



Changes in Gallbladder Surgery: Comparative Study 4 Years before and 4 Years after Laparoscopic Cholecystectomy

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Abstract. Operative procedures on the gallbladder and biliary ducts have undergone a profound transformation since the introduction of laparoscopic techniques in general surgery. As the benefits of minimally invasive procedures become universally known, patients are seeking surgery at an earlier stage, resulting in an increased number of cases for elective surgery and a considerable reduction in emergency operations, morbidity, need for intraoperative cholangiography (IOC), fewer common bile duct (CBD) explorations, shortened hospital stay, and reduced overall costs. The early criteria for IOC and the need for CBC explorations must be reevaluated in view of the observed changes and appropriate modifications made. Looking at the present trends, it seems that the routine use of IOC is not justified in the average patient who presents for laparoscopic cholecystectomy with no history of jaundice or pancreatitis, normal liver function tests, and a normal-size CBD on ultrasonography. Under those conditions, the chance of leaving an unsuspected stone in the CBD is less than 1%; and if it happens the stone can be easily retrieved by endoscopic sphincterotomy as an outpatient procedure.

Since the first report on laparoscopic cholecystectomy in 1986 [1] and its revolutionary acceptance in surgical centers all over the world after 1989 [2–6], radical changes have occurred in the practice of biliary tract surgery. To analyze those changes we undertook the current study, comparing our surgical practice 4 years before and 4 years after the introduction of laparoscopic cholecystectomy.

Patients and Methods

We reviewed the charts of all patients with biliary tract problems operated by us (J.C., G.R.) at the American British Cowdray Hospital in Mexico City for an 8-year period, from January 1, 1987 to December 31, 1994. The initial 4 years (1987–1990) were the years prior to laparoscopic surgery (PLC); and the remaining 4 years (1991–1994) are the years during which laparoscopic surgery (LC) was done. There were 193 cases in the PCL group and 249 cases in the LC group. The distribution by year and type of surgery is shown in Table 1.

Of the 193 operations performed during the initial 4 years, intraoperative cholangiography (IOC) was performed in 168 cases (87%). Open common bile duct (CBD) exploration for classic

indications was carried out in 36 patients (18.7%), among whom the exploration was negative for stones in 16 cases (44.4%). Three patients required choledochoduodenal anastomosis in addition to cholecystectomy and CBD exploration.

There were 59 cases (30.6%) of emergency operations and 9 instances (4.7%) of complications of surgery during the PLC period. Emergency surgery was considered when the patient was seen with acute right upper quadrant pain, fever, an elevated white blood cell (WBC) count, and an edematous, thick gallbladder wall seen on ultrasonography. These patients were usually operated on within a few hours after admission. Complications occurred in two cases of hepatic insufficiency and in one case each of atelectasis, pneumonia, pulmonary embolism, myocardial infarction, prolonged ileus, abnormal drainage of ascitic fluid, and a subhepatic collection. The last two patients required minor reoperations: one to close the drain orifice in the abdominal wall to arrest the ascitic fluid leak and the other to evacuate a small subhepatic collection. There were no instances of retained CBD stones or operative deaths during this PLC period.

The second group (LC) consisted of 249 cases of biliary tract operations, analyzed in Table 2. In this LC group, 25 patients underwent intraoperative IOC (10.4%) and 5 had CBD exploration (2.0%), two of which were done by laparoscopy (0.8%). Two patients required open choledochoduodenal anastomosis (0.8%); one was a patient with acute cholangitis and multiple CBD stones who presented 6 months after laparoscopic cholecystectomy with intraoperative cholangiography operated by another surgeon in the same hospital.

During the LC period 53 (21.3%) patients underwent emergency surgery, and there were 6 patients (2.4%) with complications: two cases of retained CBD stones and one each of postoperative hemorrhage, bile leak, prolonged ileus, and intrahepatic subcapsular biloma. The two cases of unsuspected CBD stones occurred in patients with normal liver function tests, no history of jaundice or pancreatitis, and normal CBD on ultrasonography. No IOCs were performed; for the two patients who returned with typical biliary pain 6 and 13 days after LC, the problem was solved by endoscopic sphincterotomy (ERCP) as outpatients. These procedures had a duration of 8 and 12 minutes, respectively, without complications.

One patient had a prolonged ileus of 6 days' duration, with no

Table 1. First group (prior to laparoscopic cholecystectomy).

Year	No. of cases	Open cholecystectomy and intraoperative cholangiography (no.)	Cholecystectomy (simple) (no.)
1987	48	40	8
1988	44	39	5
1989	45	35	10
1990	56	54	2
Total	193 (100%)	168 (87%)	25 (13%)

clear cause. The case of the bile leak was due to a minute perforation of the posterior wall of the cystic duct incurred during duct cannulation for the IOC. The bile leak was detected during the immediate postoperative period by observing biliary drainage via the closed-system subhepatic tube used in this case, as we do in most cases of difficult dissections. The problem was handled conservatively until the leak ceased, and the drainage system was removed 6 days later.

The patient with an intrahepatic subcapsular biloma presented 2 weeks after LC with pain in the right upper quadrant. An ultrasound scan and computed tomography (CT) scan revealed an intrahepatic collection. Under ultrasonic control and local anesthesia, 1100 ml of bile was removed by percutaneous drainage. This rare complication was reported in the surgical literature because of its unusual characteristics [7].

During the LC period only one patient (0.45%) was reoperated. It was a case of bleeding, which manifested as large amounts of fresh blood in the drainage system. The patient was scheduled for open surgery 8 hours after LC, and it was found that the two clips that had been applied to the cystic artery had fallen off. The problem was solved by applying a new clip; the defective reusable clip applicator utilized during the initial operation was discarded.

Among the 237 patients initially scheduled for LC it was necessary to convert to open surgery in 9 instances (3.8%); most of them occurred during the first year, and the reason for the conversions in all cases was lack of experience, emergency situations, or patients with difficult visualization due to previous surgery, adhesions, scarring, or fibrosis. There were no patients with lesions of the common or hepatic bile ducts.

There were only 12 cases (5%) of biliary tract operations scheduled as open procedures in the LC group: nine cases during the first year, two during the second year, one during the third year, and none during the fourth year. Of these 12 patients, 3 required open CBD exploration and 2 underwent choledochoduodenal anastomosis.

There were no deaths caused by open surgery or LC during this second period. The operative time ranged from 27 to 330 minutes (average 64 minutes) for the PLC group and 20 to 270 minutes (average 61 minutes) for the LC group. There were no differences in sex and age in the two groups. The hospitalization time was 2 to 6 days (average 4.4 days) for the PLC group and 1 to 6 days (average 1.6 days) for the LC group.

Results

While analyzing the data obtained in this comparative study of the two periods before and after laparoscopic surgery of the biliary

Table 2. Second group (laparoscopic cholecystectomy).

Year	No. of cases	Scheduled for laparoscopic cholecystectomy (no.)	Scheduled for open cholecystectomy (no.)	Conversion (no.)
1991	49	40	9	4
1992	52	50	2	1
1993	71	70	1	2
1994	77	77	0	2
Total	249 (100%)	237 (95%)	12 (5%)	9 (3.7%)

tract in the practice of two surgeons, the following facts became evident.

1. There was an increase of 30% in the total number of patients referred to surgery after LC.
2. The number of cases of emergency surgery decreased from 30.0% in the PLC group to 22.8% in the LC surgery group.
3. There was a considerable reduction in the number of IOCs, from 87% (PLC) to only 10.4% (LC).
4. The number of CBD explorations was significantly reduced from 18.5% (PLC) to only 0.8% (LC).
5. There were two cases of residual CBD stones in the LC group and none in the PLC group.
6. Morbidity was also reduced in half, from 4.6% (PLC) to 2.4% (LC).
7. There were no instances of damage to the bile ducts. The "lesions of the learning curve" did not occur in this series.
8. Hospitalization time was shortened from an average of 4.4 days (PLC) to 1.6 days (LC).
9. The number of cases scheduled for open surgery was 100% in the PLC group and only 5% in the 4 years of LC.
10. Operative times were similar in both groups, averaging 1 hour.
11. There were no deaths in either group.

Discussion

There is no question that laparoscopic surgery has radically changed the traditional practice of the general surgeon. As our data have shown, we have seen a considerable increase in the number of cases and a significant reduction in emergency surgery, IOC, CBD exploration, morbidity, and hospitalization time.

The increase of referrals is perhaps due to the fact that more information is available to the general public about the benefits of minimally invasive surgery. Hence patients with gallstones are demanding surgical treatment sooner, and medical practitioners are being forced to refer patients for operations at an early stage of the disease. This fact is probably responsible for the significant reduction in the number of emergency cases and instances of CBD exploration. It has long been known that having gallstones for longer periods predisposes to complications [8]. Hence the trend is in the direction of early surgery, with all its advantages.

The traditional concept of doing routine CBD explorations [9] in patients with abnormal liver functions tests, a history of jaundice, pancreatitis, multiple small gallstones, a large cystic duct and a CBD larger than 1 cm must now be seen in a different

perspective during this era of laparoscopic surgery. As can be appreciated in this series, following the old criteria we conducted CBD explorations in 18.5% of the patients during the 4 years of PLC; and among patients in whom we opened the CBD, the exploration was negative for stones in 44% of the cases. Thus according to the traditional criteria, we were doing unnecessary explorations of the bile ducts in a large number of cases.

Regarding the ongoing controversy of routine versus selective or no IOC, profound changes are occurring, with proponents of the three methods stating their views [10–12]. According to our experience, in which we have seen a considerable reduction of IOC (from 87% of the cases PLC to 10.4% during the era of LC) and only two documented patients with retained CBD stones among 249 with gallbladder surgery over a 4-year period), we cannot justify the added expense, time, and risks involved in routine IOC in the typical patient scheduled for LC. Our experience tells us that with normal liver function tests, no history of jaundice or pancreatitis, and normal CBD on ultrasound scans, the chances of leaving stones in the CBD are less than 1%; and if they do occur and the patients return with a typical biliary colic, the retained stone can be removed by an expert endoscopist by means of ERCP on an outpatient basis.

Even in experienced hands, IOC involves more dissection, more time, more costs, and more radiation exposure to the patient and to the operating team; moreover, the results are not always satisfactory owing to a number of factors, including technical difficulties, air bubbles, and other artifacts. Furthermore, the surgeon must ask the following questions when performing IOC: If there is a filling defect in the CBD, what should be done? Is the operating room equipped with the advanced instruments required to perform laparoscopic CBD exploration? Is the surgeon going to convert to open surgery for an air bubble? Is the surgeon adequately trained in advanced laparoscopic techniques so a CBD exploration can be done expeditiously by laparoscopy [13]? These are burning questions that must be answered as soon as more data become available concerning the significant changes in surgical practice we are witnessing.

Our current practice is that if a patient is initially seen with clinical, laboratory, and ultrasound evidence of CBD stones the patient is first examined by an endoscopist, followed by an ERCP and then by LC the next day.

Regarding the increased incidence of biliary duct lesions associated with LC—the “learning curve” reported in many initial series [14, 15]—we did not experience this dreadful complication. We believe the explanation is simple: adequate training by two Board-certified surgeons who took three courses on LC in animals before starting clinical practice and strict adherence to the guidelines for laparoscopic surgery at our hospital, which are basically those proposed by SAGES [16] and the American College of Surgeons [17].

Résumé

Les techniques chirurgicales utilisées pour la chirurgie biliaire ont connu des changements radicaux depuis l'introduction de la chirurgie laparoscopique. Au fur et à mesure que les avantages des procédés peu invasifs deviennent connus universellement, les patients eux-mêmes cherchent à se faire opérer à un stade plus précoce. Ceci augmente alors le nombre de patients opérés à

froid, diminuant le nombre d'interventions nécessaires en urgence, la morbidité, la nécessité de pratiquer une cholangiographie per-opératoire (CPO), le besoin d'explorer la voie biliaire principale (VBP), la durée d'hospitalisation et les coûts. Les indications du temps jadis de la CPO et de l'exploration de la VBP doivent être revues et actualisées. En tenant compte des tendances actuelles, il paraît que la CPO de routine n'est plus justifiée chez le patient d'aujourd'hui qui se présente pour une cholécystectomie laparoscopique (CL) sans antécédent d'ictère ou de pancréatite, avec des tests hépatiques normaux et une VBP de taille normale à l'échographie. Dans ces conditions, les chances de laisser en place un calcul insoupçonné dans la VBP est inférieure à 1% et si cet incident se produit, le calcul peut généralement être retiré par la sphinctérotomie endoscopique pratiquée en ambulatoire.

Resumen

Los procedimientos operatorios sobre la vesícula biliar y los canales biliares han sufrido una transformación profunda desde la introducción de las técnicas laparoscópicas a la cirugía general. En la medida que los beneficios de los procedimientos mínimamente invasores son conocidos universalmente, los pacientes solicitan la cirugía en fases tempranas de su enfermedad, lo cual resulta en un número creciente de casos de cirugía electiva y en una considerable reducción de las operaciones de emergencia, así como de la morbilidad, de la necesidad de realizar colangiogramas intraoperatorios (CIO), de la incidencia de exploraciones de la vía biliar (EVB), de la estancia hospitalaria y de los costos globales. Los viejos criterios para realizar CIO y para determinar la necesidad de EVB deben ser reevaluados a la luz de los cambios y modificaciones ocurridas. Al contemplar las tendencias actuales parece que el uso rutinario de CIO no se justifica en el paciente común que se presenta a colecistectomía laparoscópica sin historia de ictericia o de pancreatitis, con pruebas de función hepáticas normales y con un colédoco normal en el ultrasonido. Bajo tales condiciones, las posibilidades de dejar un cálculo no sospechado en el colédoco son menores a 1% y si esto ocurre, el cálculo puede ser fácilmente removido mediante esfinterotomía endoscópica practicada como procedimiento de consulta externa.

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Invited Commentary

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I was interested to read this article and would like to comment, step by step, on the rationale used by the authors. (1) Laparoscopic cholecystectomy is the first choice of treatment for symptomatic gallstones. (2) The benefits of the mini-invasive surgery make patients consult earlier for surgical treatment. (3) The traditional criteria of preoperative cholangiography (PC) must be modified or even abolished because its higher risk and cost, and it is a time-consuming operation.

1. Laparoscopic cholecystectomy. Since 1994 laparoscopic cholecystectomy is accepted as the gold standard for treatment of symptomatic gallstones [1]. Indeed, several large series have demonstrated morbidity and mortality rates similar to those obtained by the classic approach. The advantages of the mini-invasive approach are a shorter postoperative stay and an earlier return to normal activities.

2. Nevertheless, the good results achieved in young patients suffering from uncomplicated gallstones and the harmlessness of the operation itself do not justify the argument to operate on asymptomatic lithiasis in order to avoid potential complications [2]. Laparoscopic cholecystectomy has been performed in our department since 1990. During this time we have not observed any increase in the number of cholecystectomies per year. The arrival of the laparoscopic area has changed neither the natural history of this pathology nor the operative indications.

3. The discussion about PC has existed for a long time in regard to open cholecystectomy, and the attitude of each surgeon was

mostly influenced by "school philosophies" and good common sense. Those surgeons who advocate routine PC do so in order to avoid residual gallstones and to obtain a complete map of biliary drainage. During laparoscopic procedures this might be of great interest because it allows one to detect anatomic variations of the biliary tree and to avoid or recognize immediately iatrogenic lesions of the main biliary trunk. Residual stones are rare, but should you ignore them, removing them by endoscopic sphincterotomy (ERCP)? Does an unsuccessful ERCP lead us to reoperation? Teams performing systematic PC by the laparoscopic approach do not report important iatrogenic complications or a significant increase in operation time. In terms of cost, Liberman et al. [3] have reported a study comparing laparoscopic cholecystectomy plus PC with laparoscopic cholecystectomy plus ERCP, showing a better cost-effectiveness rate for the first group. This report makes us believe that PC must be employed in a larger number of patients, especially if there is any doubt about the surgical anatomy.

In conclusion, laparoscopic cholecystectomy is a procedure that any general surgeon should be able to employ. The utilization of PC should be adapted to the surgical environment (adequate material, good endoscopists, and the history of the patient).

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