ORIGINAL ARTICLE

INTRA-OPERATIVE CHOLANGIOGRAPHY DURING LAPAROSCOPIC CHOLECYSTECTOMY. IS IT ESSENTIAL?

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Abstract

Aim: The aim of this work is to assess the value of using intraoperative cholangiogram during laparoscopic cholecystectomy.

Methods: Thirty patients scheduled for laparoscopic cholecystectomy were subjected to intraoperative cholangiogram in the period between June 2006 and June 2009.

Results: Four (13%) cholangiograms revealed short wide cystic ducts. Three (10%) cholangiograms revealed stones in the CBD. One of them was totally unsuspected preoperatively. The remaining two patients had mild elevation of liver enzymes preoperatively, without any clinical evidence. The operative time for the cholangiography procedure was 25 (15-40) minutes.

Conclusions: Despite the increased operative time in using intraoperative cholangiogram, it helps to identify abnormal anatomy especially in difficult cases, avoid leaving an excessive length of the cystic duct stump and detect unsuspected biliary duct stones. Intraoperative cholangiogram is recommended especially in difficult cases and with unclear anatomy. Surgeons should train themselves to use operative cholangiography to the point of perfection and should have a low threshold for performing it to define ductal anatomy.

Keywords: Laparoscopy, Biliary tract, Choledocholithiasis.

INTRODUCTION

Laparoscopic cholecystectomy is the gold standard for the treatment of symptomatic gallstones and other benign diseases of the gallbladder. It is the commonest operation performed laparoscopically worldwide.[1,2] Many reports had affirmed its feasibility and general safety in the vast majority of patients.[3] Laparoscopic techniques, however, have a few inherent disadvantages. One disadvantage is the loss of surgeon's tactile sense, leading to the total reliance on visual senses. Laparoscopic exposure of the operative field, although generally better, can occasionally be suboptimal, in the presence of dense inflammatory adhesions or because of limitations in siting ports and use of instruments.[4] Injury to the common bile duct (CBD) during cholecystectomy occurs infrequently, but it is an important source of patient morbidity. Serious injuries often require at least surgical repair, and these repairs have variable long-term outcomes.[5] Furthermore, CBD injury is the leading cause of medical malpractice claims against most general surgeons.[6,7] Tenting of the CBD is easier in laparoscopic than in

open cholecystectomy. Lastly, the "fundus first" technique, although it is useful when definition of Calot's triangle anatomy is difficult, is still much more difficult laparoscopically.[8] This means that adequate visualisation of biliary anatomy is an absolute must, to avoid biliary duct injury. Misinterpretation of biliary tract anatomy is indeed the commonest cause of such injuries, although occasionally hasty attempts to control hilar bleeding or inexpert use of diathermy near hilar structures can result in ductal injuries.[9] Routine intraoperative cholangiography during cholecystectomy was first recommended by Mirizzi in 1932 to assess the presence of unsuspected bile duct pathology.[10] The role of operative cholangiography in laparoscopic cholecystectomy is debatable. It is contested whether it increases the safety of the procedure, or adds usefull information regarding duct stones.[11]

PATIENTS AND METHODS

Thirty unselected patients with symptomatic gall stones were operated upon between June 2006 and June 2009, at Bugshan Hospital, Prince Abd El Aziz Bin Mosaed Hospital and Obeid Hospital in Saudi Arabia. Females with positive pregnancy test were excluded from the study. All patients had routine pre-operative liver function tests, chest radiograph, ECG and abdominal ultrasonography. Patients presenting with acute cholangitis or pancreatitis were allowed to settle first before the operation. Preoperative endoscopic retrograde cholangio-pancreatography (ERCP) with or without sphincterotomy was performed prior to laparoscopic cholecystectomy in those patients presenting with jaundice, abnormal liver function tests or unresolved cholangitis. All patients had informed consent of the procedure's risk and the chances for conversion to open surgery. Laparoscopic cholecystectomy was conducted under general endotracheal anaesthesia. Prophylactic antibiotic and subcutaneous heparin were given to all patients prior to surgery. Laparoscopic cholecystectomy was performed using the standard 4 abdominal ports.[12] Intraoperative cholangiography was attempted in all patients.

Technique of Intraoperative Cholangiography:

Intraoperative cholangiography was performed through a cholangiogram catheter or a ureteric catheter (5F) which was used when the cholangiogram catheter is not available. A clip was then applied to the junction of the cystic duct and Hartmann's pouch. The catheter was then threaded into a plastic cannula inserted in the midclavicular line inferior to the right anterior axillary port. A small nick was made in the cystic duct, near the clip, using the endoscopic scissor and the catheter was gently guided into the hole in the cystic duct (Fig. 1), as the assistant was gently squeezing a saline syringe first, to prevent air bubbles from entering the duct system. Once in place, the catheter was secured with a clip applied loosely on the cystic duct just distal to the hole with injection of 15-30ml of Iohexol (OmnipaqueTM GE Healthcare), under image intensifier view.[13]

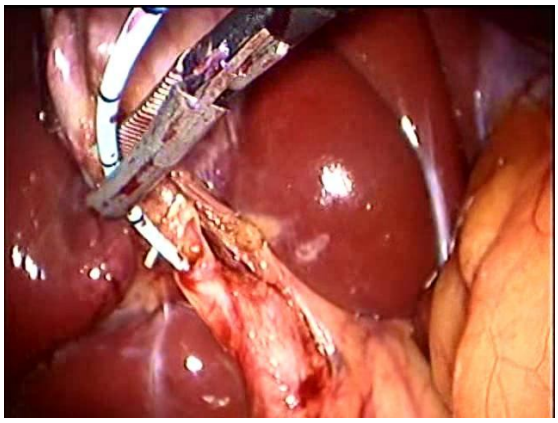

Fig 1. Cholangiogram catheter introduced in the cystic duct.

RESULTS

The study was performed over 30 patients (19 female and 11 male), their median age was 44 (range 23-72).

- ***Operative cholangiography***

Operative cholangiography was attempted in all patients (even those who had preoperative ERCP) (Fig. 2). The operative time for the cholangiography procedure ranged from 15-40 minutes with a median duration of 25 minutes. It was successfully completed in all except 3 (10%) patients, in whom the initial cut in the cystic duct was large resulting in its complete division, while manipulating the catheter into the duct. In these cases the anatomy was clear and thus cholangiography was cancelled. Four (13%) cholangiograms revealed short wide cystic ducts. Three (10%) cholangiograms revealed stones in the CBD (Fig. 3). One of them was totally unsuspected preoperatively. The remaining two patients had mild elevations of liver enzymes preoperatively, without clinical symptoms or signs. All had one or two small stones and these three patients were refered for postoperative ERCP.

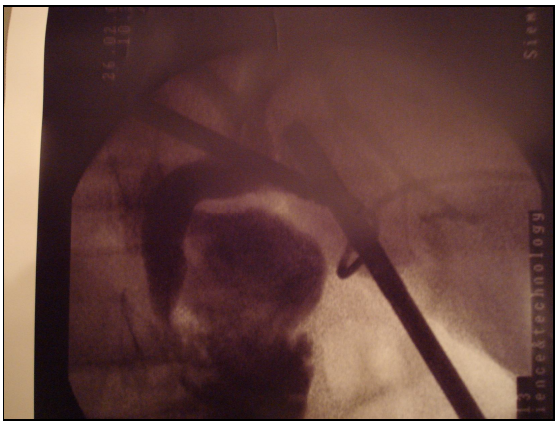

Fig 2. A clear biliary tract.

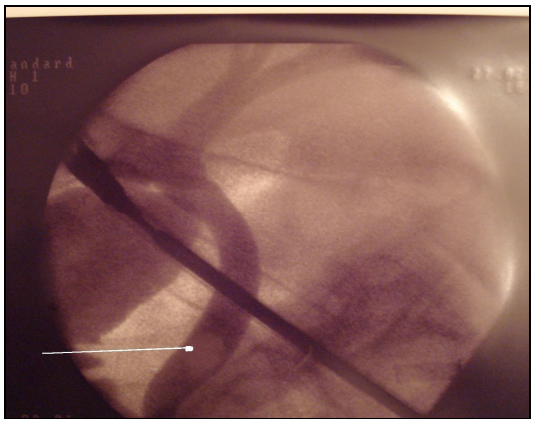

Fig 3. A stone in the distal.

- ***Morbidity***

There was no bile duct injury in all cases. One (3%) patient had massive subcutaneous ecchymosis (thought to be the result of subcutaneous heparin). One (3%) female patient had persistent right hypochondrial pain for 2 weeks postoperatively. She had a negative ultrasonographic examination and she was relieved spontaneously. No specific cause was discovered. The pain is thought to be related to the pneumoperitoneum. One (3%) patient had a sessile cystic duct, which was deemed unsuitable for clipping or endoloop ligature and was divided by endo GIA.[14] Operative cholangiography could not be done to him and he was excluded from the study.

DISCUSSION

The frequency of common bile duct injury is 0%-0.8% in laparoscopic cholecystectomy.[15-19] The issue of routine versus selective intraoperative cholangiography during laparoscopic cholecystectomy has been widely debated.[20,21] Some authors are of the view that intra-operative cholangiography is essential to detect biliary tract injuries and detect missed CBD stones,[18,22,23] others feel that it is an unnecessary step.[24] Choledocholithiasis occurs in 3.4% of patients undergoing laparoscopic cholecystectomy but more than one third of these pass the calculi spontaneously within 6 wk of operation.[25] Collins and co-workers concluded that treatment decision based on assessment by intra-operative cholangiography alone would result in unnecessary intervention in 50% of patients who had either false positive studies or subsequently passed the calculi.[22] The other arguments against intra-operative cholangiography are that routine cholangiogram picks up unsuspected stones in 1%-4% of cases only, needs additional radiological personnel and more cost; hence routine intra-operative cholangiography is not advisable.[21] Misinterpretation of ductal anatomy is particularly dangerous in only 6-10% of patients who have biliary ductal anomalies of surgical importance.[26] The most important are short cystic duct draining into the common bile or right hepatic duct and the extreme proximity of the common bile duct in case of spiral or posterior entry of the cystic duct.[27] The only variant of ductal anatomy seen in this study was one (3%) patient with sessile cystic duct. Ductal injuries occuring during laparoscopic cholecystectomy has been reported to range from 0% up to 3%.[27-29] The rate of CBD injury is significantly lower when intra-operative cholangiography is used and this effect is magnified during the early experience of surgeons.[30] Some authors suggested that ductal injuries during laparoscopic cholecystectomy are in reality under-reported, citing dramatic increases in number of referred duct injuries.[31,32] The reported higher incidence of bile duct injury in laparoscopic cholecystectomy may be attributed to inadequate dissection, starting dissection near the CBD rather than on the gall bladder wall, presence of variant biliary anatomy, failure to obtain an operative cholangiogram and unwise use of diathermy near the bile ducts resulting in thermal injury.[29] Rossi and his associates reported 11 patients who sustained ductal injuries during laparoscopic cholecystectomy. They recommend 3 main safeguards; a strict policy of adequate dissection and identification of Calot's triangle structures, routine use of operative cholangiography and a low threshold for conversion to open procedure to prevent such injuries.[33] Duct injury usually occurs above the entrance of the cystic duct. The great majority affect the common hepatic ducts and the confluence of hepatic ducts.[28] Routine use of operative cholangiography to delineate ductal anatomy, is believed by many to be essential for prevention of ductal injuries,[27,33,34] and even believed that omission of operative cholangiography 'a major safeguard' is hazardous.[35] Some question this, contending that this should be adequately achieved by careful wide dissection of Calot's triangle to provide a "critical view of safety", or the use of selective preoperative ERCP.[31,32] Sun and his associates have suggested a scoring system for selective IOC during laparoscopic cholecystectomy. Although reliance should first and foremost be on adequate dissection to identify biliary anatomy, operative cholangiography is very useful in some of the more difficult cases.[34] One of the less often cited advantages of routine operative cholangiography is to avoid leaving an excessive length of the cystic duct stump. In a study of 113 patients who had laparoscopic cholecystectomy without peroperative cholangiography, intravenous cholangiography was done 2-3 month postoperatively. This revealed that the presence of a cystic duct remnant in many patients. Stumps between 1 and 2 cm were found in 36.3% while 29.2% had a stump measuring more than 2 cm.[35] The other issue in performing operative cholangiography is the detection of duct stones. Our study, as well as others[32,35] suggested that 2-5% of patients undergoing laparoscopic cholecystectomy may have totally unsuspected stones. Many of these unsuspected stones are single and small, thus amenable for ERCP treatment. Some are however, multiple; a finding which may force a change into an open procedure. It is reasonable to believe that detecting

the presence of multiple stones, spares these patients developing postoperative jaundice and possibly another operation, since ERCP is likely to fail in clearing the ducts in some of these patients. The reasons cited against the use of routine cholangiography include increased operative time, risk of biliary injury, low yield of unsuspected CBD stones and a concern over an increased risk of false positive studies leading to unnecessary CBD exploration or ERCP.[37] Increased operative time is a real disadvantage. In the current study, the operative time for the cholangiography procedure was 25 (15-40) minutes. This correlates with other studies that found an increase of 20 minutes in operative time.[38] On the other hand, some studies claimed that operative cholangiography added only 5 minutes, when using an image intensifier and 10 minutes when using flat films.[39] It might be that our insistence on attempting cholangiography in all patients partially explains our longer time. Another reason could be related to the insertion of the catheter into the cystic duct as others employed a specially designed cholangiogram clamp[40] or using a stainless steel cholangiocatheter which can be manipulated extraabdominally,[17] both with reported shorter time. Many studies suggest that routine intra-operative cholangiography is both indeed safe and feasible in the great majority of patients.[22,24] Puplished studies of routine operative cholangiography report no biliary ductal injuries or other complications attributed to the performance of the cholangiogram.[41,42] Thus, we can state that intra-operative cholangiography is probably essential to decrease the incidence of ductal injuries and retained duct stones especially in cases with difficult cystic duct identification. Surgeons should train themselves to use intra-operative cholangiography to the point of perfection, so as to be able to utilize the technique if and when needed. Surgeons should have a low threshold for performing it on to define ductal anatomy when a question arises about ductal anomalies.

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