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Difficult Cholecystectomies: Validity of the Laparoscopic Approach

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ABSTRACT

Objectives: The aim of this work was to determine the outcome of "difficult cholecystectomy" caused by acute cholecystitis or cirrhosis, in relation to the number of conversions, principal biliary duct injuries, the length of the operation, and of postoperative hospitalization.

Methods: From 1998 through 2000, 51 patients, 38 females and 13 males, underwent cholecystectomy for acute cholecystitis and cholecystitis associated with liver cirrhosis; the average age was 58.8 years (range, 24 to 86 years). No preoperative selection was made for video laparoscopic treatment. An open laparoscopy was performed in all cases.

Results: All interventions were completed by video laparoscopy. No injury of the major bile ducts occurred in the 51 cases. The average time of operation was 110 minutes. The average length of hospitalization was 3 days.

Conclusion: This study demonstrates that the results after "difficult laparoscopic cholecystectomy" are comparable to those after "open cholecystectomy." Difficult cholecystectomy executed with video laparoscopic methodology is safe and effective if performed with appropriate equipment and by experienced surgeons.

Key Words: Difficult cholecystectomy, Laparoscopic cholecystectomy, Acute cholecystitis, Cirrhosis.

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INTRODUCTION

Because of manifest operating difficulties, some anatomical conditions have been considered relative or absolute contraindications to laparoscopic cholecystectomy, ie, acute cholecystitis,[1-3] hepatic cirrhosis,[4,5] or certain clinical-anatomical situations (Mirizzi syndrome).[6] Today, these limitations should be reconsidered.

The aim of this study is to show the practicality and advantages of laparoscopic intervention in so-called "difficult cholecystectomies."

Laparoscopy offers considerable advantages, such as a more comfortable, less painful postoperative course and a more rapid return to normal activities, with the same or even lower postoperative morbidity and mortality compared with that for laparotomy.

MATERIALS AND METHODS

We examined the outcome of 51 difficult cholecystectomies performed from 1998 through 2000. These cholecystectomies included 49 performed due to acute cholecystitis (5 for chronic hepatopathy) and 2 for cholelithiasis associated with liver cirrhosis **(Table 1)**. The association of acute phlogosis (inflammation), portal hypertension, and cholelithiasis found on preoperative evaluation are considered predictive of a difficult cholecystectomy.

Based on intraoperative criteria, we consider the following objective parameters indicative of a "difficult cholecystectomy": circumscribed peritonitis in the right hypochondrium, difficult identification and isolation of the cystic artery and cystic duct, and the presence of portal hypertension. Of 115 randomly selected, sequential patients with acute cholecystitis who underwent laparoscopic cholecystectomy, 51 fell within these parameters and therefore comprised our cohort. Two of the 51 had cirrhotic cholelithiasis and 49 had acute cholecystitis. Among the clinical and hemato-chemical parameters of this group of patients, pain and parietal contracture in the right hypochondrium, fever, leukocytosis, and modest aspartate aminotransferase/alanine aminotransferase alterations were noted **(Table 2)**.

Evidence of acute cholecystitis included an increase in

gallbladder volume, wall thickness, ultrasonographic (US) signs of pericholecystic inflammation, and US signs of hepatopathy in cirrhotic patients. Acute inflammation was histologically confirmed in all patients **(Table 3)**.

An accurate diagnostic definition of acute cholecystitis is fundamental. In fact, acute biliary pancreatitis and possible concomitant lithiasis of the principal biliary duct (PBD) must be differentiated. A medical history, such as jaundice accompanied by painful symptomatology, may help differentiate pancreatitis from lithiasis of the PBD.

Therefore, the laboratory data capable of discerning cholestasis and pancreatic involvement are essential in the preoperative evaluation; however, the morphological verification of the gallbladder and the biliary tree with US, Computed tomography, and, when indicated, ERCP (endoscopic retrograde cholangiopancreatography), and MRCP (magnetic resonance cholangiopancreatography) are important nonetheless.

Table 1.
51 Difficult Cholecystectomies: 1998–2000

38 Females
13 Males
Mean age 58.8 years (range 24–86)
44 Cases acute cholecystitis (86.27%)
5 Cases acute cholecystitis in cirrhotic patients (9.8%)
2 Cases cirrhotic cholelithiasis (3.9%)

Table 4 shows the alterations in cholestasis indices noticed in some of the 115 patients examined. The concomitant lithiasis of the PBD was diagnosed and treated with preoperative ERCP in 9 patients. Consequently, all patients underwent a video laparoscopic cholecystectomy **(Table 5)**.

Video laparoscopic cholecystectomy represents the first and only option in our therapeutic program, because no choice between laparoscopic cholecystectomy and open cholecystectomy was foreseen.

Equipment used comprised a high-intensity light source, high-capacity insufflators, and a high-resolution telecamera. In all patients, the pneumoperitoneum was established with the Hasson open procedure.

RESULTS

The time from hospitalization, to clinical/instrumental diagnosis of acute cholecystitis, and surgery was 48 hours (mean, 24 to 72 hours). The time interval did not vary because of intraoperative results (conversions, lesions of PBD) or postoperative course.

In all patients, a subhepatic drain was placed and removed after 24 to 36 hours. In most patients (82%), the cystic duct was closed by clips; however, in some cases (17.6%), we used Endoloops to secure the cystic duct. The mean duration of operative intervention was 110 minutes with a range of 70 to 240 minutes. In this series,

Table 2.
Clinical and Hematochemical Parameters for 115 Acute Cholecystitis Cases— 49 Difficult Cholecystectomy Cases (42.6 %)

Parameters	% of Cases
Pain (right hypochondrium [RHy])	100%
Contracture of circumscribed defense (RHy)	76.5% (88 cases)
Fever (38.5°C)	80.8% (93 cases)
Leukocytosis (11 000–18 000 WBC*/mm3)	92% (106 cases)
AST†/ALT‡ twice the standard	7.8% (9 cases)
Amylase under normal values	100%
IL-6 under normal values	100%

*WBC = white blood cell.
†AST = aspartate aminotransferase.
‡ALT = alanine aminotransferase.

Table 3.
Instrumental Parameters for 115 Acute Cholecystitis Cases—49 Difficult Cholecystectomy Cases (42.6 %)

Parameters	% of Cases
US*: normal PBD† morphology	87% (100 cases)
US*: ultrasonographic identification of acute cholecystitis	
•Volume of gallbladder	
•Thickness of the wall	
•Pericholecystic phlogosis	100%
US*: ultrasonographic morphology of chronic hepatopathy	4.3% (5 cases)
Histology: acute phlogosis	87% (100 cases)

*US = ultrasound.
†PBD = principal biliary duct.

no conversion to open exploration, injury to the PBD, or dehiscence of the cystic binding occurred. The mean postoperative stay was 3 days with an average of 1 to 9 days. Postoperative morbidity included respiratory infection (11.7%) and modest subhepatic accumulations (3.8%), all successfully treated with medical therapy **(Table 5)**.

The results were compared with those of 44 "difficult cholecystectomies," identified with the same intraoperative criteria, treated with traditional open laparotomy during the preceding period (1996 to 1998), at the beginning of our laparoscopic experience. These included acute cholecystitis (36 patients) and cholelithiasis associated with liver cirrhosis (8 patients).

Table 4.
Indicies of Cholestasis Imaging for 115 Acute Cholecystitis Cases—49 Difficult Cholecystectomy Cases (42.6 %)

Total bilirubinemia	2.5-3 mg/100 mL 15.68 % (18 cases)
Alkaline phosphatase	Twice the standard 10.4 % (12 cases)
Gamma-Gutamyl Transferase	Twice the standard 10.4% (12 cases)
US*: dilatation of PBD†	13% (15 cases)
ERCP‡: choledochal lithiasis	7.8% (9 cases)

*US = ultrasound.
†PBD = principal biliary duct.
‡ERCP = endoscopic retrograde cholangiopancreatography.

Table 5.
Results of 51 Video Laparoscopic Cholecystectomies

Clipped cystic duct	42 (82 %)
Cystic duct closed with Endoloops	9 (17.6 %)
Subhepatic tubular drain	51
Conversions	-
Duration of the operation	110 min (range, 70 to 240)
Lesions of PBD*	-
Mean postoperative stay in hospital	3 days (range, 1 to 9)
Morbidity	Subhepatic accumulations (medical therapy) 2 cases (3.9 %)
	Respiratory infections 6 cases (11.7 %)

*PBD = principal biliary duct.

The diagnostic criteria and the therapeutic choices were the same in both groups. The mean operative time for open cholecystectomy was 70 minutes (range, 50 to 180 minutes). The mean postoperative stay was 8 days (range, 5 to 15 days). No deaths occurred; the greatest morbidity was represented by a small injury to the principal biliary duct (2.2 %), intraoperatively recognized and treated with a direct suture. A subhepatic drain was placed in all patients, which was removed on the fifth postoperative day. Minor postoperative morbidity was represented by a suppuration of the operative incision in 4 patients (9%) and bronchopneumonic infections in 7 patients (15.9%), all cured with medical therapy.

The validity of the laparoscopic approach in difficult cholecystectomies is confirmed by the absence of conversions and perioperative accidents, the shortness of the intervention and postoperative stay, and the low morbidity.

It's important for us to emphasize that our results come from a small operative unit where almost all biliary-pancreatic pathologies have been treated by the same surgical team, giving stability and unity to the surgical programs.

DISCUSSION

The clinical-anatomical conditions that can make a laparoscopic cholecystectomy "difficult" are cirrhosis, anatomical anomalies, and acute and chronic inflammation. Anatomical anomalies of the biliary tree make it difficult to identify the structure to be dissected, depending on the type of anomaly and the modality of verification. In fact, anomalies of the extrahepatic biliary tree are often identified unexpectedly during surgery. Simple suspicion during surgery requires an immediate, precise, and full morphological definition so the dissection can be completed, if possible, with intraoperative cholangiography.

Conversion to laparotomy can be indicated in some particular and rare situations, because of the persistence of an unclear anatomical scenario.[7,8] On the contrary, the technical difficulties connected with cholecystitis and cirrhosis are in part foreseeable. Therefore, the following parameters must be evaluated: the medical history, the hepatic biologic balance, the morphological findings, and the macroscopic appearance of the liver that must be

confirmed by histologic examination.

The definition of "difficult cholecystectomy" is often subjective, because it can be established by the operator in an arbitrary manner. Instead, it is necessary to establish and make use of objective intraoperative parameters. The following parameters allow defining cholecystectomy as "difficult": the presence of circumscribed peritonitis in the right hypochondrium, difficult identification and isolation of the cystic artery and duct, scarring of Calot's triangle, inflammation, an abundance of adipose tissue, a short cystic duct, difficult dissection of the gallbladder wall from the hepatic bed, and the presence of portal hypertension.

The validity and reliability of the laparoscopic approach in difficult cholecystectomies can be evaluated based on the number of conversions to laparotomy, injury to the PBD, duration of the operation, postoperative morbidity and the comfort of the postoperative course, both in cases of acute cholecystitis and in cirrhotic patients or those with missed anomalies of the biliary tree.

The laparoscopic procedure can be considered acceptable if the number of conversions does not exceed 15%. In fact, recent data reported in the literature[7,9-13] show that the percentage of conversions for acute cholecystitis is less than 10%, with a range of 1.3% to 12.4%.

Moreover, data from the last 2 years report a reduction in laparotomy conversions (mean, 5%). These data are extremely important because they show that the laparoscopic procedure has a good margin of safety, and it is not bound by technical abilities of the operating surgeon.

The percentage incidence of PBD injury in laparoscopy for difficult cholecystectomies is slightly higher than that reported for laparotomy (0.6 to 1.5% vs 0.1 to 0.15%).[14,15] Two elements need particular consideration to prevent possible injury to the PBD. The first is a technical choice to perform ante grade dissection that, in some cases, can aid visualization of the cystic duct without injury.[16] Furthermore, the acquisition of all possible information about the morphology and anatomic relationships of the PBD in the preoperative phase, is of fundamental importance. The decision to perform further clinical investigation (ERCP, MRCP) is driven, in the preoperative phase, by US visualization of PBD dilatation or by alterations in enzymatic indices suggestive of cholestasis, or both of these.

To limit the risk of dehiscence of the cystic duct, in cases of inflammation and edema of the gallbladder wall and of the cystic duct, its closure can be carefully accomplished with Endoloops. The duration of the operative intervention does not significantly impact the postoperative course. In our experience, the mean operative time was 120 minutes with a range of 70 to 240 minutes.

Finally, postoperative morbidity is not different from that generally observed with laparotomy in the acute condition.[11,17,18] Its mean value varies around 8%.[9]

In our experience, global postoperative morbidity is 15.6% after video laparoscopic cholecystectomy in acute cholecystitis; nevertheless, no major complications are present. In 2 cases (3.9%), a modest subhepatic accumulation was noted, and in 6 cases (11.7%) a respiratory infection occurred. In both situations, resolution was reached quickly with medical management.

CONCLUSION

In our experience, the advantages of a laparoscopic approach (compared with open intervention) are evident in terms of a shorter postoperative course, less painful symptomatology, and a prompt resumption of normal activities with reintegration into social life, even in the "difficult cholecystectomy" for acute cholecystitis or for gallbladder disease associated with hepatic cirrhosis.

In recent experience,[9,19] a lower incidence of major and minor postoperative complications (between 31% and 40%) was noted for acute cholecystitis treated with the laparoscopic approach. Laparoscopy has a particularly positive effect on the incidence of respiratory infections, primarily in elderly patients, because of the shorter stay in bed and the minor postoperative pain.

Finally, laparoscopic techniques diminished the potential problems of a laparotomy incision (infections, dehiscence, laparocele). Pre- and postoperative medication of the umbilicus with rifamycin can control and reduce local infections to a minimum.

Nevertheless, it must not be forgotten that the laparoscopic procedure for "difficult cholecystectomies" is a technically complex treatment and needs a high degree of experience and skill from the surgical team together with appropriate equipment.

In conclusion, it is suggested that a laparoscopic

approach for difficult cholecystectomies does not increase complications, but that it simplifies the postoperative course by accelerating the resumption of normal activities.

References:

1. Zucher KA, Flowers JL, Bailey RW, Graham SM, Buell J, Imbembo AL. Laparoscopic management of acute cholecystitis. *Am J Surg.* 1993;165:508-514.

2. Velasco JM, Vallina VL. A technique for laparoscopic retraction of the acutely inflamed thick-walled gallbladder. *Surg Endosc.* 1994;8:809-811.

3. Assaff Y, Metter I, Sabo E, et al. Laparoscopic cholecystectomy for acute cholecystitis and the consequences of gallbladder perforation, bile spillage, and "loss" of stones. *Eur J Surg.* 1998;164:425-431.

4. Urban L, Eason GA, Remine S, et al. Laparoscopic cholecystectomy in patients with early cirrhosis. *Curr Surg.* 2001;58:312-315.

5. D'Alburgnerque LA, de Miranda MP, Genzini T, Copstein JL, Oliveira-e-Silva A. Laparoscopic cholecystectomy in cirrhotic patients. *Surg Laparosc Endosc.* 1995;5:272-276.

6. Bagia JS, North L, Hunt DR. Mirizzi syndrome: an extra hazard for laparoscopic surgery. *Aust NZ J Surg.* 2001;71:394-397.

7. Mattioli FP, Cagnazzo A, Razzetta F, et al. Colecistectomia laparoscopica. Analisi dei motivi per la conversione alla chirurgia convenzionale in reparto di chirurgia d'elezione. *Minerva Chir.* 1999;54:471-476.

8. Doldi SB, Marinoni M, Mozzi E, Longoni F, Zappa MA. Iatrogenic injury in videolaparoscopic cholecystectomy: difficult surgical correction biliary tract. *Hepatogastroenterology.* 1999;46:1631-1633.

9. Amarol PCG, Azaro Filho EM, Galv-ão-Neîo MP, et al. Acute cholecystitis: video-laparoscopic versus traditional treatment. *JSLS.* 2001;5:159-165.

10. Thompson MH, Benger JR. Cholecystectomy, conversion and complications. *HPB Surg.* 2000;11:373-378.

11. Greenwald JA, McMullen HF, Coppa GF, Newman RM. Standardization of surgeon-controlled variables: impact on outcome in patients with acute cholecystitis. *Ann Surg.* 2000;231:1339-344.

12. Uecker J, Adams M, Skipper K, Dunu E. Cholecystitis in the octogenarian: is laparoscopic cholecystectomy the best approach? *Am Surg.* 2001;67:637-640.

13. Glavic Z, Begic L, Simlesa D, Rukavina A. Treatment of acute cholecystitis. *Surg Endosc.* 2001;15:398-401.

14. Strasberg SM. Laparoscopic bile duct injuries. In: Eubanks WS, Swanström LL, Soper NJ, eds. *Mastery of Endoscopic and Laparoscopic Surgery.* Philadelphia, PA: Lippincott Williams & Wilkins; 2000:265-273.

15. Targarona EM, Mano C, Balague C, et al. How, when and why bile duct injury occurs. *Surg Endosc.* 1998;12:322-326.

16. Raj PK, Castillo G, Urban L. Laparoscopic cholecystectomy: fundus-down approach. *J Laparoendosc Adv Surg Tech A.* 2001;11:95-100.

17. Shapiro AJ, Costillo C, Harkabus M, North JH Jr. Predicting conversion of laparoscopic cholecystectomy for acute cholecystitis. *JSLS.* 1999;3:127-130.

18. Chahin F, Elias N, Paramesh A, Saba A, Godziachvili V, Silva YJ. The efficacy of laparoscopy in acute cholecystitis. *JSLS.* 1999;3:121-125.

19. Pisanu A, Floris G, Ambu R, Uccheddu A. Early surgical treatment of acute cholecystitis. A retrospective comparative study of the laparoscopic and open approach. *Chir Ital.* 2001;53:159-165.

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