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Role of Tokyo Guidelines 2018 in Early Laparoscopic Cholecystectomy for Mild and Moderate Acute Calculuscholecystitis

Dr. Nitish S[1], Dr. Kailash Jagannath[2], Dr Sri Bhargav Kolli[3]

Department of General Surgery, Kempegowda Institute of Medical Sciences, Rajiv Gandhi University of Health Sciences, Karnataka
Email ID: *sris000.999[at]gmail.com*

Abstract: ***Acute calculus cholecystitis (ACC) is the most common complication of gallstone disease and is a very common inflammatory disease of the gallbladder. In recent years, the Tokyo Guidelines 2018 diagnostic criteria and severity grading of acute cholecystitis have become widely established with a reported sensitivity of 91% and specificity of 96%. We aimed to compare the outcomes of patients undergoing early LC for mild and moderate ACC. Based on our findings, we evaluated the feasibility and impact of using TG18 in early LC for mild and moderate ACC. The mean age of the patients was 39.50+14.552 years.69% had grade I ACC and 31% had grade II ACC. LC was converted to a bail - out procedure of LSC and open cholecystectomy in 12% and 2% of the patients respectively. Early surgical complications occurred in 13% patients. The proportion of patients in Grade II ACC had higher degree of bailout procedures, conversion and complications when compared with Grade I ACC (P<0.001). Our study found that using TG18 in early LC for mild and moderate ACC results in acceptable clinical outcomes in a subset of carefully selected patients.***

Keywords: Tokyo guidelines, Acute calculous cholecystitis, Early laparoscopic cholecystectomy, Early complications

1. Introduction

Gallstones are estimated to affect 10 - 15% of the general population, with some variations across countries. Gallstone - related complications affect between 20 and 40% of patients with gallstones, with an annual incidence of 1 - 3%; acute calculus cholecystitis (ACC) is the first clinical manifestation in 10 - 15% of cases [1] - [4]. Acute calculus cholecystitis (ACC) is the most common complication of gallstone disease and is a very common inflammatory disease of the gallbladder [5]. ACC is caused by an inflammatory or infectious process involving the gallbladder wall, which is often caused by an impacted gallstone in the infundibulum or the cystic duct. The disease can be diagnosed at any stage of severity, including wall inflammation, local complications, and systemic organ dysfunction [6].

Acute cholecystitis, if detected early, can be treated very easily through surgical resection with low morbidity and mortality [7], [8]. If the disease progresses, it can be associated with considerable morbidity and mortality [9]. It is therefore important to define the severity of the illness in order to fully evaluate and improve outcomes associated to individual disease severity stages.

The Tokyo Guidelines were developed in 2007 [TG7] by a working committee to improve the diagnosis of AC. It underwent revision on 2013 [10]. In recent years, the Tokyo Guidelines 2018 (TG18) diagnostic criteria and severity grading of acute cholecystitis have become widely established with a reported sensitivity of 91% and specificity of 96%. It is being utilised not only in clinical practise but also in several research investigations on this condition [11].

The Tokyo guidelines (TG18) is composed of a combination of clinical, biochemical, and radiologic parameters. In our hospital, we diagnose and manage ACC in accordance with the TG18, which proposed mild (Grade I) and moderate (Grade II) ACC to early LC regardless of time since symptoms began. The aim of this study was to compare the outcomes of patients undergoing early LC for mild and moderate ACC. Based on our findings, we evaluated the feasibility and impact of using TG18 in early LC for mild and moderate ACC.

2. Materials and Method

This hospital based prospective study was conducted in Kempegowda Institute of Medical sciences, Bengaluru over a period of 2 years from November 2020 to November 2022. All patients with grade I and II ACC who underwent early LC were included in the study. Patients with history of previous biliary surgery, intrahepatic biliary or common bile duct stones, malignant biliary or pancreatic tumours, suppurative cholangitis or biliary pancreatitis, intended open or delayed cholecystectomy after primary admission or percutaneous cholecystostomy, American Society of Anaesthesiologists (ASA) score ≥ 4 and pregnancy were excluded from the study. Clearance was taken from the institutional ethical committee before starting the study. Written informed consent was taken from the study participants before collecting the data. A pre - tested, semi - structured questionnaire was used to collect information on socio - demographic variables and history of ACC by interview method. The diagnosis of ACC was assessed by three criteria: (1) local signs of inflammation, such as Murphy'ssign, or right upper quadrant mass/pain/tenderness; (2) systemic signs of inflammation, such as fever, elevated C - reactive protein (CRP), or elevated white blood cell (WBC); (3) imaging findings [11]. Patients fitting the criteria for the study underwent LC.

Patients were placed in a reverse Trendelenburg position under general anaesthesia. We tended to use a three - trocar method: the first 10 mm trocar was placed in the

subumbilical area for carbon dioxide insufflation and laparoscope. The second 10 mm trocar was located in the area below the xiphoid. The third 5 mm trocar was placed in the midclavicular line, 1–2 cm under the right costal margin. Sometimes, an additional 5 mm trocar in the right anterior axillary line was needed when the inflammation or adhesion was severe in the operation area. Based on TG18, we adopted the standardized safe steps in LC that included decompression of tense gallbladder, appropriate retraction of the gallbladder to develop a plane in Calot's triangle area, exposing the gallbladder surface above Rouviere's sulcus, maintaining the plane of dissection on the gallbladder surface, dissecting at least one - third lower part of the gallbladder bed, and creation of the critical view of safety (CVS) [12]. An attempt to dissect at the area of Calot's triangle was made in all cases. Dissection was completed using electrocautery hook dissector, scissors, or ultrasonic shears. We routinely freed the cystic artery and cystic duct, achieved a CVS, and then the cystic duct and artery were sealed and dissected with Hemo - lock. After gallbladder dissection, securing haemostasis, intraabdominal cavity irrigation, leaving a drain in the subhepatic space, and removal of the collecting bag through the 10 mm umbilical port was done.

The fundus first technique was attempted in some cases in which the cystic duct and common bile duct were difficult to be identified [13]. If a CVS showing anatomically important landmarks cannot be achieved, the surgery was converted to a bail - out procedure, open approach, or laparoscopic subtotal cholecystectomy (LSC), as it is introduced in TG18. LSC included opening of Hartmann's pouch, aspiration of bile, removal of all gallstones, removing as much of the gallbladder wall as possible, and then closed gallbladder remnant using barbed sutures. Early surgical complications occurring within 30 days after surgery were monitored and the findings were documented.

The data was collected and compiled in MS Excel. Descriptive statistics has been used to present the data. To analyse the data SPSS (Version 26.0) was used. Significance level was fixed as 5% ($\alpha = 0.05$). Qualitative variables are expressed as frequency and percentages and Quantitative variables are expressed as Mean and Standard Deviation. To compare proportions between variables, Chi - Square test was applied.

3. Results

A total of 100 study participants fitted the criteria of the study during the study period. The mean age of the study participants was found to be 39.50+14.552 years of age.85% of the study participants were females with males contributing to 15% of the study participants.69 (69%) had mild (grade I) ACC and 31 (31%) had moderate (grade II) ACC. The mean duration of symptoms to admission, admission to LC, and symptoms to LC were 2.58+1.350, 4.96+1.377, and 2.39+0.601 days respectively. The mean operation time was 83.02+28.791 mins, and the mean intraoperative blood loss was 28.05+10.394ml. LC was converted to a bail - out procedure of LSC and open cholecystectomy in 12 (12%) and 2 (2%) of the study participants respectively. The mean total and postoperative hospital stay was 6.07+0.820 and 2.70+0.611 days respectively. No major postoperative complications requiring any re - surgery occurred. Early surgical complications occurred in 13 (13%) patients, which included surgical site infection (11), and abdominal collection (2). There was no bile duct injury, postoperative bleeding, and 30 - day mortality in the present study (Table 1).

The proportion of study participants in Grade II ACC had higher degree of bailout procedures, conversion and complications when compared with Grade I ACC. The association was found to be statistically significant between bailout procedure, conversion and complications with grade of ACC of the study participants (Table 2).

The mean duration of symptoms to admission, admission to LC, and symptoms to LC were comparatively lower among study participants with Grade 1 ACC. Statistically significant association was found between duration of symptoms to admission, duration of symptoms to LC and the Grading of ACC of the study participants. The mean operation time and the mean intraoperative blood loss was significantly lower among the study participants with Grade I ACC when compared to Grade II ACC with statistical significance. The mean total and postoperative hospital stay was significantly lower among the study participants with Grade I ACC when compared to Grade II ACC. Statistically significant association was found between postoperative hospital stay and the Grading of ACC of the study participants (Table 3).

Table 1: Demographic and operative data of study participants:

Parameters		Total (n = 100)
Age (years)		39.50+14.552
Gender n (%)	Male	15 (15.0)
	Female	85 (85.0)
Grade of ACC, n (%)	Mild	69 (69.0)
	Moderate	31 (31.0)
Duration of symptoms to admission (days)		2.58+1.350
Duration of symptoms to LC (days)		4.96+1.377
Duration of admission to LC (days)		2.39+0.601
Operative time (min)		83.02+28.791
Intra operative blood loss (mL)		28.05+10.394
Post op hospital stay (days)		2.70+0.611
Total duration of hospital stay (days)		6.07+0.820

Table 2: Association of bailout procedure, conversion and complications with grade of ACC

Parameters		Grade of ACC		Total	P value
		1	2		
Bailout procedure	Yes	5 (7.2%)	9 (29.0%)	14 (14.0%)	0.006
	No	64 (92.8%)	22 (71.0%)	86 (86.0%)	
Conversion	LSC	5 (7.2%)	7 (22.6%)	12 (12.0%)	0.005
	Open	-	2 (6.5%)	2 (2.0%)	
	No	64 (92.8%)	22 (71.0%)	86 (86.0%)	
Complications	Yes	3 (4.3%)	10 (32.3%)	13 (13.0%)	0.000
	No	66 (95.7%)	21 (67.7%)	87 (87.0%)	
	SSI	3 (4.3%)	8 (25.8%)	11 (11.0%)	0.001
	AC	-	2 (6.5%)	2 (2.0%)	

Table 3: Association of Demographic and operative parameters with grade of ACC

Parameters	Grade of ACC		P value
	1	2	
Duration of symptoms to admission	1.81+0.733	4.29+0.643	0.000
Duration of symptoms to LC	4.23+0.860	6.58+0.807	0.000
Duration of admission to LC	2.29+0.588	2.43+0.606	0.269
Operative time (min)	66.23+12.988	120.39+16.186	0.000
Intra operative blood loss (mL)	23.04+39.19	5.830+9.669	0.000
Post op hospital stay	2.59+0.551	2.94+0.680	0.009
Total hospital stay	6.03+0.785	6.16+0.898	0.456

4. Discussion

LC is now the standard surgical modality for ACC management, particularly for patients in good medical condition. Although several clinical guidelines have established early LC for ACC, the definition of early LC is still being debated [14]. There are currently few studies on the feasibility and impact of early LC for mild and moderate ACC regardless of time since symptoms began, according to the TG18. This study identified and managed ACC of grades I and II using the TG18, as well as analysed their postoperative outcomes. The present study included100study participants grade I and II ACC who underwent early LC to compare the outcomes of study participants undergoing early LC for mild and moderate ACC and to evaluate the feasibility and impact of using TG18 in early LC for mild and moderate ACC.

In the present study, the mean age of the study participants was found to be 39.50+14.552 years of age.85% of the study participants were females with males contributing to 15% of the study participants. In a study done by Yan Y et al [15], the mean age of the study participants was 61.8 years with equal proportion of males and females (50: 50). In a study done by Bouassida M et al [16], the median age was 57 years with higher proportion of females (195 males and 454 females). In a study done by González - Castillo AM et al [17], The median age of patients was 69 years. In a study done by Cheng WC et al [18], the mean age was 60.3+15.0 with higher proportion of males. In a study done by Morales - Maza J et al [19], The mean patient age was 49.1±16.8 and 65% were females. In a study done by Hernandez M et al [20], the cohort had a mean age of 64.8 (±18) years and 59% were male.

In the present study, 69 (69%) had mild (grade I) ACC and 31 (31%) had moderate (grade II) ACC. In a study done by Yan Y et al [15], 29 (43.9%) had mild (grade I) ACC and 37 (56.1%) had moderate (grade II) ACC. In a study done by Bouassida M et al [16], 46.22 % of the patients had mild cholecystitis and 53.78 % had moderate grade cholecystitis. In a study done by González - Castillo AM et al [17], The grade of cholecystitis according to TG18 was mild in 21%, moderate in 39%, and severe in 40% of patients. In a study done by Cheng WC et al [18], 48 patients were classified as grade I and 31 patients were classified as Grade II. In a study done by Hernandez M et al [20], 154 patients were classified as grade I and 148 patients were classified as Grade II.

In the present study, the mean duration of symptoms to admission, admission to LC, and symptoms to LC were 2.58+1.350, 4.96+1.377, and 2.39+0.601 days respectively. In a study done by Yan Y et al [15], The median duration of symptoms to admission, admission to LC, and symptoms to LC were 3, 3, and 7.5 days, respectively. In a study done by Bouassida M et al [16], The average time from the onset of symptoms to admission was 2.3 days.

In the present study, the mean operation time was 83.02+28.791 mins, and the mean intraoperative blood loss was 28.05+10.394ml. In a study done by Yan Y et al [15], The median operation time was 120 min, and median intraoperative blood loss was 20 ml.

In the present study, LC was converted to abail - out procedure of LSC and open cholecystectomy in 12 (12%) and 2 (2%) of the study participants respectively. In a study done by Yan Y et al [15], LC was converted to a bail - out procedure of LSC and open cholecystectomy in 12 (18.2%) and 4 (6.1%) of the 66 patients, respectively. In a study done by Bouassida M et al [16], Laparoscopic surgery was converted to open surgery 7.8 %.

In the present study, the mean total and postoperative hospital stay was 6.07+0.820 and 2.70+0.611 days respectively. In a study done by Yan Y et al [15], the median of total and postoperative hospital stay was 10 and 7 days respectively. In a study done by González - Castillo AM et al [17], the median post - operative hospital stay was 3 (5) days.

In the present study, no major postoperative complications requiring any re - surgery occurred. Early surgical complications occurred in 13 (13%) patients, which included surgical site infection (11), and abdominal collection (2). There was no bile duct injury, postoperative bleeding, and 30 - day mortality in the present study. In a study done by Yan Y et al [15], a total of 19 early surgical complications occurred in 13 (19.7%) patients, which included wound infection (5), abdominal infection (7), choledocholithiasis (3), bile leakage (3), and adhesive ileus (1). In a study done by Bouassida M et al [16], Postoperative complications developed in 1.7 %of the patients (postoperative bile leak in five patients and abdominal abscess in three patients). In a study done by González - Castillo AM et al [17], 41% of the patients developed complications.

In the present study, The proportion of study participants in Grade II ACC had higher degree of bailout procedures, conversion and complications when compared with Grade I ACC. The association was found to be statistically significant between bailout procedure, conversion and complications with grade of ACC of the study participants. In a study done by Bouassida M et al [16], LC was converted to OC in 17.82 % of the patients with moderate cholecystitis vs.4.22 % of the patients with mild cholecystitis ($P<0.001$). The rate of postoperative complications ($p = 0.12$) did not differ between the patients with mild and those with moderate grade cholecystitis. In a

study done by Hernandez M et al [20], Laparoscopic was converted to open procedure in 12% of patients with Grade II ACC when compared with 3.9% of patients with Grade I ACC (P<0.001).

In the present study, The mean duration of symptoms to admission, admission to LC, and symptoms to LC were comparatively lower among study participants with Grade 1 ACC. Statistically significant association was found between duration of symptoms to admission, duration of symptoms to LC and the Grading of ACC of the study participants. The mean operation time and the mean intraoperative blood loss was significantly lower among the study participants with Grade I ACC when compared to Grade II ACC with statistical significance. The mean total and postoperative hospital stay was significantly lower among the study participants with Grade I ACC when compared to Grade II ACC. Statistically significant association was found between postoperative hospital stay and the Grading of ACC of the study participants. In a study done by Bouassida M et al [16], The preoperative, postoperative, and total hospital stay was significantly longer for the patients with moderate grade than those with mild cholecystitis. In a study done by Cheng WC et al [18], Hospital stay according to Tokyo grading was higher among Grade II when compared with Grade I.

5. Conclusion

Our study found that using TG18 in early LC for mild and moderate ACC results in acceptable clinical outcomes in a subset of carefully selected patients. It is critical to use standardised safe steps to overcome difficulties, achieve a CVS, and convert to an LSC bail - out procedure to avoid biliary injury in difficult cases.

References

[1] Shaffer EA. Gallstone disease: Epidemiology of gallbladder stone disease. Best Pract Res Clin Gastroenterol.2006; 20 (6): 981–96.
[2] Kratzer W, Mason RA, Kächele V. Prevalence of gallstones in sonographic surveys worldwide. J Clin Ultrasound.1999 Jan; 27 (1): 1–7.
[3] Friedman GD. Natural history of asymptomatic and symptomatic gallstones. Am J Surg.1993 Apr; 165 (4): 399–404.
[4] Kimura Y, Takada T, Strasberg SM, Pitt HA, Gouma DJ, Garden OJ, et al. TG13 current terminology, etiology, and epidemiology of acute cholangitis and cholecystitis. J Hepatobiliary Pancreat Sci.2013 Jan; 20 (1): 8–23.
[5] Portincasa P, Di Ciaula A, De Bari O, Garruti G, Palmieri V, Wang DH. Management of gallstones and its related complications. Expert Review of Gastroenterology & Hepatology [Internet].2016 Jan 2 [cited 2023 Apr 15]; 10 (1): 93–112. Available from: http: //www.tandfonline. com/doi/full/10.1586/17474124.2016.1109445
[6] Gomes CA, Junior CS, Di Saverio S, Sartelli M, Kelly MD, Gomes CC, et al. Acute calculous cholecystitis: Review of current best practices. World J Gastrointest Surg.2017 May 27; 9 (5): 118–26.
[7] Cao AM, Eslick GD, Cox MR. Early cholecystectomy is superior to delayed cholecystectomy for acute cholecystitis: a meta - analysis. J Gastrointest Surg.2015 May; 19 (5): 848–57.
[8] Borzellino G, Sauerland S, Minicozzi AM, Verlato G, Di Pietrantonj C, de Manzoni G, et al. Laparoscopic cholecystectomy for severe acute cholecystitis. A meta - analysis of results. Surg Endosc.2008 Jan; 22 (1): 8–15.
[9] Yeh DD, Cropano C, Fagenholz P, King DR, Chang Y, Klein EN, et al. Gangrenous cholecystitis: Deceiving ultrasounds, significant delay in surgical consult, and increased postoperative morbidity! J Trauma Acute Care Surg.2015 Nov; 79 (5): 812–6.
[10] Yokoe M, Takada T, Strasberg SM, Solomkin JS, Mayumi T, Gomi H, et al. TG13 diagnostic criteria and severity grading of acute cholecystitis (With videos). Journal of Hepato - Biliary - Pancreatic Sciences [Internet].2013 Jan [cited 2023 Apr 15]; 20 (1): 35–46. Available from: http: //doi. wiley. com/10.1007/s00534 - 012 - 0568 - 9
[11] Yokoe M, Hata J, Takada T, Strasberg SM, Asbun HJ, Wakabayashi G, et al. Tokyo Guidelines 2018: diagnostic criteria and severity grading of acute cholecystitis (With videos). J Hepatobiliary Pancreat Sci [Internet].2018 Jan [cited 2023 Apr 15]; 25 (1): 41–54. Available from: https: //onlinelibrary. wiley. com/doi/10.1002/jhbp.515
[12] Wakabayashi G, Iwashita Y, Hibi T, Takada T, Strasberg SM, Asbun HJ, et al. Tokyo Guidelines 2018: surgical management of acute cholecystitis: safe steps in laparoscopic cholecystectomy for acute cholecystitis (With videos). J Hepatobiliary Pancreat Sci [Internet].2018 Jan [cited 2023 Apr 15]; 25 (1): 73–86. Available from: https: //onlinelibrary. wiley. com/doi/10.1002/jhbp.517
[13] Huang SM, Hsiao KM, Pan H, Yao CC, Lai TJ, Chen LY, et al. Overcoming the difficulties in laparoscopic management of contracted gallbladders with gallstones: possible role of fundus - down approach. Surg Endosc [Internet].2011 Jan [cited 2023 Apr 15]; 25 (1): 284–91. Available from: http: //link. springer. com/10.1007/s00464 - 010 - 1175 - y
[14] Pisano M, Allievi N, Gurusamy K, Borzellino G, Cimbanassi S, Boerna D, et al.2020 World Society of Emergency Surgery updated guidelines for the diagnosis and treatment of acute calculus cholecystitis. World J Emerg Surg [Internet].2020 Dec [cited 2023 Apr 15]; 15 (1): 61. Available from: https: //wjes. biomedcentral. com/articles/10.1186/s13017 - 020 - 00336 - x
[15] Yan Y, Hua Y, Yuan W, Zhu X, Du Y, Zhu S, et al. Utility of Tokyo Guidelines 2018 in early laparoscopic cholecystectomy for mild and moderate acute calculus cholecystitis: A retrospective cohort study. Front Surg [Internet].2023 Jan 16 [cited 2023 Apr 15]; 9: 1022258. Available from: https: //www.frontiersin. org/articles/10.3389/fsurg.2022.1022258/full
[16] Bouassida M, Charrada H, Feidi B, Chtourou MF, Sassi S, Mighri MM, et al. Could the Tokyo guidelines on the management of acute cholecystitis be adopted in developing countries? Experience of one center. Surg Today [Internet].2016 May [cited 2023 Apr 15]; 46

(5): 557–60. Available from: http: //link. springer. com/10.1007/s00595 - 015 - 1207 - 2

[17] González - Castillo AM, Sancho - Insenser J, De Miguel - Palacio M, Morera - Casaponsa JR, Membrilla - Fernández E, Pons - Fragero MJ, et al. Mortality risk estimation in acute calculous cholecystitis: beyond the Tokyo Guidelines. World J Emerg Surg [Internet].2021 Dec [cited 2023 Apr 15]; 16 (1): 24. Available from: https: //wjes. biomedcentral. com/articles/10.1186/s13017 - 021 - 00368 - x

[18] Cheng WC, Chiu YC, Chuang CH, Chen CY. Assessing clinical outcomes of patients with acute calculous cholecystitis in addition to the Tokyo grading: A retrospective study. The Kaohsiung Journal of Medical Sciences [Internet].2014 Sep [cited 2023 Apr 15]; 30 (9): 459–65. Available from: http: //doi. wiley. com/10.1016/j. kjms.2014.05.005

[19] Morales - Maza J, Rodríguez - Quintero JH, Santes O, Aguilar - Frasco JL, Romero - Vélez G, García - Ramos ES, et al. Conversión de colecistectomía laparoscópica a abierta: análisis de factores de riesgo con base en parámetros clínicos, de laboratorio y de ultrasonido. Revista de Gastroenterología de México [Internet].2021 Oct [cited 2023 Apr 15]; 86 (4): 363–9. Available from: https: //linkinghub. elsevier. com/retrieve/pii/S0375090620301312

[20] Hernandez M, Murphy B, Aho JM, Haddad NN, Saleem H, Zeb M, et al. Validation of the AAST EGS acute cholecystitis grade and comparison with the Tokyo guidelines. Surgery [Internet].2018 Apr [cited 2023 Apr 15]; 163 (4): 739–46. Available from: https: //linkinghub. elsevier. com/retrieve/pii/S0039606017307791

Author Profile

Dr. Nitish S., Assistant Professor, Department of General Surgery, Kempegowda Institute of Medical Sciences & Research Centre, Bangalore, 560002.
Email: nitishkims[at]gmail.com

Dr. Kailash Jagannath, Assistant Professor, Department of General Surgery, Kempegowda Institute of Medical Sciences & Research Centre, Bangalore.
Email: kailash. jagannath[at]gmail.com

Dr. Sri Bhargav Kolli, Post Graduate, Department of General Surgery, Kempegowda Institute of Medical Sciences & Research Centre, Bangalore.
Email: sris000.999[at]gmail.com