

## ORIGINAL ARTICLE

**Critical View of Safety for Safe Laparoscopic Cholecystectomy***Siddharth P. Dubhashi<sup>1</sup>, Ratnesh Jenaw<sup>2</sup>, Riddhima S. Dubhashi<sup>3</sup>**<sup>1</sup>Department of Surgery, All India Institute of Medical Sciences (AIIMS), Nagpur-441108**(Maharashtra) India, <sup>2</sup>Department of Surgery, Sawai Man Singh Medical College, Jaipur-302004**(Rajasthan) India, <sup>3</sup>Department of Surgery, Dr. V.M. Govt. Medical College, Solapur-413003**(Maharashtra) India***Abstract:**

**Background:** Different anatomy in laparoscopic view of the area around the gallbladder, especially the Calot's triangle, leads to misidentification of structures. Extrahepatic biliary system injuries lead to considerable morbidity, occasional mortality and medico-legal issues. **Aim and Objectives:** To assess the utility of "Critical View of Safety" (CVS) for a safe laparoscopic cholecystectomy, in terms of: frequency of occurrence, anatomical description and relationship with level of difficulty in performing laparoscopic cholecystectomy. **Material and Methods:** This is a prospective study including 50 cases of symptomatic gall stone disease, managed with laparoscopic cholecystectomy. The cases were grouped into three categories (easy, difficult and very difficult) using a validated scoring system. The CVS was identified and evaluated. The relationship between occurrence of complications and level of difficulty in performing the procedure was also noted. The results were analyzed using the Chi-square test. **Results:** The study included 17 males and 33 females. Majority of patients (34%) were in the age group of 21-30 years. The CVS was demonstrated in 68% of patients. Out of the 34 patients in whom CVS was demonstrated, 28 cases (82.3%) belonged to the 'easy' group and the relationship was statistically significant. The relationship between operating time and level of difficulty in performing laparoscopic cholecystectomy was statistically significant. Out of three cases with complications

(bleeding and bile spillage), two cases (66.6%) were in the 'difficult' group. **Conclusions:** Safe dissection of Calot's triangle is vital for a successful outcome following laparoscopic cholecystectomy. The demonstration of CVS is an effort to standardize the approach to the cystic artery and duct, effectively avoiding the area of aberrant ductal and arterial anatomy. It is essential to implement evidence-based protocols for safe laparoscopic cholecystectomy using validated anatomical landmarks.

**Keywords:** Critical View of Safety; Safe Laparoscopic Cholecystectomy, Calot's triangle

**Introduction:**

Laparoscopic cholecystectomy is associated with more biliary, vascular and visceral complications when compared with open cholecystectomy [1]. Laparoscopic bile duct injury is a known complication even in the hands of an experienced surgeon [2-3]. Different anatomy in laparoscopic view of the area around the gallbladder, especially the Calot's triangle, leads to misidentification of structures [4-5]. Extra-hepatic biliary system injuries lead to considerable morbidity, occasional mortality and medico-legal issues [6]. This study evaluates the role of identification of the "Critical View of Safety" (CVS) for a safe laparoscopic cholecystectomy. To assess the utility of "CVS" for

a safe laparoscopic cholecystectomy, in terms of:

1. Frequency of occurrence
2. Anatomical description
3. Relationship with level of difficulty in performing laparoscopic cholecystectomy

### Material and Methods:

This is a prospective study including 50 cases of symptomatic gall stone disease, managed with laparoscopic cholecystectomy. The sample size was calculated taking into account the acceptable level of significance, power of study, underlying event rate and standard deviation in the population. This study which was approved by the Institutional Ethics Committee, was conducted over 15 months at a tertiary care centre. Written and informed consent was obtained from all cases before inclusion in the study.

Clinical examination, liver function profile and abdominal ultrasound was done for all patients. All patients underwent laparoscopic cholecystectomy under general anaesthesia. The operative timing was noted from the first port site incision till the last port closure. The degree of difficulty in performing the procedure was assessed using a standard scoring system [7] and the cases were grouped into three categories: easy, difficult and very difficult.

The critical view of safety was identified. Evaluation of the same as a landmark for safe laparoscopic cholecystectomy was done in terms of: frequency of occurrence, anatomical description and relationship with difficulty in performing laparoscopic cholecystectomy. The relationship between occurrence of complications and level of difficulty in performing the procedure was also noted. The results were analyzed using the Chi-square test.

### Results:

The study included 17 males and 33 females. The age of the youngest patient in the study was 22 years and that of the oldest patient was 68 years. Majority of patients 17 cases (34%) were in the age group of 21-30 years (Table 1). The CVS was demonstrated in 34 (68%) patients (Figs. 1 and 2). Out of the 34 patients in whom CVS was demonstrated, 28 cases (82.3%) belonged to the 'easy' group and the relationship was statistically significant (Table 2). The relationship between operating time and level of difficulty in performing laparoscopic cholecystectomy was statistically significant (Table 3). Out of three cases (6%) with complications (bleeding and bile spillage), two cases (66.6%) were in the 'difficult' group.

Group	Description
Easy	Time taken <60 min, no bile spillage, no duct / artery injury
Difficult	Time taken 60 to 120 min, bile / stone spillage, duct injury, no conversion
Very difficult	Time taken >120 min, conversion



**Fig.1: Demonstration of Critical View of Safety (Case 1)**



**Fig.2: Demonstration of Critical View of Safety (Case 2)**

**Table 1: Age and Gender Distribution**

Age Group (Year)	Male	Female	Total	Percentage
21 – 30	4	13	17	34
31 – 40	3	7	10	20
49 – 50	4	2	6	12
51 – 60	3	7	10	20
> 60	3	4	7	14
<b>Total</b>	<b>17</b>	<b>33</b>	<b>50</b>	<b>100</b>

**Table 2: Relationship with Level of Difficulty in Performing Laparoscopic Cholecystectomy**

Level of Difficulty	Critical View of Safety		Total
	Demonstrated	Not Demonstrated	
Easy	28	2	<b>30</b>
Difficult	6	11	<b>17</b>
Very Difficult	0	3	<b>3</b>
<b>Total</b>	<b>34</b>	<b>16</b>	<b>50</b>

*Chi-square = 23.580 with 2 degrees of freedom; P <0.001; statistically significant*

**Table 3: Trace Elements Levels and Biochemical Parameters in Asthmatic Patients and Control Subjects**

Level of Difficulty	Operating Time (min)				Total
	20 to 30	30 to 45	45 to 60	> 60	
Easy	7	23	0	0	30
Difficult	2	10	4	1	17
Very Difficult	0	1	2	0	3
<b>Total</b>	<b>9</b>	<b>34</b>	<b>6</b>	<b>1</b>	<b>50</b>

*Chi-square = 17.349 with 6 degrees of freedom; P = 0.008; statistically significant*

### Discussion:

Anatomical aberrations and misinterpretation of normal anatomical structures cause a significant incidence of complications related to hepatobiliary surgical procedures [8]. As per the scoring system [7], 60% of patients in our study were in 'easy' group, 34% in difficult group and 6% in the 'very difficult' group. In a study by Randhawa and Pujahari [7], maximum cases were in the age group of 30 to 50 years. 78% were 'easy' and 22% were 'difficult'. The operative outcome showed a positive predictive value of 88.8% and 92.2% for 'easy' and 'difficult' respectively. In our study, the positive prediction value was 80% for 'easy' and 84% for 'difficult' group.

The concept of CVS was first proposed by Strasberg and colleagues in 1995 to minimize the risk of bile duct injuries in laparoscopic cholecystectomy [6]. They emphasized the need for achieving the CVS 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

aspects [9]. The CVS has three requirements [6, 10]:

- Dissection of the triangle of Calot from all the fatty and fibrous tissue
- Mobilization of the lowest part of the gallbladder from its bed
- The unambiguous identification of two and exclusively two structures (cystic duct, cystic artery) entering the gall bladder

The common bile duct is usually mistaken to be the cystic duct and sometimes an aberrant duct is misidentified as the cystic duct. The former is called the 'classical injury' by Davidoff and colleagues [11]. The CVS was identified in 68% patients in our study. Compliance with all three criteria of CVS [6, 10] may prevent inadvertent bile duct injuries, as it indicates reliable exposure and identification and all structures in the Calot's triangle. The CVS is not a dissection technique, but rather a technique of identification. Dissection reveals the CVS, but affirmation that the CVS has

been achieved takes place in a moment of time, when no dissection is going on. The Critical View should be demonstrated and ideally the surgeon and assistant should agree that it is achieved [10]. Photo documentation of CVS has been recommended by Heistermann and colleagues [12].

In a study by Yegiyants *et al.* [13], 3042 patients had laparoscopic cholecystectomy using CVS for identification from 2002-2006. None of these patients had an injury due to misidentification. Averginos *et al.* [14] used CVS in 998 cases. The conversion rate was 2.7%. There were no major bile duct injuries. Heistermann *et al.* [12], in their study of 100 patients using CVS, completed 97 cases laparoscopically, in spite of high incidence of acute cholecystitis and prior abdominal surgery. There was one postoperative cystic duct stump leak.

The Dutch Society of Surgery established a commission to study the problem of biliary injury in Netherlands. They have adopted CVS as the standard method of performing ductal identification. Wauben *et al.* [15] have reported on use

of ductal identification techniques, including CVS. A heightened awareness of the CVS through mandatory documentation may improve both trainee and surgeon technique in laparoscopic cholecystectomy [16]. There is no level I evidence regarding utility of CVS in preventing bile duct injuries due to lack of randomized trials [13-14].

In our study, the relationship of demonstration of CVS with the ease of performing laparoscopic cholecystectomy was statistically significant.

### Conclusions:

Safe dissection of Calot's triangle is vital for a successful outcome following laparoscopic cholecystectomy. The demonstration of CVS is an effort to standardize the approach to the cystic artery and duct, effectively avoiding the area of aberrant ductal and arterial anatomy. A photographic documentation of the same is highly desirable. It is essential to implement evidence-based protocols for safe laparoscopic cholecystectomy using validated anatomical landmarks.

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**How to cite this article:**

Dubhashi SP, Jenaw R, Dubhashi RS. Critical View of Safety for Safe Laparoscopic Cholecystectomy. *J Krishna Inst Med Sci Univ* 2020; 9(4):44-49

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Submitted: 18-Mar-2020 Accepted: 08-Aug-2020 Published: 01-Oct-2020

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