



CASE REPORT

Successful Laparoscopic Management of Emphysematous Cholecystitis in a 75 year old Cardiac and Alzheimer's patient- A case report and Literature review

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Abstract:

Emphysematous cholecystitis (EC) is a life-threatening surgical emergency characterized by gangrene of the gallbladder due to an infection with gas-forming organisms. It is a severe and rare variant of acute cholecystitis commonly seen in elderly males, immune-compromised hosts, patients with arteriosclerosis, history of embolic events. Delayed presentation or Delayed diagnosis is associated with high morbidity and mortality.

Percutaneous trans-hepatic drainage of the gallbladder (GB) is the initial treatment of choice for severe acute cholecystitis in a patient with multiple comorbid conditions and unstable hemodynamic status. An interval laparoscopic cholecystectomy is usually recommended after 6 weeks. However, this drainage procedure may not serve the purpose in patients with emphysematous cholecystitis because of the frequent association of focal gangrenous patches in the gall bladder in these patients.

Laparoscopic surgery is a feasible option with an excellent postoperative outcome. However, it is often very challenging due to the distortion of the anatomy secondary to severe inflammatory changes and demands a skilled laparoscopic surgeon. We report the case of a 75 years female known as Alzheimer's, hypertensive and congestive cardiac failure patient with a delayed presentation and decreased responsiveness, diagnosed as emphysematous cholecystitis by a contrast CT scan, who underwent successful laparoscopic management after initial periods of resuscitation. The culture of the pus from the gallbladder grew *Escherichia coli*. A literature search was performed to highlight the management options of these patients.

Keywords: Emphysematous cholecystitis, perforated gall bladder, Empyema of the gall bladder, laparoscopic cholecystectomy, predisposing factors

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1 | INTRODUCTION

Emphysematous cholecystitis (EC) is a severe form of acute cholecystitis due to infection of the gallbladder gas-forming organisms and is associated with high morbidity and mortality [1, 2]. The presentation of EC is similar to those of acute cholecystitis; with sudden onset of pain in the right upper quadrant of the abdomen and fever being the most common [1]. The key diagnostic criteria of EC are the finding of gas in the gallbladder wall or within the lumen of the gallbladder [3]. Computed tomography (CT) scan remains the gold standard method of diagnosis. Early diagnosis and prompt surgical intervention can minimize further morbidity and mortality. The traditional approach is open cholecystectomy [2]. Emergent laparoscopic cholecystectomy has become the preferred approach in the presence of a skilled laparoscopic surgeon. Emergent cholecystostomy tube can act as a hybrid procedure in a patient with unstable medical conditions and severe comorbidities and before considering interval laparoscopic cholecystectomy. We herein present the case of an EC in an elderly female with severe comorbid conditions presented in an unstable condition; underwent successful emergency laparoscopic cholecystectomy after a brief period of resuscitation. The patient had an uneventful postoperative recovery.

2 | CASE REPORT

A 75-year-old known hypertensive, congestive cardiac failure (CCF), dementia, and a past history of myocardial infarction (MI) patient brought into a private hospital with right-sided abdominal pain, and vomiting for three days. The family stated that the patient was drowsy and had impaired consciousness over the last 48 hours. There was no history of previous abdominal surgery. On examination, the patient was in mild painful distress. Her Glasgow Coma score was 9-10, and mucous membranes were dry, pink, and anicteric. Her blood pressure was normal but she was tachycardic with a pulse of 115 beats/minute, normal temperature, and SPO2 of 90%.

Examination of the chest revealed bilateral basal crepitation. Her abdomen was distended with diffuse tenderness in the right upper quadrant with guarding, rebound tenderness, and decreased bowel sounds. Her RBS was normal. The novel rapid covid-19 antigen test was negative. ECG revealed LBBB with LVH. A clinical diagnosis of acute abdomen secondary to severe acute cholecystitis with CCF was made. Blood investigation revealed WBC of $23.4 \times 10^9/L$, Hb 11.8 g/dl.

The platelet count, serum electrolytes, creatinine, and LFT were normal. The C-reactive protein level was 90 mg/L and an arterial blood gas revealed mild respiratory alkalosis. Urgent CT scan of the brain revealed no acute cerebrovascular accident (CVA) but showed signs of Alzheimer's disease.

CT scan of the abdomen and pelvis with intravenous contrast showed severe acute cholecystitis with free fluid around the gallbladder and pockets of air within the gallbladder suggesting emphysematous cholecystitis (Figure 1).

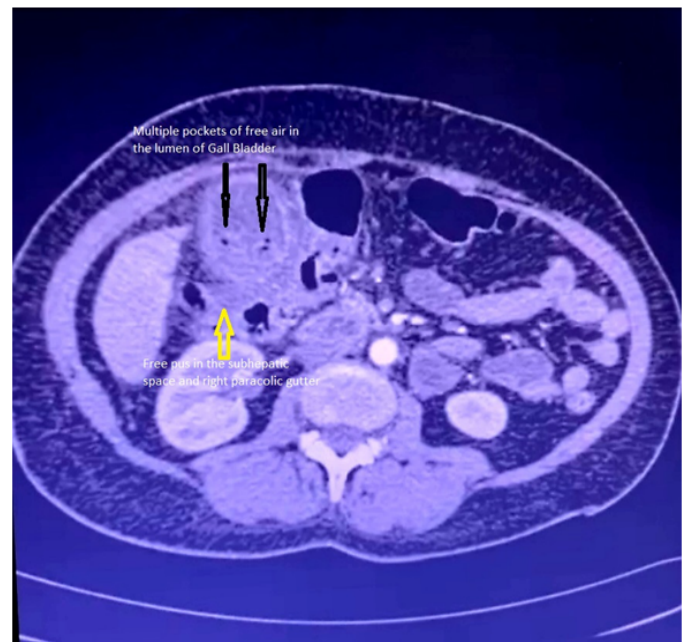


Figure 1: CT scan of Abdomen with intravenous contrast showing air within the lumen of gall bladder (black arrows) and free pus in sub-hepatic space and right para-colic gutter

Echocardiogram was performed which revealed CCF with an ejection fraction (EF) of 35%. The patient was managed by a multidisciplinary team involving physicians, cardiologists, surgeons, and an intensivist. Broad-spectrum antibiotic (Invanz-1gm OD) was started, nasogastric tube was inserted and she was catheterized. The family was counseled extensively, and it was decided to proceed with conservative management followed by insertion of a cholecystostomy tube once her condition improves.

The patient's condition improved dramatically with 24 hours of conservative treatment and the patient gained full consciousness and her coagulation profile was normal. At this stage, the decision was made to proceed with the insertion of the cholecystostomy tube under ultrasound guidance. However; the family members were not keen to go ahead with the drainage procedure as they thought she might pull it out and will cause more problems in future. The family members unanimously decided to take the risk and consented to go ahead with the laparoscopic cholecystectomy.

A multidisciplinary team meeting involving the cardiologist, anesthesiologist, and family members was conducted, and the high risk of morbidity, and mortality involving an emergency cholecystectomy were outlined. Consent was obtained from the patient, and from the family members. Under endotracheal intubation with the patient in supine position, cardiac anesthesia was performed. The abdomen was cleaned and draped.

Pneumo-peritoneum was created by open Hasson technique via a supra-umbilical incision and was maintained up to 12 mm Hg. A standard 4 ports technique was used. On laparoscopy, it was noted that the gall bladder, omentum, and transverse colon were densely adhered to the anterior abdominal wall and there was free pus in the right sub-diaphragmatic (Figure 2), right sub-hepatic, and right para-colic gutter (Figure 3).

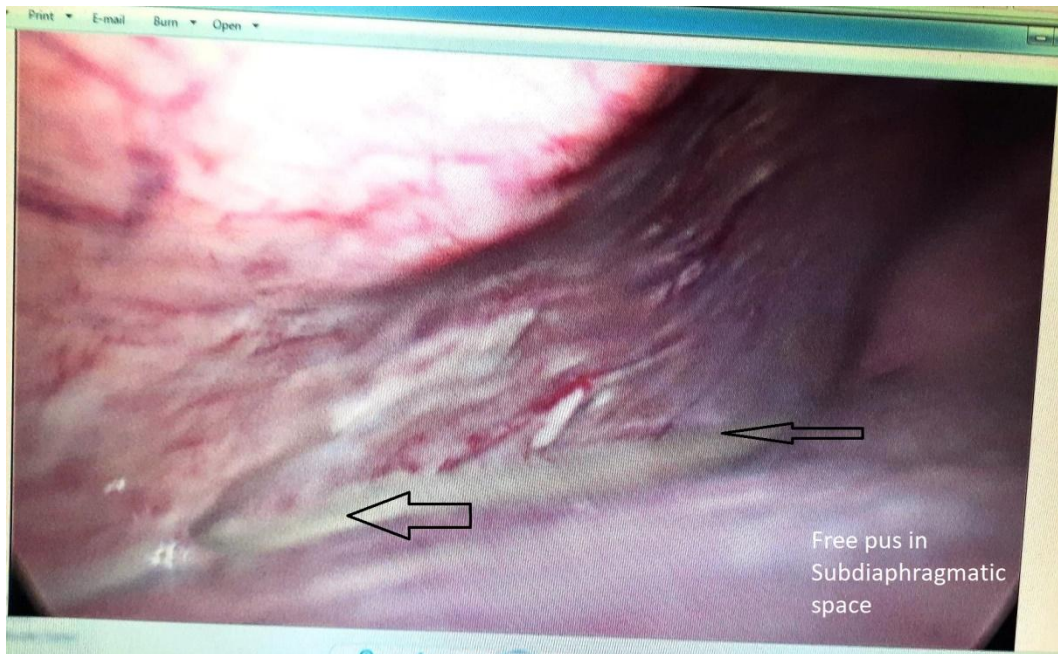


Figure 2: Laparoscopic view showing free pus in right sub diaphragmatic space (black arrows)

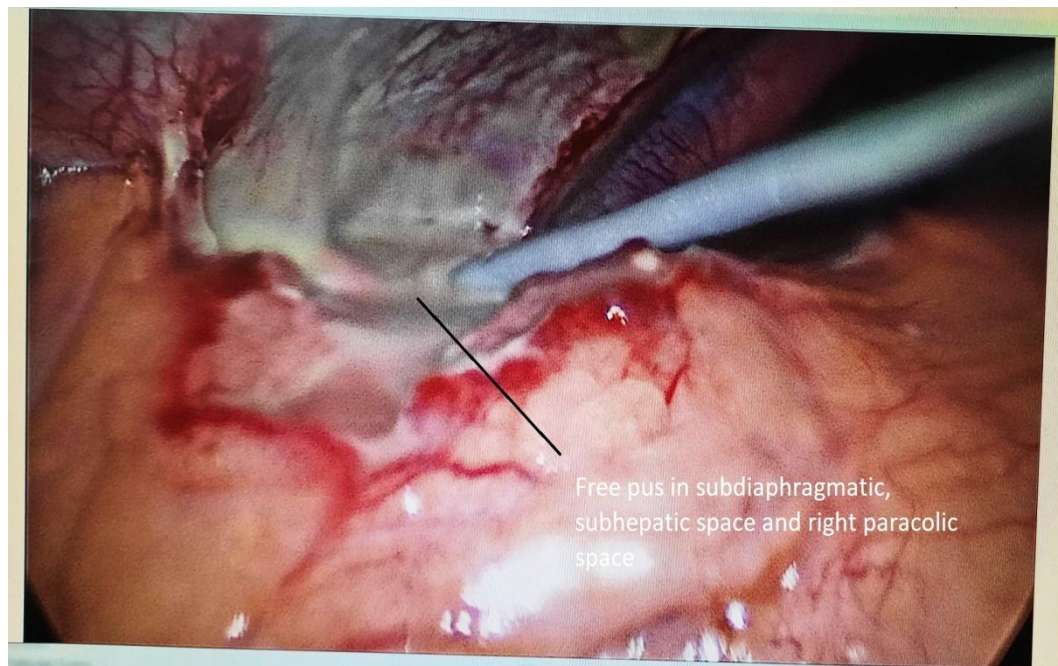


Figure 3: Laparoscopic view showing free pus in right sub hepatic and right para-colic gutter (black line)

All free pus was sucked out. Adhesiolysis around the GB was done bluntly with the suction tube to expose the fundus of the GB, which was found to be

gangrenous and its wall was veru friable (Figure 4). Lateral and medial dissection were performed bluntly with the suction tube.

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Figure 4: Laparoscopic view- demonstrating gangrenous gall bladder with multiple necrotic patches

The critical view of safety was obtained (Figure 5). Cystic artery and cystic duct were transected together with an endo GI 45 stapler with a white reload. The GB was bluntly dissected from the liver bed by the suction tube and harmonic ligasure and removed within a retrieval bag.

The abdomen was irrigated with 4 liters of normal saline and sucked out. A size 15 J VAC drain was placed in the GB bed and brought out through the left upper quadrant port. Supra umbilical port was closed with # 1 proline and the skins were closed with 3-0 proline.

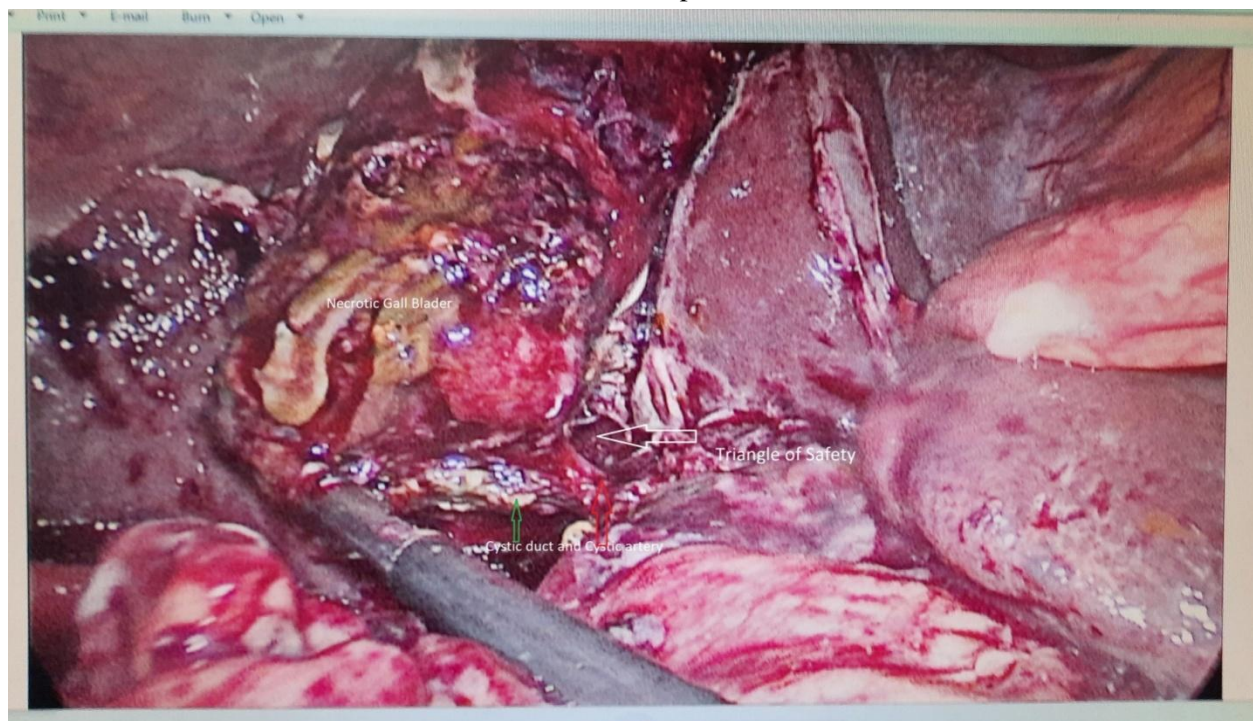


Figure 5: Laparoscopic view- the triangle of safety (white arrow)

Postoperatively the patient was admitted to the high dependency unit. The patient had an excellent postop recovery and was discharged home on day 4 of the surgery.

The culture of the pus from the GB grew *Escherichia coli*. The final histopathology report

revealed focal transmural necrosis with neutrophilic exudates which extends into the surrounding adipose tissue of the gallbladder (Figures 2 and 3) in combination with denudation of surrounding fat onto the serosa features suggestive of gangrenous cholecystitis (Figures 6).

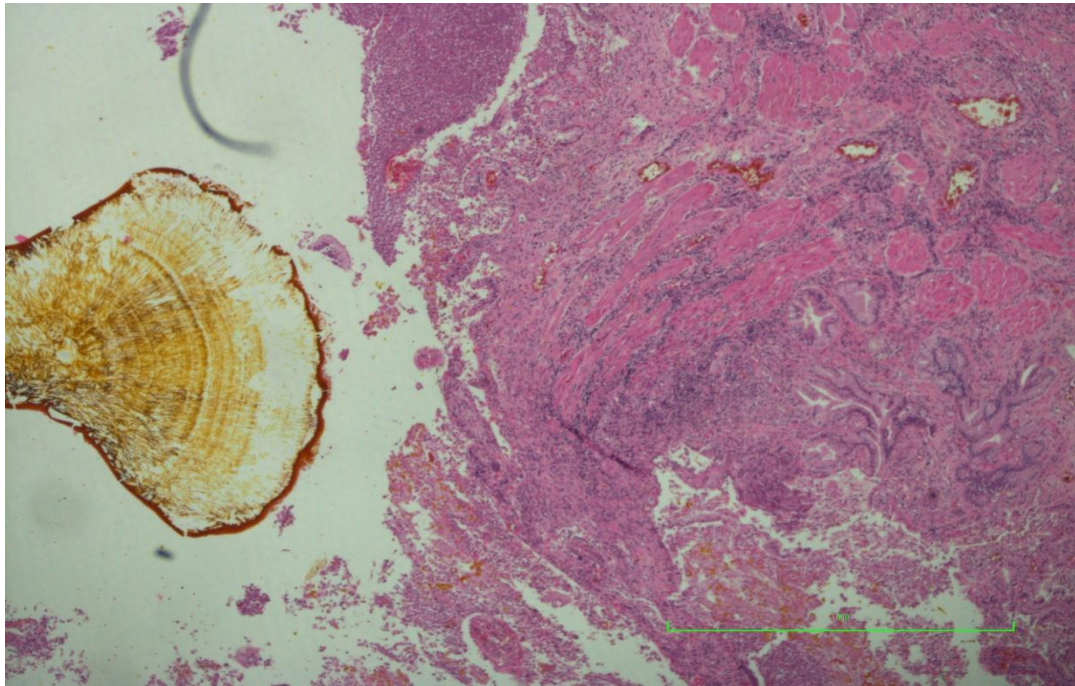


Figure 6: Histo-micrograph showing trans-mural necrosis of the gall bladder wall with exudate extending into surrounding tissue
At 6 weeks of follow up the patient is doing well with no further complaints.

3 | DISCUSSION

Emphysematous cholecystitis is a rare but severe variant of acute cholecystitis. It was first described by Stoltz et al. in 1990 [4]. However, Garcia-Sancho et al first reported its clinical features. The morbidity and mortality of EC varied in the literature depending on the patient's comorbid condition and clinical features.

For uncomplicated and healthy patients the morbidity and mortality are reported as 1%–3% and 15%, respectively but for complicated cases and patients with severe comorbid conditions, it is up to 25% and 50% [1, 5, 6]. Gall stones and cholecystitis are commonly known as diseases of females. Contrary to this finding, EC is frequently reported in males compared to females with a male: female ratio of 7:3 [1, 6]. It is frequently reported in the elderly over the age of 50 years [7].

More than 40% of these patients are found to be diabetic. Other predisposing factors are immunosuppression, peripheral vascular disease [8], history of trauma, and abdominal surgery [9].

The reason EC is common in elder diabetic patients is that the relative ischemic environments in these patients reduce the mobility of the phagocytes in the infected area and further reduce its antimicrobial activity [10].

Therefore, tight glycemic control can reduce the overgrowth of the bacteria and the severity of the disease.

However, EC is also reported in healthy and young patients [9-17].

Our patient was elderly but not diabetic; with severe comorbid conditions i.e. hypertension, dementia, congestive cardiac failure (CCF), and a history of MI with an ejection fraction of 30%. Her condition was worsened by her delayed presentation.

The pathophysiology of gallstone-related acute cholecystitis and emphysematous cholecystitis has some differences between them [18]. The typical pathological findings of EC are the development of ischemia and gangrene within the gallbladder [7].

In gallstones related to EC, the cystic duct is blocked by the stone leading to increased intraluminal pressure with resultant vascular compromise. On the other hand, EC that is not related to gallstones is due to vascular compromise of the cystic artery and its branches either due to atherosclerosis, vasculitis and or arterial embolic disease. The resultant ischemic changes lead to bacterial (gas-forming) translocation across the GB wall, leading to the accumulation of gas in the lumen or wall of the gallbladder.

The pathogenesis of EC is probably based on the vascular compromise in combination with gas-forming bacterial infection of the gallbladder. The first case of EC was reported in 1985, after embolization

of the hepatic artery [19]. The ischemia of the GB is often associated with vasculitis, diabetes, and or arteriosclerosis [20].

Immunosuppressive medication may also play a significant role in the pathogenesis of EC [21]. Our patient was not diabetic but she was hypertensive with a history of recent myocardial infarction 6 months prior. Atherosclerosis may have predisposed her to her EC.

EC is frequently caused by Clostridia [5, 13, 22- 24]; Escherichia [14,16]; Klebsiella and Streptococci organisms [25]; Salmonella [10]; Enterobacter cloacae and Enterococcus faecalis [26]. The culture of the pus from the GB in our patient grew Escherichia coli sensitive to ciprofloxacin, cefuroxime, tazobactam, and imipenem.

The presenting features of EC are similar to acute cholecystitis, sudden onset of right upper quadrant pain, fever, nausea, vomiting, and jaundice. Le Brun noted that EC without gallstones is different from common acute cholecystitis [7]. The key diagnostic criteria of EC are based on the clinical presentation and findings of gas in the wall or lumen or around the GB.

In general, plain abdominal X-ray can be used for the diagnosis of EC [26] however; these changes can be seen earlier on USG and CT scan. EC is also reported in patients presenting with radiological features of pneumoperitoneum [18,27].

Ultrasonography (USG) can also be used for the diagnosis of EC with a specificity of 95% but it is less sensitive and it is operator-dependent [28]. The typical feature on USG is the highly echogenic reflection in the wall or lumen of GB with posterior acoustic shadowing with reverberation artifact [26]. It also depends on the number of pockets of air as well as localization in the soft tissues.

In critically ill patients, bedside USG can rapidly diagnose the pathology and guide prompt management. It is easily reproducible and can be used at the bedside without leaving the ED [29]. CT scan of the abdomen remains the modality of choice for investigation. It is the most sensitive and specific in the diagnosis of EC with findings of gas within the GB or in the biliary tree [28]. It also provides the exact location and amount of air, the presence of any peri-cholecystic edema or free fluids, and can exclude any other differential diagnoses [18, 25].

In our case, the abdominal CT scan with intravenous contrast revealed peri-cholecystic edema with gas in the lumen of GB and free fluids in the GB fossa. Gill et al. divided EC into three stages based on the distribution of air in the GB and or biliary tree i. e Stage I- air in the lumen of GB; Stage II- air in the wall of GB; and Stage III - the air around the GB. The Ct staging of EC in the index case was stage I as the air was noted within the lumen of GB [30].

Routine blood tests, complete blood count, renal function test, serum electrolytes, liver function as well as blood and biliary fluid or pus cultures also assist in the diagnosis and management of these cases.

Early diagnosis, prompt resuscitation, broad-spectrum antibiotics, and immediate surgical intervention are the key to a successful outcome in these patients. Broad-spectrum antibiotics should be started intravenously and they should be changed later on based on blood or pus or bile culture reports [3, 25, 26] Cholecystectomy is the treatment of choice [31] and the traditional method is via the open approach [2]. The approach to surgery depends on patients' underlying co-morbid conditions and the presence of a skilled laparoscopic surgeon.

For hemodynamically stable patients, emergency laparoscopic cholecystectomy is the preferred method of choice. Despite the theoretical risk in identifying vital structures and obtaining the critical view of safety in these patients, literature has reported its successful use in stable patients. Emergency laparoscopic cholecystectomy is now recommended as a safe and effective method of treatment for EC [2].

Literature has reported a high conversion rate in these patients due to significant anatomic distortion caused by the severe inflammation in these EC patients and also the risk of injury to the bile duct and surrounding viscera [32]. However, success largely depends on the skill level of the laparoscopic surgeon. Recent literature has documented the successful use of laparoscopic surgery for EC despite significant anatomical distortion and this is due to the improved skills of the surgeons over the years [2]. However, in severely ill patients with severe comorbid conditions and unstable hemodynamic status, percutaneous trans-hepatic cholecystostomy with broad-spectrum intravenous antibiotics may be a choice of treatment followed by interval laparoscopic cholecystectomy [33-35].

However, this method of treatment might not be appropriate for all emphysematous cholecystitis due to the high risk of necrosis and perforation of the GB.

In severely ill patients, in particular, percutaneous cholecystostomy with broad-spectrum antibiotics may be a choice of treatment. In the index case, we were able to obtain the critical view of safety despite severe inflammatory changes around the GB with free pus in right sub-diaphragmatic space, along with a necrotic patch in the GB. However, if the surgeon is unable to perform laparoscopic cholecystectomy, gallbladder drainage should be considered.

4 | CONCLUSION

Emphysematous cholecystitis is a life-threatening surgical emergency and is associated with a high morbidity and mortality rate. Finding gas in the gall bladder on a CT scan is the most accurate and sensitive method of diagnosis. Percutaneous trans-hepatic drainage of the gallbladder (GB) is the initial treatment of choice for severe acute cholecystitis in a patient with multiple comorbid conditions, and unstable hemodynamic status. However: in stable patient emergency laparoscopic cholecystectomy can be a safe and an effective method of choice. The presence of an experienced laparoscopic surgeon is of paramount importance for a successful outcome. Conflicts of interest: The authors declare no conflicts of interest.

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The corresponding author will accept the full responsibility for the work.

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