

The Rationale of Critical View of Safety in laparoscopic cholecystectomy. A study done in Al-Diwanyia Teaching Hospital

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Abstract

Background :

Laparoscopic cholecystectomy (LC) has become the standard method for the removal of a diseased gallbladder. The technique most commonly employed is the infundibular approach which entails dissecting the gallbladder (GB) from its neck upward, after dissecting the cystic artery and cystic duct using laser or electrocautery. Common bile duct (CBD) injury is one of the most serious complications of LC. Misidentification of the bile duct during dissection of the Calot's triangle can lead to such injuries.

The critical view of safety (CVS) has been recently discussed in controlled study, it is characterized by dissection of the upper part of the Calot's space, which does not usually contain arterial or biliary anomalies so it is ideal for a safe dissection even in less experienced hands.

Key Words:

Gallstones, acute cholecystitis, laparoscopic cholecystectomy, critical view of safety.

Aim of study :

To introduce a safe method for dissection of the GB away from CBD which forms one boarder in the Calot's triangle

Patients and methods

Prospective clinical analysis of 1000 cases of LC utilizing the CVS technique over a period from January 2014 to January 2017 was conducted at Al-Diwanyia Teaching Hospital Laparoscopic Center.

The diagnosis of acute cholecystitis, chronic cholecystitis and cholelithiasis was established with history, physical examination, and ultrasound examination.

The patients were categorized for sex ,age, operating time and post-operative complications.

There were 270 (27 %) LC for (acute cholecystitis) and 730 (73 %) LC for (chronic cholecystitis and cholelithiasis).

Results

There were minor significant complications when compared with CBD injuries complications with short operating time (mean time for operation in our study 35.9 minutes).

Conclusion

Critical view of safety (CVS) seems to be a safe method of dissection that clearly demonstrating the cystic duct and help to reduce the bile duct injuries.

Introduction

Laparoscopic cholecystectomy (LC) has become the Standard method of treatment for the removal of the diseased GB¹.

Sir Alfred Cuschieri, in the editorial released in 1990, chered the first step in LC as the beginning of a new, exciting era³. Significant increase in the incidence of bile duct injury was noted more than that occurring in the

era of open cholecystectomy reaching up to 0.5% as reported by David flum from the University of Washington^{4,5}. Indeed biliary morbidity with LC is not less than the 0.4% rate of traditional open surgery, but almost 3 times higher ⁶. The National Institutes of health consensus elected LC as the" gold standard" for cholelithiasis in 1992 ⁷. Injury occurs as a result

of misidentification of the ducts or other technical errors^{8,9}.

Strasberg *et al*, in the early nineties, pointed out how a "critical view of safety" (CVS) should be achieved every time, by dissecting the entire infundibulum off the liver bed and by freeing it of all fatty tissue, both in its dorsal and ventral aspect. This according to his study, would have prevented accidental biliary and vascular injuries, due to uncommon variation, incautious bleeding control, or unclear anatomy. This way of dissecting the gallbladder pedicle would bear a highly protective role against bile duct injuries¹⁰.

So Triangle of Safety Technique (TST) provides better definition of the anatomy in a relatively safer area of dissection and we recommended this technique in our center as a routine one for (LC).

Patients and Methods

Prospective clinical analysis of 1000 cases of LC utilizing the CVS technique over a period from January 2014 to January 2017 was conducted at Al-Diwanyia Teaching Hospital Laparoscopic Center.

The diagnosis of acute cholecystitis, chronic cholecystitis and cholelithiasis was established with history, physical examination, and ultrasound examination.

Preoperative investigations were done to all patients in form of CBP, RFT, RBS and LFT.

The operations were conducted by 15 surgeons in the center who were licensed to practice laparoscopic surgery.

All cases with dense fibrous adhesion in the Calot's triangle and those with Mirizzi's syndrome were excluded from the study.

The inclusion criteria for our study:

- 1- Chronic calculus cholecystitis and cholelithiasis.
*Chronic calculus cholecystitis which included any case with recurrent attack of biliary colic with presence of gallstones on abdominal ultrasound.
- 2- Acute calculus cholecystitis including empyemic gallbladder.
*Acute calculus cholecystitis which included any case presented with acute right hypochondrial pain which persists

more than 24 hour with abdominal ultrasound revealed:

A- Gallstones.

B- Pericholecystic fluid.

C- Gallbladder distention.

The patients were categorized for sex, age, post-operative complications and operative time. We usually discharge the patients in the zero postoperative day (treated as day case surgery) in uncomplicated cases, in cases with post-operative complications the hospital stay was prolonged due to re-admission. The patients were examined on the tenth postoperative day at time of removal of stitches. An informed consent was taken from all patients.

Surgical procedure:

The procedure was performed under general anesthesia using the standard four-ports technique. The first entry port is a 10 mm infraumbilical camera port inserted by closed (which was either by veress needle or direct trocar) and open technique methods, the other three ports were inserted under camera vision. The camera used during operation was 30°.

The fundus of the GB retracted above the right lobe of liver towards the right shoulder by assistant. The Hartman's pouch was retracted by the surgeon left hand in outward lateral direction through the second port for establishing triangle of safety. There were many steps should be accomplished in order to obtain critical view of safety.

First step was releasing the lateral peritoneal attachment of the GB with avoiding the posterior cystic artery branch (posterior dissection). (**Figure 1**)

Second step was dissection the peritoneum over the GB wall just lateral and parallel to the cystic artery (anterior dissection) (**Figure 2**), The Cystic artery usually follows a constant pathway and seen underneath the peritoneum of the GB, sometimes there is difficulty in identifying the cystic artery in cases which the peritoneum of the GB is thickened due to inflammation, in these cases sweeping the peritoneum to uncover the cystic artery and its branches was done. Any bleeding can easily be controlled by electrocautery, as the area of dissection on the GB is away from vital structures, the dissection continued to divide the

tissue between the cystic duct and the cystic artery (**Figure 3**), this will expose the cystic duct-infundibulum junction, then we release the GB from the medial peritoneal attachment and this allowing the cystic artery to fall down forming the medial border of triangle of safety. (**Figure 4**)

By this way we obtained a critical view, and the dissection in this manner away from the CBD. (**Figure 5**)

Final step is clipping and transecting the cystic artery over the GB this will avoid dissection and injury to common hepatic duct and will leave only the cystic duct which is clipped and divided near it's junction with the infundibulum of the GB after milking the cystic duct.

Some cases with empyemic gallbladder aspiration was done in order to facilitate proper traction of the (GB).

All dissection during the operation was performed by hook and monopolar diathermy.

Suction- irrigation was done to remove a retained blood or bile in accidentally biliary leakage from the GB.

Some surgeons put drain in the morrison pouch routinely while others didn't drain the field even in a cute cholecystitis.

There were 276 patients have drains.

2 Cases had bleeding in acute cholecystitis which were from liver bed and posterior branch of cystic artery which were controlled by electrocautery and clipping respectively.



Figure (1) Release lateral peritoneum attachment of the GB

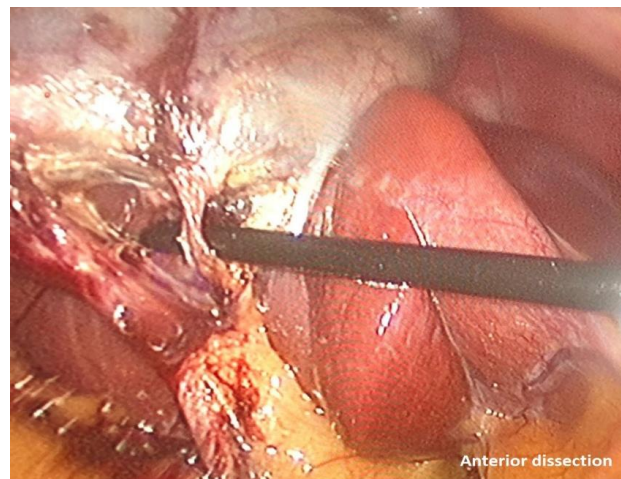


Figure (2) Anterior dissection



Figure (3) Divide the tissue between the cystic duct and the cystic artery

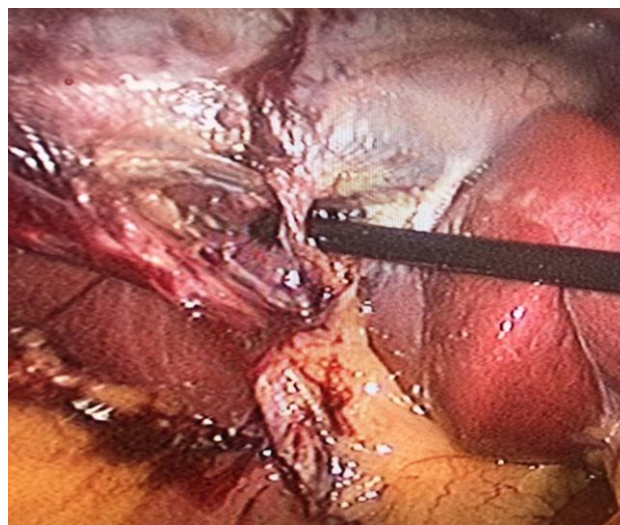


Figure (4) Release medial peritoneum attachment of the GB



Figure (5) Critical view

Results

1000 patient have been examined , there were 700 **(70 %)** female and 300 **(30 %)** male included in our study.

Female : male ratio = **2.3 : 1**

730 **(73 %)** of the patients had a chronic cholecystitis and cholilithiasis and 270 **(27 %)** were a cute cholecystitis **(table 1)**.

The mean age was **(38.1)** years range from 15 to 65 years. **(table 2)**.

The mean time for operation was **(35.9)** minutes which was calculated from insertion of first port till removal the last port **(table 3)**.

There were 2 cases **(0.2 %)** had post-operative complications which were

(biliary leak) in acute cholecystitis **(table 4)**, whom were diagnosed on (third to fifth) post-operative day, the two patients have no drains and presented as acute abdomen, an abdominal ultrasound was done to them and sub-hepatic collection was reported, aspiration was done under ultrasound guidance the aspirated fluid was bile in both cases.

The leakage in both cases was from GB bed which was proved by ERCP (endoscopic retrograde cholangiopancreatography) and was resolved after percutaneous drainage followed by endoscopic sphincterotomy.

Table (1) Gender distribution of the patients

Gender	Acute cholecystitis	chronic cholecystitis and cholilithiasis	Total	P. Value
Female	180	520	700	
Male	90	210	300	
Total	270 (27 %)	730 (73 %)	1000	0.162

Table (2) Age distribution of the patients

Age	Acute cholecystitis	chronic cholecystitis and cholilithiasis	Total	P. Value
15 – 25	23	91	114	
26 – 35	103	236	339	
36 – 45	93	181	274	
46 – 55	64	124	188	
56 – 65	26	59	85	
Mean	41.2 years	35.5 years	38.1	> 0.05

Table (3) Operation time

Operation time	Acute cholecystitis (% from 270 cases)	chronic cholecystitis and cholilithiasis (% from 730 cases)	Total no. %	P. Value
< 30 minutes	103 (38.1 %)	201 (27.5 %)	304 (30.4 %)	
30 – 60 minutes	167 (61.9 %)	529 (72.5 %)	696 (69.6 %)	
Mean	33.5 minutes	36.7 minutes	35.9 minutes	0.001

Table (4) Post-operative complication

Parameter	Acute cholecystitis (% from 270 cases)	chronic cholecystitis and cholilithiasis (% from 730 cases)	Total no. (% from 1000)	P. Value
Biliary leak	2 (0.7 %)	-	2 (0.2 %)	0.02
Total	2 (0.7 %)	-	2 (0.2 %)	0.02

Discussion

Avoiding iatrogenic bile injuries is still a matter of significant concern, despite almost 26 years passing since first LC was performed ¹¹.

In Italy, a national survey shows an incidence of 0.42 % of major bile injuries during LC in 56591 patients, with higher rates in cholecystitis and low volume practice subgroups ¹².

The approach to the gallbladder's pedicle is of the utmost importance for the prevention of the injuries. Few methods have been advocated to reduce the incidence of ductal injuries which include : routine performance of intraoperative

cholangiography ^{9,13} and fundus first technique ^{14,15}.

These methods and guidelines are still do not emphasize the proper identification of the cystic duct structure and the cystic artery before it's division. The “dome-down” or “fundus-first” technique, often advocated for acute cholecystitis ¹⁶. The error trap of this technique (following Strasberg) concerns the possible injury to the right hepatic artery, which might be retracted downwards, along with the GB ¹⁷.

Intraoperative cholangiography does not seem to prevent bile duct injuries even if it helps with immediate identification of the injury ¹⁸.

Intraoperative cholangiography ineffectiveness at lowering the rate of biliary lesions has been confirmed in large multicenter trials ¹².

There was no need for intraoperative cholangiograms during our study, which were not routinely performed in our patients.

The importance of cholangiography in clarifying unclear anatomy is ascertained, but largely unnecessary in our study, both for the rate of failure of cystic duct cannulation and for the possible injuries that may be caused by the incautious forcing of the biliary catheter through the cystic valve, especially in the inflammatory entanglement of the duct.

Strasberg suggested that no clipping or cutting should be done until the Calot's triangle is cleared from all fat to visualize only two structures : the cystic artery and the duct ¹⁹.

The advantage in this technique(CVS) in our opinion is; by starting the dissection at GB wall identifying first the cystic artery which will be followed toward the cystic ductinfundibular junction to help in reducing misperception errors, because failure to identify the artery should alert the surgeon toward the thinking of anomalies in both the arterial and ductal systems to be more vigilant and careful in the dissection

Dividing the peritoneum and branches of cystic artery over the GB wall to open the triangle of safety will leave the GB away from the liver bed uncovering possible short or hidden cystic duct.

In triangle of safety technique , dissection starts in an area away from Calot's triangle whereby no ductal or arterial anomalies are encountered.

In few cases GB puncturing with bile leakage was occurred due to vigorous traction or incidental injury by electrocautery without leakage of the stone and treated by suction irrigation and these not regarded as complication in our study.

Complications in our study were **(0.2 %)** compared to **(0.3 %)** in other study in literature (Vettoretto, N.) ², and **(0.1 %)** in (Almutairi, A.F.) ²⁰.

In our study the mean operating time was **(35.9)** minutes compared to **(51.5)** minutes in the other study in the literature (Vettoretto, N.) ² and **(68)** minutes in (Almutairi,A.F.) ²⁰.

The short operating time increase the confidence and make the surgeon feel more secure with both inflamed and non-inflamed anatomy.

Conclusion

Critical view of safety seem to be safe technique in demonstrating the anatomy of the cystic duct and the cystic artery and minimize intra and post-operative complication, it might be practical and desirable one in training hospital.

Recommendation

The result in our study and in the literature might suggest the approach as gold standard in the dissection of the GB.

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