A Randomized Controlled Trial Comparing Intraoperative Cholangiography by Cystic Duct Cholangiography and Cholecystocholangiography During Laparoscopic Cholecystectomy

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Abstract

Introduction: Intraoperative cholangiography (IOC) is an essential step during laparoscopic cholecystectomy for identifying common bile duct pathology. The conventional technique for intraoperative cholangiography is the cystic duct cannulation, which required laparoscopic skill. A puncture through the gallbladder is a less complicated technique.

Objective: To compare the success rate, operative time and postoperative complications between cholangiography via the cystic duct method and through the gallbladder method.

Methods: 86 patients who underwent IOC during laparoscopic cholecystectomy were randomized for the operation via either cystic duct cannulation or though gallbladder method. Success rate in cholangiography, operating time and complications were compared between the two groups.

Results: The success rate of cholangiography via cystic duct and trans-gallbladder route were 100% (43/43) and 90.7% (39/43), respectively (p=0.12). The average operating time for cholangiography through the cystic duct was longer than through the gallbladder (15.0 $\pm$ 11.2 minutes and 8.9 $\pm$ 6.7 minutes, (p <0.01). There was no complication in both groups.

Conclusion: The simple technique of cholangiography through the gallbladder was feasible and had a low risk of complication. Therefore, this technique may be recommended as an alternative method.

Keywords: Laparoscopic cholecystectomy, IOC, cholecystocholangiography

การศึกษาแบบสุ่มเปรียบเทียบการทำ Intraoperative Cholangiography ด้วยวิธี Cystic Duct Cholangiography และ Cholecystocholangiography ระหว่างการทำ Laparoscopic Cholecystectomy

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บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาเปรียบเทียบผลของการฉีดสีในท่อน้ำดีระหว่างการฉีดสีผ่านท่อถุงน้ำดีซึ่งเป็นวิธีมาตรฐานเทียบกับการฉีดสีผ่านถุงน้ำดีในแง่ของ อัตราความสำเร็จ ระยะเวลาผ่าตัด และภาวะแทรกซ้อนจากการผ่าตัด

วิธีดำเนินการวิจัย: ทำการสุ่มเลือกผู้ป่วยเป็นสองกลุ่มเท่าๆกันจากจำนวนผู้ป่วยทั้งหมด 86 ราย เพื่อทำการฉีดสีเข้าในท่อน้ำดีขณะทำการผ่าตัดส่องกล้องตัดถุงน้ำดี โดยกลุ่มแรกทำการฉีดสีผ่าน ท่อถุงน้ำดี และกลุ่มที่สองทำการฉีดสีผ่านทางถุงน้ำดี เปรียบเทียบอัตราสำเร็จในการทำ ระยะเวลาผ่าตัด และภาวะแทรกซ้อนจากการผ่าตัดระหว่างผู้ป่วยทั้งสองกลุ่ม

ผลการวิจัย: พบว่าการฉีดสีเข้าในท่อน้ำดีโดยวิธีการฉีดสีผ่านท่อถุงน้ำดีสามารถทำสำเร็จได้ร้อยละ 100 (43/43) ในกลุ่มที่หนึ่ง ในขณะที่อัตราสำเร็จในการฉีดสีเข้าในท่อน้ำดีโดยวิธีฉีดสีผ่านถุงน้ำดีมีอัตราความสำเร็จร้อยละ 90.7 (39/43) ($p=0.12$) กลุ่มที่ทำการฉีดสีผ่านท่อถุงน้ำดีใช้เวลาในการทำผ่าตัด เท่ากับ 15.2 ± 11.2 นาที ซึ่งมากกว่ากลุ่มที่ทำการ ฉีดสีผ่านถุงน้ำดีที่ใช้เวลา 8.9 ± 6.7 นาที อย่างมีนัยสำคัญทางสถิติ ($p<0.01$) ผู้ป่วยทั้งสองกลุ่มไม่มีภาวะแทรกซ้อนจากการผ่าตัด

สรุป: การฉีดสีเข้าสู่ท่อน้ำดีโดยวิธีการฉีดผ่านถุงน้ำดีสามารถทำได้โดยไม่มีผลแตกต่างจากวิธีปกติ โดยอาจพิจารณาเป็นวิธีเลือกในกรณีที่ไม่สามารถทำการฉีดสีผ่านท่อถุงน้ำดีได้

Introduction

Laparoscopic cholecystectomy is the gold standard treatment for the symptomatic gallstones. However, 6-12% of patients with gallstones also have coexisting common bile duct stones. Approximately 1-2% of patients with normal liver function tests can be managed with laparoscopic cholecystectomy (LC) without a routine cholangiogram for gallstones presented with retained stones after cholecystectomy[1]. The indication for routine intra-operative cholangiography (IOC) remains a controversial topic[2]. Routine IOC is a valuable method for detecting unsuspected CBD stone and reduce the risk of bile duct injury[3]. Numerous techniques for cholangiography during LC have been described but most of them require the cystic duct cannulation. For inexperienced surgeons, it is a time-consuming, difficult procedure and may increase the risk of common bile duct injury[4]. For these reasons, many surgeons do not perform IOC routinely. The intraoperative cholangiography through the gall bladder is an alternative technique .Theoretically, it is easier, less time-consuming, and may reduce the risk of common bile duct injury or cystic duct stump leakage. From the previous studies, there are different results of outcomes and successes for this technique. In 1996, Fox et al. reported in the success rate of 84% and less than 10 minutes added to operating time [4]. In 2001 Köksal[5] reported the procedure was evaluated as successful in 36 patients (90%) and it added an average of 13.5 minutes to the operating time. An unsuspected common bile duct stone was identified by cholecystocholangiography in one patient and there were no cholangiogram-related complications. They concluded that laparoscopic cholecystocholangiography is a safe, simple, and quick procedure that can be used as an alternative to cystic duct cholangiography to identify the biliary anatomy and detect any common bile duct calculi prior to laparoscopic dissection[5].

The argument came from the report in 1993. Glättli found that cystic duct cholangiography had significantly better results than cholecystocholangiography with optimal visualization of the biliary tree in 76% and 22%, respectively. The failure rate was 8% and 52%, respectively. Delineation of the cystic duct junction is important in order to prevent bile duct injury. The anatomy in this region was clearly delineated in 89.5% using cystic duct cholangiography but only in 35.5% of cases with cholecystocholangiography[6]. Wills, et al also reported significant numbers of cholecystocholangiography that failed to demonstrate the anatomy of the biliary tract. Successful cholecystocholangiography was associated with inferior image quality and greater radiation exposure. It provides no greater benefit in time or cost and should not be routinely recommended for operative cholangiography[7]. In our department, laparoscopic cholecystectomy was the most frequent operation for treatment of gall stone disease. This technique may be useful for inexperienced surgeons and trainees. The aim of this study was to assess the success rate of this technique.

Patients and Methods

Between October 2008 and July 2009, 86 patients who underwent laparoscopic cholecystectomy were randomized to perform IOC by injection of the contrast through either transcystic or trans-gallbladder. Patients' age ranged from 25 to 85 years. Indication for LC were symptomatic gallstone in 74 patients, gall stone pancreatitis in 4 patients and acute cholecystitis in 4 patients. All patients' liver function tests were within normal limit. The cholangiogram was taken by fluoroscopy and was evaluated by operating surgeons. Each cholangiogram was defined as successful if anatomy of biliary tree was satisfiedly demonstrated. If trans-gall bladder contrast injection were not success, standard cystic duct cannulation was done. The success rate of cholangiography, operating time and complications were collected and compared between the two groups. Statistical analysis was accomplished by SPSS program using Student's t test and Chi-Squared test. This study was approved by

Institutional review board of the Faculty of Medicine Vajira Hospital, Navamindradhiraj University and all patients provided written informed consent.

Surgical technique

In all cases, pneumoperitoneum were achieved by the open method and carbon dioxide gas was insufflated to the maximum pressure at 12 mmHg. Standard 3 or 4 ports for LC were inserted.

In cholecystocholangiography group, the gall bladder was punctured by percutaneous nephostomy needle. Proper position of the needle in the gall bladder was confirmed by bile aspiration. 30-50 cc of diluted 1:1 contrast media was injected prior to radiological imaging by fluoroscopy (figure 1 and 2).

In transcystic duct cannulation group, after the Calot's triangle was dissected. Cystic duct was isolated, distally clipped and then opened by scissors. Ureteric catheter or epidural catheter were cannulated via choledochal clamp. Contrast media was injected and imaging was taken as same as the previous group (figure 3). The total time for cannulation was recorded. After intraoperative cholangiograhy, standard technique for laparoscopic cholecystectomy was completed.

Results

The average age was 56.34 years. Patients in trans-gall bladder cannulation group was younger than the other (52.16 ± 14.32 vs. 60.62 ± 14.32, p= 0.02). Gender (p=0.27), history of previous surgery (p=0.9) and preoperative diagnosis (p=0.12) were not different between two groups (table 1). Preoperative liver function tests were within normal limits in all patients. Common bile duct stone was found in 5 patients, 1 in the transcystic duct cannulation group and 4 in the trans-gall bladder cannulation group. All patients with common bile duct stones were treated by post operative ERCP and the stones were successfully cleared. Success rate was100% (43/43) with trancystic duct route and 90.7% (39/43) with

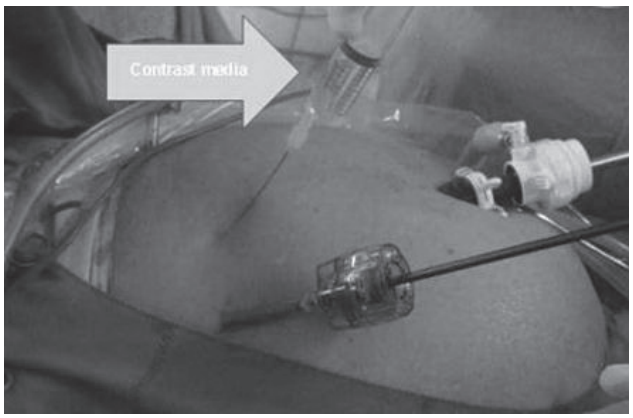

Figure 1: Surgical technique of trans-gallbladder intraoperative cholangiography

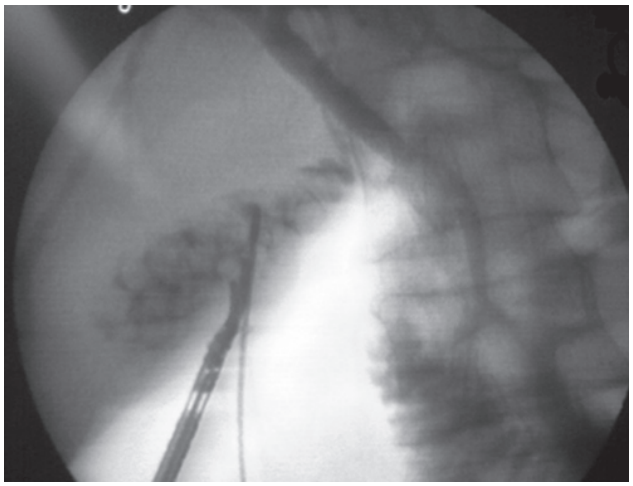

Figure 2: Cholangiography of trans-gallbladder injection intraoperative cholangiography

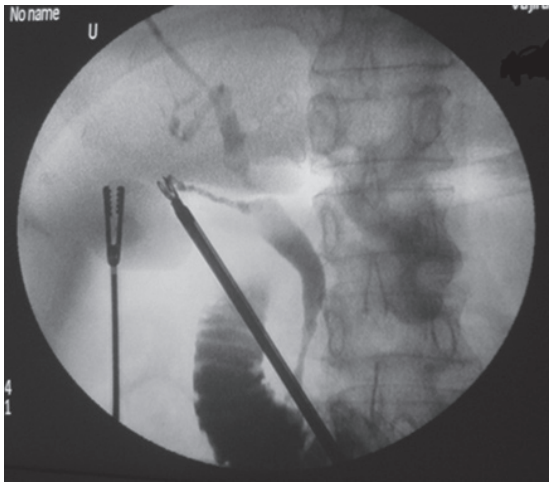

Figure 3: Cholangiography of trans-cystic duct cannulation intraoperative cholangiography

trans-gallbladder route, respectively (p=0.12). In 4 cases of failed trans-gallbladder cannulation was due to the fact that contrast could not pass through the cystic duct, one from inflammation due to acute cholecystitis, and the remaining 3 from cystic duct obstruction by stones. All of the patients successfully underwent repeated cholangiography via cystic duct cannulation. Average time for performing cholangiography was 11.9± 9.7 minutes. The operating time for cholangiography through the cystic duct and through the gallbladder were 15.0 ± 11.2 and 8.9 ± 6.7 minutes, respectively with a significant longer time for cystic duct cannulation (p = 0.007). There was no complication in either group. (table 2)

Discussion

Common bile duct stones are found in 6-12% of patients with stones in the gall bladder[1]. In our study, choledocholithiasis were detected in 5 of 86 patients (6%). Currently, there are several options for diagnosing common bile duct stones such as magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP), endoscopic ultrasound (EUS) and laparoscopic ultrasound (LUS). Hence, the trends

Table 1:

Baseline characteristics of study subjects.

	Transcystic duct cannulation (N=43)	Transgall bladder cannulation (N=43)	Total (N=86)	p- value
Age	60.62±19.03	52.16±14.32	56.34±17.25	0.02
Previous surgery	4/43	5/43	9/86	1.00
Sex				
- Male	19	14	33	0.27
- Female	24	29	53	
Diagnosis				
- Calculus of gallbladder with other cholecystitis	19	18	37	0.12
- Calculus of gallbladder without cholecystitis	15	22	37	
- Gall stone pancreatitis	7	1	8	
- Acalculous cholecystitis	2	2	4	

Table 2:

Outcome and results stratified by cannulation techniques.

	Transcystic duct cannulation (N=43)	Transgall bladder cannulation (N=43)	Total (N=86)	p-value
IOC success rate	100%(43/43)	90.7%(39/43)	95.3%(82/86)	0.12
Cannulation time	15.0 ± 11.2	8.9 ± 6.7	11.97+/-9.7	0.007
Lesion identification	1/43	4/39	5	

of IOC performing was significantly declining. Many surgeons choose to selectively perform preoperative ERCP and some are discouraged from performing routine IOC in view of its low yield and significant rate of false positive results[8,9]. EUS and MRCP are emerging as a reliable, low risk alternative for diagnosis of ERCP that is associated with higher complications[10]. Nevertheless, in Thailand, both sophisticated investigations are more expensive and not available throughout the whole country. LUS is another option to detect CBD stone while performing operations. Its sensitivity and specificity are comparable to that of IOC yet faster than IOC. Result of this investigation is operator-dependent. Visualization of the distal CBD is difficult and cannot provide sufficient images of biliary tract anatomy[11].

Nevertheless,in laparoscopic cholecystectomy IOC remains an invaluable tool for the detection of asymptomatic common bile duct stone, as well as prevention and detection of possible common bile duct injury[12]. Most surgeons use a various techniques of cystic duct cannulation, which can be time-consuming, especially with limited experience. In addition, bile duct injury may be possible during cannulation of the cystic duct[5]. The simple technique of gall bladder cholangiography has been largely ignored even though it has been occasionally mentioned in many articles with various results of success ranged from 22-90%[4,5,6,7]. In our experience, the results of cholecystocholangiography are quite good with visualization of common bile duct rate of 90.7% (p=0.12). There were five patients that contrast media could not pass into the cystic duct. 2 patients had acalculous cholecystitis and in 3 other patients, cystic ducts had been occluded by stones. IOC times in gall bladder injection group were significantly shorter than those in cystic duct cannulation group (15.0 $\pm$ 11.2 vs 8.9 $\pm$ 6.7, p=0.07). Cholangiography also helped surgeons to understand biliary tract anatomy and to dissected the Calot's triangle area with more confidence, especially in acute inflammation condition.

In this study, none of the surgeons had any familiarity with cholecystocholangiography prior to starting this study. Hence this technique is easy to perform with a high success rate.

Conclusion

The Simple technique of cholangiography through the gall bladder is safe, has a high success rate, low risk of complication and may be suggested for an alternative option for performing intraoperative cholangiography.

Acknowledgement

This study received the financial support from Faculty of Medicine Vajira Hospital, Navamindradhiraj University.

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