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Early Laparoscopic Cholecystectomy in High-Risk Patients with Acute Cholecystitis

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Abstract

Acute cholecystitis is a frequent surgical emergency, especially in elderly patients with several comorbidities. The study was a prospective cohort study carried out at Al-Karama Teaching hospital, Wasit, Iraq, during a period of 36 months (January 2023-January 2026) and involved 58 high-risk patients to determine the safety of early laparoscopic cholecystectomy (ELC) and the short-term outcomes, as well as whether disease sever. The term high-risk was considered as having at least one of the following systemic comorbidities (hypertension, type 2 diabetes mellitus, obesity, ischaemic heart disease, chronic kidney disease, or COPD). The severity of the disease was stratified in terms of the Tokyo Guidelines 2018 (TG18), and the burden of comorbidity was measured through ASA classification and cumulative comorbidity count. Results demonstrated that higher TG18 severity grades were significantly associated with longer operative time, increased complications, a conversion rate of 20.7% (n=12), and prolonged hospital stay ($p < 0.05$). In contrast, cumulative comorbidity burden had limited impact on most primary outcomes. ELC was successfully completed laparoscopically in 79.3% of cases, with acceptable morbidity and low 30-day mortality (1.7%). In conclusion, ELC is safe in comorbid patients, and TG18 disease severity is the primary determinant of surgical outcomes, outperforming comorbidity burden in predicting operative difficulty and recovery trajectory.

Keywords: Acute cholecystitis, early laparoscopic cholecystectomy, comorbidity, Tokyo Guidelines, and high-risk surgical patients.

1. Introduction

Acute cholecystitis (AC) represents a leading indication for emergency general surgical admission globally, accounting for approximately 3–10% of acute abdominal presentations [1]. Contemporary epidemiological transitions including progressive population ageing, escalating prevalences of type 2 diabetes mellitus (T2DM), obesity, metabolic dysfunction-associated steatotic liver disease (MASLD), and sedentary behaviour have collectively shifted the disease burden towards older, comorbidity-laden individuals [2, 3].

These patients manifest a heightened propensity for severe inflammatory phenotypes, present with delayed clinical recognition, and sustain substantially greater rates of systemic organ dysfunction and perioperative adverse events than their younger counterparts. Moreover, from a pathophysiological standpoint, AC is precipitated in approximately 90–95% of cases by calculus impaction within the cystic duct, triggering a cascade of intraluminal pressure elevation, mural ischaemia, and secondary bacterial colonisation [5].

The resultant inflammatory spectrum from mild oedematous cholecystitis through gangrenous cholecystitis to frank gallbladder perforation directly governs operative complexity and clinical outcomes. Systemic comorbidities further modulate this inflammatory trajectory: T2DM impairs leukocyte function and microvascular integrity, predisposing to gangrenous and emphysematous variants; chronic kidney disease introduces immune dysregulation and haemodynamic lability; and cardiovascular disease diminishes physiological reserve [6,7].

The treatment environment of AC has changed radically in the last 20 years. ELC performed at the time of index admission, ideally within 72 hours of symptom onset has been determined by randomised controlled trials, systematic reviews, and large registry studies to have shorter hospitalisation, fewer interval biliary events, lower costs, and equal or better safety than deferred surgical strategies [8,9]. Risk stratification in AC is based on Tokyo Guidelines 2018 (TG18) to assess disease severity and the ASA physical status classification to quantify perioperative risk. However, the relative importance of disease severity compared to cumulative comorbidity burden in determining operative difficulty and postoperative outcomes remains incompletely characterised.

The aim of this study was to systematically assess the safety and short-term outcomes of ELC in comorbid patients with AC and to determine whether Tokyo Guidelines disease severity or comorbidity burden is the primary predictor of operative difficulty, perioperative morbidity, and recovery.

2. Patients and Methods

2.1 Study Design and Setting

A prospective observational cohort study was conducted at Al-Karama Teaching Hospital, Wasit Governorate, Iraq, a 36-

month period (January 2023–January 2026) The study enrolled a total of 58 consecutive patients meeting the inclusion criteria. The cohort comprised both males (n=25, 43.1%) and females (n=33, 56.9%), with a mean age of 61.3 ± 8.5 years (range: 44–80 years). Ethical approval was obtained from the Institutional Review Board (IRB) of the University of Wasit, College of Medicine, in accordance with the Declaration of Helsinki. Administrative authorization was also obtained from the Wasit Directorate of Health. Oral informed consent was secured from all participants, and strict data confidentiality was maintained.

2.2 Eligibility Criteria

Comorbidity burden was categorised based on the cumulative count of pre-existing systemic conditions. Single comorbidity, Presence of one condition only (e.g., hypertension OR type 2 diabetes mellitus OR obesity, etc.). Dual comorbidities: Coexistence of any two conditions (e.g., hypertension + type 2 diabetes mellitus, hypertension + CKD, obesity + COPD, etc.).

Triple comorbidities:Presence of any three concurrent conditions from the predefined list. This stratification allowed for direct comparison between cumulative comorbidity load and TG18 disease severity.

2.3 Diagnostic and Severity Classification

The diagnosis of AC was established using the tripartite Tokyo Guidelines system, including local manifestations of inflammation of the gallbladder (pain in the right upper quadrant, Murphy sign), systemic inflammation (fever, leukocytosis, increased C-reactive protein), and typical sonographic appearances (wall thickening more than 3 mm, pericholecystic fluid, impacted calculus). It was graded as Grade I (mild, no dysfunction of the organs), Grade II (moderate, marked local inflammation, no organ failure) or Grade III (severe, 1 or more dysfunction of the organs) as per TG18.

2.4 Operative Protocol

All procedures were performed under general anaesthesia via a standard four-port laparoscopic approach using carbon dioxide pneumoperitoneum. Prior to division of vascular and ductal structures, critical view of safety (CVS) was systematically sought. Fundus-first dissection, gallbladder decompression, subtotal laparoscopic cholecystectomy was placed in extreme anatomic areas. Selective drainage of the subhepatic was done by closed suction. Reduction to open cholecystectomy was only done based on safety and was classified as an operative decision and not as a complication.

2.5 Statistical Analysis

Data analysed using SPSS version 26 (IBM Corp., Armonk, NY). Continuous variables are reported as mean ± SD with range; categorical variables as frequencies and percentages. Chi-square or Fisher's exact tests were applied for categorical comparisons; one-way ANOVA for continuous variables across ≥3 groups. Significance was set at $p < 0.05$ (two-tailed).

Table 1: Sociodemographic and Baseline Clinical Characteristics (N = 58).

Variable	Subcategory	n	%
Age (years)	< 50	7	12.1
	50–60	18	31.0
	> 60	33	56.9
	Mean ± SD (Range)	61.3 ± 8.5 (44–80)	
Sex	Female	33	56.9
	Male	25	43.1
BMI (kg/m²)	Normal (18.5–24.9)	4	6.9
	Overweight (25.0–29.9)	33	56.9
	Obese (≥30.0)	21	36.2
	Mean ± SD (Range)	29.17 ± 3.01 (23–37)	
Symptom duration (h)	Mean ± SD (Range)	36.12 ± 11.26 (6–66)	

3. Results

3.1 Baseline Sociodemographic Characteristics

The cohort comprised 58 comorbid patients. Mean age was 61.3 ± 8.5 years (range 44–80); 56.9% (n = 33) exceeded 60 years. Females constituted 56.9% (n = 33). Body mass index (BMI) was elevated in 93.1%: 56.9% (n = 33) were overweight (BMI 25.0–29.9 kg/m²) and 36.2% (n = 21) obese (BMI ≥30.0 kg/m²), yielding a mean BMI of 29.17 ± 3.01 kg/m² (range 23–37). Mean symptom duration prior to presentation was 36.12 ± 11.26 hours (range 6–66). Full sociodemographic data are presented in table 1.

3.2 Comorbidity Profile and Severity Classification

Hypertension was the most prevalent comorbid condition (55.2%, n = 32), followed by T2DM (43.1%, n = 25), morbid obesity (36.2%, n = 21), ischaemic heart disease (IHD; 27.6%, n = 16), chronic kidney disease (CKD; 17.2%, n = 10), and COPD (15.5%, n = 9). The distribution of comorbidity burden per patient is illustrated in Figure 1: majority harboured two concurrent comorbidities (60.3%, n = 35), while 22.4% (n = 13) had one and 17.2% (n = 10) had three. Full comorbidity data are presented in table 2.

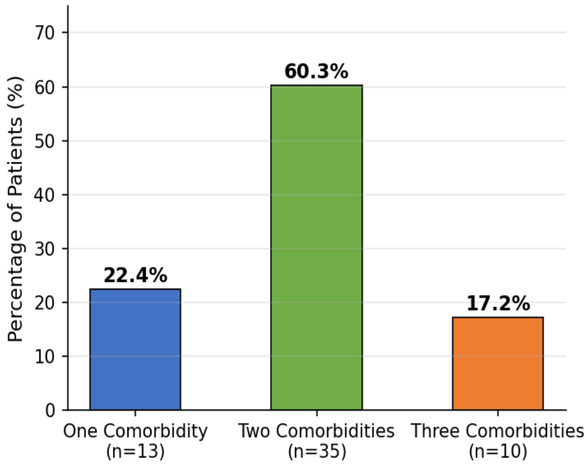

Figure 1: Distribution of comorbidity burden per patient (N = 58), Where n = number of patients in each comorbidity-count category.

Table 2: Comorbidity Profile, Burden Distribution, and Severity Classification (N = 58).

Variable	Subcategory	n	%
Comorbid conditions	Hypertension	32	55.2
	Type 2 diabetes mellitus	25	43.1
	Morbid obesity	21	36.2
	Ischaemic heart disease	16	27.6
	Chronic kidney disease	10	17.2
	COPD / Asthma	9	15.5
Comorbidity count	One	13	22.4
	Two	35	60.3
	Three	10	17.2
ASA classification	Class II	25	43.1
	Class III	24	41.4
	Class IV	9	15.5
Tokyo severity grade	Grade I (Mild)	20	34.5
	Grade II (Moderate)	28	48.3
	Grade III (Severe)	10	17.2

3.3 Intraoperative Findings and Conversion

A technically challenging Calot's triangle was encountered in 37.9% (n = 22) of cases, reflecting the operative complexity inherent to ELC within an inflamed, comorbid surgical field (Table 3). Subtotal laparoscopic cholecystectomy was necessitated as a bail-out manoeuvre in 12.1% (n = 7). A subhepatic closed-suction drain was placed in all patients (100%), representing an institutional protocol. Mean operative time was 76.31 ± 16.17 minutes. Laparoscopic completion was achieved in 79.3% (n = 46). Conversion to open cholecystectomy was required in 20.7% (n = 12), with the predominant indications being dense adhesive disease (8.6%, n = 5) and indeterminate ductal anatomy (8.6%, n = 5); intraoperative haemorrhage necessitated conversion in 3.4% (n = 2).

Table 3: Intraoperative Characteristics and Conversion Outcomes (N = 58).

Variable	n	%
Difficult Calot's triangle	22	37.9
Subtotal cholecystectomy	7	12.1
Subhepatic drain inserted	58	100.0
Operative time, min Mean ± SD	76.31 ± 16.17	
Laparoscopic completion (no conversion)	46	79.3
Conversion dense adhesions	5	8.6
Conversion indeterminate anatomy	5	8.6
Conversion intraoperative haemorrhage	2	3.4

3.4 Postoperative Complications and Clinical Outcomes

Surgical site infection (SSI), defined per CDC/NHSN criteria, was the most frequently recorded postoperative complication (67.2%, n = 39). Bile leak, defined as bilious drain output persisting beyond postoperative day 3 or requiring intervention, was noted in 46.6% (n = 27).

These rates exceed international benchmarks and should be interpreted in the context of universal drain placement and pulmonary atelectasis (37.9%, n = 22). Cardiac arrhythmia occurred in a single patient (1.7%). Multiple complications coexisted in a proportion of patients. A favourable overall outcome -- defined as discharge without ICU admission, no Clavien-Dindo grade III or higher complication, and no 30-day mortality -- was achieved in 84.5% (n = 49); ICU admission was required in 15.5% (n = 9), 30-day readmission in 5.2% (n = 3), and 30-day mortality in 1.7% (n = 1). Mean postoperative hospital stay was 5.04 ± 1.77 days and mean time to resume oral nutrition was 18.88 ± 6.54 hours (table 4).

Table 4: Postoperative Complications and Clinical Outcomes (N = 58).

Variable	n	%
Surgical site infection	39	67.2
Bile leak	27	46.6
Pulmonary atelectasis	22	37.9
Cardiac arrhythmia	1	1.7
Overall favorable outcome	49	84.5
ICU admission	9	15.5
30-day readmission	3	5.2
30-day mortality	1	1.7
Hospital stays, days Mean ± SD	5.04 ± 1.77	
Time to oral intake, hours Mean ± SD	18.88 ± 6.54	

3.5 Association Between Tokyo Severity Grade and Outcomes

Mean patient age increased progressively across severity strata 55.54 ± 8.76 years (Grade I), 63.35 ± 6.68 years (Grade II), and 67.56 ± 6.00 years (Grade III) with all patients aged below 50 years exclusively classified as Grade I (p = 0.0001 and p = 0.002, respectively). BMI demonstrated a significant severity-dependent association (p = 0.011), with all normal-BMI patients confined to Grade I.

Symptom duration escalated markedly with grade: 24.95 ± 7.64 h (Grade I), 38.04 ± 3.41 h (Grade II), and 53.1 ± 5.99 h (Grade III) (p = 0.0001) (Table 5). No statistically significant associations were identified between Tokyo grade and individual comorbidities (hypertension p = 0.551; T2DM p = 0.652; IHD p = 0.266; CKD p = 0.786; COPD p = 0.752; morbid obesity p = 0.430), indicating that single-diagnosis comorbid labels do not independently discriminate disease severity. Operative time demonstrated a highly significant severity-dependent gradient: 61.55 ± 9.87 min (Grade I), 78.86 ± 9.96 min (Grade II), and 98.70 ± 9.55 min (Grade III) (p = 0.0001) (table 6).

A technically challenging Calot's triangle was absent in Grade I but encountered in 59.1% of Grade II and 40.9% of Grade III cases (p = 0.0001). Subtotal cholecystectomy and conversion to open surgery were confined to Grades II–III (each p = 0.0001; Grade III conversion rate 66.7%). SSI, bile leak, and atelectasis each demonstrated unequivocal severity-dependent escalation (all p = 0.0001). ICU admission was confined to Grades II (11.1%) and III (88.9%; p = 0.0001), as was the single 30-day mortality (Grade III). Hospital stays increased from 3.49 ± 1.12 days (Grade I) to 5.37 ± 1.08 days (Grade II) and 7.19 ± 1.66 days (Grade III) (p = 0.0001); time to oral intake followed an identical gradient: 13.00 ± 4.21 h, 19.93 ± 4.22 h, and 27.70 ± 3.59 hours, respectively (p = 0.0001) (tables 7-8).

Table 5: Association Between Tokyo Severity Grade and Demographic / Clinical Characteristics (N = 58).

Variable	Subcategory	Grade I (n=20)	Grade II (n=28)	Grade III (n=10)	p-value
Age (years)	< 50	7 (100%)	0 (0%)	0 (0%)	0.002
	50–60	6 (33.3%)	10 (55.6%)	2 (11.1%)	
	> 60	7 (21.2%)	18 (54.5%)	8 (24.2%)	
	Mean ± SD	55.54 ± 8.76	63.35 ± 6.68	67.56 ± 6.00	0.0001
Sex	Female	13 (39.4%)	16 (48.5%)	4 (12.1%)	0.427
	Male	7 (28.0%)	12 (48.0%)	6 (24.0%)	
BMI (kg/m²)	Normal	4 (100%)	0 (0%)	0 (0%)	0.039
	Overweight	9 (27.3%)	16 (48.5%)	8 (24.2%)	
	Obese	7 (33.3%)	12 (57.1%)	2 (9.5%)	
	Mean ± SD	27.58 ± 3.16	29.92 ± 2.87	30.21 ± 1.66	0.011
Symptom duration (h)	Mean ± SD	24.95 ± 7.64	38.04 ± 3.41	53.1 ± 5.99	0.0001

Table 6: Association Between Tokyo Severity Grade, Comorbidities, ASA Class, and Operative Time (N = 58).

Variable	Subcategory	Grade I (n=20)	Grade II (n=28)	Grade III (n=10)	p-value
Hypertension	Yes	11 (34.4%)	14 (43.8%)	7 (21.9%)	0.551
T2DM	Yes	7 (28.0%)	13 (52.0%)	5 (20.0%)	0.652
IHD	Yes	7 (43.8%)	5 (31.3%)	4 (25.0%)	0.266
CKD	Yes	4 (40.0%)	5 (50.0%)	1 (10.0%)	0.786
COPD	Yes	4 (44.4%)	4 (44.4%)	1 (11.1%)	0.752
Morbid obesity	Yes	7 (33.3%)	12 (57.1%)	2 (9.5%)	0.430
ASA class	II	13 (52.0%)	10 (40.0%)	2 (8.0%)	0.076
	III	4 (16.7%)	13 (54.2%)	7 (29.2%)	
	IV	3 (33.3%)	5 (55.6%)	1 (11.1%)	
Operative time (min)	Mean ± SD	61.55 ± 9.87	78.86 ± 9.96	98.70 ± 9.55	0.0001

Table 7: Association Between Tokyo Severity Grade and Intraoperative Findings / Postoperative Complications (N = 58).

Variable	Grade I (n=20)	Grade II (n=28)	Grade III (n=10)	p-value
Difficult Calot's triangle	0 (0.0%)	13 (59.1%)	9 (40.9%)	0.0001
Subtotal cholecystectomy	0 (0.0%)	1 (14.3%)	6 (85.7%)	0.0001
Conversion to open	0 (0.0%)	4 (33.3%)	8 (66.7%)	0.0001
Surgical site infection	5 (12.8%)	24 (61.5%)	10 (25.6%)	0.0001
Bile leak	2 (7.4%)	16 (59.3%)	9 (33.3%)	0.0001
Pulmonary atelectasis	1 (4.5%)	11 (50.0%)	10 (45.5%)	0.0001
Cardiac arrhythmia	0 (0.0%)	0 (0.0%)	1 (100%)	0.087

Table 8: Association Between Tokyo Severity Grade and Postoperative Outcomes / Recovery Parameters (N = 58).

Variable	Grade I (n=20)	Grade II (n=28)	Grade III (n=10)	p-value
ICU admission	0 (0.0%)	1 (11.1%)	8 (88.9%)	0.0001
30-day readmission	0 (0.0%)	1 (33.3%)	2 (66.7%)	0.057
30-day mortality	0 (0.0%)	0 (0.0%)	1 (100%)	0.087
Hospital stays (days) Mean ± SD	3.49 ± 1.12	5.37 ± 1.08	7.19 ± 1.66	0.0001
Time to oral intake (h) Mean ± SD	13.00 ± 4.21	19.93 ± 4.22	27.70 ± 3.59	0.0001

3.6 Association Between Comorbidity Burden and Outcomes

Mean age differed significantly across comorbidity-count strata (one: 63.23 ± 6.50; two: 59.26 ± 8.87; three: 66.38 ± 7.63 years; p = 0.043). A technically challenging Calot's triangle was significantly associated with comorbidity burden (p = 0.011), occurring in 18.2%, 45.5%, and 36.4% of patients with one, two, and three comorbidities, respectively. Bile leak (p = 0.032) and pulmonary atelectasis (p = 0.008) also demonstrated significant associations with comorbidity count (tables 9-10). In contrast, subtotal cholecystectomy rate (p = 0.293), conversion rate (p = 0.251), SSI (p = 0.201), cardiac arrhythmia (p = 0.716), operative time (p = 0.193), ICU admission (p = 0.660), 30-day readmission (p = 0.354), 30-day mortality (p = 0.716), hospital stay (p = 0.325), and time to oral intake (p = 0.087) showed no significant association with the number of concurrent comorbidities.

Table 9: Association Between Comorbidity Count and Intraoperative Findings / Postoperative Complications (N = 58).

Variable	One (n=13)	Two (n=35)	Three (n=10)	p-value
Difficult Calot's triangle	4 (18.2%)	10 (45.5%)	8 (36.4%)	0.011
Subtotal cholecystectomy	1 (14.3%)	6 (85.7%)	0 (0.0%)	0.293
Conversion to open	2 (16.7%)	6 (50.0%)	4 (33.3%)	0.251
Surgical site infection	9 (23.1%)	21 (53.8%)	9 (23.1%)	0.201
Bile leak	7 (25.9%)	12 (44.4%)	8 (29.6%)	0.032
Pulmonary atelectasis	5 (22.7%)	9 (40.9%)	8 (36.4%)	0.008
Cardiac arrhythmia	0 (0.0%)	1 (100%)	0 (0.0%)	0.716
Operative time (min) Mean ± SD	76.54 ± 14.18	73.54 ± 17.60	85.70 ± 9.49	0.193

Table 10: Association Between Comorbidity Count and Postoperative Outcomes / Recovery Parameters (N = 58).

Variable	One (n=13)	Two (n=35)	Three (n=10)	p-value
ICU admission	1 (11.1%)	6 (66.7%)	2 (22.2%)	0.660
30-day readmission	0 (0.0%)	3 (100%)	0 (0.0%)	0.354
30-day mortality	0 (0.0%)	1 (100%)	0 (0.0%)	0.716
Hospital stays (days) Mean ± SD	5.06 ± 1.16	4.82 ± 2.08	5.78 ± 0.86	0.325
Time to oral intake (h) Mean ± SD	19.15 ± 5.03	17.66 ± 7.28	22.80 ± 3.67	0.087

4: Discussion

The current prospective cohort supports the feasibility and safety of ELC in aged dominantly older adults (61.3 years), overweight, comorbidity-saturated demographic with AC, with a 30-day mortality of 1.7% and favourable outcomes in 84.5% of patients. The data confirms a predominant hierarchical operation of Tokyo Guidelines disease severity grade as the consistent predictor of operative difficulty and perioperative morbidity and recovery pattern, and the limited impact of cumulative comorbidity burden. The epidemiological coherence of the age proportion 56.9% of them aged over 60 years is consistent with the well-defined comorbidity gradient of severe AC. Osterman et al. [11] who wrote about a population based Swedish registry of 32463 patients recorded progressive rises in the rate of postoperative complication, 34.9% (ASA I52) to 47.7% (ASA III5 V) and 55.7, with equal steps in 30 day mortality.

The female predominance (56.9) is in accord with the regional Iraqi operative data [12]. However, sex composition also is largely determined by referral patterns and case-mix, which is demonstrated by the prevalence of males (54.8) in a Japanese acute cholecystitis series [13]. A conversion rate of 20.7 percent indicates the anatomic and inflammatory complexity of this comorbid group. Dense adhesive disease and indeterminate Calot anatomy each contributed to the outcome of 8.6% of conversions that comply with technical difficulty frameworks where necrotising cholecystitis is a significant increase in conversion risk [14].

ELC viability is supported by the 79.3% laparoscopic completion rate, incorporating advanced intraoperative bail-out strategies: subtotal laparoscopic cholecystectomy (12.1%) and fundus-first dissection (11%). Importantly, subtotal cholecystectomy is an intraoperative laparoscopic bail-out technique and must not be conflated with open conversion; open conversion rates are reported separately.

The scale of the frequencies of the postoperative complications should be put into perspective. SSI (67.2) and bile leak (46.6) are much higher than in general emergency cholecystectomy series Terho et al. [15] that cited SSI in 1.9% and bile leak in 1.1% in 400 Finnish patients. These differences may be explained by universal drain placement which allows identification of small amounts of bile staining; high proportion of challenging Calot anatomy (37.9%), and Grade III disease (17.2%); and centre-specific cut-off levels of complication ascertainment may have contributed to these differences [16].

Hussein et al. [17] have reported the leak of bile in 2.4% of 122 Iraqi patients and this once again indicates definition heterogeneity. The uniform severity-linked modifications all over the significant operating and postoperative parameters are the most essential finding of the study. The fact that individual comorbidity diagnoses were not significantly associated with Tokyo grade highlights an important point that comorbidities cause host physiology changes and enhance inflammatory signalling, but the severity of the disease is dependent more on obstruction duration, bacterial burden, and tissue ischaemia than on systemic disease labels as per the comorbidity modelling framework of Dzyubanovsky et al. [18]. Comorbidity burden, however, selectively influenced bile leak ($p = 0.032$) and pulmonary atelectasis ($p = 0.008$). These relationships are biologically plausible: the existence of impaired hepatic synthetic activity and coagulopathy in multimorbid patients may lead to the loss of ductal seal integrity and the presence of concurrent cardiopulmonary disease diminishes pulmonary reserve under anaesthesia.

The lack of comorbidity-induced intensification of ICU admission, conversion rate, and hospital stay also justify Tokyo grade to be the key operational stratifier. These results validate the TG18 pragmatic framework [19]: mild-to-moderate disease and acceptable physiological reserve should be followed by urgent ELC; Grade III disease in an optimisable host in an expert centre should receive a course of rapid resuscitation with early expert laparoscopy with bail-out option; prohibitive physiological reserve should be treated with percutaneous drainage in a temporising fashion. Registry data support the superiority of ELC in achieving better 6-12-month results in comparison with conservative methods even in harshly comorbid groups [20].

Limitation of this study was Single-centre design and moderate sample size (n = 58) limit statistical power and generalisability. Universal drain insertion may have led to over-ascertainment of bile leak events by capturing clinically insignificant bile staining. The absence of a delayed-surgery comparator group precludes direct head-to-head comparison within this cohort.

5. Conclusion

Early laparoscopic cholecystectomy is safe and efficacious in comorbid patients with acute cholecystitis, yielding favourable outcomes in 84.5% and 30-day mortality of 1.7%. Tokyo Guidelines severity grade not cumulative comorbidity burden is the primary determinant of operative complexity, perioperative morbidity, ICU utilisation, and recovery trajectory. Comorbidity burden retains selective prognostic relevance for bile leak and pulmonary atelectasis, informing perioperative optimisation rather than surgical contraindication.

Integration of disease-centred severity stratification (TG18) with patient-centred risk assessment (ASA classification) provides the most actionable framework for high-risk AC management. Early referral, prompt operative intervention, and institutional access to experienced laparoscopic teams with intensive care support are essential prerequisites for optimal outcomes.

6. References

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