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Safer Laparoscopic Cholecystectomy with Right Posterior Approach Technique: Evaluation of Egyptian Experience

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Abstract

Background: More than 600,000 cholecystectomies are being performed laparoscopically each year in United States. Incidence of Bile Duct Injuries (BDI) reported in laparoscopic cholecystectomy ranges from (0.2% to 0.5%) which is higher than the reported injuries in open cholecystectomy (0.1% to 0.2%). Despite of many techniques that were described and many studies designed for dissection of CALOT`S triangle, there is no consensuses about an appropriate or a standard method for dissection that claimed to prevent BDI. All trials are aiming to decrease the number of injuries but no one is superior to other in preventing injury.

Methods and Results: The study enrolled 120 patients with symptomatizing chronic calcular cholecystitis. The technique that was done for all patients followed the same principles for dissection of CALOT`s triangle with accomplishing criteria of critical view of safety dissection, but starting from right side or what is called (Right posterior approach). There were 27 patients who expressed very difficult dissection. The GB was punctured in 4 cases with bile and stones leakage occurred. Post-operative pain was tolerable. No recorded cases of major post- operative leak or life threaten morbidities.

Conclusion: Dissection of CALOT's by right posterior approach technique represents one more step for safer laparoscopic cholecystectomy, which is helpful in reduction of morbidities specially the vascular and duct injuries. We recommend this safe technique for junior doctor especially during their steep learning curve.

Keywords: Laparoscopic cholecystectomy; Safe dissection; Safe cholecystectomy; CALOT's

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Introduction

Nowadays Open cholecystectomy has been replaced widely by Laparoscopic Cholecystectomy (LC) which is a frequently performed procedure in laparoscopic surgical practice. It was introduced into surgical field since nineties; its uptake was accelerated, but unregulated that led to increased incidence and severity of Biliary Injury (BI). Prevalence of biliary injuries stays unsatisfactory high in spite of low frequency (<0.5%) which is reasonably low. This is due to the frequently performed LCs across communities [1]. Biliary injury is a disastrous complication of laparoscopic cholecystectomy, usually followed by reduction of patient's quality of life and survival. Many surgeons consider biliary injury as an inescapable disadvantage related to the procedure, a change of this concept between surgeons is essential for improvement of patient care [2,3]. There is no a consensus of a novel and standard technique for CALOT'S triangle dissection, that claimed to inhibit BI injuries, but all are hoping to decrease the number of injuries [4,5]. Classic dissection usually starts from medial to lateral, however this maneuver has some challenges, especially with presence of adhesions or aberrant anatomy [6].

Aim of the work

Our aim was to feature additional steps for safe dissection of triangle of CALOT's with clear identification of components of critical view of safety which is helpful in difficult cholecystectomies especially for those with less experience in laparoscopic surgery and for junior surgeons.

Ethical considerations

Our study is a prospective study; concerning patients were operated in four surgical centers in

Cairo, Banha and Shebin Elkom. All prospective patients enrolled in this study had an informed consent before joining our study and all had the rights to take away from the study without any interruption of their treatment plan and rights. All personal data of our enrolled patients will be preserved and kept away from data retrieving personnel.

Patients and Methods

Our research was conducted in the period between January 2016 and April 2018 on 120 patients with symptomatic gall bladder stones. Laparoscopic cholecystectomy was carried out in four different hospitals (BANHA teaching hospital, NHTMRI-National Hepatology and Tropical Medicine Research Institute, SHEBIN ELKOM teaching hospital, ALMADEINA medical center). Involved patients accepted the study signed consent for their acceptance. Patients with hepatic co-morbidity especially (cirrhosis) were excluded.

These variables were recorded:

- Sex
- BMI
- Intraoperative Difficult Dissection
- Mean Operative Time
- Intra-operative blood loss

Technique

All patients were operated by qualified experienced surgeons with the same technique. In supine position (American position for LC) under general anesthesia with endotracheal tube and 2gm of 3rd generation cephalosporin were given 2hrs before induction of anesthesia, and analgesia was given at time of induction.

Trocar placement

Our patients were operated using four-ports (American technique), with the 1st one inserted at supra-umbilical site. This port is used for camera and Co_2 insufflation, and is inserted using open technique (similar to 'open' peritoneal lavage). About Two liters of CO_2 were conducted to insufflate the abdomen maintaining an intra-peritoneal pressure between 10 to 15 mmHg. 10 mm camera was introduced to the abdomen through this port allowing global overview of the abdomen, ruling out any present pathology, and looking for any present adhesions or occurred hematoma due to trocar insertion. The other 3 ports are inserted under direct vision. One (10 mm) working port is placed in subxiphoid position slightly to the RT of midline. Two (5 mm) retracting ports are sub-costaly placed. With one of them in the RT mid-clavicular line which is used for cephalad retraction of the GB, and the second one in the RT anterior axillary line used for infundibular retraction.

Steps of the operation

After trocar insertion and cephalad retraction of the GB any adhesions should be taken off to expose the infundibulum which is then retracted outward and medially, not laterally as in conventional technique. We are cautious not to hurt the duodenum or transverse colon as these structures could be adherent to the gallbladder. By infundibular exposure and retraction to the left, sulcus of ROUVIERE (which represent the pedicle of the RT portal system) could be identified. Dissection is started posteriorly (using hook electrocautery) few above the sulcus of ROUVIERE separating all fibro fatty and areolar tissue between the lower part of the GB and liver doing what is known as shouldering of the GB. This will clear up the field from posterior or the RT side, and this shouldering will unfold tented tubular structures, and identify any aberrant duct or vessels if present. Effort is persistent until both cystic duct and artery are recognized from posterior with undeniable entry of the cystic duct into the GB. Now surgeon can swing anteriorly or to the LT side continuing dissection as usual from medial to lateral separating peritoneum between GB and liver dissecting all fibrous and fatty tissue within triangle of CALOT. By this technique anterior dissection is easier than in traditional technique as the earlier efforts done during right posterior dissection makes the anterior layer of fibro fatty tissue very thin to be cleared out with minimal effort. Hence, the passage through window between cystic plate and lower part of the GB is simple. By this step we revise our job achieving criteria of Critical View of Safety (CVS) which is formed of *A-removing fibrous and*

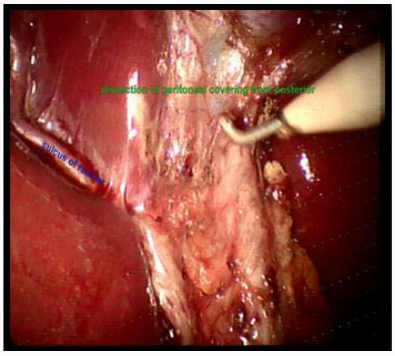

Figure 1: GB retraction forward and to the LT with identification of rouviere's sulcus.

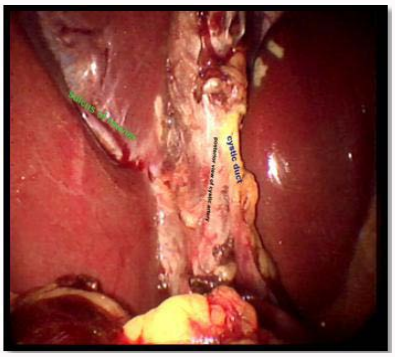

Figure 2: Dissection from RT posterior with shouldering of the GB.

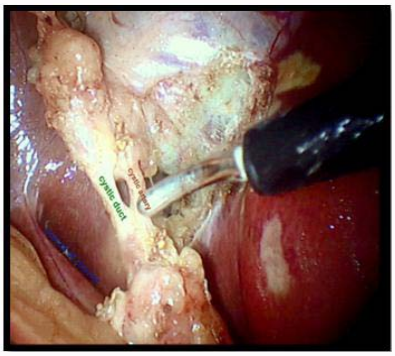

Figure 3: Dissection is completed ANT. With achieving criteria of critical view of safety.

Table 1: Baseline Characteristics.

Variable	Number	Percent
Gender		
Male	25	20.8
Female	95	79.2
Age in years		
Mean ± SD	41 ± 11.2	
Min – max	22-60	
BMI	32.5 ± 1.5	
Mean ± SD	20-45	

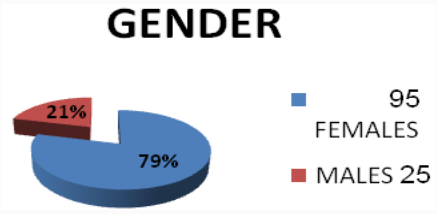

Diagram 1: Male to female gender.

Table 2: Operative data.

Variable	Number	Percent
Difficult dissection	27	22.5%
Conversion to open	2	1.7%
GB puncture with bile and stones leak	4	3.4%
Operative time Mean ± SD	65±12.5	

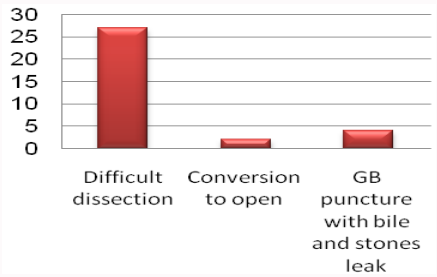

Diagram 2: Operative data among patients.

fatty tissue of CALOT`s triangle. B- Separation of the lower part of the GB from lower part of cystic plate. C-Identify two structures entering GB which represent cystic duct and artery. Now, it is safe to clip then cut both structures. NB: the golden rule for safety is to identify both cystic artery and cystic duct before clipping. Never to clip a structure before identification of both structures. GB will be dissected up of its fossa after clipping and separation of both artery and duct, by usage of hook electrocautery up to the fundus (ante-grade Technique), where the bladder is released and extracted out of the abdomen through the 2nd port below xiphisternum. Warm saline is used for irrigation of the bed and upper surface of the liver under diaphragm; this will clean the operating field, detect any bleeder, or biliary leak, and decrease pain as well. This fluid is then drained out by suction. Our policy is to put a drain for 12 h. Then to remove at the time of discharge. A 10 mm wounds are closed by sheath closure needle then followed by simple 2/0 polyprolene suture while 5 mm wounds are closed directly by 2/0 polyprolene suture. Photos from 1 to 3 illustrate our technique

Table 3: Blood loss class severity.

Class severity according to blood loss			
1	2	3	4
no loss if less than 1cc	minimal <50cc loss	mild 50-100cc	severe if >100cc

Diagram 3: Patients' distribution according to blood loss severity index.

of laparoscopic cholecystectomy starting right posterior approach for dissection.

Statistical analysis

Results were analyzed using SPSS (ver. 25.0; IBM, Chicago, IL, USA). Quantitative data was displayed in the form of mean ± Standard Deviation (SD). Qualitative data was demonstrated through figures of frequency and percentage. Qualitative data were expressed as percentage (Figure 1-4).

Results

Patients of the study were 95 females and 25 males (Diagram 1). The mean age was 41 years (between 22 and 60 years). Mean BMI 32.5 (between 20 and 45). Estimated operative time was 65 min. 27 patients (22.5%) had difficult dissection. We take a decision of conversion to open surgery in 2 cases (1.7%). One of them because of avulsed cystic artery with uncontrollable bleeding, while the other was due to extensive adhesions that render the identification of CVS impossible after 15 min of continuous trial. Bile leak and stones spillage occurred in 4 cases (3.4%) (Table 1 and Diagram 2). Mean hospital stay was one day. Post-operative pain was tolerated for all our candidates. Post-operative fever was recorded in 5 patients and this was due to chest infection. Biliary leakage was not recorded in any of our patients enrolled in the study. No incidence of BDI was recorded. According to blood loss class severity; 44 patients in class 1, 52 patients in class 2, 25 patients in class 3 and 9 patients in class 4 (Diagram 3). No major complications as major post-operative bleeding or fistula had been occurred; no one required intervention or re-exploration Table 2-4.

Discussion

Laparoscopic cholecystectomy has become the standard modality of treatment for gallbladder diseases. The technique most commonly employed is the infundibular approach which entails dissecting the gallbladder from its neck upward, after dissecting the cystic artery and the cystic duct (ante-grade dissection). A significant increase in the incidence of bile duct injury was noted in laparoscopic cholecystectomy more than that occurring in the era of open cholecystectomy reaching up to 0.5% [7]. Etiologies of biliary Injuries show wide range, as it may result from misidentification of the ducts and arteries, technical errors due to bad surgical technique, lack of knowledge about the mechanism of injuries, fight not to convert to open surgery, inadequate visualization, inflammation, and accidently present anatomical variants. As the outcome of bile duct injuries are usually catastrophic with dramatic effect on the patient and require long hospital stay or referral to highly specialized

Table 4: Post-operative follow up data.

Variable	Number	Percent
Post-operative leak	0	0%
Post-operative fever	5	4.2%
Hospital stay Mean ± SD	1 ± 0	

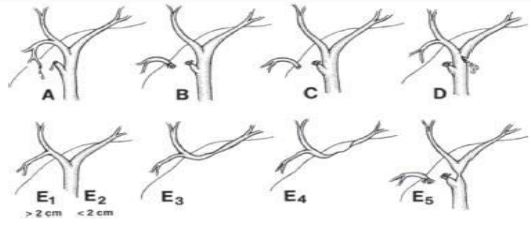

Table 1. Strasberg Classification of injuries

Type A	Cystic duct leaks or leaks from small ducts in the liver bed
Type B	Occlusion of part of the biliary tree, typically clipped and divided right hepatic ducts
Type C	Transection (but not ligation) of the aberrant rigght hepatic ducts
Type D	Lateral injuries to major bile ducts
Type E1	Common hepatic duct division, > 2cm from bifurcation
Type E2	Common hepatic duct division, < 2cm from bifurcation
Type E3	Common bile duct division at bifurcation
Type E4	Hilar stricture, involvement of confluence and loss of communication between right and left hepatic duct
Type E5	Involvemnt of aberrant right hepatic duct alone or with concomitant stricture of the CHD

Table 5: Strasberg classification of biliary injuries.

centers to deal with such cases, so all efforts are directed to prevent BDI [8-10]. (CVS) represents the greatest example for these efforts it was first described in1995 by Strasberg. Components of (CVS) are 1-dissection of fibrous and fatty tissue of hepatocystic triangle. 2-separationof the lower portion of the GB from its corresponding part of cystic plate. 3-identification of cystic duct and artery while entering the gall bladder. This method has been adopted by surgeons around the world because of its association with marked reduction of biliary injury. It is considered to be the safest technique in performing laparoscopic cholecystectomy that renders the identification of the structures easier and safer. Thus, laparoscopic surgeon should expend all efforts to achieve criteria of CVS routinely with practicing of LC. It is important to understand the concept of the CVS, and its proper application [11]. In spite of that there is no level 1eveidence that (CVS) prevent the incidence of BDI, as the incidence of the injury is so low that it will be difficult to clarify the role of any technique over the other by prospective randomized trial. Despite of its description more than twenty years ago, surgeons have not been using it frequently [12], or have been interpreting or understanding it incorrectly [13,14]. A recent Dutch study, on reviewing the operative notes and videos of LC, revealed that the CVS was actually achieved only in 10.8% of cases, despite the fact that it was mentioned to have been achieved in 80% of cases [15]. If a surgeon faces any difficulty in achieving the CVS, he/she should take this difficulty as a warning that proceeding with further dissection may be hazardous, and carry an increased risk of biliary and/or vascular injury [16]. As a method of target identification, it needs to be achieved before the cystic duct and the artery are divided. Failure to achieve the CVS after a reasonable attempt indicates a difficult situation with a higher risk of injury with an ongoing attempt at dissection. Thus, the CVS itself acts as a barrier to biliary/vascular injury [17]. So, we adopted the theory that every institute or group of surgeons should establish their own technique depending on their experience and their rate of incidence of BDI [18-20]. For us we adopted a technique depending mainly on achieving criteria of (CVS), but with our own steps of dissection starting with right posterior dissection. This raised from our notice that, many injuries occurred usually due to high incidence of anatomical variants in this area. The right hepatic artery normally arises from common hepatic artery then passes laterally and to the right with portal vein lies posterior and common hepatic duct with right hepatic duct present anterior. It gives off the cystic artery and finally splits into the right anterior and right posterior sectorial branches before entering the liver parenchyma. Superior mesenteric artery may be the origin of replaced right hepatic artery that runs behind the portal vein and the lower end of the (CBD) to continue on its right border. It is present in about 17% of cases. In 2.5% of cases the Common Hepatic Artery (CHA) rises wholly from the Superior Mesenteric Artery (SMA) [21]. Even with this common variant anatomy, hepatic artery injury isn't uncommon and can be easily mistaken as cystic artery. Vascular injuries recorded in LC has been estimated to be 0.25% with incidence of hepatic artery injuries recorded to be 0.06% [22]. Unintentional ligation of right hepatic artery in cholecystectomy has been followed by elevation of liver enzymes, liver ischemia, and sometimes deserving hepatic lobectomy [23]. According to Strasberg classification, injury of aberrant RT duct isn't infrequent (Strasberg B&C), and (bismuth E5) this is may be due to hidden aberrant duct in chronic inflammation with CHD, which could be misdiagnosed as cystic duct with anterior dissection, and may be very challenging as well. In the present technique it is clearly found that; to start the dissection from RT posterior side is very safe with a considerable less risk of injuries of aberrant vessels. The purpose of our technique is to describe structured steps of dissection in the anatomical triangle, adding one safer step starting dissection from RT posterior relatively away from CBD which forms one of the edges of Calot's triangle thus reducing misidentification issue leading to ductal injury, as well as other accompanied vascular injuries. Junior laparoscopic trainees should be aware of anatomical variations of biliary and vascular structures during their early practice, and they should be familiar with classic dissection of hepatocystic triangle and attaining criteria of (CVS). Then they can adopt their own technique of dissection with best results and least complications. This approach is ideal for the surgical trainees, and it is more convenient for LT handed surgeons.

Conclusion

Dissection using right posterior approach represents one more step for safer laparoscopic cholecystectomy which is helpful in reducing CBD and vascular injuries. We believe that right posterior approach technique provides better identification of the anatomy in a relatively safe area of dissection, so we recommend this approach for laparoscopic Cholecystectomy. This approach is ideal for surgical trainees and for left hander surgeons.

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