International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 3, March 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.3.2025.177

Original Research

Study The Achievement Of Critical View Of Safety In Laparoscopic Cholecystectomy

[1]Dr. Raj Kishan, [2]Dr. Shamim Siddiqui, [3]Dr. Divyansh Kaushik, [4]Dr. C. S. Rawat

[1,2,3]Junior Resident 3, Department of Surgery, Era's Medical College Lucknow, U.P., India
[4]Professor, Department of Surgery, Era's Medical College Lucknow, U.P., India

Corresponding author
Dr. Shamim Siddiqui
Junior Resident 3, Department of Surgery, Era's Medical College Lucknow, U.P., India

Received date: 11 February 2025 Acceptance date: 16 March 2025 Published: 25 March, 2025

Abstract

Aim: To study the critical view of safety of Strasberg in laparoscopic cholecystectomy.

Materials and methods: This study is a prospective interventional study conducted on patients undergoing elective laparoscopic cholecystectomy at Era's Lucknow Medical College & Hospital. A total sample size of 60 patients was determined using statistical formulas, considering a 20% loss to follow-up. The inclusion criteria included patients aged 18 years and above, while cases of gallbladder malignancy and choledocholithiasis were excluded. The study employed statistical analysis using SPSS Version 21.0. Various statistical tools were utilized, including mean and standard deviation for descriptive analysis, the paired t-test for comparing changes over time, and the chi-square test for categorical variables. Odds ratio calculations assessed the likelihood of outcomes between groups, while ANOVA determined variance between study groups. The level of significance was set at $p < 0.05$. This research aims to evaluate the achievability of CVS in different patient profiles and its impact on surgical outcomes, including operative time, postoperative complications, pain levels, and hospital stay duration.

Results: A majority of the patients in present study were Females (66.7%), while the remaining were Males (33.3%). Gender ratio of the present study was 2:1. Mean age of the patients included in the study was 39.50±11.66 years and ranged from 21 to 71 years. Majority of the patients were in 3rd to 5th decade of life (61.6%). The mean duration of surgery was 57.37±11.24 minutes and ranged between 39.0 & 78.0 minutes. Blood loss ranged through 20 to 125 ml. Mean Blood loss was 69.75±21.72 ml. Nassar grade of the cases ranged between 1 & 5. Mean grade was 1.85±0.92. The average drain collection was 25.58±10.08 ml and ranged from 5 to 50 ml. Mean post-op pain at 1 hour was 4.45±0.50. At repeated intervals of 2 hour, 4 hour and 24 hour was 3.2±0.65, 2.58±0.36 & 1.18±0.70. Mean hospital stay of the cases was 3.35±0.77 days & it ranged between 2 to 5 days. CVS was achieved in a majority of the cases (73.3%), while it failed to be achieved in 26.7% of the cases. On comparing statistically, no significant association of age with achievement of CVS achievement was found. On comparing statistically, no significant association of gender with achievement of CVS achievement was found. On comparing statistically, intra-operative findings between the cases where CVS was achieved to those in whom CVS achievement failed, though the cases where CVS was not achieved had a longer duration of surgery (58.43±11.89 vs. 54.44±8.90 minutes) and had more Drain collection (25.56±8.70 vs. 25.23±10.62 ml). However, statistically, this difference was not significant. On the other hand, cases in whom CVS was achieved as compared to those where it failed to be achieved a significantly lower Blood Loss (64.09±20.35 vs. 85.31±17.75 ml) and Nassar Grading (1.55±0.79 vs. 2.69±0.70). Though the pain was higher at all post-operative intervals in the cases, where CVS was not achieved, on comparing statistically, no significant association of pain was found at any post-operative interval with achievement at CVS. Though the hospital stay was longer in cases in whom CVS could not be achieved as compared to those where CVS was achieved, however statistically this difference was not significant.

Conclusion: No significant association of age and gender was found with achievement of CVS and significantly lower Blood Loss and Nassar Grading was found in cases in whom CVS was achieved. In cases in whom CVS was achieved, there was shorter duration of hospital stay and shorter duration of surgery. Pain at different intervals were similar in patients in whom CVS was achieved and not achieved

Keywords: Laparoscopic, Cholecystectomy, Surgery

Introduction

Minimally invasive surgery, particularly laparoscopic cholecystectomy (LC), has gained widespread adoption due to its advantages, including smaller incisions, reduced postoperative pain, and shorter recovery times compared to traditional open cholecystectomy (OC). In the United States alone, approximately 750,000 to 1,000,000 LC procedures are performed annually. Despite its benefits, LC is associated with a higher incidence of bile duct injuries

DOI: 10.69605/ijlbpr_14.3.2025.177

(BDI) compared to OC, significantly affecting patient outcomes, life expectancy, and financial burden. The overall biliary complication rate remains around 1.5%, emphasizing the need for improved safety measures.[1,2,3,4]

The introduction of the Critical View of Safety (CVS) technique by Strasberg in 1995 aimed to minimize the risk of BDI. CVS involves clearing the hepatocystic triangle of fibrofatty tissue, ensuring only two structures connect to the gallbladder, and dissecting the lower third of the gallbladder from the cystic plate before dividing the cystic duct and artery. Achieving CVS is crucial for reducing BDI; however, its application can be challenging in cases of abnormal anatomy, adhesions, inflammation, or stone impaction. In such scenarios, an experienced surgeon must handle the procedure, or conversion to open surgery may be necessary to prevent complications.[5,6,7]

Despite the widespread adoption of CVS, studies have not shown a significant reduction in BDI rates. Some research suggests that routine use of CVS can mitigate BDI risks, but a lack of control groups makes it difficult to draw definitive conclusions. Furthermore, challenges in correctly identifying and executing CVS persist, with variations in gallbladder anatomy, cholecystitis severity, and stone incarceration influencing its success. These factors contribute to the ongoing debate regarding the effectiveness of CVS in preventing BDI, highlighting the need for standardized training and clear guidelines for its application in clinical practice.[8,9,10]

Efforts to enhance the safe implementation of CVS include initiatives such as the SAGES safe cholecystectomy program, which provides structured guidelines and training modules for surgeons. Understanding and applying CVS correctly, as well as recognizing when to modify the approach in difficult cases, remain critical for improving surgical outcomes.[11] Given that CVS has become the standard method for identifying cystic structures and preventing vasculobiliary injuries, the present study aims to evaluate its achievability across different patient profiles at a tertiary care center in North India. The study assesses LC outcomes in terms of intraoperative time, postoperative bile leak, recovery, pain levels, and hospital stay duration.

Hence we aimed to study the critical view of safety of Strasberg in laparoscopic cholecystectomy

Materials and methods

This study is a prospective interventional study conducted on patients undergoing elective laparoscopic cholecystectomy at Era's Lucknow Medical College & Hospital. A total sample size of 60 patients was determined using statistical formulas, considering a 20% loss to follow-up. The inclusion criteria included patients aged 18 years and above, while cases of gallbladder malignancy and choledocholithiasis were excluded. The surgeries followed a standard four-port laparoscopic technique, with operative difficulty graded using the Modified Nassar Scale, ranging from Grade I (simple cases) to Grade V (severe complications like Mirizzi Syndrome or fistula formation). Key parameters recorded included patient demographics, clinical presentation, radiological findings, operative difficulty, achievement of Critical View of Safety (CVS), operative time, conversion to open surgery, complications, and outcomes.

The study employed statistical analysis using SPSS Version 21.0. Various statistical tools were utilized, including mean and standard deviation for descriptive analysis, the paired t-test for comparing changes over time, and the chi-square test for categorical variables. Odds ratio calculations assessed the likelihood of outcomes between groups, while ANOVA determined variance between study groups. The level of significance was set at $p < 0.05$. This research aims to evaluate the achievability of CVS in different patient profiles and its impact on surgical outcomes, including operative time, postoperative complications, pain levels, and hospital stay duration.

Results

The present study was conducted to evaluate achievement of Critical View for Safety, among 60 patients screened form all the patients to undergo laparoscopic surgery at the Department of Surgery, Era's Lucknow Medical College & Hospital for the inclusion and exclusion criteria for the study and giving consent for participation. Table 1 below shows the distribution of the study population according to ag

Table 1: Age and Gender profile of the patients

Age group (years)	No.	%
21-30 years	13	21.7
31-40 years	23	38.3
41-50 years	14	23.3
51-60 years	7	111.7
≥61 yrs	3	8.3
Total	60	100.0

Mean Age ± SD (Range) years: 39.50±11.66 (21-71)

DOI: 10.69605/ijlbpr_14.3.2025.177

Table 2: Gender profile of the patients

Gender	No.	%
Female	40	66.7
Male	20	33.3

A majority of the patients in present study were Females (66.7%), while the remaining were Males (33.3%). Gender ratio of the present study was 2:1.

Table 3: Intra-operative Finding

Findings	Min.	Max.	Mean	SD
Duration of surgery (mins)	39.0	78.0	57.37	11.24
Blood Loss	20.0	125.0	69.75	21.72
Nassar Grading	1	5	1.85	0.92
Drain Collection	5.0	50.0	25.58	10.08

The mean duration of surgery was 57.37±11.24 minutes and ranged between 39.0 & 78.0 minutes. Blood loss ranged through 20 to 125 ml. Mean Blood loss was 69.75±21.72 ml. Nassar grade of the cases ranged between 1 & 5. Mean grade was 1.85±0.92. The average drain collection was 25.58±10.08 ml and ranged from 5 to 50 ml.

Table 4: Post-op Pain

Interval	Min.	Max.	Mean	SD
1 hour	4	5	4.45	0.50
2 hour	2	4	3.2	0.65
4 hour	2	30	2.58	0.36
24 hour	0	2	1.18	0.70

Mean post-op pain at 1 hour was 4.45±0.50. At repeated intervals of 2 hour, 4 hour and 24 hour was 3.2±0.65, 2.58±0.36 & 1.18±0.70.

Table 5: Duration of Hospital Stay (days)

	Min.	Max.	Mean	SD
Hospital Stay	2	5	3.35	0.77

Mean hospital stay of the cases was 3.35±0.77 days & it ranged between 2 to 5 days.

Table 6: Distribution of patients according to CVS achievement

CVS achievement	No.	%
No	**16**	**26.7**
Yes	**44**	**73.3**

CVS was achieved in a majority of the cases (73.3%), while it failed to be achieved in 26.7% of the case

Table 7: Association of CVS achievement with Age

Age Group	CVS Not-Achieved		CVS Achieved	
	No.	%	No.	%
21-30 years	3	18.80%	10	22.7%
31-40 years	5	31.30%	18	40.90%
41-50 years	4	25.00%	10	22.70%
51-60 years	3	18.80%	4	9.10%
≥61 yrs	1	6.30%	2	4.50%
χ 2 =1.404; p=0.844				

On comparing statistically, no significant association of age with achievement of CVS achievement was found.

Table 8: Association of CVS achievement with Gender

Gender	CVS Not Achieved		CVS Achieved	
	No.	%	No.	%
Female	11	68.80%	29	65.90%
Male	5	31.30%	15	34.10%
χ 2 =1.404; p=0.844				

On comparing statistically, no significant association of gender with achievement of CVS achievement was found.

DOI: 10.69605/ijlbpr_14.3.2025.177

Table 9: Association of intergroup comparison of Intra-op findings with CVS achievement

	CVS Not Achieved		CVS Achieved		Student's t-test	
	Mean	SD	Mean	SD	't'	'p'
Duration of surgery (mins)	58.43	11.89	54.44	8.90	1.233	0.226
Blood Loss	85.31	17.75	64.09	20.35	3.688	<0.001
Nassar Grading	2.69	0.70	1.55	0.79	5.084	<0.001
Drain Collection	26.56	8.70	25.23	10.62	0.450	0.654

On comparing statistically, intra-operative findings between the cases where CVS was achieved to those in whom CVS achievement failed, though the cases where CVS was not achieved had a longer duration of surgery (58.43±11.89 vs. 54.44±8.90 minutes) and had more Drain collection (25.56±8.70 vs. 25.23±10.62 ml). However, statistically, this difference was not significant.

On the other hand, cases in whom CVS was achieved as compared to those where it failed to be achieved a significantly lower Blood Loss (64.09±20.35 vs. 85.31±17.75 ml) and Nassar Grading (1.55±0.79 vs. 2.69±0.70).

Table 10: Association of Pain at different intervals with CVS achievement

	CVS Not-Achieved		CVS Achieved		Student's t-test	
	Mean	SD	Mean	SD	't'	'p'
1 hour	4.50	0.51	4.31	0.48	1.287	0.203
2 hour	3.27	0.59	3.00	0.82	1.431	0.158
4 hour	2.77	0.42	2.06	0.25	0.670	0.506
24 hour	1.20	0.70	1.13	0.72	0.368	0.701

Though the pain was higher at all post-operative intervals in the cases, where CVS was not achieved, on comparing statistically, no significant association of pain was found at any post-operative interval with achievement at CVS.

Table 11: Association of Hospital Stay

	CVS Not-Achieved		CVS Achieved		Student's t-test	
	Mean	SD	Mean	SD	't'	'p'
Hospital Stay	3.56	0.89	3.27	0.73	1.284	0.204

Though the hospital stay was longer in cases in whom CVS could not be achieved as compared to those where CVS was achieved, however statistically this difference was not significant.

Discussion

The Critical View of Safety (CVS) is a vital technique in laparoscopic cholecystectomy, the most common surgical procedure for removing the gallbladder. CVS is crucial for preventing bile duct injuries (BDIs), a significant and potentially severe complication during this surgery. The CVS method involves identifying and clearing the hepatocystic triangle (formed by the cystic duct, the cystic artery, and the liver's edge) and ensuring only two structures are entering the gallbladder before any dissection is performed. This meticulous approach ensures the safe identification and isolation of anatomical structures, thereby minimizing the risk of BDIs.

The most compelling reason for the emphasis on achieving CVS is the prevention of BDIs. Bile duct injuries can result in serious complications, including bile leaks, strictures, and infections, which may necessitate further surgeries and lead to long-term morbidity. By ensuring that only the cystic duct and artery are clipped and cut, surgeons can avoid mistakenly injuring the common bile duct or other critical structures. Numerous studies have shown that the adoption of CVS significantly reduces the incidence of these injuries, highlighting its importance in improving surgical safety.

Achieving the CVS also enhances overall surgical outcomes by reducing operative time and blood loss. The clear identification of structures allows for more precise and efficient dissection, minimizing the time the patient spends under anesthesia and reducing intraoperative blood loss. This contributes to faster recovery times, shorter hospital stays, and lower healthcare costs.

Furthermore, clear visualization and identification of the anatomy decrease the likelihood of postoperative complications, leading to better patient outcomes and satisfaction.

The CVS technique has become a cornerstone in the standardization of training for laparoscopic cholecystectomy. By adopting CVS as a standard practice, surgical training programs ensure that new surgeons are equipped with the skills necessary to perform safe and effective surgeries. This standardization also facilitates better communication and consistency across surgical teams, which is

DOI: 10.69605/ijlbpr_14.3.2025.177

particularly important in teaching hospitals and institutions with rotating staff.

Educational programs and interventions that emphasize CVS have proven to be effective in enhancing surgical skills and confidence among trainees. Structured training programs focusing on CVS help residents and practicing surgeons improve their technique and adherence to safety protocols. These interventions lead to a higher rate of successful CVS achievement, which translates to safer surgical practices and improved patient outcomes.

In complex or difficult cases, such as those with severe inflammation or anatomical variations, achieving CVS becomes even more critical. It guides the surgeon in navigating challenging scenarios, ensuring that safe and methodical dissection techniques are followed. In such situations, the principles of CVS help in avoiding intraoperative complications and making informed decisions about when to convert to an open procedure if necessary.

For this purpose, we conducted a study to see the achievability of critical view of safety of Strasberg in different patient profile and also evaluated the outcome in Lap cholecystectomy in terms of intra-op time, postop bile leak, post op recovery, post-op pain and duration of hospital stay. The age of the patients included in the study ranged through 21 to 71 years. Mean age was 39.50±11.66 years. A female preponderance of 66.7% was found in our study population.

In their study, Nassar et al.[12] reported a median age of 53 years for the study population, while this was slightly higher than the present study, one of the reasons attributed to that can be the larger sample size of 1060 participants and the second because of higher average age among the European population, where the study was conducted. In another study by Iftikar et al.[13], they included patients aged between 30 to 70 years and reported the mean age of 50 in these patients.

Most of the other contemporary studies evaluating achievement of CVS have been conducted under routine guidelines for laparoscopic surgery and have confirmed achievement of CVS using photographs and videos of the surgery, & hence due the lacking clinical studies have resulted in insufficient data for demographics of this population. However most of the contemporary studies from India, evaluating laparoscopic surgeries have reported a similar age of the patients as the present study.

In the present study, we found that the CVS was achieved in majority of the cases (73.3%), while in the remaining it could not be achieved. The only clinical studies which evaluated the CVS achievement as an intra-op findings were conducted by Nassar et al.[12], Gupta et al.[14].

In their study, Nassar et al.[12] reported obtaining CVS in 84.2% of the patients. Similarly, Gupta et al.47 reported achieving CVS in 87.2% patients.

In their study, Sgaramella et al.[15] conducted a multicenter study in Italy, emphasizing the role of CVS in reducing biliary duct injuries (BDI) and intraoperative bleeding, for which they retrospectively evaluated achievement of CVS and compared in between cases with or without evidences of BDI, they reported that CVS could not be achieved in almost half of the cases with BDI, while in almost 74.2% of cases without BDI, CVS was achieved. The findings of the study by, Sgaramella et al.[15] further enhances the findings of the present study.

Some other studies evaluating achievement of CVS in surgeries performed by residents, such as one conducted by Terho et al.[16], have reported very low incidence of CVS achievement. While, Terho et al.[16] have reported CVS being achieved in only almost a quarter of the cases (23.2%). They compared the achievement of satisfactory CVS between residents and consultants have reported that while a higher rate of achievement of CVS was found among residents as compared to consultants in elective surgeries (34.9%vs. 23.0%), however in emergency surgeries, consultants had better rate (18.4% vs. 15.0%).

In our study, we did not find any significant association of age and gender with achievement of CVS.

In the present study, we compared the intra-operative findings between the cases where CVS was achieved to those in whom CVS achievement failed. Our findings revealed that though the cases where CVS was not achieved as compared to those in whom CVS was achieved had a longer duration of surgery (58.43±11.89 vs. 54.44±8.90 minutes) and had more Drain collection (25.56±8.70 vs. 25.23±10.62 ml). However, neither Drain collection nor Duration of surgery were comparable between the cases where CVS was achieved and in those where it failed.

In their study Zarin et al.[17] compared the CVS technique with the infundibular technique, highlighting that while CVS requires more dissection, it results in a faster and safer identification process during LC. In their study, they reported significantly reduced operative times for the CVS technique (50 vs. 73 minutes) and lower rates of major bile duct injuries, reinforcing the CVS method as a superior approach for patient safety. These findings were similar to our findings in terms of duration of surgery.

In the present study, cases in whom CVS was achieved as compared to those where it failed to be achieved a significantly lower Blood Loss (64.09±20.35 vs. 85.31±17.75 ml) and Nassar Grading (1.55±0.79 vs. 2.69±0.70)

In the present study, we compared the Pain at different intervals between cases in whom CVS was achieved and those in whom it failed to be achieved, though however at none of the intervals it was significantly different.

In the present study, we compared the Hospital stay between the cases in whom CVS was achieved and failed to be achieved, though in cases in whom CVS

DOI: 10.69605/ijlbpr_14.3.2025.177

was achieved, a shorter duration of hospital stay was found.

While, on the overall, present study's findings align with contemporary literature in emphasizing the importance of achieving CVS for improving surgical outcomes and patient safety, there are notable differences in study design, patient populations, and specific focus areas that contribute to variations in findings. While, across all studies, the critical role of achieving CVS in preventing BDIs and ensuring patient safety is a common theme. This universal recognition underscores the fundamental importance of CVS in laparoscopic cholecystectomy.

However a majority of the studies highlight the positive impact of educational interventions on achieving CVS39, These findings align with the present study's implication that improved surgical techniques and training can enhance CVS achievement. Further, both the present study and contemporary literature have consistently reported that achieving CVS is associated with reduced complications, lower blood loss, and better surgical outcomes, reinforcing the technique's value in clinical practice.

However, certain differences among the contemporary studies & the present study can be identified in terms of the study's design focus, while in our study we focused on a general patient population and overall outcomes, a majority of the studies like Chen et al.39 and Nakazato et al.[18] involved specific educational interventions and targeted training, leading to differences in findings related to CVS achievement rates. These variations can further be also found in patient demographics, such as age, gender distribution, and preoperative conditions, can influence the achievability of CVS and surgical outcomes. The present study's younger mean age and higher female predominance might account for differences compared to studies with different demographic profiles.

Differences in surgical techniques and interventions, such as the use of Intraoperative Cholangiogram, Near-Infrared Fluorescent Cholangiography, or the Triple One technique, can impact CVS achievement and outcomes. The present study did not evaluate specific techniques, which may explain discrepancies with studies focusing on particular methods.

Larger multicenter studies, such as those by Sgaramella et al.[15] and Nassar et al[12]., provide a broader perspective on CVS achievability and outcomes across different clinical settings. The present study's smaller sample size and single-center design might limit the generalizability of its findings.

Further, studies like the one conducted by Gupta et al.35, they analysed in detail the preoperative predictors of CVS failure, and hence provided more specific insights into factors influencing CVS achievement, while these were beyond the scope of the present study & we focused on overall outcomes without extensive analysis of individual predictors.

Conclusion

No significant association of age and gender was found with achievement of CVS and significantly lower Blood Loss and Nassar Grading was found in cases in whom CVS was achieved. In cases in whom CVS was achieved, there was shorter duration of hospital stay and shorter duration of surgery. Pain at different intervals were similar in patients in whom CVS was achieved and not achieved.

References

1. Lee WJ, Chan CP, Wang BY. Recent advances in laparoscopic surgery. Asian J Endosc Surg. 2013;6(1):1-8.
2. Brunt LM, Deziel DJ, Telem DA, Strasberg SM, Aggarwal R, Asbun H, Bonjer J, McDonald M, Alseidi A, Ujiki M, Riall TS, Hammill C, Moulton CA, Pucher PH, Parks RW, Ansari MT, Connor S, Dirks RC, Anderson B, Altieri MS, Tsamalaidze L, Stefanidis D; and the Prevention of Bile Duct Injury Consensus Work Group. Safe Cholecystectomy Multi-society Practice Guideline and State of the Art Consensus Conference on Prevention of Bile Duct Injury During Cholecystectomy. Ann Surg. 2020;272(1):3-23.
3. Törnqvist B, Strömberg C, Persson G, Nilsson M. Effect of intended intraoperative cholangiography and early detection of bile duct injury on survival after cholecystectomy: population based cohort study. BMJ. 2012;345:e6457.
4. Törnqvist B, Strömberg C, Akre O, Enochsson L, Nilsson M. Selective intraoperative cholangiography and risk of bile duct injury during cholecystectomy. Br J Surg. 2015;102(8):952-8.
5. Sharma S, Behari A, Shukla R, Dasari M, Kapoor VK. Bile duct injury during laparoscopic cholecystectomy: An Indian e-survey. Ann Hepatobiliary Pancreat Surg. 2020;30;24(4):469-476.
6. Ahmad DS, Faulx A. Management of Postcholecystectomy Biliary Complications: A Narrative Review. Am J Gastroenterol. 2020;115(8):1191-1198.
7. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg. 1995;180(1):101-25.
8. Pucher PH, Brunt LM, Fanelli RD, Asbun HJ, Aggarwal R. SAGES expert Delphi consensus: critical factors for safe surgical practice in laparoscopic cholecystectomy. Surg Endosc. 2015;29(11):3074-85.
9. McKinley SK, Brunt LM, Schwaitzberg SD. Prevention of bile duct injury: the case for incorporating educational theories of expertise. Surg Endosc. 2014;28(12):3385-91
10. Chen CB, Palazzo F, Doane SM, Winter JM, Lavu H, Chojnacki KA, Rosato EL, Yeo CJ, Pucci MJ. Increasing resident utilization and recognition of the critical view of safety during laparoscopic cholecystectomy: a pilot study from an academic medical center. Surg Endosc. 2017;31(4):1627-1635.
11. Onoe S, Maeda A, Takayama Y, et al. A preoperative predictive scoring system to predict the ability to achieve the critical view of safety during laparoscopic cholecystectomy for acute cholecystitis. HPB (Oxford). 2017;19(5):406-410.

DOI: 10.69605/ijlbpr_14.3.2025.177

12. Nassar AHM, Ng HJ, Wysocki AP, Khan KS, Gil IC. Achieving the critical view of safety in the difficult laparoscopic cholecystectomy: a prospective study of predictors of failure. Surg Endosc. 2021;35(11):6039-6047.
13. Iftikhar M, Shah M, Ullah Z, Shakoor HA, Ullah S. Achieving Critical View of Safety via a New Technique: The Triple One (111) Technique. Cureus. 2023;15(8):e44098
14. Gupta R, Khanduri A, Singh A, Tyagi H, Varshney R, Rawal N, Daspal U, Singh SK, Morey P, Pokharia P. Defining Critical View of Safety During Laparoscopic Cholecystectomy: The Preoperative Predictors of Failure. Cureus. 2023;15(4):e37464
15. Sgaramella LI, Gurrado A, Pasculli A, de Angelis N, Memeo R, Prete FP, et al.; SYoN Italian Collaborative Group. The critical view of safety during laparoscopic cholecystectomy: Strasberg Yes or No? An Italian Multicentre study. Surg Endosc. 2021;35(7):3698-3708.
16. Terho P, Sallinen V, Lampela H, Harju J, Koskenvuo L, Mentula P. The critical view of safety and bile duct injuries in laparoscopic cholecystectomy: a photo evaluation study on 1532 patients. HPB (Oxford). 2021;23(12):1824-1829.
17. Zarin M, Khan MA, Khan MA, Shah SAM. Critical view of safety faster and safer technique during laparoscopic cholecystectomy? Pak J Med Sci. 2018;34(3):574-577.
18. Nakazato T, Su B, Novak S, Deal SB, Kuchta K, Ujiki M. Improving attainment of the critical view of safety during laparoscopic cholecystectomy. Surg Endosc. 2020;34(9):4115-4123.