

Laparoscopic Cholecystectomy in Gangrenous Cholecystitis

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ABSTRACT

Introduction: Gangrenous cholecystitis (GC) is difficult to diagnose preoperatively. A delay in diagnosis leads to increased complications. A high index of suspicion followed by early surgery leads to increased chances of laparoscopic cholecystectomy with decreased morbidity and early discharge. The aim of the study was to study the demographics, contrast-enhanced computerized tomography (CECT) and magnetic resonance imaging (MRI) findings, type of procedure (laparoscopic/open), and the outcome of the patients.

Materials and methods: A retrospective study was undertaken on GC patients. Patients were divided into three groups depending upon the type of surgery (LC, OC, LC-OC). Patient demographics, comorbidities, preoperative biochemical, CECT, MRI findings, time taken from admission to surgery, type of surgery, post-op complications, and length of stay were compared.

Results: During a 5-year period, a total of 55 patients were diagnosed with GC. Of these cases, 47.27% underwent laparoscopic cholecystectomy (LC), 41.82% were treated with OC, and the remaining 10.91% had a combination of LC and OC. The median age of the patients was 58.12 ± 16.66 years, 65.65 ± 11.13 , 58.16 ± 12.79 years in LC, OC, LC-OC groups respectively. The male to female ratio was 1.4:1. Approximately 45.45% of the individuals had hypertension, while 41.81% were diagnosed with diabetes. Additionally, 16.36% of the patients were found to have coronary artery disease (CAD), and 14.54% were undergoing antiplatelet therapy. Moreover, leukocytosis was observed in 40% of the patient cases. The conversion rate from laparoscopic procedure to open procedure was 18.75%. Postoperative morbidity was seen in 18.18% of patients. Average hospital and ICU stay in the LC group was the shortest (3.76 ± 1.94 days, 0.53 ± 1.38 days respectively). Hospital and ICU stay in the OC group was 10.8 ± 5.76 and 2.43 ± 5.35 days respectively. The average stay of the LC-OC group in the hospital and ICU was 9 ± 6.75 and 3.5 ± 6.8 days. The *p*-value for hospital and ICU stay was 0.0001 and 0.0179 respectively.

Conclusion: A high index of suspicion, and increased use of CECT and MRI in suspected cases followed by early LC leads to favorable outcomes in GC.

Keywords: Cholecystitis, Gangrenous, Laparoscopic.

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INTRODUCTION

Gangrenous cholecystitis (GC) is a severe form of acute cholecystitis (AC).¹ It results from increasing vascular insufficiency resulting in mural infarction, necrosis, and perforation of the gall bladder (GB).^{2,3} Treatment of GC is challenging due to difficulty in preoperative diagnosis, increased intraoperative complications, and more morbidity and mortality postoperatively.^{1,4,5} Early preoperative diagnosis of GC is essential to reduce delays in surgery. Preoperative evaluation of GC requires cross-sectional imaging techniques like computed tomography and magnetic resonance.⁶ Management of GC is similar to AC, i.e., laparoscopic cholecystectomy (LC).⁷ Early LC in GC can decrease the incidence of complications.^{8,9} The threshold for conversion to open surgery should be kept low in patients with GC.¹⁰ Conversion rates in GC are higher varying from 14 to 35% compared to non-GC AC (3.4–7%).^{4,11,12} In our study, we reviewed the records of patients with GC. Demographics, radiological and histopathological findings, and postoperative complications of the patients with GC were noted. The time taken from admission to surgery and hospital and intensive care unit (ICU) stay of patients who underwent LC, OC, and LC-OC were compared.

MATERIALS AND METHODS

This retrospective observational study was conducted in Fortis Hospital, Mohali from 2010 to 2015 after necessary approvals from the Institutional Ethics Committee. We reviewed data of patients who underwent cholecystectomy for cholecystitis in the above period. Patients who were diagnosed with GC on histopathology

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examination were included. The study was approved by the institutional ethics committee. The study population was divided into three groups based on the type of surgical procedure, i.e., laparoscopic cholecystectomy (LC), open cholecystectomy (OC), and laparoscopic cholecystectomy converted to open cholecystectomy (LC-OC). For each patient medical record was analyzed for the demographics (age, gender), preexisting comorbidities [hypertension (HT), diabetes mellitus (DM), coronary artery disease (CAD)], etc., preoperative manifestations (upper abdomen pain, vomiting, and fever), preoperative laboratory

examination [leukocytosis, total serum bilirubin (TSB), aspartate transaminase (AST), alanine transaminase (APT) and serum creatinine]. Preoperative radiological findings on contrast-enhanced computerized tomography (CECT) of the abdomen and magnetic resonance imaging (MRI) of the abdomen were also analyzed. Intraoperative findings, histopathology examination features, postoperative morbidity, and length of hospital and ICU stay were compared for the three groups.

RESULTS

In the study period, 55 cases of GC were identified. About 26 (47.27%) patients underwent LC, OC was performed in 23 (41.82%) and LC was converted to OC (LC-OC) in 6 (10.91%) patients. In the LC group 13 patients were male and 13 were female (50% each), in the OC group 14 (60.87%) were males and 9 (39.13%) were females, while in the OC-LC group 5 (83.33%) were males and 1 (16.66%) was female. The median age of the patients in the LC, OC, and LC-OC groups was 58.12 ± 16.66 years, 65.65 ± 11.13 years, and 58.16 ± 12.79 years respectively. Patients with hypertension accounted for 45.45% (25 patients), while 41.81% (23 patients) were diagnosed with diabetes. Moreover, 16.36% (9 patients) had CAD, and 14.54% (8 patients) were on antiplatelet therapy. Preoperatively leukocytosis was seen in 22 (40%) patients, raised bilirubin in 13 (23.63%) patients, impaired AST/ALT in 7 (12.72%) and raised alkaline phosphatase in 6 (10.90%) patients. Creatinine was raised in 8 (14.54%) patients. CECT abdomen was done preoperatively in 15 patients. GB distension (60%), gall stones (53.3%), wall thickening (53.3%), irregular or absent wall (40%), and a pericholecystic fluid (40%) were the common findings. Few patients had pericholecystic abscess (20%), adjacent liver changes (13.34%), and mural striations (6.67%) on the CECT abdomen. Magnetic resonance imaging abdomen was done in 23 patients. Distended GB with the edematous wall was the commonest finding (78.26%) on MRI, followed by irregular mucosal surface (47.82%) and absence of enhancement of wall (43.78%). Time taken from admission to surgery was 0.84 ± 1.54 , 3 ± 4.75 , 0.66 ± 0.55 days in LC, OC, LC-OC groups respectively with p -value = 0.0008.

During cholecystectomy adhesions were the commonest finding (80%), distended GB was seen in 50.9% and thick GB wall was present in 30.9%. Gall bladder was perforated in 29.09%, and bile or pus in the abdomen was seen in 9.09%. Histopathological examination findings of resected specimens were mucosal ulceration (98.18%), diffuse edema (74.55%), prominent thickening of the wall (60%), and necrosis (52.72%). Postoperative morbidity was seen in 10 (18.18%) patients. four patients had wound infection, delirium, and atrial fibrillation was seen in two patients each, and one patient each developed myocardial infarction and bronchospasm. Average hospital and ICU stay in the LC group were the shortest (3.76 ± 1.94 days, and 0.53 ± 1.38 days respectively). Hospital and ICU stay in the OC group was 10.8 ± 5.76 and 2.43 ± 5.35 days respectively. The average stay of the LC-OC group in the hospital and ICU was 9 ± 6.75 and 3.5 ± 6.8 days. The p -value for hospital and ICU stay was 0.0001 and 0.0179 respectively.

DISCUSSION

We performed a retrospective study to analyze the demographics, radiological findings, time from diagnosis to surgery, safety of laparoscopic surgery, postoperative complications, and a hospital stay of patients with GC.

Gangrenous cholecystitis is a rare but serious complication of AC. The pathophysiology is GB distension resulting in increased tension and pressure on the GB wall. The distension leads to ischemic changes and necrosis of the GB wall. Inflammation and ischemia of the GB wall show progressive worsening with age due to deteriorating venous insufficiency with age, resulting in more necrosis and perforation.^{13,14} Various studies have shown that the risk of developing GC is higher in males as compared to females.^{2,15} Our study showed a male:female ratio of 1.4:1, which is similar to a study by Saber et al.¹⁶ With increasing age the incidence of GC rises, Yacoub et al. reported age >45 years as a risk factor for GC.¹⁷ Fang and Yerkovich reported in their studies the median age of patients of GC was 65 years, this is also similar to the study of Hunt and Chu.^{2,18} Fang et al. also demonstrated an independent association of age with GC, and each 5-year increase in age was associated with an 18% increase in the likelihood of GC.² Our study also showed similar findings with a median age of patients in LC, OC, and LC-OC groups as 58.12 ± 16.66 , 65.65 ± 11.13 , and 58.16 ± 12.79 years respectively.

The majority of the patients had one or more comorbidities in this study. In the patient cohort, there was a prevalence of hypertension in 45.45% of cases, diabetes in 41.81% of cases, and a prior history of CAD in 16.36% of cases. Various other studies have also documented similar findings.^{2,3,18} The theory purported in literature is that atherosclerosis of cystic artery may contribute to vascular insufficiency which leads to the development of GC.¹⁹ Fang and Yerkovich reported a novel association between antiplatelet medication and GC.² Our study also showed that 14.54% of patients were on antiplatelet medications with the number being more in OC (26.08%) and LC-OC group (16.6%). This finding is also consistent with the pathophysiological theory that proposes vascular insufficiency due to atherosclerosis leads to the development of GC.¹⁹

Leukocytosis was present in 22 (40%) patients. Leukocytosis as an independent predictor of GC has been shown in many studies.^{2,17} Findings in preoperative CECT abdomen were GB distension (60%), GB wall thickening (53.3%), gallstones (53.3%), irregular or absent wall (40%), and pericholecystic fluid (40%). Other findings were pericholecystic abscess (20%), liver changes (13.34%), and mural striations (6.67%). Various studies have reported similar findings in CT in patients of GC.^{20,21} Magnetic resonance imaging abdomen showed distended GB with the edematous wall (78.26%), irregular mucosal surface (47.82%), and absence of wall enhancement (34.78%). Similar findings have been reported in other studies as well.^{20,21}

We also studied the time taken from admission to surgery for the patient. This was found to be significantly less ($p=0.00080$) in LC patients (0.84 ± 1.54 days) as compared to the OC group (3 ± 4.75 days). Thus, validating the theory that early surgery leads to better results and increased chances of laparoscopic surgery. Delayed surgery due to delay in diagnosis can lead to more chances of open surgery and prolonged stay in the hospital. The conversion rate of LC to OC was 18.75% in our study. Various studies have reported conversion rates varying from 14 to 35% for GC.^{4,11,12} Dense adhesions, insufficient anatomic exploration, bleeding, and injury to the bile duct are the main causes of conversion to open.¹⁹ In our study also adhesions, GB perforation, and thick GB walls were found in patients who underwent LC-OC.

Postoperative hospital stay of patients was significantly shorter in patients undergoing LC as compared to patients with open

Table 1: Demographic characteristics of Patients with GC

Characteristics	LC	OC	LC-OC
Number	26 (47.27%)	23 (41.82%)	6 (10.91%)
Male	13 (50%)	14 (60.87%)	5 (83.33%)
Female	13 (50%)	9 (39.13%)	1 (16.66%)
Median age (years)	58.12 ± 16.66	65.65 ± 11.13	58.16 ± 12.79
Hypertension	9 (34.62%)	11 (47.83%)	5 (83.33%)
Diabetes	10 (41.67%)	10 (52.63%)	3 (50%)
CAD	2 (7.69%)	5 (21.74%)	2 (33.33%)
Antiplatelet therapy	1 (3.8%)	6 (26.08%)	1 (16.6%)

Table 2: Clinical parameters

Parameter	LC n = 26	OC n = 23	LC-OC n = 6	Lap to open n = 6
Vomiting	9	11		6
Fever	1	6	0	1
Leukocytosis	7	12	3	0
LFT impairment	5	6	3	3 (50%)
Time from admission to surgery	0.84 ± 1.54	3.0 ± 4.75	0.66 ± 0.51	0.66 ± 0.51

$p = 0.0008$

Table 3: CT findings (N = 15)

Findings	n	%
Irregular or absent wall	6	40
Pericholecystic abscess	3	20
Mural striations	1	6.67
Pericholecystic fluid	6	40
Gall stone	8	53.3
Adjacent liver changes	2	13.34
Distension	9	60
Wall thickening	8	53.3

procedure ($p = 0.0001$). Similarly, ICU stay was also short in the LC group when compared to OC patients (0.0179). Postoperative morbidity was 18.18% in this study. While no postoperative morbidity was observed in the LC group; OC and LC-OC groups reported wound infection, bronchospasm, myocardial infection, and atrial fibrillation in the postoperative period. Previous studies have reported reduced postoperative morbidity and mortality in patients of GC who underwent LC.^{18,22} Girgin et al. reported that the type of surgery does not have any effect on morbidity, and mortality of patients so LC can be safely attempted in patients with GC (Tables 1 to 6).²³

CONCLUSION

A high index of suspicion and early surgical intervention in GC patients helps in achieving optimum results. Increased and early use of imaging modalities like CECT and MRI abdomen in AC patients can help in the early diagnosis of GC. Laparoscopic cholecystectomy in GC patients is the appropriate surgical approach. Laparoscopic cholecystectomy reduces postoperative morbidity, but OC should be used where required to ensure patient safety.

Table 4: MRI findings

Findings	n	%
Absence of enhancement of wall	8	34.78
Irregular mucosal surface	11	47.82
Distended GB with edematous wall	18	78.26

Table 5: Post OP morbidity

	LC	OC	LC-OC
MI	0	1	0
Bronchospasm	0	1	0
Wound infection	0	3	1
Delirium	0	1	1
Atrial fibrillation	0	1	1
Total	0	7 (30.4%)	3 (50%)

Table 6: Hospital stay

	LC	OC	LC-OC
Hospital stay (days)	3.76 ± 1.74	10.08 ± 5.76	9 ± 6.75
$p = 0.0001$			
ICU stay (days)	0.53 ± 1.58	2.43 ± 5.35	3.5 ± 6.8
$p = 0.0179$			

Clinical Significance

Elderly patients of cholecystitis with leukocytosis should be investigated for GC with CECT and MRI and early surgery should be planned for them for optimum results.

AUTHOR CONTRIBUTIONS

Dr Preetinder Brar: Research design, writing of paper, performance of research, data analysis.

Dr Iqbal Singh: Performance of research, review and editing.

Dr Hemant Yadav: Research, review and editing.

Dr Saraansh Bansal: Writing of paper, research and data analysis.

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