

Selective use of endoscopic retrograde cholangiopancreatography to facilitate laparoscopic cholecystectomy without cholangiography

A review of 1139 consecutive cases

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Abstract

Background: The aim of this study was to show that laparoscopic cholecystectomy can be performed safely without routine intraoperative cholangiography.

Methods: We performed a retrospective analysis of 1139 consecutive patients (376 men and 763 women with an average age of 51.4 years) who underwent laparoscopic cholecystectomy between 1991 and 1999. In all, 227 patients (20%) were selected to undergo preoperative endoscopic retrograde cholangiopancreatography (ERCP) on the basis of four criteria for risk of stones.

Results: ERCP allowed us to make a diagnosis of biliary stones in 53.3% of the selected patients. Extraction of the stones was successful in 97% of the cases. In 14% of cases, ERCP was normal; in 32.7%, some useful diagnostic information was obtained. There were three complications (pancreatitis) following endoscopy (complication rate, 1.3%). Laparoscopic cholecystectomy was successful in 92% of patients. The postoperative morbidity rate was 3.2% (major complications, 0.5%). There were no deaths. During a follow-up period ranging from 3 to 97 months, six patients (0.6%) were found to have residual biliary stones.

Conclusion: This study confirms the hypothesis that laparoscopic cholecystectomy can be performed safely without routine intraoperative cholangiography.

Key words: Laparoscopic cholecystectomy — Cholangiography — Endoscopy — Biliary surgery — Endoscopic retrograde cholangiopancreatography

The introduction of laparoscopic cholecystectomy (LC) added fuel to the controversy, already present in the prelapa-

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roscopic era, over the treatment of common bile duct (CBD) stones. Two main options are available today.

First, a surgeon who is well trained in the laparoscopic treatment of CBD stones may rely entirely on routine intraoperative cholangiography (IOC). If stones are found, they can then be treated in a single surgical procedure, which tends to reduce the incidence of complications and the cost of treatment.

The second option is to perform endoscopic retrograde cholangiopancreatography (ERCP) only in selected patients. In this case, if stones are detected, ERCP needs to be completed with an endoscopic sphincterotomy.

During the period covered by our study, we selected patients to be submitted to ERCP prior to LC on the basis of a number of preoperative criteria, including clinical presentation, ultrasonography, and laboratory investigations.

The aim of the study was to show that LC can be performed safely without routine IOC.

Materials and methods

During an 8-year period from May 1991 to May 1999, 1139 consecutive patients underwent LC at the Department of Surgery of the Catholic University School of Medicine of Rome, Italy. There were 376 men and 763 women, with an average age of 51.4 years (range, 2–89).

Patients were investigated preoperatively and selected for ERCP on the basis of the following four criteria:

1. Clinical presentation with a complication due to stones, such as jaundice, cholangitis, or pancreatitis
2. CBD dilation >9 mm in diameter as measured at ultrasonography (US)
3. Elevation of liver function tests, including total bilirubin, aspartate aminotransferase (AST), alanin aminotransferase (ALT), alkaline phosphatase (AP), and gamma glutamyl transferase (GGT).
4. A positive medical history for one or more of the above conditions

In all, 227 patients fulfilled these inclusion criteria and were submitted to preoperative ERCP. The majority of these patients (136 of 227, or 60%) had a complication due to stones. The most frequent clinical presentation

Table 1. Results of endoscopic retrograde cholangiopancreatography (ERCP) in 227 patients

Preoperative ERCP	227/1139	20%
Bile duct stones	121/227	53.3%
Normal ERCP	32/227	14%
Recent passage of stones	43/227	19%
Anatomical biliary variation	18/227	8%
Pancreatic lesions	13/227	5.7%

was jaundice (71 cases), followed in frequency by cholangitis (47 cases) and pancreatitis (18 cases).

ERCP was performed as a standard procedure; if stones were present, an endoscopic sphincterotomy was attempted. The average time between ERCP and LC was 3.9 days (range, 1–6).

The remaining 912 patients underwent LC without routine IOC.

Results

Bile duct stones were found in 121 of the 227 patients (53.3%) submitted to ERCP (Table 1). The stone size ranged from 3 to 21 mm, and there were multiple stones in 101 cases. They were localized above the cystic duct junction in 62 cases (53%) and intrahepatic in four cases.

In 14% of the patients (32 of 227), ERCP was normal (Table 1). In the remaining 74 patients (32.7%), useful information was obtained with ERCP, such as the diagnosis of a recent passage of stones through the papilla (43 cases), the presence of anatomical variations of the bile ducts (18 cases), or the presence of lesions of the pancreatic duct (13 cases). A diagnosis of recent passage of stones, possible only when there is endoscopic confirmation of a disrupted papilla of Vater, is particularly useful because it can exclude other causes of cholestasis, such as ampullary submucosal tumor. A diagnosis of associated pathology of the pancreas as a cause of cholestasis can also be helpful, especially in cases of chronic pancreatitis.

Considering the distribution of preoperative selection criteria in the group of 121 patients with stones, the most accurate predictive criterion for stones was clinical presentation with a complication due to stones (Table 2). This criterion was met in 109 of the 121 patients (90%). The least reliable criterion was medical history, which was associated with the majority of normal (17 of 32, or 53%)—and therefore unnecessary—ERCP (Table 3).

The endoscopic extraction of stones was successful in 97% of the patients (117 of 121). Failures ($n = 4$) were due to size of stones (two cases of huge stones), intrahepatic stones (one case), and Mirizzi's syndrome (one case). There were three complications related to endoscopic treatment, all of them cases of moderate pancreatitis due to endoscopic sphincterotomy, for a complication rate of 1.3%. These complications resolved with medical therapy and did not prevent the performance of a laparoscopic operation. There were no deaths related to ERCP.

LC was completed in 1048 of 1139 patients—that is, in 92% of the cases. The conversion rate decreased to 4% in the last 2 years. Six major complications (0.5%) were observed following surgery—namely, respiratory failure, subphrenic abscess, bile duct lesion, biliary fistula from cystic leakage, intracapsular liver hematoma, and thrombophlebitis. There were 31 minor complications (2.7%), consisting

Table 2. Distribution of preoperative criteria for endoscopic retrograde cholangiopancreatography (ERCP) in 121 patients with stones

Criterion	No. of patients	%
Complication due to stones	109	90
Elevation of LFT	5	4
CBD dilation at US	5	4
Positive medical history	2	2
Total	121	100

LFT, liver function tests; CBD, common bile duct; US, ultrasound

Table 3. Distribution of preoperative criteria for endoscopic retrograde cholangiopancreatography (ERCP) in 32 normal cases

Criterion	No. of patients	%
Complication due to stones	2	6
Elevation of LFT	6	19
CBD dilation at US	7	22
Positive medical history	17	53
Total	32	100

LFT, liver function tests; CBD, common bile duct; US, ultrasound

of right shoulder pain in 16 cases and umbilical infection in 15 cases. There were no deaths.

The mean hospital stay was 3.9 days (range, 2–7) for patients without postoperative complications. The overall mean hospital stay was 4.1 days (range, 2–46).

The mean cost of the treatment (including endoscopy, surgery, and hospital stay), as calculated by the National Public Health System, was 13,046,000 Italian lire (~\$5500).

A thorough follow-up was obtained in 89.6% of our patients (1021 of 1139) during a period ranging from 3 months to 8 years (mean, 46 months). Six patients (six of 1021, or 0.6%) were found to have residual symptomatic biliary stones and were submitted to therapeutic ERCP. Five of these six had not had preoperative ERCP.

Discussion

The treatment of CBD stones associated with gallbladder stones remains a matter of controversy in the laparoscopic era [7]. Two main options are available: routine IOC with laparoscopic treatment of stones, or selective ERCP and endoscopic sphincterotomy combined with LC.

The first option, which is completely laparoscopic, has several advantages [1, 3, 5, 6, 8, 10, 14]. It allows for one-step treatment of stones in a single surgical procedure. As a result, there may be fewer complications than would be expected if two separate operations were performed. Furthermore, a single surgical operation tends to be cheaper. Possible disadvantages of this therapeutic option mainly involve the complexity of the operation (in some cases) and the need for advanced instrumentation. The short-term results of the laparoscopic treatment of CBD stones (Table 4) are dependent on the experience of the laparoscopic team and the feasibility of transcystic extraction, which is a less invasive procedure.

Recently, Stiegmann [16], Suc et al. [17], and Trias et al. [19] reported excellent results with the laparoscopic treat-

Table 4. Results of laparoscopic treatment of common bile duct stones

First author ref. no.	Year	No. of patients	Success (%)	Morbidity (%)	Mortality (%)
Millat [13]	1997	247	88	8.9	0.4
Arvidsson [1]	1998	39	82	10	0
Ferguson [6]	1998	302	80	—	—
Paganini [14]	1998	161	97	3.8	0.6
Brefort [5]	1999	56	73	7	0
Hyser [9]	1999	54	67	6	0
Giurgiu [8]	1999	217	97	—	—

ment, even in elderly and high surgical risk patients. Suc et al. [17], in a prospective study, limited the use of ERCP to patients with cholangitis.

The second option, ERCP, has been used since the beginning of the laparoscopic era by almost all laparoscopic surgeons. It provides for a more accurate diagnosis and an advisable simplification of surgery [4, 18]. In fact, a precise preoperative diagnosis was the primary goal when experience in laparoscopic surgery was more limited than it is today.

One of the disadvantages of ERCP is that, although several criteria have been used to select patients [11], none has been found to be sufficiently accurate. Thus, a number of patients will inevitably undergo an unnecessary ERCP.

In our series, ERCP was very widely employed, and the patients selected included many that we now know were actually at low risk for CBD stones. At the beginning of our experience, however, magnetic resonance imaging (MRI) cholangiopancreatography was not used routinely; furthermore, MRI was not as accurate in the assessment of biliary stones and biliary complications due to stones as it is today.

In 46.7% of our patients, we did not find any biliary stones; ERCP can obviously be considered, in these cases, useless, costly, and potentially dangerous. Nonetheless, in most of these ERCP, some diagnostic information was obtained. For example, in the 43 patients in whom ERCP confirmed that a recent passage of stones through the papilla was the cause of cholestasis, this accurate diagnosis excluded other serious pathologies.

Since there was a high correlation among cholangitis, jaundice, acute pancreatitis, and biliary stones in fully 90% of our cases, we have recently changed our selection policy for patients to be submitted to preoperative ERCP. Of the four selection criteria for ERCP used in this series—a complication due to stones, CBD dilation at ultrasound, elevation of liver function tests, positive medical history—only the first one, clinical presentation with a complication due to stones (cholangitis, pancreatitis, jaundice) is still considered a reliable indicator for stones today. In the remaining cases, MRI cholangiography now plays an important role in the preoperative selection of patients.

ERCP is an invasive examination with complications that may be severe in some cases. Furthermore, if management of biliary stones involves two separate treatment modalities and two different medical teams (gastroenterologists for performing ERCP and surgeons for performing LC), there may be a sum possible complications related to each modality. In our institution, both ERCP and LC were performed by a single surgical team. Our 1.3% complication rate is lower than that reported by most authors and prob-

ably reflects the wide use of diagnostic and therapeutic endoscopy in our surgical department since the late 1970s.

Recently, the combination in a single operation of LC and ERCP has offered a new, more effective, and less invasive treatment modality [2, 12].

However, data found in the literature regarding these two therapeutic options—the selective use of preoperative ERCP and totally laparoscopic treatment—are definitely contradictory, with authors on both sides tending to minimize the disadvantages associated with the approach that they prefer. In an attempt to strike a balance between the two sides and interpret the data coming from different institutions, the Society of Gastrointestinal Endoscopic Surgeons (SAGES) has published guidelines for the treatment of biliary stones. The SAGES guidelines suggest that the two most important factors to be considered when choosing a treatment modality are the local availability of specific equipment and—especially—local expertise. Gigot [7], in an editorial, stressed that since the best treatment modality for common bile duct stones has not yet been established definitively, local expertise should be the only factor influencing the choice. His opinion closely parallels the SAGES guidelines.

Our experience has demonstrated that in a center specializing in therapeutic ERCP performed by a single surgical team, short-term and long-term results can be as good as those obtained with totally laparoscopic treatment. Since this study comprised a retrospective review of our own experience, we did not have a control group of patients who had been submitted to totally laparoscopic treatment at our institution. However, we can make a purely descriptive comparison, without any statistical confirmation, to data published in the literature.

The success rate of endoscopic extraction of stones was 97% in our series of patients, matching the best success rate recorded with totally laparoscopic treatment (as shown in Table 4; success rates have ranged from 67% to 97%). In our experience, the morbidity rate for ERCP was 1.3% (three cases of mild to moderate pancreatitis, which resolved with medical treatment). If we combine our complication rates for endoscopy (1.3%) and laparoscopy (major complication rate, 0.5%; minor complication rate, 2.7%), we have an overall complication rate of 4.5%. This rate is not significantly different from the morbidity rates reported for total laparoscopic treatment, which range from 3.8% to 10% (Table 4).

Finally, our long-term results—in terms of the recurrence of symptoms due to CBD stones—were satisfactory in all but six patients, who developed biliary symptoms at an interval ranging from 6 months to 8 years after the operation. This recurrence rate of 0.6% is lower than the rates for totally laparoscopic treatment of CBD stones reported in most of the recent literature.

In our experience, ERCP was not responsible for a higher rate of complications, either related to endoscopy or to surgery. LC was simplified, thus reducing operative time and the need for special instrumentation. IOC was not used, but its absence did not result in a higher incidence of CBD lesions. Not only was our rate of residual stones very low (six patients, or 0.6%), but it also usually involved patients who were not submitted to either preoperative ERCP or IOC (five patients of six). One could well argue that if these

patients had been submitted to either ERCP or IOC, missed stones would probably have been diagnosed. This is a thorny issue, but it must be kept in mind that earlier investigators also reported an incidence of residual stones following routine IOC and that their figures tend to be higher than those documented in our series.

In conclusion, our findings support the hypothesis that a selective use of ERCP facilitates LC without routine IOC. However, to improve patient safety and reduce the overall costs of treatment, the criteria that we originally used to select the patients to be submitted to preoperative ERCP need to be reconsidered in the light of our experience.

References

1. Arvidsson D, Berggren U, Haglund U (1998) Laparoscopic common bile duct exploration. *Eur J Surg* 164: 369–375
2. Basso N, Pizzuto G, Surgo D, Materia A, Silecchia G, Fantini A, Fiocca F, Trentino P (1999) Laparoscopic cholecystectomy and intraoperative endoscopic sphincterotomy in the treatment of cholecystocholedocholithiasis. *Gastrointest Endosc* 50: 532–535
3. Berthou JC, Drouard F, Charbonneau P, Moussalier K (1998) Evaluation of laparoscopic management of common bile duct stones in 220 patients. *Surg Endosc* 12: 16–22
4. Braghetto I, Debandi A, Korn O, Bastias J (1998) Long-term follow-up after laparoscopic cholecystectomy without routine intraoperative cholangiography. *Surg Laparosc Endosc* 8: 349–352
5. Brefort JL, Samama G, Le Roux Y, Langlois G (1999) Laparoscopic treatment of common bile duct lithiasis: study of 56 cases. *Chirurgie* 124: 38–44
6. Ferguson CM (1998) Laparoscopic common bile duct exploration: practical application. *Arch Surg* 133: 448–451
7. Gigot JF (1998) Actual management of common bile duct stones: a continuous evolving approach. *Ann Ital Chir* 69: 741–750
8. Giurgiu DI, Margulies DR, Carroll BJ, Gabbay J, Iida A, Takagi S, Fallas MJ, Phillips EH (1999) Laparoscopic common bile duct exploration: long-term outcome. *Arch Surg* 134: 839–843 discussion 843–844
9. Hyser MJ, Chaudhry V, Byrne MP (1999) Laparoscopic transcystic management of choledocholithiasis. *Am Surg* 65: 606–609 discussion 610
10. Keeling NJ, Menzies D, Motson RW (1999) Laparoscopic exploration of the common bile duct: beyond the learning curve. *Surg Endosc* 13: 109–112
11. Kim KH, Kim W, Lee HI, Sung CK (1997) Prediction of common bile duct stones: its validation in laparoscopic cholecystectomy. *Hepatogastroenterology* 44: 1574–1579
12. Meyer C, Le JV, Rohr S, Thiry LC, Duclos B, Reimund JM, Baumann R (1999) Management of common bile duct stones in a single operation combining laparoscopic cholecystectomy and perioperative endoscopic sphincterotomy. *Surg Endosc* 13: 874–877
13. Millat B, Atger J, Deleuze A, Briandet H, Fingerhut A, Guillon F, Marrel E, De Seguin C, Soulier P (1997) Laparoscopic treatment for choledocholithiasis: a prospective evaluation in 247 consecutive unselected patients. *Hepatogastroenterology* 44: 28–34
14. Paganini AM, Lezoche E (1998) Follow-up of 161 unselected consecutive patients treated laparoscopically for common bile duct stones. *Surg Endosc* 12: 23–29
15. Shuchleib S, Chousleb A, Mondragon A, Torices E, Licona A, Cervantes J (1999) Laparoscopic common bile duct exploration. *World J Surg* 23: 698–701 discussion 702
16. Stiegmann GV (1998) Bile duct calculi—the new challenges. *HPB Surg* 10: 409–410
17. Suc B, Escat J, Cherqui D, Fourtanier G, Hay JM, Fingerhut A, Millat B (1998) Surgery vs endoscopy as primary treatment in symptomatic patients with suspected common bile duct stones: a multicenter randomized trial. French Associations for Surgical Research. *Arch Surg* 133: 702–708
18. Tham TC, Lichtenstein DR, Vandervoort J, Wong RC, Brooks D, Van Dam J, Ruymann F, Farraye F, Carr Locke DL (1998) Role of endoscopic retrograde cholangiopancreatography for suspected choledocholithiasis in patients undergoing laparoscopic cholecystectomy. *Gastrointest Endosc* 47: 50–56
19. Trias M, Targarona EM, Ros E, Bordas JM, Perez Ayuso RM, Balagué C, Pros I, Teres J (1997) Prospective evaluation of a minimally invasive approach for treatment of bile-duct calculi in the high-risk patient. *Surg Endosc* 11: 632–635