

Role of routine intraoperative cholangiography during laparoscopic cholecystectomy

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Abstract

Background Routine intraoperative cholangiogram (IOC) during laparoscopic cholecystectomy (LC), a radiologic contrast-based examination of the bile duct, can represent a systemic approach to avoiding common bile duct injury

Material and method This was a prospective study, conducted in the Department of General Surgery, Government Medical College/Rajindra Hospital, Patiala. 100 consecutive patients suffering from symptomatic gall stones undergoing LC were included in the study. The intraoperative cholangiograms were obtained. Two films were taken in addition to a preoperative scout film. The films were immediately interpreted. The catheter was taken out and the gall bladder was removed as usual, and ports were taken out after putting drain in the abdominal cavity.

Results A total of 100 patients were included in the study. Average age was 43.7 years and majority of them were females (80 %). 60 % of patients presented with pain abdomen while 40 % presented with dyspepsia along with pain abdomen. Out of the 100, successful cannulation of the cystic duct was achieved in 92 patients. There was significant additional operating time ranging from 17 to

42 min with mean time of 24.82 min. There was no intraoperative complication. Total additional cost of IOC was in range of Rs. 2200–2500. No patient re-presented to us with biliary symptoms within 18 months of surgery.

Conclusion In our study, we conclude that routine IOC was successful and safe, yields information that was not useful to alter operative management. The operating time was significantly longer but there was no significant difference in the hospital stay. Routine IOC decreases the readmission rate with post cholecystectomy syndrome, which occurs in 10–40 % of the post cholecystectomy patients.

Keywords Cholangiogram · Cholecystectomy · Choledocholithiasis · Common bile duct · Liver function test

Routine intraoperative cholangiogram (IOC) during laparoscopic cholecystectomy (LC), a radiologic contrast-based examination of the bile duct, can represent a systemic approach to avoiding common bile duct (CBD) injury. Common bile duct injury during laparoscopic cholecystectomy occurs with relative infrequency (1 in 200–400), but ranks among the leading sources of medical malpractice claims against surgeons [1]. Mirizzi first described IOC in 1937, to help delineate the anatomy of the biliary tree in case of advanced biliary disease [2]. As biliary surgery was refined and elective cholecystectomy became more common in the mid 20th century, the use of IOC diminished and was relegated to detection of stones in CBD.

With the advent of LC, and the subsequent surge of associated CBD injuries in the late 1980s and early 1990s, a new use for IOC appeared—as a “road map” of the biliary system that could potentially help to avoid major injury. Despite the reported use of IOC in preventing

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transaction of CBD, its routine use has been and remains a matter of surgeon's preference. Selective users highlight the added cost of IOC and the relatively small group of patients who would benefit from either the protective effect of the IOC or detection of small CBD stones, 1.1–11.4 % of patients might have stones, but their clinical significance is unknown [3]. Routine IOC users argue it is impossible to predict who is at highest risk for injury, making routine IOC the safer method [4].

Recent evidence has emerged evaluating the role of routine intraoperative cholangiography during laparoscopic cholecystectomy. This study was undertaken to assess the utility, safety and cost effectiveness of routine IOC during laparoscopic cholecystectomy.

Materials and methods

This was a prospective study, conducted in the Department of General Surgery, Government Medical College/Rajindra Hospital, Patiala. 100 consecutive patients suffering from symptomatic gall stones undergoing laparoscopic cholecystectomy were included in the study. All patients underwent routine liver function tests and abdominal ultrasonography.

Exclusion criteria included all patients under age of 18 years, any history of drug reaction to contrast material, all patients who had previously undergone major upper abdominal surgery and conversion to open cholecystectomy.

Intraoperative procedure

The intraoperative cholangiograms were obtained as follows: After the laparoscopic trocars were inserted, the gall bladder grasped and retracted cephalad and the cystic duct was dissected, a large metallic clip was positioned between the gall bladder neck and the cystic duct to prevent migration of stones or flow of contrast material during cholangiography. A paediatric feeding tube (5-French) was used for injection of contrast material. 20 cc of dilute contrast (50 % Hypaque mixed 50/50 with saline) was slowly injected. Two films were taken in addition to a preoperative scout film. The films were immediately interpreted. The catheter was taken out and the gall bladder was removed as usual, and ports were taken out after putting drains in the abdominal cavity.

Result

A total of 100 patients were included in the study. Average age was 43.7 years and majority of the patients were

females (80 %) with male to female ratio of 1:4. Pain abdomen was the main presenting symptom seen in 60 % of patients and rest of the patients (40 %) presented with dyspepsia along with pain abdomen.

Of the 100 patients subjected to IOC, successful cannulation of the cystic duct was achieved in 92 patients. Cystic duct could not be cannulated in eight patients due to small size of the cystic duct lumen. Eighty cholangiograms showed normal biliary tree anatomy with free flow of contrast into the duodenum. 12 of the remaining cholangiograms showed dilated CBD with free flow of the contrast into the duodenum but with no evidence of filling defects (Table 1).

Interestingly, there were 20 patients with abnormal serum bilirubin level (>1.2 mg/dl) and 12 patients had dilated CBD (11–16 mm) on preoperative abdominal ultrasonography; however, their IOC revealed dilated CBD with free flow of the contrast into the duodenum (without any filling defect) (Table 2). There was significant additional operating time ranging from 17 to 42 min with mean time of 24.82 min (Table 3). The performance of IOC did increase the operative time, but there was improvement as the level of experience increased. There was no intraoperative complication. Total additional cost of IOC was in range of Rs 2200–2500, which includes the cost of radiographic contrast, catheter and cost of longer anaesthesia. No patient re-presented to us with biliary symptoms within 18 months of surgery.

Discussion

Ever since its introduction in 1932 by Mirizzi, operative cholangiography has remained a controversial topic in the literature. The argument continues whether to use routine operative cholangiography or not, as use of it increased operative time, expense, risk of biliary injury, low yield of

Table 1 Ultrasound findings and intraoperative cholangiography

Ultrasound finding	Number of patients	% of patients	IOC	IOC not possible
CBD size				
CBD size less than 10 mm	80	86.96	Normal	4
CBD size greater than 10 mm	12	13.04	Normal	4
Total	92	100		8
CBD sludge				
Present	2	6	Normal	0
Absent	90	94	Normal	0
Total	92	100		0

Table 2 Liver function tests and IOC

Liver function tests	Number of patients	% of patients	IOC possible	IOC findings
Serum bilirubin				
Bilirubin between normal range (0.1–1.2 mg/dL)	80	80	72	Normal
Bilirubin above 1.2 mg/dL	20	20	20	Normal
Total	100	100	92	
Alkaline phosphatase				
Alkaline phosphatase between normal range (20–140 IU/L)	90	90	82	Normal
Alkaline phosphatase greater than 140 IU/L	10	10	10	Normal
Total	100	100	92	

Table 3 Additional operating time

Additional time (Min)	Number of patients	%
10–19	48	52.17
20–29	22	23.91
30–39	14	15.22
40–49	8	8.70
Total	92	100

Max time = 42 min, Min time = 17 min

Range = 17–42 min, Mean time = 24.82 min

unsuspected common duct stones and a concern over an increased risk of false-positive studies, leading to unnecessary common bile duct exploration or ERCP.

Our study was undertaken to assess the utility of routine intraoperative cholangiography during laparoscopic cholecystectomy for gallstone disease. The mean age at presentation in our study is 43.7 and the female preponderance 80 %, which is similar to most of the other studies, thereby implying that symptomatic cholelithiasis is most commonly present in the 4th and 5th decade of life, with a significant female preponderance.

A study conducted by Koo KP et al. shows that preoperative liver function tests and ultrasound have only a 30 % predictive value in identifying cases of choledocholithiasis [5]. Our study also gives the same verdict that ultrasonography and liver function tests are not so effective to rule out choledocholithiasis, and intraoperative cholangiography has its added value in the diagnosis of choledocholithiasis. Collins C concluded that treatment decision based on assessment by operative cholangiography alone would result in unnecessary intervention in 50 % of patients who

had either false-positive studies or subsequently passed the calculi [6].

Cystic duct cannulation was possible in 92 patients (92 %), but in eight patients (8 %) cystic duct could not be cannulated because of small cystic duct. Intraoperative cholangiography findings were normal in all of the patients in which cannulation was done, and there were no retained stones in the CBD, so we consider intraoperative cholangiography should not be rejected to rule out CBD stones during laparoscopic cholecystectomy.

In our study, there was no bile duct injury, as all the cases were done by experienced surgeon. It has been previously suggested that the high rate of biliary injury associated with laparoscopic cholecystectomy is the result of the learning curve [7]. Carroll et al. also experienced that most of the injuries occurred from surgeons who were out of the learning curve [8]. Another reason advanced by advocates of routine OTC is its potential role in preventing major biliary injury. For example, two large-scale population studies in the USA and Australia have shown that the performance of OTC is associated with a significantly reduced risk of bile duct injury [9]. In our study, all the patients in whom intraoperative cholangiography was done did not have retained stones, so our study suggested intraoperative cholangiography a safe procedure to rule out common bile duct stones and biliary anatomy, although ultrasonography is a non-invasive investigation to rule out CBD stone, but it is an operator-dependent investigation. Nies and colleagues reported successful biliary tree visualisation in only 80% of patients for whom OTC was planned, and other authors have reported comparable failure rates [10].

None of the patients who underwent intraoperative cholangiography required further treatment and none of the patients re-presented to hospital with biliary symptoms. In this study there was no mortality associated with the performance of cholangiography. Hence, although the study suggests that intraoperative cholangiography may have the potential to reduce the readmission rate, the size of cohort was too small to confirm such an effect. Pasquale MD et al. 1989 concluded a potential advantage of routine operative cholangiography is the immediate detection of biliary injury when it occurs. This approach may decrease the morbidity and mortality rates resulting from delayed diagnosis [11]. In this study, OTC was successful and safe, yielded information that was not useful to alter operative management. However, the operating time was significantly longer and there was no significant difference in the hospital stay. So we conclude that routine intraoperative cholangiogram yields very useful clinical information compared to the selective use of that technique with careful patient selection according to certain criteria, as long as meticulous operative dissection techniques are utilised.

Conclusion

In this study, OTC was successful and safe, yielded information that was not useful to alter operative management. However, the operating time was significantly longer and there was no significant difference in the hospital stay and further decreases the readmission rate with post cholecystectomy syndrome, which occurs in 10–40 % of the post cholecystectomy patients. The recognition of a short cystic duct is one abnormality frequently cited as an important variant that can be recognised by operative cholangiography. So we conclude that routine intraoperative cholangiogram yields a very little useful clinical information compared to the selective use of that technique with careful patient selection according to certain criteria, as long as meticulous operative dissection techniques are utilised.

Disclosures Drs. Ashwani Kumar, Upasna Kumar, Anand Mung-hate and Ashvind bawa have no conflicts of interest or financial ties to disclose.

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