

Video and Photographic Documentation for the Critical View of Safety: A Method for Improving Quality Control in Laparoscopic Cholecystectomy

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Background: Currently, Laparoscopic cholecystectomy (LC) is the gold standard surgical treatment of stones in the gall bladder. However, the disadvantage of LC was increases in the incidence of bile duct injury up to 0.20-3.40%. The critical view of safety (CVS) technique has been developed in an attempt to prevent the complication.

Objective: To verify the adequacy of performing CVS technique by auditing the operative note, video record and photographic documentation.

Material and Method: From January until December 2015, we investigated the accuracy of CVS establishment on video and photo prints. Two experienced laparoscopic surgeons were independent analyzer of the documentations, which classified into conclusive, probably, inconclusive and not established.

Results: A twenty-four patients underwent an elective LC. The video records provide a superior quality to prove the CVS than the photo prints (90-95% versus 75-80%). However, a combination of documenting modality including operative note, video and photo print proved that a conclusive CVS establishment could be achieved in all cases. There was no postoperative complication occurred in this study.

Conclusion: Mandatory use of the imaging documentation methods for assessment of adequate CVS generally facilitates a good quality control in surgical practice and patient care.

Keywords: Laparoscopic cholecystectomy, Technique, Quality control, Critical view of safety

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Currently, Laparoscopic cholecystectomy (LC) is the gold standard surgical treatment of stones in the gall bladder, which was found to reduce postoperative pain and encourage earlier recovery than open cholecystectomy. However, the disadvantage of LC was increased incidence of bile duct injury up to 0.2-3.4%. This condition may result in impaired quality of life, morbidity and mortality of the patients^(1,2).

Several operative techniques have been developed in attempt to prevention of bile duct injury during LC, such as the use of 30-degree lens telescope, intraoperative cholangiography (IOC) and the critical view of safety technique (CVS), which reported by Strasberg in 1995^(3,4). The critical view of safety technique was to dissection of the triangle of Calot by

low power settings cautery (less than 30 watts) to clear fibrous and fatty tissue until the cystic artery and cystic duct were entering the gall bladder prior to clipping and transection⁽⁵⁻⁷⁾.

Since the rate of bile duct injury following LC in our department seemed too higher than the standard (5-6% in the past two years). Thus, we decided to accomplish the CVS technique as a routine surgical practice to minimize the postoperative complication. In order to develop the quality control in LC, mandatory intra-operative video and photographic recordings should be done and reviewed to confirm the CVS identification⁽⁸⁾.

In the phase of learning period in CVS technique, the authors used the video and photo print documentation for a proof of the accurately procedure. The aim of this study was to verify the adequacy of performing CVS technique by auditing the operative note, video record and photographic documentation. The assessment of both documenting techniques was done to develop a system of quality control in LC.

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Material and Method

From January to December 2015, the authors performed a retrospective review on the CVS documentations. The audit processes were achieved by reviewing operative note, video records (Sony DVD recorder RDR-GX380) and photo prints (HP office jet 6000). A 30-degree view or flexible telescope was applied for better visualization of anatomical landmark in the Calot's triangle. The photo prints were taken in dorsal and ventral view of the Calot's triangle at the point of CVS prior to clipping and division of cystic artery and cystic duct. The entire procedure was also records.

Two experience, laparoscopic surgeons (performed more than 100 LC procedures) were independent analyzer of the video and photo prints. The interpretation of both documentations of adequate CVS was classified into conclusive (cystic duct and cystic artery were clearly identified in both dorsal and ventral view), probably (cystic duct and cystic artery were only identified dorsal or ventral view), inconclusive (only cystic duct or cystic artery was identified) and not established (cystic duct and cystic artery were not clearly identified). The Critical view of safety in laparoscopic cholecystectomy was illustrated in Fig. 1.

Results

Twenty-four consecutive patients underwent an elective LC with the CVS technique in our department. Four patients with subsided acute cholecystitis and extensive adhesion of the Calot's triangle were excluded from the study. The patient characteristics and the indication for LC were shown in Table 1.

The establishment of CVS was described in the operative note for all of twenty cases. No video and photographic document of the CVS procedure was missing; there was a mean of 7 photo prints per LC (range 4-10 photo; depend on the decision of operative surgeon). The video recording of the entire procedure was analyzing the adequacy of CVS establishment. The operative note demonstrates a 90% of conclusive and 10% probably CVS establishment.

The photographic documentation was less conclusive than video record (70-80% and 90-95%, respectively). A combination of operative note, video and photo print review proved that the CVS could be conclusively established in all 20 cases. At the end of the procedure, the closed suction drain was placed only in the cases that had subsided inflammation of the gall bladder.

In addition, after we apply the CVS technique as a routine procedure. There was no bile leakage or bile duct injury occurred in this study and the postoperative courses were uneventful. The quality of critical views of safety interpreting on video and photographic documentation was illustrated in Table 2.

Discussion

Factors associated with bile duct injury during LC were Identified as 1) Training experience, especially during the first 100 cases that is the learning curve of surgeons. 2) Disease severity, particularly in the patients with inflammation of the gall bladder (acute cholecystitis), which may increase the incidence of bile duct injury by 2 times⁽¹⁰⁾. 3) Anomalies of the

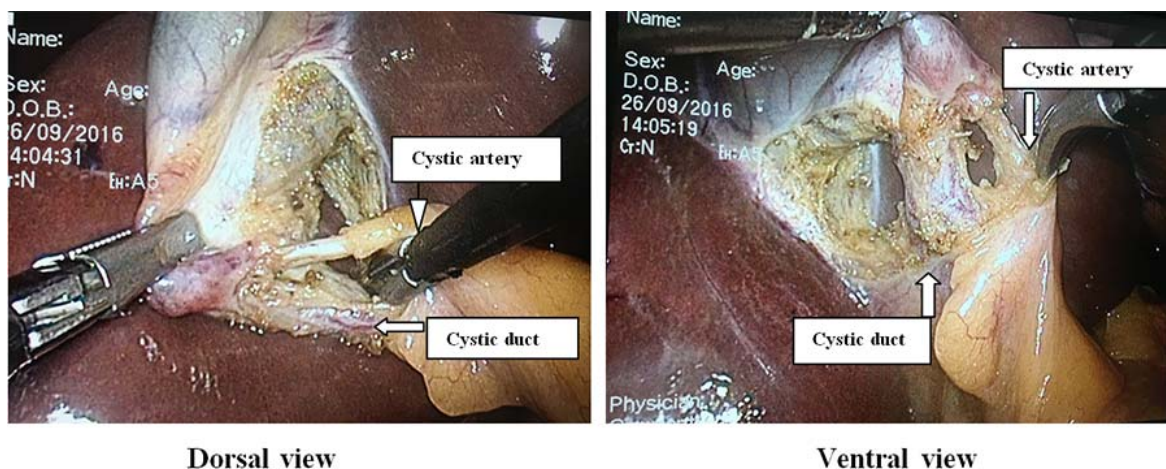


Fig. 1 Illustration of the critical view of safety in laparoscopic cholecystectomy.

Table 1. The patient characteristics and indication for laparoscopic cholecystectomy

Patient characteristic	
Sex	10 men/10 women
Age	55.5 years (21-78 years)
Mean operative time	62.2 minutes (30-110 minutes)
Indication for laparoscopic cholecystectomy	
Symptomatic gall stone	13 (65%)
Acute cholecystitis	3 (15%)
Gall stone related pancreatitis	3 (15%)
Gall bladder polyp	1 (5%)

Table 2. The quality of critical view of safety interpreting on video and photographic documentation

Results	Photo (% of patients)		Video (% of patients)	
	Surgeon 1	Surgeon 2	Surgeon 1	Surgeon 2
CVS documented conclusively	70	80	90	95
CVS documented probably	30	20	10	5
CVS documented inconclusively	0	0	0	0
CVS not established	0	0	0	0

anatomy in Calot's triangle (such as aberrant right hepatic duct) can cause misidentification and lead to bile duct injury. 4) Technical errors; for instance, deep dissection into the liver or inadequate closure of the cystic duct stump may result in post-operative bile leakage⁽¹¹⁾. At present, the safer LC technique for establishing "Critical view of safety" (CVS) before clipping and transection of the cystic duct is an effective way for precluding of bile duct injury. This surgical approach helps identify the anatomical structure correctly. Avgerinos et al reported the success rate of 95.4% to perform CVS technique in 1,046 laparoscopic cholecystectomies without post-operative bile duct injury⁽¹²⁾. Furthermore, in the case of acute gall bladder pathology (biliary colic, acute or chronic cholecystitis), a CVS helps to clarify anatomy in the circumstance of inflamed Calot's triangle. This technique is safe and was a suitable alternative method for routine use of the IOC in the selected patients⁽¹³⁾.

These evidences correspond well with our results that we had no incidence of bile duct injury or bile leak occurred following the mandatory attempt of an adequate CVS technique in laparoscopic cholecystectomy without the necessity of IOC.

For the purpose of quality audit of surgical performance in LC, mandatory video and photographic documentation is a reliable method to determine

whether CVS was archived and to interpret the adequacy of CVS establishment. To date, there was no study demonstrating the preferable system in CVS quality documentation between video and photo print⁽¹⁴⁾.

According to the result of our study, the video recording seems to demonstrate more CVS conclusively than photo print, which could be explained by 1) Difficulty to demonstrate a ventral view of the Calot's triangle, particularly in the cases with inflamed gall bladder. 2) The resolution of the photo prints, which varied from 8-12 megapixels. 3) An obscured view of the operative field caused by foggy of the telescope and surgical smoke.

In addition, the post-operative course in our series was uneventful, which is supporting the satisfactory outcomes of the CVS technique in LC. The video and photographic documenting systems also provide a benefit on the medico-legal aspect, surgical technique and training purpose in the hospital.

The limitations of this study included 1) there were small numbers of the patients in the study because of the initial experience to accomplish the CVS technique as a routine procedure in the department. Hence, we decided to convert the operation to open cholecystectomy if the CVS was not established on the inflamed gall bladder. 2) The advantage of the use

of CVS technique to replacement routine IOC for precluding bile duct injury should be studied in randomized control design in the future given that we have a small number of acute gall bladder pathology in the series.

Conclusion

The video recording was superior to photo print for evaluation of the CVS conclusively. The authors suggest for mandatory use of the imaging documentation, including video and photo print for assessment of the adequacy of CVS establishment generally facilitates a good quality control in surgical practice and patient care.

What is already known on this topic?

The critical view of safety (CVS) technique is an effective procedure for minimized the risk of bile duct injury following laparoscopic cholecystectomy.

What this study adds?

Mandatory use of video and photographic documentation for determining an adequacy of CVS establishment facilitates a good quality control in surgical practice and patient care.

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Potential conflicts of interest

None.

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การทบทวนบันทึกวิทัศน์และภาพถ่ายการผ่าตัดด้วยวิธีการส่องกล้องโดยเทคนิค *critical view of safety* เพื่อการพัฒนาคุณภาพการผ่าตัด

รัชชัช ตูวรรณนะ, ธรรมนิจ รุกขชาติ, ปริญญา อัครานุรักษ์กุล

ภูมิหลัง: ในปัจจุบันการผ่าตัดถุงน้ำดีโดยวิธีการส่องกล้องถือว่าเป็นมาตรฐานในการรักษาภาวะนิ่วในถุงน้ำดี อย่างไรก็ตามพบว่ามีอุบัติการณ์ของการบาดเจ็บของท่อน้ำดีภายหลังการผ่าตัดได้ 0.2-3.4% จึงได้มีการพัฒนาการผ่าตัดโดยใช้เทคนิค *critical view of safety* เพื่อช่วยป้องกันไม่ให้เกิดการบาดเจ็บต่อท่อน้ำดีเกิดขึ้น

วัตถุประสงค์: เพื่อตรวจสอบความสมบูรณ์ของการผ่าตัดถุงน้ำดีโดยวิธีการส่องกล้องด้วยเทคนิค *critical view of safety* โดยการตรวจสอบจากบันทึกการผ่าตัด, บันทึกวิทัศน์และภาพถ่ายการผ่าตัด

วัสดุและวิธีการ: เป็นการศึกษาระหว่างเดือนมกราคม ถึง ธันวาคม พ.ศ. 2558 โดยศัลยแพทย์ที่มีความชำนาญในการผ่าตัดถุงน้ำดีโดยวิธีการส่องกล้อง 2 คน ทำการทบทวนบันทึกวิทัศน์และภาพถ่ายของการผ่าตัดโดยใช้เทคนิค *critical view of safety* ซึ่งผลการวิเคราะห์จำแนกออกเป็นสามประเภท ทำผ่าตัดได้สมบูรณ์, ทำผ่าตัดได้เกือบสมบูรณ์, ทำได้ไม่สมบูรณ์ และไม่สามารถทำการผ่าตัดโดยใช้เทคนิค *critical view of safety* ได้

ผลการศึกษา: มีจำนวนผู้ป่วยในการศึกษานี้ 24 ราย พบว่าการบันทึกวิทัศน์สามารถแสดงการผ่าตัดถุงน้ำดีโดยวิธีการส่องกล้องโดยใช้เทคนิค *critical view of safety* ได้สมบูรณ์กว่าภาพถ่าย (90-95% และ 70-80% ตามลำดับ) อย่างไรก็ตามการใช้บันทึกการผ่าตัด, บันทึกวิทัศน์และภาพถ่ายร่วมกันสามารถแสดงให้เห็น ความสมบูรณ์ของการผ่าตัดได้ในผู้ป่วยทุกราย นอกจากนี้ไม่พบว่ามีอุบัติการณ์ของการบาดเจ็บต่อท่อน้ำดีหรือมีการรั่วของน้ำดีเกิดขึ้นภายหลังการผ่าตัด

สรุป: การบันทึกวิทัศน์และภาพถ่ายขณะทำการผ่าตัดถุงน้ำดีโดยวิธีการส่องกล้อง มีประโยชน์ในการควบคุมคุณภาพการผ่าตัดและการพัฒนาการดูแลผู้ป่วยในเวชปฏิบัติ
