

# The role of endoscopic retrograde cholangiopancreatography in management of patients recovering from acute biliary pancreatitis in the laparoscopic era

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## Abstract

**Background:** Traditionally an episode of acute biliary pancreatitis (ABP) is an indication for direct imaging of the biliary tree. The optimal approach may vary according to local expertise, and endoscopic retrograde cholangiopancreatography (ERCP) is the most common. The fact that the incidence of choledocholithiasis in patients recovering from ABP varies between 3 and 33% raises a question about the necessity of visualizing the biliary tree in all patients recovering from ABP.

**Methods:** In order to evaluate this policy, we reviewed 48 ERCPs performed on patients recovering from ABP who were scheduled for laparoscopic cholecystectomy (LC). We checked the correlations between ERCP findings and the severity of pancreatitis, biochemistry values (which were sampled during the acute phase), and ultrasonographic (US) findings.

**Results:** The ERCP demonstrated common bile duct (CBD) stones in 11 (22.9%) patients. US finding of a dilated CBD and maximal aspartate transaminase (AST) values higher than 90 units/l were significantly correlated with CBD stones (a relative risk [RR] of 2.95 with a 95% confidence interval [CI] for a dilated CBD and RR of 3.89 with a 95% CI of 1.18–12.80 for an AST value higher than 90 units/l). No other parameters were significantly correlated with CBD stones.

**Conclusion:** We, therefore, recommend performing a preoperative ERCP only on patients who present with an ultrasonographic finding of CBD dilatation. The correlation to high AST is still to be proven.

**Key words:** Acute biliary pancreatitis—Endoscopic retrograde cholangiopancreatography—Common bile duct stones—Common bile duct dilatation

Traditionally, an episode of acute biliary pancreatitis (ABP) is an indication for direct imaging of the biliary tree [2]. However, the approach to patients suspected of having common bile duct (CBD) stones has changed in the laparoscopic era [24]. As laparoscopic cholecystectomy (LC) has become the golden standard treatment for symptomatic cholelithiasis [3, 37, 39], most patients recovering from acute biliary pancreatitis (ABP) undergo LC [15, 29]. However, the optimal approach to the subgroup of patients suspected of having CBD stones remains uncertain [24] and may vary according to local expertise [8]; endoscopic retrograde cholangiopancreatography (ERCP) is the most common [5, 13, 19, 34, 44]. Some surgeons perform an ERCP after the operation on patients shown to have CBD stones by intraoperative cholangiography (IOC) [30, 43], but most surgeons advocate a preoperative ERCP, as failure of the endoscopist to remove CBD stones will influence further decisions [5]. The pathophysiology of ABP begins with an obstruction of the ampula of Vater by a biliary stone [12, 22]. This block is usually transient and the stone will find its way to the duodenum within a few hours or days [1, 22, 29]. Another point to consider is the incidence of choledocholithiasis in patients recovering from ABP, which varies between 3 and 33% [7, 27]. This creates speculation about the necessity of visualizing the biliary tree in all patients recovering from ABP. Some studies emphasize the significance of liver function tests (LFT) as predictors of choledocholithiasis [9, 11, 17, 19, 28], while others negate these findings [4, 21]. Dilatation of the CBD as demonstrated by ultrasonography (US) is a more accepted predictor of choledocholithiasis [9, 14, 22, 24].

Since the introduction of LC at the Assaf Harofeh Medical Center (September 1990), all patients over 40 years of age recovering from ABP have been referred for a preoperative ERCP, and an attempt at endoscopic sphincterotomy (ES) has been made when CBD stones are confirmed. Because we noticed, a low incidence of CBD stones in this

group of patients, we decided to reassess this policy. We tried specifically to define criteria for selecting the subgroup of patients who would be referred for ERCP prior to referral for LC.

This article summarizes our experience and our conclusions regarding the role of ERCP in patients recovering from acute biliary pancreatitis.

## Methods

### Patient population

The study was based on 48 patients. The patients were scheduled for LC following recovery from ABP. Between September 1990 and March 1994, ERCP was performed on all patients by the same endoscopist (E.S.). All ERCPs were performed 3–22 days following the return of the serum and urinary amylase values to normal. The diagnosis of acute pancreatitis was determined by symptoms and signs, laboratory evidence of elevated serum and urinary amylase values, with or without demonstration of edema of the pancreas, by computerized tomography (CT).

The diagnosis of cholelithiasis was confirmed by US scan performed within 24 h following arrival at the hospital. A biliary etiology for the pancreatitis was established after ruling out ethylism, hyperlipidemia, hypercalcemia, and, of course, the presence of cholelithiasis.

### Data collection

All data were collected from hospital charts, laboratory charts, and endoscopic, US, and CT reports.

Ranson's score was calculated by totalling the number of criteria present [31]. Biochemistry results were considered abnormal in a patient with any of the following: bilirubin  $>22 \mu\text{mol/l}$ , alkaline phosphatase (ALP)  $>120 \text{ units/l}$ , aspartate transaminase (AST)  $>41 \text{ units/l}$ , alanine transaminase (ALT)  $>39 \text{ units/l}$ , serum amylase  $>160 \text{ units/l}$ , and urinary amylase  $>700 \text{ units/l}$ . The highest serum levels during hospitalization were recorded for each patient and used for the analysis. All ultrasound interpretations were made by the same radiologist. The CBD diameter (in millimeters) was measured at its midportion. The suspicion or presence of bile duct stones seen on US was recorded, as was the presence of numerous, small (less than 1 cm) gallbladder (GB) stones. CT studies were performed on 26 patients within 4 days after hospitalization and were interpreted by the same radiologist.

ERCP findings with respect to the presence of bile duct stones and other biliopancreatic pathology were evaluated by one of the senior authors (A.H.).

### Statistical analysis

For each of the variables listed below, a relative risk (RR) for finding CBD stones by an ERCP was calculated.

The risk was considered significant when a confidence interval (CI) of 95% did not include the number 1. Continuous variables (age; laboratory values of bilirubin, ALP, AST, ALT, and amylases; duration of hospital stay; and the Ranson's score) are described in the text as mean  $\pm$  standard deviation (SD). For these variables, three to 20 cutoffs were done. The RR for finding CBD stones by ERCP was calculated for each cutoff value. CBD diameter at US was analyzed categorically with a cutoff value of  $>8 \text{ mm}$ . CT findings were analyzed as a two-categorical variable: edematous or normal pancreas.

## Results

The mean age was  $55.8 \pm 17.4$  years, range 23–85 years. The patient population comprised 36 women and 12 men. Hospital stay was  $10.5 \pm 5.6$  days, range 5–25 days. Ran-

**Table 1.** Laboratory values

Parameter	Highest value (units/l) (mean $\pm$ SD)	No. of patients studied
Serum amylase	1,129 $\pm$ 779	48
Urinary amylase	5,909 $\pm$ 3,940	48
ALP	281 $\pm$ 132	43
AST	105 $\pm$ 67	40
ALT	164 $\pm$ 85	41
Bilirubin	40 $\pm$ 26( $\mu\text{mol/l}$ )	48

**Table 2.** US findings

	No. of patients
Small GB stones	42
Big GB stones	6
Normal CBD	40
Dilated CBD	8
Choledocholithiasis	6

son's score was  $3.6 \pm 1.7$  criteria present, range zero to seven criteria.

### CT findings

Twenty-six patients underwent a CT scan. Fifteen scans were interpreted as normal. Four of the 15 patients with a normal CT scan were found to have CBD stones. Eleven scans revealed an edematous pancreas, but only one patient who presented with an abnormal CT scan was found to have CBD stones.

### Laboratory values

Table 1 details the highest value of each laboratory parameter. ALT showed the most prominent rise to about four times the normal range. AST rose to about 2.5 times the normal, ALP 2.3 times, and bilirubin twice the normal values.

### US findings (Table 2)

Forty-two patients had small (less than 1 cm) gallbladder stones and six patients large stones. There were 40 patients with normal CBDs and eight patients with dilated CBDs ( $>8 \text{ mm}$ ). Choledocholithiasis was diagnosed in six patients; only four of them were found to have CBD stones on ERCP.

### ERCP results (Table 3)

The preoperative ERCP was technically successful in 43 (89.6%) out of the 48 patients. CBD stones were found in 11 (22.9%) patients. No additional biliopancreatic pathology was found. Eight patients underwent endoscopic sphincterotomy (ES). Three patients, under 40 years of age, did not undergo ES. Later, two of them had normal intraoperative cholangiographies (IOCs) and one was treated by open choledochotomy. Six patients presented with mild complica-

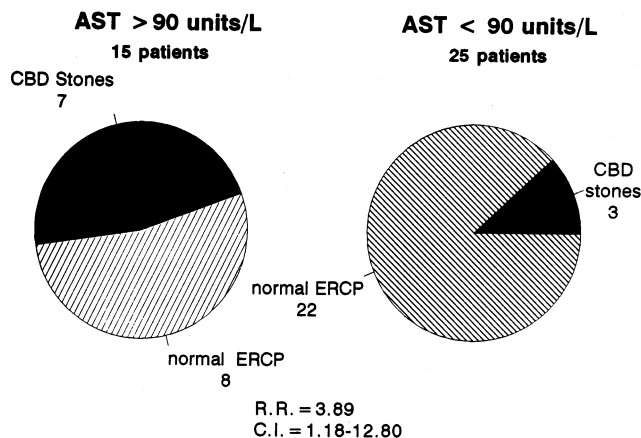


Fig. 1. Correlation of AST values to ERCP findings.

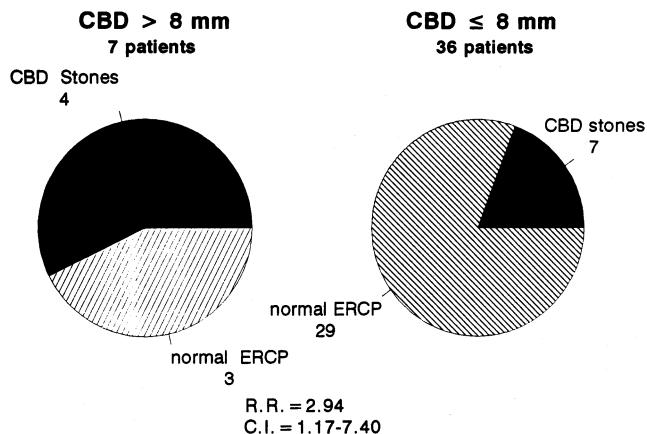


Fig. 2. Correlation of CBD diameter to ERCP findings.

Table 3. ERCP findings

	No. of patients
Normal ERCP	32
Technical failure	5
CBD stones	11
Sphincterotomy	8
Complications	6
Additional biliopancreatic information	None

tions following the ERCP: Three patients had mild pancreatitis, two patients had chest pains with no ECG or cardiac enzyme abnormalities, and one patient had upper GI bleeding which resolved spontaneously. All patients with complications were hospitalized for a period of 1 to 4 days.

### Correlations

There were no correlations between age, sex, hospital stay, Ranson's score, or CT findings and the ERCP findings. Among the laboratory values, only AST values higher than 90 units/l could predict choledocholithiasis (Fig. 1). Seven out of 15 patients with AST values >90 units/l showed CBD stones on ERCP. Three of the 25 patients with AST values <90 units/l had CBD stones. The relative risk of CBD stones in patients with AST values >90 units/l was 3.89 (CI = 1.18–12.80) as compared to patients with AST values <90 units/l. There were no correlations between other laboratory parameters and the ERCP findings.

Four out of seven patients with a US demonstration of dilated CBD stones (>8 mm) showed CBD stones on ERCP (Fig. 2). Seven out of 36 patients showed evidence of CBD stones on ERCP despite a normal US finding.

The relative risk of CBD stones for patients with a dilated CBD was 2.94 (CI = 1.17–7.40) when compared to patients with normal CBD.

### Discussion

The advent of LC has revived the debate on the optimal management of patients with suspected CBD stones [5, 8,

13, 19, 24, 34, 44]. The intention is to maintain the benefits of minimally invasive surgery. As laparoscopic techniques to clear the CBD necessitate time, resources, and specialized equipment, ERCP has become the treatment of choice for CBD stones in many centers [5, 13, 19, 34, 44]. A close to 90% success rate in our study, as well as in other series [20, 36], together with a very low complication rate of 2.3–7% [9, 20, 36], shows the ERCP to be a safe and effective method of dealing with CBD stones. However, we have to remember that this procedure is not free of serious morbidity and mortality [9, 20].

The optimal approach to CBD stones has not yet been established [40]. Moreover, there is no clear-cut consensus about the optimal time to perform exploration of the CBD endoscopically [8, 19]. A new therapeutic approach to ABP is an emergency ERCP. Preliminary reports suggest that an emergency ERCP may minimize the complications of ABP [6, 12, 26]. Most endoscopists still perform an ERCP following recovery from ABP [33] as ERCP alone can give rise to pancreatitis [7, 9].

Predictors of CBD stones have been studied extensively, but patients recovering from ABP represent a specific population. Traditionally, hyperamylasemia and history of pancreatitis are indications for CBD exploration [16, 32], but recent randomized controlled studies showed that they were not significant predictors of CBD stones [4]. Although the pathophysiology of ABP is induced by a CBD stone [22], clinical series suggest that unsustained hyperamylasemia reflects stone migration across the sphincter of Oddi [1, 22]. This phenomenon is demonstrated by two of our patients who showed CBD stones on US on admission and had a normal ERCP a few days later. CBD stones were found in 25.6% of our patients with ABP, which is in the higher portion of the range found in the literature (3–33%) [7, 15, 27]. This rate may be an exaggeration of the number of patients who require treatment, as two patients who were seen to have evidence of CBD stones on ERCP had a clear IOC. This was probably as a result of spontaneous passage of these stones.

It seems that the incidence of CBD stones after ABP does not justify performing ERCP on a routine basis, especially when no other biliopancreatic information has been obtained. Investigation of all patients with IOC may still be considered.

Haver-Jensen et al. [18] and Barkun et al. [4] found that age was a significant predictor of CBD stones. We did not find either age or sex to be a predictor of CBD stones in the subpopulation of patients recovering from ABP.

The severity of the pancreatitis was defined in our study by three parameters: Duration of hospital stay, Ranson's score, and the shape of the pancreas determined by CT (which is considered to be correlated to the severity of the pancreatitis) [38]. None of these parameters was correlated to CBD stones. Many studies examine the LFT as a predictor of CBD stones. The chance of a patient with normal LFT having CBD stones is low [11, 17, 28], and most studies found that at least two of the LFTs have to be abnormal in order to become a significant predictor [9, 11, 17, 19, 35]. Many patients with ABP present with an abnormal LFT. In our study, as in another [35], *ALT* had the most prominent rise. Yet, as we examined each laboratory parameter individually, we found that only *AST* values above 90 units/l could predict CBD stones. We cannot find any theoretical explanation for this finding, and it may be a casual result. Our sample was too small to examine combinations of laboratory values or other parameters. Further studies are needed to clarify the role of *AST* values and combinations of parameters as predictors of CBD stones in this specific population.

Many studies have found US criteria, especially dilatation of the CBD, to be useful predictors of CBD stones [9, 14, 18, 24], but others maintain that a dilated CBD alone may be an unreliable indicator [45], perhaps because of the ability of the CBD diameter to change its diameter over a short period of time [23, 25].

We found that a dilated CBD is a significant predictor of CBD stones. Gillams et al. [14] recommended performance of ERCP on every patient with US evidence of a dilated CBD, and this seems especially appropriate in patients recovering from ABP. Again, our numbers were too small to examine the predictive value of combinations of CBD dilatation with other abnormalities. Such combinations may increase the ability to predict CBD stones [9, 24]. The availability of modern US equipment enables precise measurement of the CBD diameter. For detecting CBD stones, however, US is not sensitive enough. Cronan [10] diagnosed 55% of CBD stones with US. In our study, four out of 11 patients with CBD stones as confirmed by ERCP were found by US. Accurate diagnosis of CBD stones mandates direct injection of contrast material into the biliary tree. As the availability of intraoperative criteria, which carry a strong predictive ability [17, 41, 42], have decreased in the era of LC, we will continue searching for noninvasive methods of predicting choledocholithiasis. For patients recovering from ABP, we conclude that an ERCP should be performed on those with a dilated CBD revealed on US.

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