

To study various pre-operative parameters to achieve the critical view of safety in laparoscopic cholecystectomy

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Abstract

Introduction: Currently, there are no randomized controlled trials published up-to-date to give us level-1 evidence that CVS prevents bile duct injuries. Therefore, the present study focuses on various pre-operative parameters that effect to achieve the critical view of safety during laparoscopic cholecystectomy.

Material and Methods: This prospective study was conducted in 50 patients presenting to the Department of General Surgery for Laparoscopic cholecystectomy. All patients included in this study were thoroughly clinically examined and ultrasonographic evaluation of gall bladder and hepatobiliary, pancreatic system was done followed by routine blood investigations. A Probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) Version 21.0 for Microsoft Windows.

Results: Maximum number of patients were in the age group of > 41 years (52 %) followed by 31-40 years age group. Mean age of the patients of the present study was 41.14 ± 12 years. Female patients (82%) outnumbered the male (18%) patients in our study. Most common presenting complaint was pain abdomen in 40 out of 50 patients followed by dyspepsia (26) and post meal fullness (26). 43 patients (86%) had multiple gall stones while 7 patients (14%) had single gall stone.

Conclusion: Pre operative ultrasound findings suggestive of stone impacted in the neck of the gall bladder were associated with intra operative presence of adhesions between gall bladder and surrounding structures, thus making it difficult to achieve critical view of safety.

Keywords: Gall bladder, Hepatobiliary; Laparoscopic cholecystectomy

Introduction

Laparoscopic cholecystectomy (LC) has become the procedure of choice in the surgical treatment of symptomatic biliary lithiasis.¹ The National Institutes of Health consensus elected Laparoscopic cholecystectomy as the —gold standard for cholelithiasis in 1992.² Jatzko et al in a comparative analysis reported that Laparoscopic cholecystectomy entails lower morbidity and mortality rates (1.95%) than open procedure (7.7%), also patient encounter less post operative pain, cosmetically better due to shorter incision, reduced duration of hospital stay, and a faster recovery period.³ However, since its introduction and routine use in 1990s, the incidence of biliary injuries has doubled from 0.2% to 0.4% and remained constant despite advances in knowledge, technique, and technology.^{4,5} These preventable injuries can be devastating, increasing the morbidity, mortality, and medical cost, while decreasing the patient's quality of life.⁶ Cystic duct is the commonest cause of major bile duct injury and therefore active identification of cystic structures within Calot's triangle is the key to reduce the biliary injury.⁷ The approach to the gallbladder's pedicle is of utmost importance for the prevention of injuries Routine intra operative cholangiography has been advocated by many authors.⁸ Strasberg et al standardized an approach to outline the critical view of safety. There are three criteria for a Critical view of safety (CVS). Firstly, Calot's triangle to be completely free of fat and fibrous tissue, it does not require that the common bile duct be exposed. Secondly, the lower one third part of the gall bladder be separated from the cystic plate. The cystic plate referred to as the liver bed of the gall bladder, is part of the plate/ sheath system of the liver. Thirdly, the two structures and only 2, should be seen entering the gall bladder ie cystic duct and cystic artery (figure 2).⁹



Figure 1: Image depicting intra operative Critical view of Safety

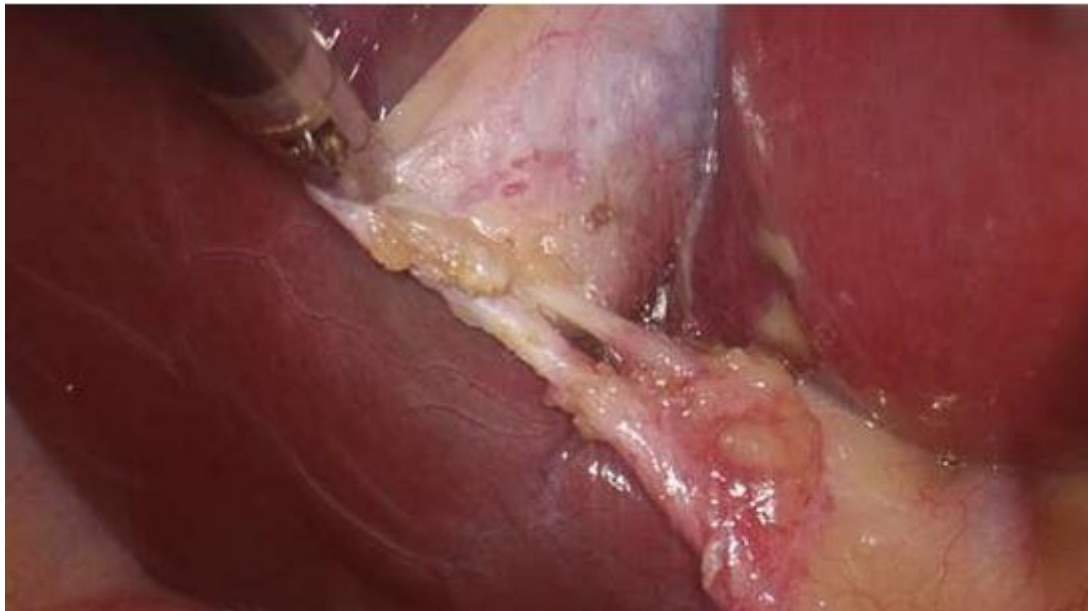


Figure 2: Image depicting only two structures entering the gallbladder

Once these three criterias have been fulfilled, the critical view of safety is attained. Currently, the Critical view of safety technique is accepted as a Gold Standard for reducing morbidity and mortality associated with Laparoscopic cholecystectomy by the European Association of Endoscopic Surgery (EAES).¹⁰ There are no randomized controlled trials published up-to-date to give us level-1 evidence that CVS prevents bile duct injuries. Singh K et al¹¹ assessed the frequency and the relevance of anatomical variations of extrahepatic biliary system in 740 patients undergoing laparoscopic cholecystectomy performed by a single surgeon by achieving a critical view of safety. Operative findings revealed 197 (26.62%) vascular anomalies and 90 (12.16%) ductal anomalies. Vascular anomalies were more frequent than the ductal anomalies. Factors influencing intra operative attainment of critical view of safety and its importance in preventing bile duct injuries needs to be studied in detail. Therefore, the present study focuses on various pre-operative parameters that effect to achieve the critical view of safety during laparoscopic cholecystectomy.

MATERIAL AND METHODS

This prospective study was conducted in 50 patients presenting to the Department of General Surgery, Government Medical College and Rajindra Hospital, Patiala taken up for Laparoscopic cholecystectomy, during the period of May 2019 to December 2020 after approval of the plan by the Ethical Committee of the institute.

Inclusion criteria comprised of all the patients who were attempted for laparoscopic cholecystectomy i.e., presenting with symptomatic gall stones. These include patients with history of chronic cholecystitis, recurrent

attacks of biliary colic or acute cholecystitis, mucocele of gall bladder, all patients who gave written informed consent for enrollment in the study and patients converted to open cholecystectomy due to difficult laparoscopic cholecystectomy were also included.

Exclusion criteria consisted of patient with age less than 18 years and with more than 70 years of age, patient who refused to give consent to participate in the study, patients who had an attack of acute cholecystitis within two weeks, patients with coagulopathy disorder, pregnancy, patients with cirrhosis and associated portal hypertension, patient who is a diagnosed case of carcinoma gall bladder and patients with any relative contraindication to laparoscopy or general anaesthesia.

All patients included in this study were thoroughly clinically examined and ultrasonographic evaluation of gall bladder and hepatobiliary, pancreatic system was done followed by routine blood investigations. Informed consent was taken from included patient.

Statistical analysis of the results of study was described in terms of continuous variables which were expressed as means with standard deviations and the chi square test was used to analyse the categorical data. A Probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) Version 21.0 for Microsoft Windows

RESULTS

Table 1: Association of CVS with age of the patient (N=50)

		CVS Achieved				Total	Chi square value	P value
		N		Y				
AGE GROUP	< 30	1	14.3%	10	23.3%	11	1.241	0.538
	31-40	1	14.3%	12	27.9%	13		
	>40	5	71.4%	21	48.8%	26		

Table 2: Association of CVS with gender

Table 2: Association of CVS with Gender								
		CVS Achieved				Total	Chi square value	p-value
		N		Y				
Gender	F	2	28.6%	39	90.7%	41	15.742	0.0001
	M	5	71.4%	4	9.3%	9		

Table 3: Association of CVS with presenting complaints

Presenting Complaints		CVS				Total	Chi square value	P value
		N	N	Y	Y			
Pain Abdomen	N	1	14.30%	9	20.90%	10	0.166	0.684
	Y	6	85.70%	34	79.10%	40		
Post meal fullness	N	2	28.60%	23	53.50%	25	1.495	0.221
	Y	5	71.40%	20	46.50%	25		
Dyspepsia	N	1	14.30%	23	53.50%	24	3.707	0.054
	Y	6	85.70%	20	46.50%	26		
Asymptomatic	N	7	100.0%	39	90.7%	48	0.708	0.48
	Y	0	0.0%	4	9.3%	4		
Fever	N	7	100.0%	43	100.0%	50		
	Y	0	0.0%	0	0.0%	0		

Table 4: Association Of CVS With History Of Recurrent Attacks

7. Association Of CVS With History Of Recurrent Attacks								
		CVS Achieved				Total	Chi square value	P value
		N		Y				
Recurrent attacks	N	1	14.3%	39	90.7%	40	21.968	0.001
	Y	6	85.7%	4	9.3%	10		

Table 5 – Association Of CVS With Ultrasonographic Findings

Usg Abdomen Findings		CVS				Total	Chi square value	P value
		N	N	Y	Y			
sing/mul	M	6	85.7%	37	86.0%	43	0.001	0.981
	S	1	14.3%	6	14.0%	7		
Pericholecystic fluid	N	7	100.0%	43	100.0%	50	0.166	0.684
Gall bladder wall thickness more than 4mm	N	7	100.0%	41	95.3%	48	0.339	0.560
	Y	0	0.0%	2	4.7%	2		
WES sign	N	5	71.4%	41	95.3%	46	4.680	0.089
	Y	2	28.6%	2	4.7%	4		
Gall bladder sludge	N	5	71.4%	38	88.4%	43	1.435	0.231
	Y	2	28.6%	5	11.6%	7		
Empyema	N	7	100.0%	43	100.0%	50		
	Y	0	0.0%	0	0.0%	0		
Stone impacted in neck of gall bladder	N	5	71.4%	43	100.0%	48	12.798	0.017
	Y	2	28.6%	0	0.0%	2		

Table 1 shows that out of 7 patients in whom critical view of safety could not be achieved, 5 patients belonged to age group of more than 40 years and age group of 31-40 years had 1 patient and 1 patient was of age less than 30 years. Most of the patients in whom critical view of safety was not achieved were more than 40 year of age but this observation has p value of 0.538 which is statistically insignificant. Out of 7 patients in whom critical view of safety was not achieved, 2 were female patients who had duration of history of more than 5 months, with one patient having history of 7 months and other one had a long history of 1 year. A long history was associated with presence of repeated attacks of biliary colic.

Table 2 shows that among the patients in whom critical view of safety was not achieved, 5 were male patients and this is statistically significant with a p value of 0.0001. Male gender is itself considered a risk factor for complicated cholecystitis due to various factors like late presentation of male patients with long history of recurrent attacks, more chances of aberrant anatomy and predisposition of male gender to adhesions between gall bladder and surrounding structures.

In this prospective study, it was observed that out of 50 patients, pain abdomen was the main presenting complaint in 40 patients thus making it the most common presentation but in association with critical view of safety, it is statistically insignificant with a p value of 0.684 (table 3). Dyspepsia was present in 26 patients, making it the second most common presenting complaint with a p value of 0.054. Post meal fullness was observed in 25 patients (p value - 0.221).

Out of 50 patients, history of recurrent attacks was present in 10 patients i.e. 20 %. Out of 10 patients with history of recurrent attacks, the attempt to achieve CVS was not successful in 6 patients and on association of CVS with recurrent attacks, p value is equal to 0.001 which is statistically significant (table 4).

Out of 7 patients in whom CVS was not achieved, 6 patients had multiple gall stones on ultrasound (p value is 0.981 which is statistically insignificant). Association of pre operative USG finding of stone impacted in the neck of the gall bladder with CVS has statistically significant with p value of 0.017 (table 5).

DISCUSSION

In the present study 52 percent of the patients belonged to the age group of more than 40 years followed by 26 % in 31-40 years age group. Mean age of the patients of the present study was 41.14 ± 12 years. The minimum age was 18 years and maximum age 70 years. Majority of the patients belonged to middle age group.

Our results were in concordance with the results obtained by Shaheed M et al¹² and Viswanathan V et al¹³ who also reported similar age group of patients in their respective studies. Mean age of the patients in the study conducted by Shaheed M et al¹² and Viswanathan V et al¹³ was 44.6 years and 36.5 years respectively. Female patients (82%) outnumbered the male (18%) patients in our study. 66.5 % were female patients in the study by Zarin et al¹⁴ on 218 patients with laparoscopic cholecystectomies done with critical view of safety technique.

It was observed that out of 50 patients, 40 patients presented to the department of General Surgery with the complaint of pain abdomen, thus making it the most common presentation followed by Dyspepsia (26 patients) and post meal fullness (25 patients). Fever was not present in any of the patients. 4 patients out of 50 patients were asymptomatic i.e. they had no chief complaint and were diagnosed with cholelithiasis as an incidental finding on ultrasonography. Study by Vishwanathan et al¹³ too reported abdominal pain as the main symptom followed by fever and then nausea/vomiting.

Pain was the most common clinical symptom encountered in patients in study by Ajay Kumar et al¹⁵, found to be present in 100 percent of the patients. Dyspepsia and vomiting were the next in number found to be present in 46.67 percent and 5.33 percent of the patients.

The history of recurrent attacks can be associated with presence of dense adhesions of gall bladder with surrounding structures like omentum, stomach, duodenum, colon etc making it a difficult case of laparoscopic cholecystectomy. M W Khan et al¹⁶ in 2005 conducted a study on 4957 patients who underwent laparoscopic cholecystectomy and observed that peri cholecystic adhesions including cholecystoenteric fistulae and acute inflammation were the main reason for difficult dissection and this could be anticipated from the history of recurrent attacks.

Volkan Genc et al¹⁷ conducted a study on 5382 patients and concluded that the main reason for conversion to be the failure of anatomical identification of Calot's triangle structures because of severe inflammation caused either by acute cholecystitis or by dense adhesions caused by recurrent attacks of cholecystitis.

In the present study, all the patients included in this study underwent radiological investigation in form of ultrasonography. It was observed that 43 patients (86%) had multiple gall stones while 7 patients (14%) had single gall stone. It was observed that WES sign (Wall echo shadow sign) was positive in 4 patients (8%). Gall bladder sludge was observed in 7 patients (14%). The stone was impacted in the neck of gall bladder in 2 patients (4%). Empyema and pericholecystic fluid were not observed in any of the cases. In 2 patients, gall bladder wall thickness more than 4 mm was present.

Vishwanathan et al study¹³ of 100 patients reported ultrasonographic findings as probe tenderness in 15, single calculi 43, multiple calculi 41, gall bladder sludge in 11 and empyema in 3 and peri cholecystic collection in 2 patients

Assessment of efficacy of critical view of safety (CVS) was studied by Ajay Kumar et al¹⁵ in 75 laparoscopic cholecystectomies. 50 percent of the patients belonged to the age group of 30 to 50 years. Mean age of the patients of the present study was 48.6 years. 80 percent of the patients of the present study were females, while the remaining 20 percent were males. Pain was the most common clinical symptom encountered in patients in the present study found to be present in 100 percent of the patients. Dyspepsia and vomiting were the next in number found to be present in 46.67 percent and 5.33 percent of the patients. Aberrant anatomy was found to be present in 2 patients, where as it was absent in 73 patients. Spillage was found to be present in 25.33 percent of the patients, while it was absent in 74.67 percent of the patients. Critical view of safety was achieved in 100 percent of the patients of the present study. Aberrant anatomy was encountered only in two cases. Those cases were converted into open cholecystectomy. Mean duration of procedure in the present study was 59.45 minutes. Manatakis DK et al in 2019¹⁸ conducted a ten-year audit of safe bail-out alternatives to the critical view of safety in laparoscopic cholecystectomy. 1226 cases were included in the final analysis. CVS was feasible in 1128 cases (92.0%), whereas 65 patients (5.3%) were managed laparoscopically by a bail-out technique. Of those, 52 (4.3%) underwent a subtotal cholecystectomy, 12 (0.9%) a fundus-first cholecystectomy, and in one patient (0.1%) the operation was concluded by a tube cholecystostomy. Overall conversion rate was 2.7% (33/1226 cases). Male gender, older age, junior surgeons, and acute cholecystitis were significantly associated with higher conversion.

CONCLUSION

Pre operative ultrasound findings suggestive of stone impacted in the neck of the gall bladder were associated with intra operative presence of adhesions between gall bladder and surrounding structures, thus making it difficult to achieve critical view of safety.

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