

Gall Bladder Empyema: Early Cholecystectomy during the Index Admission Improves Outcomes

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ABSTRACT

Objectives: We aim to evaluate our policy of index admission management of gall bladder empyema and the effect of the timing of surgery on the outcomes.

Methods: We analyzed a series of 5400 laparoscopic cholecystectomies. Data were collected prospectively over 26 y. Patients were divided into two groups: group 1, intervention within 72 h, and group 2, intervention after 72 h of admission. We had a policy of intention to treat during the index admission, but delays sometimes occurred because of late referral, a need to optimize patients, availability of theater time, or the biliary surgeon being on leave. The groups were then compared with regard to the duration of surgery, the difficulty grading, complications, hospital stay, and conversion rate.

Results: A total of 372 patients were included; 160 (43%) operated on within 72 h (group 1) and 212 (57%) after 72 h (group 2). There was no statistically significant difference between the two groups with regard to the operation time, conversion rate, and complications rate. The difference in total hospital stay was, however, statistically significant.

Conclusion: Surgical management of empyema should be offered as soon as possible after admission as with any acute cholecystitis. Surgery carried out after 72 h of admission is only associated with longer hospital stay but no statistically significant differences in other outcome parameters. In the presence of specialist expertise, fitness for

surgery should be the determining factor of whether or not to offer surgery to these patients, regardless of the interval since their admission.

Key Words: gallbladder empyema, laparoscopic cholecystectomy, difficulty grading, Nassar scale, intraoperative cholangiography.

INTRODUCTION

Although acute cholecystitis was once considered a contraindication to laparoscopic cholecystectomy,¹ recent evidence suggests that index admission cholecystectomy is the treatment of choice.² However, the management of empyema of the gallbladder, which is essentially a severe form of acute cholecystitis, is still controversial, with some authors advocating delayed surgery with or without initial percutaneous drainage. Early surgery during the index admission is still considered by some to be unsafe and to carry an increased risk of conversion and complications.³ We aim to evaluate our policy of index admission management of empyema of the gall bladder and whether the timing of surgery has an effect on the outcomes.

METHODS

Prospectively collected data from 5400 laparoscopic cholecystectomies performed by a single surgeon over 26 y were analysed. Most patients admitted with biliary emergencies were referred to a dedicated biliary firm and managed in one session, with routine intraoperative cholangiography (IOC) and laparoscopic bile duct exploration where necessary. IOC helps to clarify the anatomy of the biliary tree, particularly in difficult cases. We do not rely on routine preoperative magnetic resonance cholangiopancreatography or endoscopic retrograde cholangiopancreatography to investigate or treat patients with suspected bile duct stones. The Nassar difficulty grading scale⁴ was used to describe and document operative difficulty of the cholecystectomy. We have demonstrated that this difficulty grading helps to standardize the description of operative findings by different surgeons and to facilitate audit, training assessment, and research.⁵

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A standard four-port technique, with modified open access, was used. A blunt Duck Bill forceps (Karl Storz, Tuttlingen, Germany) was used for the dissection of the cystic pedicle, displaying the critical view of safety where feasible, and for separating the gall bladder from the cystic plate. Swab dissection or the tip of the suction probe was used when dense inflammatory adhesions were encountered. Scissors were sometimes used for dissecting thick-walled gall bladders, as in the case of empyema. Needle decompression was used for tense distended thick-walled gall bladders to facilitate grasping the fundus of the gall bladder and its retraction. The surgeon may find it necessary to make a small diathermy incision opening the fundus, using the suction probe to evacuate the gall bladder. This will then allow one of the grasper's jaws to enter the gall bladder and facilitate grasping and retraction. Fundus first cholecystectomy was occasionally used when it was believed that retrograde dissection of Calot's triangle was unsafe or impossible. These were usually cases in which the cystic duct pedicle was completely obscured by dense adhesions, the cystic artery and duct could not be separated, Hartmann's pouch was thought to be adherent to the common bile duct, and the presence of a Mirizzi abnormality was suspected. Once the fundus and the body of the gall bladder were freed, dissection should proceed only more proximally using blunt swab dissection. It is occasionally useful to divide the circumference of the proximal part of the body of the gall bladder. Dissection should proceed only as far as is possible with swab dissection, thus avoiding the main pitfalls of fundus first cholecystectomy, namely in the territory of the cystic or right hepatic arteries and the right hepatic duct. Should it still be difficult, or judged dangerous to reach the neck of the gall bladder or the cystic duct, subtotal cholecystectomy is resorted to. However, we believe that a total cholecystectomy is the best salvage procedure where possible because of the risk of bile leakage from the stump and residual or recurrent stones in the gall bladder remnant. We were liberal in using subhepatic drains in cases of empyema contrary to our normal practice in laparoscopic cholecystectomy to remove any residual irrigation fluid and reduce the risk of postoperative collections.

The diagnostic criteria of empyema were aspirating pus from the gallbladder and the presence of a pericholecystic abscess. Only patients fitting the criteria of our definition of empyema intraoperatively were included in the data analysis and not just any severe acute cholecystitis. During the period of the study, 335 cases with

an operative diagnosis of acute cholecystitis were excluded.

Patients with empyema were divided into two groups according to the timing of surgery after admission: group 1, operated on within 72 h of admission, and group 2, operated on after 72 h, still within the index admission. The delay in surgery beyond 72 h in group 2 was not intentional for the purpose of the study. Reasons included delayed referral from the original admitting team, patients being initially unfit for surgery or on anticoagulants, no available theater slots, or the biliary surgeon being away at the time of admission of the patient.

The groups were then compared with regard to the duration of surgery, difficulty grading, complications, hospital stay, and conversion rate. The *t* test was used for statistical analysis of continuous variables, whereas the χ^2 and Fisher exact test were used for categorical variables with a value of $P = .05$ used as the cutoff for statistical significance. The study was registered as a clinical audit and did not require specific institutional review board approval.

RESULTS

Three hundred seventy-seven cases of empyema were confirmed intraoperatively (7%). Three cases were excluded from further analysis because of missing admission dates. Although several patients had previous admissions with cholecystitis, no formal diagnosis of an empyema was previously documented. Only two patients have had previous conservative management of their empyema via percutaneous cholecystostomy and hence were also excluded, leaving 372 patients to be included in the data analysis.

There were 160 cases in group 1 (43%) compared with 212 in group 2 (57%). **Table 1** summarizes the demographic data of the patients.

Two hundred thirteen patients were females and 159 males (female:male ratio of 1.3:1). Age ranged from 21 to 90 y, with a mean age of 58 y.

Table 2 shows the clinical presentations of the empyema patients. Group 2 patients were statistically more likely to have clear diagnostic criteria of acute cholecystitis on admission, to present with jaundice or other risk factors for bile duct stones, and to have thick-walled gall bladders on ultrasound scanning.

Table 1.
Demographic Data

Variables	Surgery Within 72 h (Group 1)	Surgery After 72 h (Group 2)	P Value
n	160	212	
Age (mean)	56.8	59.6	.62
Age range, y	26–86	21–90	
Gender			.144
Male	61	98	
Female	99 (62%)	114 (54%)	
ASA classification			.70
I	42 (26%)	46 (22%)	
II	81 (51%)	109 (51%)	
III	29 (18%)	45 (21%)	
IV	2 (1.2%)	4 (1.9%)	
Not recorded	6	8	

The groups were comparable with regard to age, gender, and American Society of Anesthesiologists (ASA) classification.

Table 2.
The Clinical Presentations and Ultrasound Scan Findings

Clinical Presentation	Surgery Within 72 h	Surgery After 72 h	P Value
	n = 160	n = 212	
Acute cholecystitis	60 (37.5%)	161 (76.0%)	<.01
Acute pancreatitis	1 (0.6%)	11 (5.2%)	.013
Acute cholangitis	4 (2.5%)	9 (4.2%)	.36
Jaundice	23 (14.4%)	66 (31.1%)	<.01
Chest pain	1 (0.6%)	4 (1.9%)	.29
Previous cholecystitis	39 (24.4%)	16 (7.5%)	<.01
Previous pancreatitis	4 (2.5%)	2 (0.9%)	.41
CBD stone risk factors	63 (39.4%)	116 (54.7%)	<.01
Thick-walled GB on US	77 (48.1%)	147 (69.3%)	<.01
Dilated CBD on US or stone	22 (13.8%)	39 (18.4%)	.23
Mucocele on US	2 (1.25%)	5 (2.4%)	.7

CBD, Common Bile Duct; GB, gall bladder; US, ultrasound.

The interval between admission and surgery ranged from 0 to 30 d, with a median of 1 d for group 1 and 6 d for group 2.

The intraoperative characteristics in both groups are tabulated in **Table 3**. Cystic duct stones were encountered more often in group 2 cases. IOC was performed successfully in 365 patients (98%). Common Bile Duct (CBD) stones were

found in 81 patients (22%). The Nassar Difficulty Scale suggested that there was no significant increase in the technical difficulty encountered in group 2 patients. Fundus first dissection technique was used in 28 cases and a subtotal cholecystectomy was performed in only two cases. Resorting to either technique in this study was unrelated to the interval between admission and surgery.

Table 3.
Intraoperative Characteristics of Both Groups

Variables	Surgery Within 72 h	Surgery After 72 h	P Value
	n = 160	n = 212	
Cholangiogram (n = 365)	159 (99.4%)	206 (97.2%)	.2
Cystic duct stone	20 (12.5%)	52 (24.5%)	.003
Common bile duct stone	35 (21.9 %)	46 (21.7%)	.98
Difficulty grading			
I	0	0	
II	0	0	
III	14 (8.8%)	11 (5.2%)	.12
IV	138 (86.3%)	176 (83.0%)	.45
V	8 (5.0%)	25 (11.8%)	.022
Fundus first	10 (6.3%)	18 (8.5%)	.41
Drain	141 (88.1%)	201 (94.8%)	.02
Length of surgery, min			
Mean (range)	96 (32–350)	100 (35–240)	.40
Conversion to open	1 (0.6%)	1 (0.5%)	.84

The mean operative time for a cholecystectomy, including routine IOC and bile duct exploration when required, in our whole series was 72 min. It was 96 min for group 1 empyema cases and 100 min for group 2 cases.

The different complications encountered are outlined in **Tables 4** and **5**. Postcholecystectomy bile leaks were encountered in three patients from group 1 (1.88%) and eight patients from group 2 (3.78%). The difference between the two groups with regard to bile leak was statistically insignificant ($P = .364$).

This constituted 23% of the total morbidity, making this the most common complication encountered, although it was mostly transient and settled with conservative management. We had one mortality in each of the empyema groups (mortality rate 0.5%). Neither of the deaths was technique related. Gall bladders with empyemas were found to be harboring an underlying gall bladder adenocarcinoma in two patients (0.5%).

There was no statistically significant difference between the two groups with regard to the difficulty grade, operation time, conversion rate, postoperative hospital stay, and complication rate. The difference in total hospital stay was, however, statistically significant (**Table 6**).

DISCUSSION

The management of empyema of the gall bladder has been subject to practice variations in different units because of the acute presentation, the perceived operative difficulty and the availability of logistical support for urgent or semiurgent cholecystectomy. As would be expected, higher conversion rates from laparoscopic to open cholecystectomies (12.5%,⁶ 15.38%,⁷ 15.30%,⁸ 42%⁹) have been reported for gall bladder empyema patients in previous studies compared with those with other gall bladder pathology. However, in our study the conversion rate was much lower than that reported in the literature, regardless of when the cholecystectomy was carried out. The specialized nature of the service, designed to manage the great majority of biliary emergencies, aims at optimizing the handling of cases admitted with acute cholecystitis. Other outcome parameters of the management of empyema according to the index admission surgery protocol, regardless of the timing of cholecystectomy, compare favorably with published results on the management of acute cholecystitis.^{10–14}

Kwon et al.¹⁵ suggested that early laparoscopic cholecystectomy is the treatment of choice for empyema of the gall bladder because of a significantly shorter hos-

Table 4.
Group 1, Surgery Within 72 Hours, Complications

Variables	Number of Patients	Complications
Wound infection	2	
Bile leak	1	Gangrenous gall bladder, bile leak postoperatively despite drain, needed CT-guided percutaneous drainage
	1	After difficult cholecystectomy, cystic duct stump left open, drain dried in 3 d, no intervention needed
	1	Expected bile leak after suturing of a wide cystic duct stump, contained in drain, settled
Airway reintubation	1	HDU 24 h
Pneumothorax	1	Secondary to nerve block, needed chest drain
Pancreatitis	1	Hyperamylasemia, normal CT
Retained stone	1	Needed ERCP
Readmission	3	
Pain after removal of T tube	1	Small collection on CT, managed conservatively
Chest infection	1	
Dehydration	1	Due to T tube
Incisional hernia	2	
Morbidity	15/160 (9.4%)	
Mortality	1/160 (0.6%)	ASA IV, 60 y, postoperative mesenteric ischemia

CT, computed tomography; HDU, High Dependency Unit; ERCP, endoscopic retrograde cholangiopancreatography; ASA, American Society of Anesthesiologists.

pital stay without compromising outcomes. Although that study included only 61 patients, this management is also recommended by the National Institute for Health and Care Excellence guidelines¹⁶ as well as the Society of American Gastrointestinal and Endoscopic Surgeons guidelines.² Early cholecystectomy within 72 h of admission with acute cholecystitis is a Grade A recommendation/level 1 evidence.

The Tokyo Guidelines 2007 addressed the timing and optimal surgical treatment of acute cholecystitis.¹⁷ The guidelines concluded that early intervention and laparoscopic cholecystectomy was preferred to late intervention and open cholecystectomy. A large German study published in 2016⁶ reported a higher conversion rate, morbidity, and mortality for empyema compared with less severe forms of acute cholecystitis. However, that study did not address the role of the timing of surgery.

Another study from Korea³ compared three groups of patients: laparoscopic cholecystectomy without percutaneous drainage (PCD) (group 1), early laparoscopic cholecystectomy within 7 d of PCD (group 2), and

delayed laparoscopic cholecystectomy after PCD (group 3). The conversion rate in group 3 (2.8%) was lower than in group 1 (18.3%), whereas the postoperative complication rate was higher in group 1 (20%) than group 3 (5.3%). Our study, on the other hand, showed that early index admission surgery offered similar outcomes for both groups without the additional time, cost, and complications of PCD. This resulted in a significantly shorter hospital stay.

The utilization of operative cholangiography in this study highlighted a relatively high incidence of bile duct stones in cases of empyema. This is caused by our policy of not relying on the preoperative diagnosis or clearance in patients with suspected bile duct stones. Cholangiography therefore remains our means of detecting bile duct stones as the first step in single-session laparoscopic clearance. In addition, IOC helps in confirming the anatomy of the cystic pedicle and the main bile ducts. This is particularly important in view of the relatively high incidence of cystic duct stones and Nassar difficulty grades IV and V in cases of empyema. In this series we have applied our protocol for single-

Table 5.

Group 2, Surgery after 72 h, Complications

Variables	Number of Patients	Remarks
Wound infection	1	
Bile leak	8	Following bile duct explorations, including three choledochotomies, drains in place, dried spontaneously
Pancreatitis	1	
Readmission	6	
Sepsis	1	
RUQ pain/collection	1	Percutaneous drain
Pain after removal of trans cystic drain	2	Ultrasound unremarkable
RUQ pain and vomiting	1	Gastritis
Abdominal collection	1	Bile leak, needed percutaneous drain
Incisional hernia	1	Umbilical port site
Bleeding	1	Accessory right hepatic artery
Acute glaucoma	1	
Acute renal failure	1	
Urinary retention	1	
UTI	1	
Surgical emphysema	1	
Retracted drain	1	Needed reoperation
Morbidity	24/212 (11.3%)	
Mortality	1/212 (0.5%)	74 y, ASA III sepsis, liver failure

RUQ, right upper quadrant; UTI, urinary tract infection; ASA, American Society of Anesthesiologists.

Table 6.

Comparison of Outcomes when Cholecystectomy was Performed Within 72 h and When Performed After 72 h

Variables	Group1 (Within 72 h)	Group 2 (After 72 h)	P Value
Conversion rate	0.6%	0.5%	.84
Complication rate	9.4%	11.3%	.54
Mortality	0.6%	0.5%	.84
Operative time	96 min	100 min	.4
Total hospital stay, mean	4.9 d	15.8 d	<.001
Postoperative hospital stay	3.8 d	5.6 d	.073

session management of suspected bile duct stones, with reliance on IOC to diagnose ductal stones. This affects the utilization of preoperative imaging and use of endoscopic retrograde cholangiopancreatography to clear bile duct stones. In cases in which the expertise, equipment, or logistics do not allow routine IOC or laparoscopic CBD exploration, surgeons should have a low

threshold for performing magnetic resonance cholangiopancreatography for such patients because of the high prevalence of CBD stones (22% in our study) associated with empyemas of the gall bladder. This will facilitate bile duct clearance and reduce the incidence of operative or postoperative complications resulting from missed stones.

There were also more difficult grade V cholecystectomies for empyemas when surgery was carried out beyond 72 h. However, this did not have an adverse effect on the outcomes of laparoscopic cholecystectomy in this group of patients. Inadvertent delay of cholecystectomy should not therefore be a contraindication to performing surgery as soon as the patient is optimized or theater sessions become available.

There are no published guidelines on the management of empyema specifically, and not much has been published in the literature on this subgroup of acute cholecystitis. However, our results along with the available evidence indicate that this subgroup of patients should be offered an index admission laparoscopic cholecystectomy just like other patients with acute cholecystitis, Percutaneous radiologically guided cholecystostomy is necessary only in those patients who are very septic and may be unfit for surgery. The timing of surgery has no effect on the outcomes if subspecialist expertise is available. The operating surgeon should, however, use his/her own judgment and experience to decide on the safest way to proceed, given their operative findings. If reluctant to attempt a total cholecystectomy, the surgeon should not hesitate to seek the advice and help of a more experienced colleague if available or resort to subtotal cholecystectomy, conversion, or even an intraoperative cholecystostomy. In rare cases abandoning the procedure may be justifiable as the ultimate bail-out decision.

CONCLUSION

Empyema of the gall bladder does not always present as acute cholecystitis and cannot always be diagnosed clinically or on preoperative ultrasound scanning.

Surgical management of empyema should be offered as soon as possible after admission, just as with any acute cholecystitis, even if an empyema is suspected clinically. Surgery performed beyond 72 h is associated only with a longer hospital stay with no statistically significant differences in the operative difficulty grade in most cases, operative time, conversion rate, postoperative hospital stay, or complication rates.

Because empyema of the gall bladder can be associated with CBD stones in around 22% of the cases, it is advisable to consider cholangiography in these patients, regardless of their preoperative imaging findings. In the absence of facilities or expertise for cholangiography and bile duct exploration, preoperative exclusion and clearance of bile

duct stones should be considered to avoid the potential morbidity of residual stones.

Where specialist expertise is available, fitness for surgery should be the determining factor of whether or not to offer index admission surgery to patients with empyema of the gallbladder.

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