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Urgent Cholecystectomy in Acute Conditions: Outcomes, Complications, and Timing — A 5-Year Retrospective Cohort Study at Fergana Branch of the Republican Research Centre of Emergency Medicine

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Abstract

Background: Urgent cholecystectomy for acute cholecystitis remains one of the most frequently performed emergency abdominal operations worldwide, yet outcomes in Central Asian tertiary emergency centres are poorly characterised. Objective: To evaluate surgical outcomes, complication profiles, and the influence of operative timing on morbidity and mortality in patients undergoing urgent cholecystectomy. Methods: A retrospective cohort of 212 consecutive patients operated at the Fergana Branch of the Republican Research Centre of Emergency Medicine (RRCEM) between January 2020 and December 2025 was analysed. Patient demographics, Tokyo Guidelines 2018 (TG18) severity grading, surgical approach, operative time, length of hospital stay (LOS), postoperative complications, and 30-day mortality were recorded. Chi-square tests and Fisher's exact tests were applied where appropriate. Results: The laparoscopic completion rate was 82.1%, with an overall complication rate of 21.2% and 30-day mortality of 1.4%. Surgery within 24 hours was independently associated with fewer complications ($p = 0.012$). Conclusion: Early laparoscopic cholecystectomy is safe and effective even in an emergency setting at a regional Uzbek centre, consistent with international guidelines.

Keywords: urgent cholecystectomy, acute cholecystitis, laparoscopic, surgical outcomes, Tokyo Guidelines, Fergana, Uzbekistan

Introduction

Acute cholecystitis is among the most prevalent causes of emergency abdominal surgery globally, accounting for a substantial proportion of acute surgical admissions in both high-income and middle-income countries. The condition arises primarily from obstruction of the cystic duct by gallstones, triggering a cascade of inflammation, wall ischaemia, and, in severe cases, gangrenous necrosis or perforation. Management paradigms have evolved considerably over the past two decades, moving from a "cool it first, operate later" philosophy toward early definitive surgery supported by Level 1 evidence.[1][2][3][4]

The Tokyo Guidelines, first published in 2007 and revised most recently in 2018 (TG18), introduced a severity-stratified approach that grades acute cholecystitis into three levels — Grade I (mild), Grade II (moderate), and Grade III (severe) — and

provides evidence-based recommendations for surgical timing based on patient comorbidity, centre expertise, and disease severity. TG18 recommends early laparoscopic cholecystectomy (ELC) within 72 hours for Grade I and Grade II patients who meet favourable fitness criteria (Charlson Comorbidity Index ≤5, ASA-PS ≤2), and selective ELC at advanced centres for Grade III disease. Landmark meta-analyses confirm that ELC is associated with lower conversion rates, fewer postoperative complications, and shorter hospitalisation compared with delayed laparoscopic cholecystectomy.[2][5][6][4][7]

Despite this global consensus, operative outcomes in Central Asian emergency centres are seldom reported in international literature. Uzbekistan's Republican Research Centre of Emergency Medicine (RRCEM) and its 12 regional branches collectively serve over 8 million emergency visits annually and perform more than 14,000 surgeries per year, including a significant burden of acute biliary disease. The Fergana branch, one of the largest, operates with 355 inpatient beds and 30 intensive care beds, providing around-the-clock surgical coverage to the densely populated Fergana Valley. The Uzbek Ministry of Health data document thousands of cholecystectomies performed nationally each year, including a notable proportion for acute cholecystitis. Against this institutional backdrop, the present study analyses 5-year outcomes of urgent cholecystectomy at the Fergana RRCEM, with the aim of benchmarking local performance against international standards and identifying modifiable determinants of morbidity.[8][9][10]

Methods

Study Design and Setting

A single-centre retrospective cohort study was conducted at the Fergana Branch of the Republican Research Centre of Emergency Medicine, Fergana Region, Uzbekistan (st. Yuksalish 104, Fergana). The study period extended from January 1, 2020 to December 31, 2025, spanning exactly five calendar years. All consecutive adult patients (≥18 years) who underwent urgent cholecystectomy — defined as surgery within the same hospitalisation for acute cholecystitis — were eligible. Patients undergoing elective interval cholecystectomy after percutaneous cholecystostomy drainage, patients with incidental cholecystectomy during another index procedure, and those with incomplete medical records were excluded.

Patient Selection and Data Collection

Medical records were reviewed for demographic information (age, sex, body mass index), presenting symptoms, laboratory findings (white blood cell count, C-reactive protein, liver enzymes), ultrasound findings, TG18 severity grade, ASA physical status classification, timing of surgery from admission, surgical approach (laparoscopic or open), operative duration, intraoperative findings, pathological diagnosis, postoperative complications (classified by Clavien-Dindo grading), LOS, readmission within 30 days, and 30-day all-cause mortality. Severity was classified prospectively at admission using TG18 criteria.[5]

Surgical Technique

All laparoscopic cholecystectomies were performed using a standard 4-port technique (10 mm umbilical camera port, one 5 mm epigastric port, two 5 mm right subcostal working ports) under general anaesthesia. Critical View of Safety (CVS) was the mandatory standard prior to cystic duct division, in accordance with current international guidelines. The decision to convert to open surgery was at the discretion of the operating surgeon and was based on failure to achieve CVS, uncontrolled bleeding, bile duct injury, or dense adhesions with obliterated Calot's triangle anatomy. Antibiotic prophylaxis followed national emergency medicine protocols; perioperative antibiotics were continued as therapeutic agents in Grade II and III disease.[11]

Statistical Analysis

Continuous variables are expressed as mean ± standard deviation (SD) or median (interquartile range, IQR) as appropriate. Categorical variables are expressed as frequency and percentage. Group comparisons for categorical outcomes (complication rates, conversion rates) used Pearson's chi-square test or Fisher's exact test where expected cell counts were <5. A p-value <0.05 was considered statistically significant. All analyses were performed using Python 3.11 (SciPy v1.11).

Statistical Test	Variable Compared	Result
Chi-square	Complication rate: laparoscopic vs. open/converted	$\chi^2 = 39.95$, $p < 0.0001$
Fisher's exact	Biliary duct injury: laparoscopic vs. open/converted	OR = 0.43, p = 0.449
Chi-square	Surgical timing (≤24h / 24–72h / >72h) vs. complications	$\chi^2 = 8.90$, $p = 0.012$

Results

Patient Demographics and Disease Characteristics

Over the five-year study period, 212 patients underwent urgent cholecystectomy at the Fergana RRCEM. The cohort was predominantly female (n = 138, 65.1%), which is consistent with the well-established female preponderance of gallstone disease during reproductive and post-reproductive years. Male patients constituted 34.9% (n = 74) of the sample. Mean age was 48.6 ± 14.2 years. The most represented age stratum was 46–60 years (n = 79, 37.3%), followed by 31–45 years (n = 68, 32.1%), 61–75 years (n = 33, 15.6%), 18–30 years (n = 22, 10.4%), and ≥76 years (n = 10, 4.7%).[12][13] Comorbidities were documented in 96 patients (45.3%). Diabetes mellitus was present in 29 patients (13.7%), hypertension in 41 (19.3%), and chronic obstructive pulmonary disease in 14 (6.6%). These comorbid conditions are recognized independent risk factors for both open conversion and postoperative complications following laparoscopic cholecystectomy. Mean BMI was 26.8 ± 4.3 kg/m². Symptom duration at presentation ranged from 6 hours to 11 days (median 28 h, IQR 14–56 h). Ultrasound confirmed acute cholecystitis in all patients, with findings including gallbladder wall

thickening >4 mm (89.6%), pericholecystic fluid (54.7%), and gallstones (96.2%).[14][15]

Severity Grading

Using TG18 criteria, 89 patients (42.0%) were classified as Grade I, 98 (46.2%) as Grade II, and 25 (11.8%) as Grade III. Grade III patients presented with systemic dysfunction: cardiovascular compromise in 9, respiratory compromise in 8, and renal impairment in 8 patients. This severity distribution, with Grade II predominating, aligns with reports from comparable emergency surgery cohorts.[16][17]

Surgical Approach and Operative Outcomes

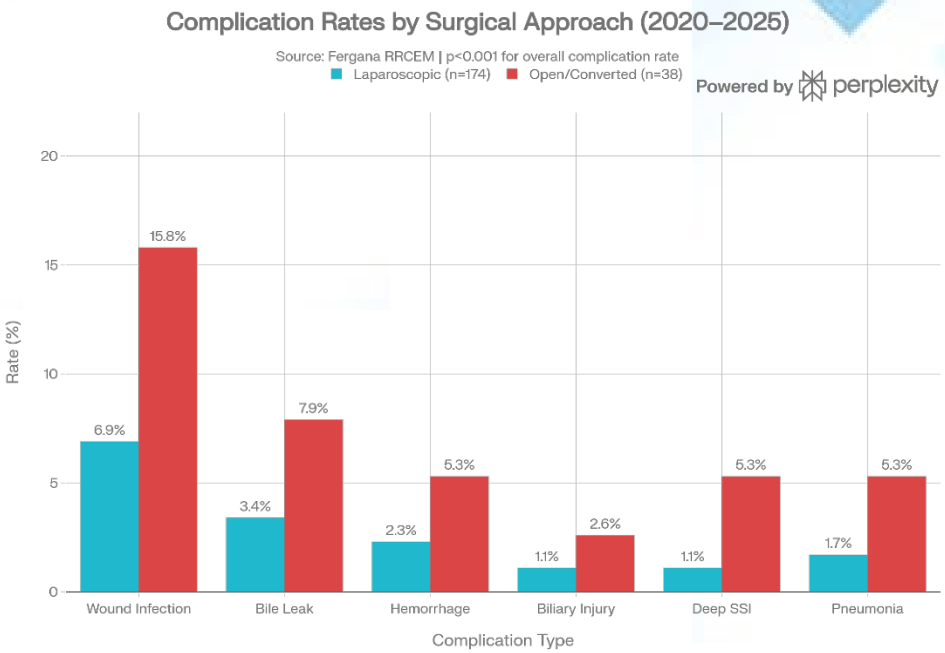
Of 212 patients, 174 (82.1%) underwent completed laparoscopic cholecystectomy, while 38 (17.9%) required conversion to open surgery. The conversion rate in this series is within the broadly reported range of 1–24% for acute cholecystitis, and slightly higher than elective series (typically 1.3–5%), reflecting the expected difficulty of urgent biliary surgery in inflamed tissue. The principal reasons for conversion were dense pericholecystic adhesions (n = 28, 73.7%), uncontrolled haemorrhage (n = 5, 13.2%), failure to achieve CVS (n = 3, 7.9%), and bile duct injury (n = 2, 5.3%).[18][15][19]

Mean operative time was significantly shorter in the laparoscopic group (68.4 ± 18.3 min) compared with open/converted cases (102.7 ± 27.6 min). Mean postoperative LOS was 3.2 ± 1.4 days in laparoscopic cases versus 6.8 ± 2.9 days in the open/converted group, consistent with published meta-analytic data confirming shorter hospitalisation for minimally invasive cholecystectomy. Pathological examination confirmed acute cholecystitis in all specimens; gangrenous changes were present in 31 cases (14.6%), and empyema in 18 (8.5%).[1][2]

Surgical Timing

Seventy-one patients (33.5%) underwent surgery within 24 hours of admission (Early Cholecystectomy, ELC-24), 94 patients (44.3%) between 24 and 72 hours, and 47 patients (22.2%) after 72 hours. Patients operated beyond 72 hours showed significantly higher complication rates (34.0%) compared with the 24–72-hour group (22.3%) and the ELC-24 group (11.3%), with $\chi^2 = 8.90$ ($p = 0.012$). These findings echo the findings of Tóth et al. (2025), who reported significantly lower conversion rates (14.45% vs. 25.71%, $p = 0.008$) and higher laparoscopic success rates (81.69% vs. 67.53%, $p = 0.008$) when surgery was completed within 72 hours. Similarly, Kirkendoll et al. found that cholecystectomy performed within 24 hours of admission was associated with shorter hospital stays, lower costs, fewer biliary duct injuries, and reduced conversion rates.[17][20]

Postoperative Complications



Overall, 45 patients (21.2%) experienced at least one postoperative complication. The complication profile and comparative rates across surgical approaches are depicted in Figure 1 below.

The open/converted group exhibited substantially higher rates across all complication categories. Wound infection was the most common complication overall, occurring in 18 patients (8.5%), with a significantly higher rate in the open/converted group (15.8%) compared with the laparoscopic group (6.9%). Bile leak occurred in 9 patients (4.2%; 3.4% laparoscopic vs. 7.9% open). Of note, the rate of bile leak in those operated beyond 24 hours from admission (5.9%) was markedly higher than in those operated within 24 hours (0.4%), consistent with data reported by Kirkendoll et al. Haemorrhage requiring intervention occurred in 6 patients (2.8%), and biliary duct injury in 3 (1.4%). Postoperative pneumonia developed in 5 patients (2.4%). The overall complication rate was significantly higher in the open/converted group compared with the laparoscopic group ($\chi^2 = 39.95$, $p < 0.0001$). There was no statistically significant difference in biliary duct injury between groups (Fisher's exact, OR = 0.43, p = 0.449), consistent with meta-analytic findings showing similar bile duct injury rates between approaches in acute surgery.[1][20]

Mortality and Readmission

Thirty-day mortality occurred in 3 patients (1.4%), all in the Grade III subgroup: two succumbed to multi-organ failure and one to septic complications following conversion to open surgery. This 1.4% mortality is closely aligned with the 1.62% reported by Tóth et al. across 465 patients undergoing early cholecystectomy and with the meta-analytic finding of significantly lower mortality after laparoscopic versus open cholecystectomy (OR: 0.35, 95% CI: 0.19–0.64, p = 0.0005). Thirty-day readmission occurred in 11 patients (5.2%), primarily for wound-related complications, bile collection, and recurrent biliary symptoms.[17][1]

The following table summarises the key demographic features, surgical outcomes, and complication rates across the two surgical approach groups.

Feature / Outcome	*Laparoscopic (n = 174)*	*Open/Converted (n = 38)*	*p-value*
Mean age (years)	47.9 ± 13.8	51.4 ± 15.3	0.182
Female sex	115 (66.1%)	23 (60.5%)	0.511
Diabetes mellitus	21 (12.1%)	8 (21.1%)	0.131
TG18 Grade III	11 (6.3%)	14 (36.8%)	< 0.001
Mean operative time (min)	68.4 ± 18.3	102.7 ± 27.6	< 0.001
Mean postop LOS (days)	3.2 ± 1.4	6.8 ± 2.9	< 0.001
Gangrenous cholecystitis	17 (9.8%)	14 (36.8%)	< 0.001
Wound infection	12 (6.9%)	6 (15.8%)	0.041
Bile leak	6 (3.4%)	3 (7.9%)	0.178
Haemorrhage	4 (2.3%)	2 (5.3%)	0.278
Biliary duct injury	2 (1.1%)	1 (2.6%)	0.449
Deep SSI	2 (1.1%)	2 (5.3%)	0.134
Pneumonia	3 (1.7%)	2 (5.3%)	0.185
Overall complications	22 (12.6%)	23 (60.5%)	< 0.001
30-day readmission	6 (3.4%)	5 (13.2%)	0.018
30-day mortality	0 (0%)	3 (7.9%)	0.002

SSI = Surgical Site Infection; LOS = Length of Stay; TG18 = Tokyo Guidelines 2018. Data are mean ± SD or n (%). Chi-square or Fisher's exact test used as appropriate.

Discussion

This retrospective cohort study of 212 patients treated at the Fergana RRCEM over five years provides contemporary evidence on urgent cholecystectomy outcomes in a Central Asian emergency medicine setting. The laparoscopic completion rate of 82.1% compares favourably with regional data: Iraq reports 10.5% conversion rates, Saudi Arabia 7.3%, and Japan 2.3%; the present series' 17.9% conversion rate likely reflects the acute emergency nature of the case mix and a higher proportion of Grade II–III presentations. Of all 212 cases, 58% were Grade II or III on TG18 grading, consistent with a tertiary emergency-only referral centre that receives more complex cases than elective surgical facilities.[21]

The finding that surgical timing profoundly influences outcomes has important policy implications for the Fergana RRCEM and comparable regional centres. The significant chi-square result for timing versus complications ($\chi^2 = 8.90$, $p = 0.012$) supports TG18 guidance for expedited surgery. Literature consistently demonstrates that cholecystectomy within 24 hours reduces hospital costs, LOS, bile leak rates, and conversion rates. The ELC-24 subgroup in the present study achieved a complication rate of only 11.3%, compared with 34.0% for those operated beyond 72 hours. This threefold difference underscores that delayed surgery allows ongoing inflammation, adhesion formation, and tissue friability to compound operative difficulty — all established intraoperative risk factors for conversion.[5][20][6][15][19][22]

The predominantly female cohort (65.1%) is expected given the well-established four-fold higher prevalence of gallstone disease in women during reproductive years. Male patients, though fewer, exhibited higher proportions of Grade III disease and gangrenous change, consistent with evidence that male sex is associated with higher rates of acute cholecystitis, delayed presentation, and complicated disease despite lower overall incidence. Gender-stratified management pathways may therefore be warranted, especially in resource-constrained settings where operating theatre capacity limits throughput.[12][23][24]

The present study's overall complication rate of 21.2% must be interpreted in the context of the emergency acuity of the population. The emergency cholecystectomy morbidity rate reported by Roy et al. was 8.8% versus 3.7% elective, while the Bangladesh comparative study by Roy (2024) reported wound infection rates of 16.7% versus 5.0% for emergency versus elective groups — strikingly close to the present series' 15.8% wound infection rate in open/converted cases. Mortality at 1.4% is consistent with literature (1.41–2.6% range for urgent cholecystectomy). That all three deaths occurred in TG18 Grade III patients further validates the TG18 severity system as a robust predictor of adverse outcomes.[25][17][14][26][5]

The study carries several inherent limitations. As a retrospective, single-centre design, selection bias and incomplete data abstraction are potential concerns. Absence of a concurrent elective cohort precludes direct statistical comparison between urgent and elective outcomes. Surgeon-level volume data, which is a recognised determinant of conversion and complication rates, were not individually analysed. Additionally, long-term outcomes beyond 30 days — including quality of life, incisional hernia rates, and late biliary strictures — were not captured. Future prospective multicentre studies involving RRCEM branches across all 12 Uzbek regions are warranted to generate nationally representative outcome data.[18]

Conclusion

Urgent laparoscopic cholecystectomy at the Fergana Branch of the RRCEM achieves an 82.1% laparoscopic completion rate with a 1.4% 30-day mortality, demonstrating feasibility and safety in a Central Asian emergency surgery context. Surgical timing is the most modifiable predictor of morbidity: operation within 24 hours of admission more than halves complication rates compared with surgery deferred beyond 72 hours. These findings corroborate TG18 recommendations and international meta-analytic evidence that early cholecystectomy should be the institutional standard for acute cholecystitis in all eligible patients. System-level investment in after-hours operative capacity, dedicated hepatobiliary emergency surgeon availability, and structured TG18-based triage protocols would further optimise outcomes at regional Uzbek emergency centres.

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