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Routine versus Selective Intra-Operative Cholangiography during Laparoscopic Cholecystectomy

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Opinion is divided whether intra-operative cholangiography should be performed routinely or on a selective basis during laparoscopic cholecystectomy. We therefore performed the first prospective randomized trial of static cholangiography in patients who did not have indications for cholangiograms. Laparoscopic cholecystectomy was attempted on 164 consecutive patients, of whom 49 (30%) patients were excluded from the trial due to indications for or against cholangiography. In the remaining 115 (70%) patients, 56 were randomized to the cholangiography group while 59 patients did not receive cholangiograms. Duration of postoperative hospitalization and interval to return to full activity were identical in the two groups. Static cholangiograms added 16 ± 1 min (mean ± SEM) to the procedures ($p < 0.01$). Cholangiography increased the total charges for the operation by almost $700 ($p < 0.01$). Cholangiograms were performed successfully in 94.6% of the patients and changed the operative management in 4 (7.5%) patients. There was 1 (1.9%) false negative study. Intra-operative cholangiography did not reveal aberrant bile ducts at risk of injury from the operative dissection. There was no mortality or cholangiogram-related morbidity in either group. In follow-up ranging from 2–12 months, there has been no clinical evidence of bile duct injury or retained common bile duct stones. In summary, in patients *without* indications for cholangiography, the performance of static cholangiograms markedly increased the operative time and cost of laparoscopic cholecystectomy. The operative management of a minority of patients was changed by the information obtained, but laparoscopic cholecystectomy may be performed safely in the absence of cholangiograms with little risk of injury to the major ductal system or retained calculi.

Since first described by Mirizzi [1] in 1932, the issue of whether to perform cholangiography selectively or on a routine basis during cholecystectomy has been debated fervently by surgeons. The proponents of cholangiography during traditional open cholecystectomy state that the anatomic "road map" thus obtained reduces the incidence of bile duct injuries and diminishes the incidence of retained choledocholithiasis [2]. Other surgeons have argued that routine application of intra-operative cholangiography during open cholecystectomy unnecessarily increases the duration and cost of the operation, results in a finite risk of iatrogenic ductal injury, and has little impact on the incidence of retained common bile duct stones [3]. In recent years, laparoscopic cholecystectomy has become the new "gold standard" technique for removing the gallbladder and the debate about the appropriateness of cholangiography has been rekindled [4–6].

Since initiating a clinical program of laparoscopic cholecystectomy in November 1989, the author practiced selective application of cholangiography. Using standard selection criteria, intra-operative cholangiograms were obtained in approximately one-third of all operations to assess ductal status and to develop technical facility in their performance [4]. Beginning in April 1991, a randomized prospective trial of cholangiography in those patients who did *not* have indications for cholangiography was initiated. The aims of the present study were to assess the safety, utility and cost of intra-operative cholangiography performed using standard static radiographic imaging during laparoscopic cholecystectomy.

Patients and Methods

Patients

From April 1991 to February 1992, 164 consecutive patients underwent attempted laparoscopic cholecystectomy. All patients were considered to be candidates for general anesthesia, laparoscopy, and cholecystectomy. There were 46 (28%) men and 118 (72%) women ranging in age of 22–84 yrs (mean ± SEM, 51 ±1 yr) and weighing 44–150 kg (77 ± 1 kg). Patients with compelling reasons for or against the performance of cholangiography were not entered into the randomized trial. The prospectively determined exclusion criteria (Table 1) included both pre-operative and intra-operative variables.

Methods

Laparoscopic cholecystectomy was performed using a standardized technique which has been described previously [7]. In brief, a "four-puncture" approach used with a video laparoscope placed through an umbilical port and three laparoscopic sheaths inserted into the right subchondrium for operative manipulation of the gallbladder and porta hepatis. The infundibulum of the gallbladder was carefully dissected to expose the

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Table 1. Exclusion criteria for intra-operative cholangiography.

Not indicated
Pregnancy
Severe allergy to iodinated contrast material
Indicated
Pre-operative factors
ERCP ± sphincterotomy
Ultrasonographic findings
Dilated common bile duct (>6 mm)
Choledocholithiasis
History of jaundice or pancreatitis
Elevated serum liver enzymes[a]
Intra-operative factors
Unclear anatomy
Conversion to open cholecystectomy
Dilated cystic duct (>4 mm)
Cystic duct stones

[a]Liver enzymes: Bilirubin, alkaline phosphatase, transaminases.
ERCP: Endoscopic retrograde cholangiogram

junction of the gallbladder with the proximal cystic duct. A short length of cystic duct was dissected from the surrounding tissues and a curved dissecting instrument passed around it to gauge its size. If the cystic duct >4 mm in diameter or if the patient was randomized to undergo cholangiography, a cholangiocatheter was then inserted and cholangiograms performed as described below. When cholangiography was not performed, attempts were made to dissect the cystic duct close to its junction with the common bile duct.

Early in our experience, the cystic duct was then doubly clipped with 9 mm titanium clips and divided. Subsequently, unsuspected cystic duct stones were discovered during performance of the cholangiograms leading to a modification of the technique. We now place a clip across the junction of the cystic duct with the gallbladder and incise the anterolateral wall of the cystic duct. An atraumatic dissecting forceps is then used to palpate and squeeze the cystic duct gently, beginning near its junction with the common bile duct and "milking" the duct toward the cystic ductotomy (Fig. 1). After dissecting the duct completely or demonstrating normal cholangiograms, the duct was controlled and divided, the cystic artery dissected, doubly clipped and divided, and the gallbladder removed from its hepatic bed using electrocautery.

Cholangiograms were obtained after catheterizing the cystic duct. In most cases, the duct was intubated using a 4 Fr ureteral catheter placed through a cholangioclamp (Storz Endoscopy-America, Culver City, California, U.S.A.) that was inserted through the lateral subcostal port while placing traction on the gallbladder with a clamp placed through the mid-clavicular port. The catheter was inserted 1–2 cm into the duct, the jaws of the clamp were advanced over the incision in the cystic duct and closed, thereby securing the catheter and preventing leakage of contrast material. When free flow of contrast was not achieved using this technique, a stiff 4 or 5 Fr catheter was placed either through a hollow, gasketed needle guide or through a 14 g angiocatheter, inserted into the cystic duct, and anchored in place using a clip placed gently across the duct while flushing the catheter to ensure patency (Fig. 2).

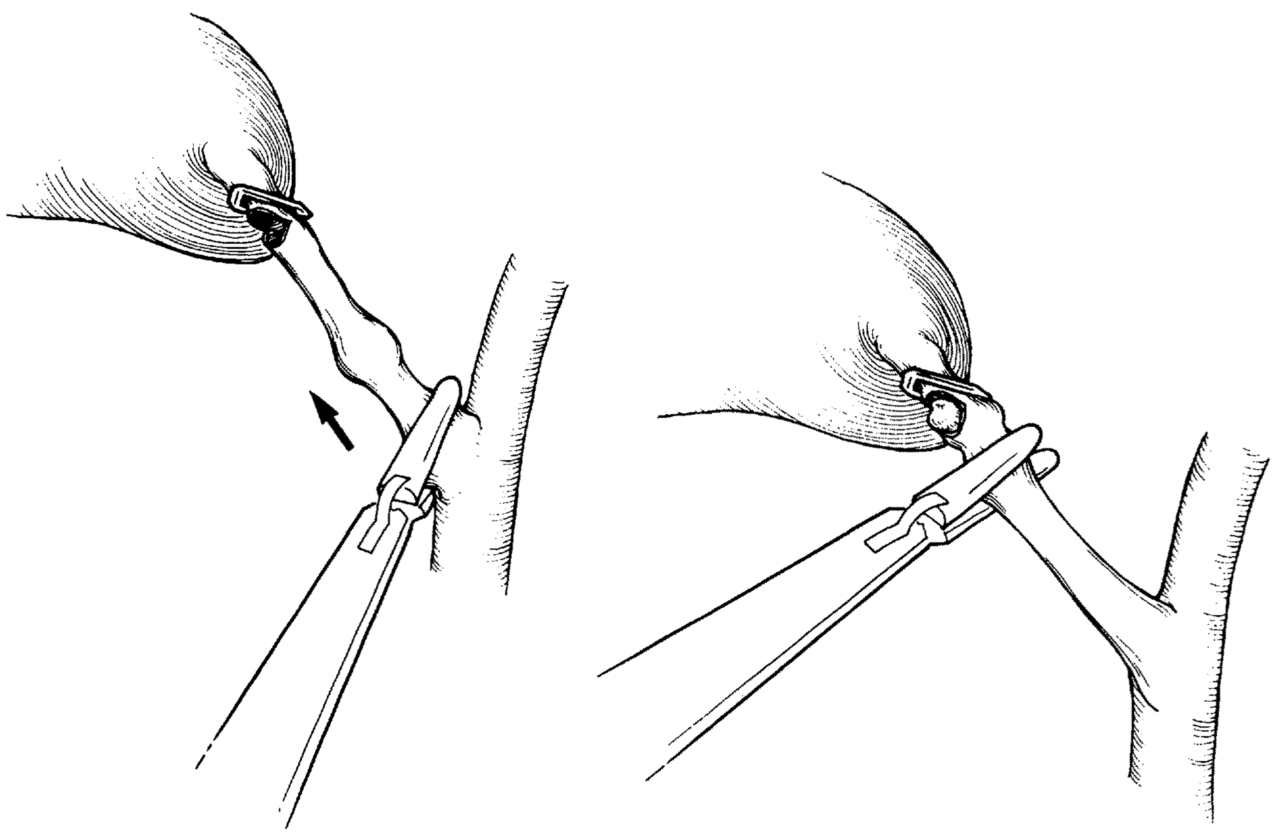
Cholangiograms were obtained using a General Electric portable x-ray unit and static radiographic techniques. Two films were initially obtained, using a small volume (3–5 ml) and then a larger volume (10–15 ml) of 30% diatrizoate meglumine (Hypaque, Winthrop Pharmaceuticals, New York, New York, U.S.A.) while interrupting patient respiration. When there was no flow of contrast material into the duodenum, the films were repeated after intravenously administering 1 mg of glucagon. Alternatively, if the proximal intrahepatic ducts were not visualized, the patient was administered 2–4 mg of morphine sulfate intravenously and the cholangiogram was repeated with additional contrast material while placing the patient in a slight Trendelenburg position.

Patients were randomly assigned to the "cholangiography" or "no cholangiography" groups using a random numbers table. Data which were recorded included duration of operation (from skin incision to skin closure), time to obtain the cholangiogram (from placement of the first clip to division of the cystic duct), total cost of the operation (cost of supplies, professional fees [surgeon, radiologist, anesthesiologist], technical fees, and operating room charge per minute of elapsed time), pertinent cholangiographic findings, the occurrence of intra-operative and postoperative complications, duration of postoperative hospitalization, serum liver enzymes (total bilirubin, alkaline phosphatase, serum glutamate oxalate transaminase) obtained at 1 day and 30 days following cholecystectomy, postoperative interval to resumption of normal activity or employment, and postoperative evidence of retained common bile duct stones. All patients were admitted to the hospital the evening following surgery and were discharged when tolerating oral feedings and experiencing minimal abdominal discomfort. All patients were examined in the outpatient office at 1 month postoperatively and subsequently as clinically indicated. Comparisons between the groups were assessed statistically using Student's unpaired t-test or chi square analysis where appropriate. All summary values in the text are expressed as mean ± SEM.

Results

Of the 164 patients undergoing attempted laparoscopic cholecystectomy, 49 (30%) were excluded from the prospective randomized trial. It was elected not to perform cholangiograms in a 42 year old woman in the 14th week of a normal intrauterine pregnancy with severe biliary colic and no evidence of choledocholithiasis. The remaining 48 patients met our criteria for cholangiography: pre-operative endoscopic retrograde cholangiopancreatography (ERCP) in 14 (8.5%) patients; history of elevated serum liver enzymes, jaundice or pancreatitis in 13 patients; dilated cystic duct in 7 patients; unclear anatomy in 9 patients, with conversion to open cholecystectomy in 4 of these patients; dilated common bile duct in 3 patients; and visible cystic duct stones in 2 patients.

The remaining 115 (70%) patients were entered into the randomized cholangiography trial (Table 2). In this study group, there were 30 (26%) men and 85 (74%) women, ranging in age from 22–81 yrs (49 ± 1 yr). Fifty-nine patients were randomized not to receive cholangiograms while 56 were randomized to the cholangiography group. There were no differences between the two groups in regard to patient age, weight, or gender ratio. There was no mortality in the peri-operative period in any patient. One patient in the cholangiogram group required reoperation on the second postoperative day for a jejunal perforation caused by introduction of the umbilical trocar. There was



A B

Fig. 1A. In patients not undergoing cholangiography, a clip is placed across the junction of the gallbladder with the cystic duct. **B.** A cystic ductotomy is then made and the cystic duct is gently "milked" back toward the ductotomy to diagnose and remove cystic duct stones.

no documented injury to the common bile duct in either group. Postoperative determination of serum liver enzymes revealed no significant differences between the groups. The duration of postoperative hospitalization (mean of 1 day) and interval to return to employment or full activity (mean of 9 days) was the same in both groups.

Cholangiography increased the duration of operation from 78 ± 3 minutes without cholangiograms to 94 ± 3 minutes with cholangiograms ($p < 0.01$), for a difference of 16 minutes (Fig. 3). This difference in operative (and anesthesia) time coupled with the additional cost for supplies, professional, and technical fees increased the cost of operation from \$3425 ± 34 to \$4115 ± 32 ($p < 0.01$; Fig. 4).

In the group randomized to receive intra-operative cholangiograms, cholangiography was unsuccessful in 3 (5.4%) of the 56 patients. In 2 patients, the cystic duct was avulsed near the junction with the common bile duct and could not be cannulated (Table 3). The cystic duct stumps were ligated without further sequelae. In the other patient, the external diameter of the cystic duct was <1 mm and the lumen could not be intubated despite repeated attempts. In the 53 patients undergoing successful cholangiography, the cholangioclamp was used in 49 patients and the catheter/clip technique was employed in the other 4 patients. The standard number of 2 static images was considered to be adequate in 43 of the patients whereas 10 patients required 3–4 films to display the ductal system adequately. Either morphine sulfate or glucagon was administered to 4 (7.5%) patients to optimize the radiographic images. The time required to perform intra-operative cholangiography was 24 ± 1 minutes.

Relevant information was obtained from the intra-operative cholangiograms in 8 (14%) patients. Cystic duct stones not previously appreciated were demonstrated and removed in 2 patients. In 2 additional patients, filling of the gallbladder with the radiographic contrast material was evident (Fig. 5), indicating the presence of an aberrant biliary communication with the gallbladder. In one patient a previously appreciated short cystic duct (<1 cm) was demonstrated, but in no patient was an abnormal ductal system demonstrated requiring change of the operative technique. Likewise, there were no instances of aberrant ducts at risk of injury from the dissection. In 4 (7.5%) patients filling defects were visualized within the ductal system. These were interpreted as air bubbles in 3 of the patients both by the surgeon and by the radiologist. In the other patient, a filling defect was not appreciated by the surgeon but was interpreted retrospectively as a small (3 mm) ductal stone. In the 12 months since operation, this patient has had no symptoms of biliary colic and postoperative ultrasonography and serum liver enzymes have been normal. Therefore, there was 1 (1.9%) false negative study which has not been clinically significant.

Information obtained from the cholangiograms changed the intra-operative management of 4 (7.5%) patients. In the 2 patients demonstrating cystic duct stones, the calculi were

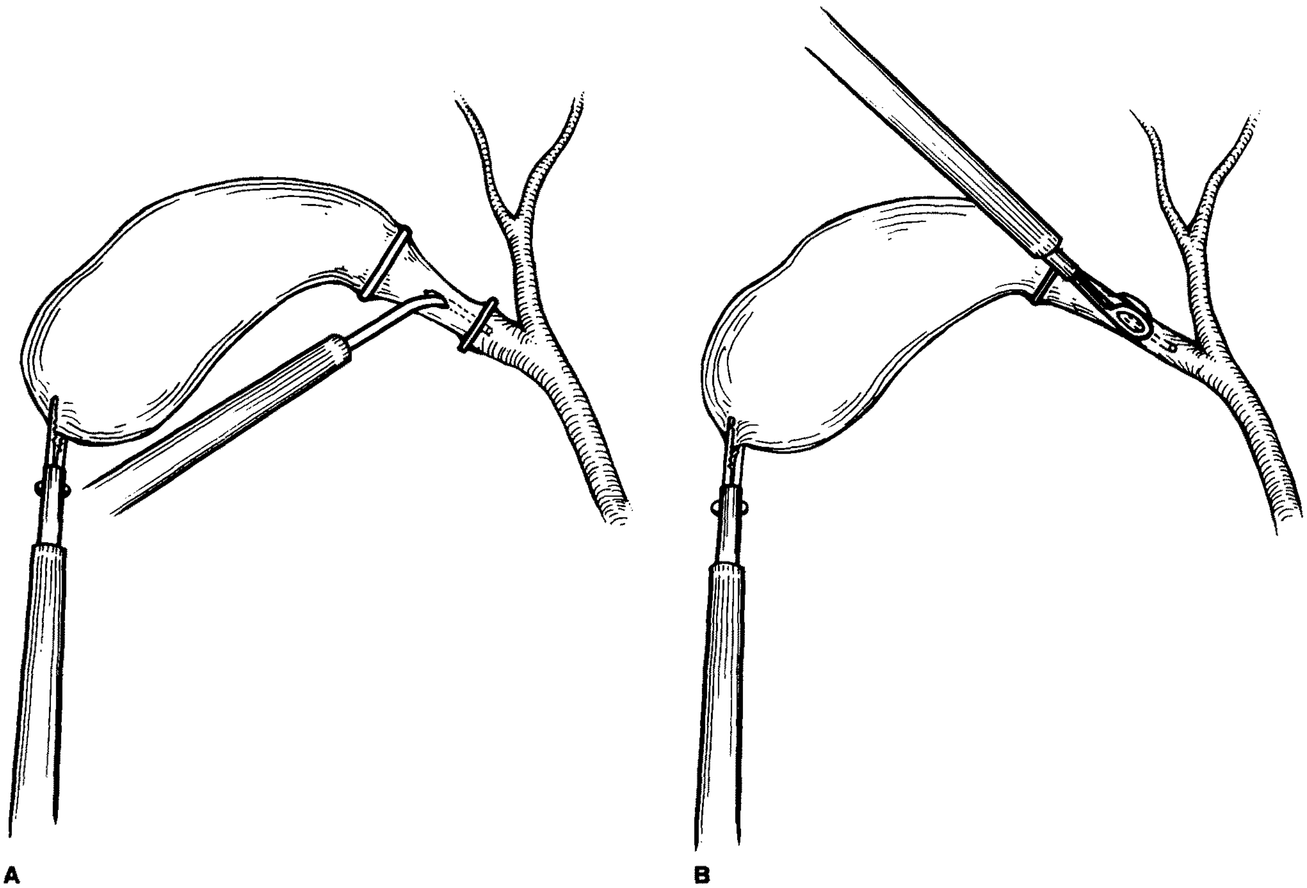


Fig. 2. Schematic illustrations of two techniques to perform cystic duct cholangiograms A. using a catheter clipped into place or B. by the use of a cholangiography clamp. Reprinted with permission [7].

Table 2. Study group data (n = 115).

Clinical characteristic	No intra-operative cholangiography (n = 59)	Intra-operative cholangiography (n = 56)
Age (yrs)	48 ± 2	51 ± 2
Wt (kg)	76 ± 2	78 ± 3
Female gender (%)	75	73
Total bilirubin, POD #1 (mg/dl)	0.8 ± 0.1	0.7 ± 0.1
Alkaline phosphatase, POD #1 (IU/l)	77 ± 3	81 ± 5
Postoperative hospitalization (days)	1.0 ± 0.1	1.0 ± 0.1
Postoperative interval to return to employment (days)	9.2 ± 0.6	9.4 ± 0.9
Mortality	—	—
Major morbidity (%)	—	1.8

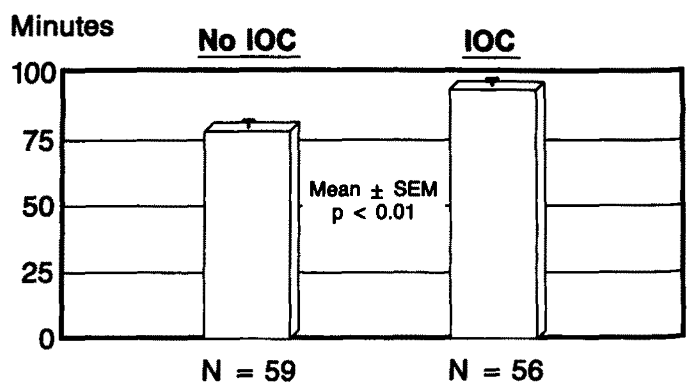


Fig. 3. Duration of operation in patients undergoing laparoscopic cholecystectomy. Operative time increased from 78 ± 3 min without cholangiograms to 94 ± 3 min with cholangiograms ($p < 0.01$). IOC: Intra-operative cholangiography.

removed laparoscopically. In the 2 individuals whose gallbladders filled with contrast material, great care was taken during dissection of the gallbladder from its bed. In one of these patients an aberrant tubular structure was identified entering the posterior aspect of the gallbladder fundus, which was clipped and divided. Both of these patients had closed suction drainage catheters placed into the right upper quadrant, there was no bile in the drain output and the drains were removed on the first postoperative day without sequelae.

At 1 month postoperatively, all patients in both groups were doing well with normal levels of total bilirubin and alkaline phosphatase. In the postoperative interval, ranging from 2–12

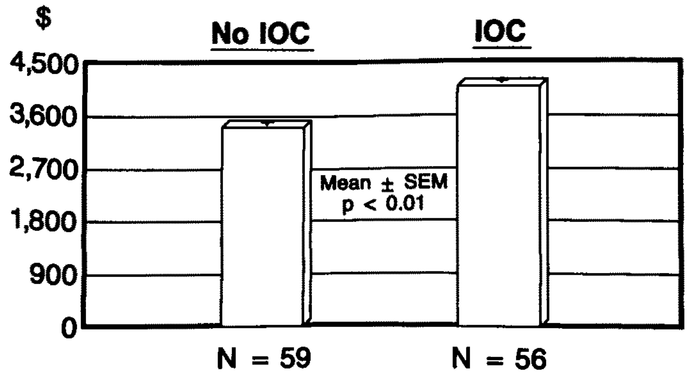


Fig. 4. Cost of operation in patients undergoing laparoscopic cholecystectomy. The total cost increased from \$3,425 ± 34 without cholangiography to \$4,115 ± 32 with cholangiography ($p < 0.01$). IOC: Intra-operative cholangiography.

Table 3. Results of intra-operative cholangiography (n = 56).

Result	No. of pts.
Failed	3 (5.4%)
Avulsed cystic duct	2
Obliterated cystic duct	1
Technique (n = 53)	
Cholangioclamp	49
Catheter inserted/clipped	4
Number of x-ray films obtained	
2	43
3	7
4	3
Drugs administered to improve visualization	
MSO_4	3
Glucagon	1
Time to obtain (min)	24 ± 1

months, there have been no instances of biliary colic nor clinical evidence of retained common bile duct stones.

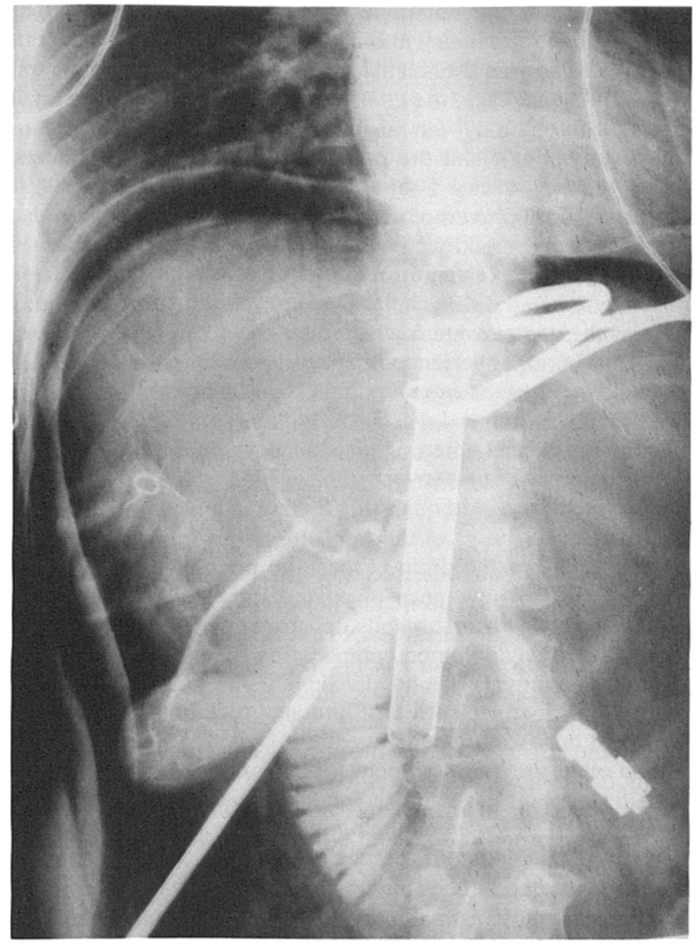


Fig. 5. Static radiographic film obtained after injecting contrast into the cystic duct during laparoscopic cholecystectomy. The ductal system appears normal, but contrast can be seen filling the gallbladder and outlining faceted gallstones.

Discussion

The current study corroborates our previous findings that laparoscopic cholecystectomy may be performed safely with or without cholangiography. There were no bile duct injuries in either group and no mortality was seen. It must be emphasized that 14 (8.5%) patients underwent pre-operative ERCP for suspected or proven common bile duct stones and that 30% of the total group were excluded from the randomized study due to compelling reasons for or against cholangiography. Also, the duration of follow-up was brief and it is possible that retained stones may become apparent in the future.

Using the techniques described herein, cholangiography did not result in any iatrogenic injuries. In 2 patients, the cystic duct was torn and was unable to be cannulated, but the proximal duct (adjacent to the common bile duct) was ligated effectively in all cases. In 3 (5.4%) of the patients selected for cholangiography, it was not technically possible due to a fibrotic duct or cystic duct avulsion. These results are similar to the failure rates of 5.1% and 9% previously reported by Berci and coworkers [4] and by Flowers and associates [6], respectively. It has been suggested that intra-operative cholangiography during open cholecystectomy may result in injury to the bile duct in a small percentage of patients [8]; we did not find this to be the case during laparoscopic cholangiography in our patients.

The rationale for performing cholangiography routinely during laparoscopic cholecystectomy is to prevent injury to the main biliary tree, to detect anomalies which may change the operative strategy, and to document the presence or absence of common bile duct stones. We feel that cholangiography is only one component of the operative strategy to prevent bile duct injuries during laparoscopic cholecystectomy. The most critical technical maneuver during laparoscopic cholecystectomy is to dissect the infundibulum of the gallbladder from both the ventral and dorsal aspects of Calot's triangle and thereby demonstrate the cystic duct arising in continuity from the gallbladder neck [7]. Although previous studies of bile duct injuries following open cholecystectomy suggested duct injury to occur much more frequently when cholangiograms were not performed [9], the data from the current randomized study as well as results published previously from our institution [4] and those of other surgeons [10] support the concept that it is possible to perform laparoscopic cholecystectomy safely when cholangiograms are not done routinely. There has been one common bile duct injury in our entire series that occurred due to introduction of a cholangiocatheter into the common bile duct [7]. In that case, the cholangiogram was obtained because of unclear anatomy (an absolute indication for performing cholangiography), and the patient was opened and the ductal injury repaired over a T-tube. Therefore, the cholangiogram in that individual prevented a catastrophic bile duct injury that could have occurred by mistaking the common bile duct for the cystic duct and excising it in continuity with the gallbladder.

It is often stated that cholangiography will display abnormalities of the ductal system which alter the conduct of cholecystectomy. In our experience, this has rarely been the case. In no case did we demonstrate major aberrant ducts that were at risk for operative injury. In 2 (3.8%) patients undergoing cholangiography contrast entered the gallbladder, indicating an abnormal communication between the gallbladder and the intrahepatic biliary tree. Although this finding stimulated us to insert closed suction drains in the right upper quadrant, no bile was demonstrated in the drain output and none of the patients in either group had evidence of postoperative bile leaks. In the experience of other surgeons, postoperative bile leaks have been a relatively common complication following laparoscopic cholecystectomy [11], and division of the so-called ducts of Luschka or inadvertent entry into superficial bile ducts in the liver bed may lead to such events.

The other primary argument for performing cholangiography is to discover unsuspected choledocholithiasis and minimize the incidence of retained common bile duct stones. Using our selective cholangiogram approach, we have previously reported an incidence of retained common bile duct stones of 0.2% [4]. In the current study, a small common bile duct stone appreciated only postoperatively (false negative rate of 1.9%) has not resulted in symptoms or signs over the ensuing 12 months of follow-up. In no other patients were common bile duct stones demonstrated by cholangiography, and no clinical evidence of choledocholithiasis has surfaced in the patients being operated without cholangiography. We assume that this low incidence of choledocholithiasis and retained common bile duct stones stem from our liberal use of selective cholangiograms, as well as our referral pattern with many patients receiving pre-operative ERCP for suspected common bile duct stones. Findings on intra-operative cholangiography may change the conduct of the operation. In our experience, the operation was modified in 4 (7.5%) of the patients receiving cholangiography due to radiologic contrast material entering the gallbladder and unsuspected stones within the cystic duct. However, it should be noted that in the 59 patients not undergoing cholangiography there was no occurrence of clinically evident bile leak or retained ductal stones.

In our experience, intra-operative cholangiograms performed using standard static radiographic techniques and a portable x-ray unit were time consuming and expensive. The mean time to obtain cholangiograms was 24 min (although only adding 16 min to the total operative time) and the additional cost of cholangiography was approximately $700 per patient. These figures are similar to those reported by Flowers and colleagues [6], with a mean time of 20 min and cost of $300 (which did not include the extra $280 added to the surgeon's fee) for cholangiography during cholecystectomy. Using static techniques, the operator is injecting blindly and not infrequently the radiographs demonstrate catheter dislodgement or inadequate ductal opacification, requiring additional time and repeated films. This occurrence is naturally frustrating to the surgeon. Due to this time factor, there is a hesitancy to repeat films when the study is technically suboptimal.

Whether or not surgeons choose to perform cholangiography on a routine or selective basis during laparoscopic cholecystectomy, they must develop the technical facility to do so when needed [12]. Therefore, it is imperative to learn a number of different techniques for cystic duct cannulation and perfect these maneuvers early in one's operative experience to master the techniques. We have used a cholangioclamp inserted through the axillary port to direct and stabilize the cystic duct catheter in most cases. However, insertion of the catheter either through a hollow introducer tube or a separate puncture in the epigastrium [13] is sometimes preferable. Ancillary techniques should be considered if visualization of the ductal system is inadequate, including administration of morphine sulfate (to contract the sphincter of Oddi and thereby fill the intrahepatic ducts) or administration of glucagon (to relax the sphincter) [14].

Based on our experience and theoretical considerations, we believe additional dissection of the cystic duct should be performed in patients who do not undergo operative cholangiography. It is important to dissect a longer segment of the cystic duct in an attempt to visualize its junction with the common bile duct and to open and "milk" the cystic duct gently to discover and remove unsuspected cystic duct stones. We have demonstrated that it took an average of 24 min to perform laparoscopic operative cholangiography. The mean difference in operative time between patients who underwent cholangiography and those who did not, however, was only 16 min. We assume that the unaccounted operating time in cases without cholangiography was spent performing this additional cystic duct dissection.

As stated above, surgeons performing laparoscopic cholecystectomy must dissect the neck of the gallbladder and cystic duct meticulously. Patients may require cholangiography on the basis of pre-operative investigations or due to intra-operative findings. These latter criteria include a dilated cystic duct, the presence of cystic duct stones, and most importantly, unclear anatomy in the region of the porta hepatis. An additional benefit of gaining operative experience in this area is the ability to progress technically towards trans-cystic duct extraction of unsuspected common bile duct stones [13, 15, 16], techniques which require manual dexterity and the desire to discover such stones intra-operatively.

A major question which is raised by this study is whether static cholangiography should ever be utilized in this era of improving technology and cost containment. We have shown these techniques to be time consuming, expensive, and clinically irrelevant in most patients who have no indications for obtaining cholangiograms. Other authors have championed the use of fluoroscopic radiographic techniques for this purpose [5, 17]. The advantages of fluoroscopic cholangiography would include "real time" visualization of the ductal system (thereby decreasing the incidence of false positive and false negative examinations), a diminution of operative time, and the ability to place baskets or balloons into the common bile duct for extraction of common bile duct stones under fluoroscopic guidance [13, 15, 16].

In summary, we have shown static cholangiographic techniques to increase markedly the operative time and cost of laparoscopic cholecystectomy. After excluding 30% of all patients who met the criteria for cholangiography, little additional information was gained, but in 7.5% of the patients the operative management was changed slightly. Laparoscopic cholecystectomy without cholangiograms can therefore be performed safely with little risk of injury to the major ductal system. The technical ability to perform cholangiography must be developed by each surgeon early in his experience and applied when needed. We would recommend that surgeons working in hospitals where only static radiographic facilities are available apply intra-operative cholangiograms on a selective basis as long as meticulous operative dissection techniques are utilized. For those surgeons with fluoroscopic equipment available, the use of routine intra-operative cholangiography may be preferable.

Résumé

Les avis sont partagés quant à la pratique systématique, ou seulement élective, d'une cholangiographie lors de la cholécystectomie coelioscopique. Nous avons mené le premier essai randomisé prospectif de cholangiographie peropératoire chez des patients n'ayant pas d'indication formelle de cholangiographie. Dans une série de 164 cholécystectomies coelioscopiques consécutives, 49 patients (30%) ont été éliminés de l'étude parce qu'il existait une indication ou une contreindication formelles à la cholangiographie peropératoire. Les 115 patients restants (70%) ont été randomisés; 56 ont eu une cholangiographie alors que 59 n'ont pas eu de cholangiographie peropératoire. La durée de l'hospitalisation postopératoire et le délai entre l'intervention et la reprise de travail étaient similaires dans les deux groupes. La cholangiographie a prolongé l'intervention de 16 ± 1 min (moyenne ± écart type de la moyenne) ($p < 0.01$). Le coût supplémentaire d'une cholangiographie peropératoire a été estimé à environ 700 $ US ($p < 0.01$). La cholangiographie a pu être effectuée chez 94.6% des patients, et celle-ci a changé la tactique opératoire chez 4 (7.5%) patients. Il y a eu un résultat faussement négatif (1.9%). La cholangiographie peropératoire n'a pas montré d'anomalie anatomique des voies biliaires pouvant les compromettre lors de la dissection. La mortalité a été nulle dans chaque groupe. De même, il n'y a eu aucune morbidité en rapport direct avec la cholangiographie. Dans la période du suivi allant de 2 à 12 mois, il n'y a eu acune lésion biliaire ni de lithiase résiduelle de la voie biliaire cliniquement évidentes. En conclusion, chez un patient *sans* indication formelle de cholangiographie, la réalisation d'une cholangiographie peropératoire augmente considérablement la durée et le coût de l'intervention. La tactique opératoire a été très peu influencée très peu par les donées de la cholangiographie. La cholécystectomie coelioscopique peut être réalisée sans cholangiographie peropératoire systématique sans augmenter pour autant le risque de lésions des voies biliaires ou de calcul résiduel.

Resumen

Las opiniones se encuentran divididas respecto a si se debe realizar colangiografía intraoperatoria en forma rutinaria o en forma selectiva en el curso de una colecistectomía laparoscópica. Por ello hemos realizado el primer estudio aleatorizado de colangiografía estática en pacientes que no tenían indicaciones para colangiograma. Se intentó la colecistectomía laparoscópica en 164 pacientes consecutivos; 49 (30%) fueron excluidos debido a indicaciones en favor o en contra de colangiografía. Los otros 115 pacientes (70%) se repartieron al azar 56 a colangiografía y 59 al grupo de no colangiografía. La duración de la hospitalización postoperatoria y del tiempo de retorno a actividad normal fueron idénticos en los dos grupos. Los colangiogramas estáticos añadieron 16 ± 1 min. al procedimiento ($p < 0.01$) y elevaron el costo de la operación en $700 ($p < 0.01$). Los colangiogramas fueron exitosamente realizados en 49.6% de los pacientes y modificaron el manejo operatorio en 4 (7.5%); hubo un falso positivo (1.9%). La colangiografía intraoperatoria no reveló la prescencia de canales biliares aberrantes en riesgo de lesión por la disección opeatoria. No hubo mortalidad o morbilidad relacionada con la colangiografía, y en un seguimiento de 2–12 meses no se registró evidencia clínica de lesión de canales biliares o de cálculos retenidos en el colédoco. En resumen, en pacientes sin indicaciones para colangiografía, la realización de colangiogramas estáticos aumentó notoriamente el tiempo operatorio y el costo de la colecistectomía laparoscópica. Aunque el manejo operatorio de una minoría de pacientes sí fue modificado por la información obtenida, se considera que la colecistectomía laparoscópica puede ser practicada en forma segura en ausencia de colangiogramas con mínimo riesgo de lesión del sistema biliar o de cálculos retenidos.

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Invited Commentary

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One of the problems that continues to generate controversy among laparoscopic surgeons concerns intraoperative cholangiography (I.O.C.). Should it be performed routinely, selectively, or perhaps not at all?

The protagonists in favour of *routine* intra-operative imaging of the bile ducts have 3 arguments [1, 2]. First, by clarifying the anatomy of the extrahepatic and possibly aberrant bile ducts, injuries should be prevented; and if perchance they have already occurred, they should be discovered immediately. Second, "unexpected", silent stones in the ducts will be detected and can then be dealt with. Third, the routine use of I.O.C. provides the practice required to perform this investigation expeditely if required.

Those who practice I.O.C. selectively counter with the following 4 statements [3, 4]. First, I.O.C. cannot be performed for technical reasons in 5% to 9% of patients, even in experienced hands. Second, I.O.C. is no guarantee against bile duct injury, as witness the reports by protagonists of the investigation. It is only one of several steps in avoiding this calamity and it cannot replace the meticulous dissection of Callot's triangle. In fact, injuries have been caused (albeit rarely) by the cholangiography catheter itself [5]. Third, false-positive and false-negative findings during I.O.C. only confirm the old axiom that there is no 100% fool-proof method for detecting common duct stones [6]. Fourth, the (uncertain) advantages of I.O.C. have to be weighed against the increase in operating time and cost.

In this paper the authors have shown that laparoscopic cholecystectomy can be safely performed with or without cholangiography, and so they plead for selective application of this modality. The only flaw in this investigation and its conclusion is the fact that only a static x-ray unit was available. The argument concerning the cost and time factors will lose some of its cogency if fluoroscopic radiography were available [1].

However, in this commentator's experience, based on more than 800 consecutive laparoscopic cholecystectomies, the selective use of fluoroscopic I.O.C. has also brought good results with no ductal injuries, no need for relaparotomy, and no postoperative deaths. There were, however, (at least) four known patients with "missed" common duct stones, who returned to hospital with symptoms some weeks and even as late as 2 years after the procedure. Immediate endoscopic retrograde cholangiography (performed by Professor B.C. Manegold) was able to locate and remove the offending stone in 2 patients; in the other 2 the stones had presumably passed spontaneously since the common duct was clear. It will remain a moot point whether these stones would have been detected if I.O.C. had been used routinely.

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