .An electric current was passed down the wire, creating a 1-1.5 cm incision at 11 o'clock direction, depending on the size of the stones.

The stones were retrieved immediately with active extraction by balloon catheter or with Dormia basket. If the stones clearance was not complete during the initial sphincterotomy we performed a second session of ERCP to achieve complete clearance of CBD. If sphincterotomy failed in stone extraction, a nasobiliary (N.B) catheter was inserted and the patient referred for surgical treatment.

After the procedure, the patients were allowed to eat and drink when they had recovered from sedation. All patients were discharged from hospital on the 2nd day after the ERCP if no complications had occurred.

Statistical analysis :All data were coded and entered to the computer. Statistical analysis done by using statistical package for social science (SPSS 7.0).All measurements were tabulated and arranged by using number, percent and mean ± standard deviation. The association between different variables measure by using Chi – square and t – test. The probability" P" value < 0.05 considered at the level significantly.

Results

In this study of 100 patients, 50 % had G.B. in situ, 32% had only previous cholecystectomy, and 18% had previous cholecystectomy and CBD exploration.

CBD stones were most prevalent among age group (50-79) years (in 71% of patients) with peak incidence (33%) at age group 60-69 years.

Sixty percent of affected patients were females, and 40% were males

The most common presentation was jaundice and biliary colic in 60%, followed by acute cholangitis in 24% (table 2).

Total serum bilirubine (TSB) was elevated in 60 % of patients while S.ALP S.alkaline phosphatase) was elevated in 95% of patients .

Abdominal U/S was done in all patients, and it was successful in diagnosing CBD stones in 60%, of patients. MRCP was done in 30 patients (30 %) and was diagnostic in 25 patients (85 %).T-tube cholangiogram was done in those 13 patients of GIII, with T-tube in situ and achieved 100% successful rate in diagnosing CBD stones. ERCP was attempted in all patients and it was successful in 90 patients (90%) but failed in 10% due to failure of cannulation of papilla because the papilla was hidden by duodenal diverticulum, papillary edema, scarring due to chronic duodenal ulceration or due to papillary stenosis from previous surgery (Table 3).

In 72% percent of patients the stone number was less than 3 stones and in 28% the stone number was 3-5 stones. A high successful stone extraction rate of 75% was achieved when stone number was less than 3 .(Table 4,).

Stone size was less than 1 cm in 66% of patients, in 32% stone size was 1-1.5 cm, and in 2% more than 1.5 cm. The highest successful stone extraction rate (84.8%) was achieved when stone size was less than one cm. (table 5).

E.S. was attempted in all patients but it was achieved successfully in only 84 patients (84%), while in 10 patients cannulation failed and in other six patients deep cannulation sufficient to perform E.S. was failed (table 6).

Retrieval of the stones was done by active extraction by balloon catheter or Dormia basket. Balloon catheter was used in 75 patients and succeeded in stone extraction in 65 patients (86.6%). Dormia basket was used in 9 patients and succeeded in 8 patients (88.9%). (table 7)

The overall success rate of E.S. in stone extraction was 86.9% (73 patients) (table 8). Mostly the failure of E.S. to clear the CBD from stones was due to large and multiple stones.

In 58 patients (79.2%) , complete CBD clearance was achieved during the first E.S. session, while 15 patients (20.8%) required a second session for complete clearance of CBD .

Nasobiliary catheter was used in 11 patients (40.8%) in whom E.S. failed in stone extraction and in two patients in whom E.S. succeeded in stone extraction .

The overall complication rate after E.S. was 17% and the most common complication was bleeding followed by acute cholangitis (table 9).

The overall mortality was 1% due to duodenal perforation following E.S. in one patient of GIII .

In groupI (50 patients): The mean age was 56.3 years and there were 20 males and 30 females (table 1). The most common presenting feature was biliary colic and jaundice in 36 patients(72%) and acute cholangitis in 10 patients (20%) (Table 2). The stone size in 31 patients (62%) was less than 1 cm, in 18 patients (36%) 1-1.5 cm, and in one patient (2%) more than 1.5 cm. Stone number in 35 patients (70%) was less than 3 stones, and in 15 patients (30%) were 3-5 stones .

E.S was achieved in 39 patients (78%) and the percentage of duct clearance was 82% (34 patients). No mortality had occurred and complications were recorded in 7 patients (18 %) (table 6). The most common complication was bleeding in 3 patients (7.6%). The bleeding was mild to moderate, and one patient only required 2 units of blood transfusion, while no patient needed operation. Acute cholangitis was reported in 3 patients (7.6%) within 48 hours of the procedure and was treated successfully with antibiotics and i.v. fluid .Acute pancreatitis was reported in one patient (2.5%) in this group and was treated conservatively without further complications (table9).

Group II included 18 female and 14 male, their mean age was 56.9 years (table 1). The most common presentation in this group was biliary colic and jaundice in 23 patients (72%) followed by acute cholangitis in 8 patients (25%).(table 2).

The stone number was less than 3 stones in 23 patients (72%) and 3-5 stones in 9 patients (28%) Stone size was less than 1 cm in 20 patients (62%), 1-1.5 cm in 11 patients (34%) and in one patient (3%) more than 1.5 cm .

E.S. was achieved in 28 patients (87.5%) in this group and in 15 patients of them (89.3%) complete CBD clearance was achieved. No mortality had occurred and complications occurred in 5 patients (17.9 %) (table 6).

Regarding complications the most common one was bleeding (10.7%) that occurred within 24 hour post E.S. It was mild bleeding, and no patient required blood transfusion or operation. Acute cholangitis occurred in 3.5% of patients and was treated conservatively (table 9).

In group III: There were 12 female and 6 male with mean age of 54.7 years . The presenting feature was biliary colic and jaundice in 7 patients (38.9%), acute cholangitis in 6 patients (33.3%) and jaundice only in 5 patients (27%) (table 2).

The stone number was less than 3 stones in 14 patients (77.8%) and in 4 patients (22.8%) there were 3-5 stones .The stone size was less than 1 cm in 15 patients (83.3%) and in 3 patients (16.7%) the size was 1-1.5 cm. (Table5).

E.S. was achieved in 17 patients (94.4%) and complete CBD clearance was achieved in 94.1% (table 6).

Complications were reported in 3 patients (16.7%). (table 9). The most common complication in group III was bleeding in 3 patients (11.7%). Only one patient (5.8%) required transfusion of one pint of blood .Duodenal perforation occurred in one patient 5.8% . This patient developed acute abdomen at the second day post-ERCP. He was submitted to an urgent laparotomy and the

perforation was sutured but the patient died 48hr post-operatively.

Discussion

Initially E.S was reserved for frail patients at high risk for operations with retained or recurrent CBD stones. Recently E.S increasingly is being performed for high risk patients with gallbladder in situ. In this study of one hundred patients 50% of them had gallbladder in situ, that is similar to the incidence of 58% reported from several European and British centers [11, 12, 15], although other series have reported that approximately 15% of patients undergoing E.S had gallbladder in situ [16].

The diagnostic workup for CBD stones depends on combination of clinical features, laboratory and radiological investigations in addition to abdominal ultrasound and MRCP. In this study it was found that liver function tests was neither specific nor sensitive for the diagnosis of CBD stones, similar results reported by other series [2, 17].

Diagnostic accuracy of abdominal U/S in detection of CBD stones is highly operator dependent and distal biliary lesions are often obscured by overlying bowel [18]. The diagnostic accuracy of U/S in our study was 60%, that was comparable to the results of Blackbourne LH et al [18] who reported accuracy of 20-80%) and Shawqi[17] result of 54.6% accuracy.

The ability to detect CBD stones non invasively has assumed increasing importance with wide spread acceptance of L.C. MRCP represents a non invasive important alternative to direct cholangiography in detection of CBD stones [19]. We reported the ability of MRCP to detect stones in 85%of patients which was comparable to the results of Thomas et al who reported 92% accuracy rate [19].

in patients who had T-tube in situ, T-tube cholangiography was the best tool for detection of CBD stones (100% accuracy rate) as mentioned by Shawqi et al [17] who reported 100% accuracy rate.

The relevance of ERCP in diagnosing and treating CBD stones has increased since the introduction of L.C [5] and that was evident in this study as ERCP achieved the highest diagnostic accuracy(90%) in patients without T-tube [5,17] .

E.S was attempted in one hundred patients in our study, it was successful in 84% and the overall successful rate of CBD clearance was 86.9%. Apart from the results of Shawqi [17] and Siegel[20] who achieved a high successful rate of 95.7% and 97% respectively , our results were comparable with many other workers like Safrany et al[11], Cotton and Vallon et al and Hatfield et al (table 11)[11,13,21,22] .

Causes of E.S failure were mostly due to failure of papillary cannulation as the papilla was hidden within a duodenal diverticulum, scarred edematous papilla by chronic duodenal ulceration or stenosed papilla from previous surgery. This coincides with previous series that showed similar causes of failure of cannulation [2, 3, 6, 23, and 24]. The other cause of E.S. failure was due to failure to achieve deep cannulation because of papillary stenosis, biliary stricture and the experience of the operator [2, 25].

The size and number of stones carry a potential cause of failure of E.S in achieving stone extraction. In this series the failure of E.S in CBD clearance was mostly among patients with large (1.5 cm and more) and multiple (3-5) stones. The highest successful rate (76%) was achieved when stone number was less than 3 and stone size less than 1 cm ;a fact that was reported by Kumar-N et al [26] as he reported (97%) successful rate of stone extraction for those with single stone and less than 1 cm .

Shawqi [17] and Kumar et al [26] reported high successful rate of stone extraction 95% and 97% respectively depending on spontaneous passage of stones after adequate E.S. although they achieved their results by choosing patients with favorable stones size and number (1 cm and single stone) . In our study we included patients with different stone size and number by using active extraction method with balloon catheter or dormia basket. We used balloon in the majority of patients with favorable stone size and number and achieve 86.7% successful rate, and we use basket for those stone size 1.5 cm or more than 1.5 cm and achieve 89% successful rate. These results were relatively less than those reported by other workers [6, 26, 27].

The number of attempts required before clearance of the ducts achieved depended on number of stones [28]. M.E Lambert et al [24] reported that 44% require a second ERCP. In our series 20% required second session of ERCP for complete clearance of CBD.

Nasobiliary catheter was used by many routinely to drain the biliary duct to prevent cholangitis if complete stones clearance is not achieved [29] to infuse the biliary duct with normal saline or mono-octanion to aid clearance of stones in some patients in whom CBD was not cleared at the time of initial E.S [6]. Also N.B. catheter was used for sequential cholangiography to confirm the passage of stones after E.S[6].In this series N.B. catheter was used for biliary duct drainage to prevent cholangitis in patients in whom E.S failed to clear CBD to make subsequent surgery safer .

We reported a mortality of 1 % in our series; this rate was comparable with most other series [11, 13, 17, 20, 21, 22].

The striking feature in our series is the relatively high morbidity rate (17.8%), that was comparable to those reported by Shawqi [17] and Lambert et al [24] who reported morbidity rate of 18% and 19% respectively, while it was relatively high in comparison to the results of Safarany et al [11], Cotton et al [13] and Hatfield et al [22] who reported

7%, 8.5% and 9.5% respectively. This may be due to strict criteria for definition of bleeding adopted by these workers.

Bleeding was the most common complication in our patients; this was also reported by Neoptolemos et al [6] and Lambert et al [24]. Although Shawqi [17] and Assouline et al [28] had reported acute cholangitis as the most common complications.

In our study urgent operation for management of complication was required in one patient (1%) for treatment of duodenal perforation after sphincterotomy. This was comparable to the result of Siegel [20] and Safarany [11] who reported 1-2% while other workers like Lambert et al [24] and Miller et al [29] reported 8% and 7% respectively.

Comparing the results of E.S in stone clearance among groups of patients with gallbladder in situ and patients with recurrent or retained stones. In our study, although the mean age, gender, clinical presentations and associated medical diseases were comparable in the three groups we found that G III achieved the highest successful E.S and stone extraction rate of 94.4% and 94.1% respectively. G I achieved relatively lower successful E.S and stone extraction rate of 78% and 82% respectively but these differences are not statistically significant. The results of ES and stone clearance could be affected by other factors like stone size and number, abnormal papilla anatomy and the operator experience. [2, 3, 6, 23, 24]

In those patients with CBD stones and GB in situ E.S. is beneficial following successful stone extraction because it obviates the need for CBD exploration, thus it reduces the morbidity and mortality of the subsequent operation. [29]

We confirmed from our results in G II and G III that E.S should remain the procedure of choice for CBD stones after previous biliary surgery based on the high successful rate of stone extraction, the short hospitalization time, patient's preference and the great cost effectiveness. [3, 24, 29]

Our study showed no difference in successful stone extraction between those with or without T-tube in situ. In both the E.S was safer and effective treatment for CBD stones. This fact is also mentioned by Singh et al. [30]

Conclusion

1. Endoscopic sphincterotomy is considered the first line of treatment of CBD stones whether primary or secondary, gallbladder in situ or removed especially in high risk patients. It is safe and effective in endoscopic sphincterotomy failed to clear CBD and to make subsequent surgery safer.
2. The use of balloon catheter and basket proved to increase the rate of stone clearance as compared to E.S. alone.
3. The morbidity of E.S. is still high, but probably it is much less than complications following surgery especially in high risk patients.

Table (1): Age distribution of 100 patients

GROUPS	No.	Mean age	SD	Maximum
Group I	50	56.34	17.65	90.00
Group II	32	56.97	13.90	75.00
Group III	18	54.78	16.74	80.00

Table (2): Clinical presentation in 100 patients
P value = Not significant

Clinical Presentations	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Jaundice and colic	30	60%	23	71.9%	7	38.9%	60	60%
Jaundice	7	14.0%	1	3.1%	5	27.8%	13	13%
Acute cholangitis	10	20%	8	25.0%	6	33.3%	24	24%
Biliary colic	3	6.0%	0	0%	0	0%	3	3%
Total	50	100%	32	100%	18	100%	100	100%

Table (3): Diagnostic tools used in diagnosis of 100 patients

gnostic tools	No. of patients	Successful diagnosis		Failed diagnosis	
		No.	%	No.	%
ERCP	100	90	90%	10	10%
U/S	100	60	60%	40	40%
MRCP	30	25	85%	5	15%
Tube cholangiogram	13	13	100%	0	0%

Table (4): Relation between stone number and successful stone extraction
P-value=0.089

Stone Number	Successful stone extraction		Failed stone extraction		Total	
	No.	%	No.	%	No.	%
<3	54	75%	18	25%	72	100%
3-5	17	60.7%	11	39.3%	28	100%

Table (5): Relationship* of stone size to successful stone extraction.

Stone Size	Successful Stone Extraction		Failed Stone Extraction		Total	
	No.	%	No.	%	No.	%
<1cm	56	84.8%	10	15.2%	66	100%
1-1.5cm	17	53%	15	46.9%	32	100%
>1.5cm	0	0%	2	100%	2	100%

*P-value <0.01

Table (6): Results of E.S: Endoscopic sphincterotomy in group I, II & III

Groups	No.	Successful E.S*.	No.	% of ducts clearance	No.	morbidity	No.	mortality
Group I	50	78%	39	82%	34	18%	7	0%
Group II	32	87.5%	28	89.3%	15	17.9%	5	0%
Group III	18	94.4%	17	94.1%	13	16.7%	3	5.8%

*P value = Not significant

Table (7): Use of balloon and basket

Instrument	Successful		Failed		Total	
	No.	%	No.	%	No.	%
Balloon	65	86.7%	10	13.3%	75	100%
basket	8	88.9%	1	11%	9	100%

Table (8): The relationship of ERCP sessions with successful stone extraction

Number of sessions	Successful Stone Extraction		Failed Stone Extraction		Total	
	No.	%	No.	%	No.	%
One	58	79.2%	22	81%	80	80%
Two	15	20.8%	5	19%	20	20%
Total	73	100%	27	100%	100	100%

table (9): Complication in group I, II & III
P value = Not significant

complications	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Bleeding	3	7.6%	3	10.7%	2	11.7%	8	9.5%
Acute cholangitis	3	7.6%	1	3.5%	0	0%	4	4.7%
Acute pancreatitis	1	2.5%	1	3.5%	0	0%	2	2.3%
Duodenal perforation	0	0%	0	0%	1	5.8%	1	1.2%
No complication	32	82%	23	82.1%	14	82.5%	69	82%
Total complictions	7		5		3		15	

Table(10)comparison between our results with other workers(

reference	Author	Successful E.S.	% of duct clearance	morbidity	mortality
	Our study	84%	86.9%	17%	1%
26	Shawqi 1997	100%	95.7%	18.18%	2.27%
23	Classen safrany 1975	84.7%	84%	2%	0%
10	Safrany 1978	93.4%	90%	7%	1.4%
16	Cotton & vallon 1981	86.8%	76%	8.5%	1%
22	Siegel 1981	79.8%	97%	5%	0.8%
24	Hatfied 1985	94%	85%	9.5%	0%

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