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Clinical outcomes of early and delayed cholecystectomy for acute gallstone-related disease

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ABSTRACT

Objective: Laparoscopic cholecystectomy is the definitive treatment for gallstone-related disease. Early laparoscopic cholecystectomy (ELC) is recommended for management of acute gallstone-related disease, as delayed laparoscopic cholecystectomy (DLC) is associated with recurrent presentations and complications. This series evaluated the outcomes of ELC and DLC in patients presenting acutely to secondary care.

Material and Methods: All cholecystectomies performed for patients presenting with acute gallstone-related disease including biliary colic, acute cholecystitis, gallstone pancreatitis and obstructive jaundice over a 24-month period were included. Clinical outcomes including hospital stay, peri-operative complications, re-presentation of gallstone-related disease, and repeat hospital admissions and imaging were recorded for ELC and DLC cases.

Results: Of 105 cholecystectomies performed, only 6.7% were ELC. The mean time from index presentation to cholecystectomy was 3.4 days and 119.6 days for ELC and DLC, respectively. Over one-third of patients (38.8%) undergoing DLC experienced recurrent gallstone-related disease between index presentation and surgery. Re-admission to hospital for gallstone-related symptoms was seen in 25.5% of patients. The mean additional inpatient stay for readmission for gallstone-related disease in the DLC group was 3.3 days, with 30.6% requiring repeat imaging.

Conclusion: DLC is associated with significant recurrence of gallstone-related complications. Re-admission to hospital incurs additional inpatient stay, and investigation, leading to a negative impact on patients' health and additional financial burden.

Keywords: Cholecystectomy, gallstones, pancreatitis, cholecystitis, biliary colic, choledocholithiasis

INTRODUCTION

Gallstones or cholelithiasis are the leading cause of acute admissions for gastrointestinal disease, affecting up to 20% of patients (1). Cholelithiasis is associated with a spectrum of diseases, including biliary colic, acute cholecystitis, gallstone-related pancreatitis, and obstructive jaundice secondary to choledocholithiasis. Surgical resection with laparoscopic cholecystectomy remains the mainstay for symptomatic gallstone disease. However, the optimal timing for cholecystectomy remains unclear. Traditionally, delayed laparoscopic cholecystectomy (DLC) has been advocated, in particular for acute cholecystitis, due to perceived increased technical difficulty secondary to acute inflammation (2). However, there is increasing evidence supporting the use of early laparoscopic cholecystectomy (ELC) in the management of acute gallstone presentations. A meta-analysis of seven randomised controlled trials, demonstrated that ELC (<7 days of presentation) in acute cholecystitis was not associated with increased intra-operative complications, such as bile duct injury, when compared to DLC (>6 weeks after index presentation) (3). Conversion rates between ELC and DLC were comparable, with ELC shown to shorten hospital stay by 4 days (3). These findings have been supported by further meta-analysis (4,5), all advocating the use of ELC for acute cholecystitis.

Similar findings have been demonstrated for the management of biliary colic. Only a single randomised control trial of 75 patients compared the outcomes of ELC (defined as <24 hours after diagnosis) and DLC (mean time 4.2 months after diagnosis) for biliary colic (6). DLC was associated with increased operating times, hospital stays and repeat hospital admissions for symptomatic gallstones. Expert review of these

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findings suggested ELC was beneficial for management of biliary colic (7). A single trial of 50 patients for the use of ELC (defined as performed <3 days from admission) in mild acute gallstone pancreatitis again demonstrated no increase in complication rate and patients who underwent ELC experienced a shorter hospital stay (8,9), though these findings are limited to mild cases of pancreatitis. Currently, the European Association for the Study of Liver Diseases recommends cholecystectomy during the same admission, or a delay of no longer than 2 weeks from presentation with acute gallstone related pancreatitis (10,11). Similarly, in patients with choledocholithiasis, ELC 72 hours after endoscopic retrograde cholangiopancreatography (ERCP) sphincterotomy is associated with fewer recurrent biliary events with no difference in conversion rates or postoperative complications compared to DLC after 6-8 weeks (12). Despite these studies suggesting that ELC is associated with more favourable clinical outcomes, rates of ELC in practice remain low (13-15). This study reviews the clinical outcomes of patients undergoing either an ELC or DLC for acute symptomatic gallstone disease at a secondary-care surgical centre over a two-year period.

MATERIAL and METHODS

All cholecystectomies performed at a secondary-care surgical centre in the United Kingdom between 2011-2013 were reviewed. Cholecystectomies for non-acute presentations, such as elective referrals from other centres, were excluded. ELC was defined as cholecystectomy performed within the timeframes for each gallstone presentation based on the current recommendations shown in Table 1. DLC was any cholecystectomy after these recommended time frames.

Pre-operative parameters measured included demographic data, symptomatic presentation (biliary colic, acute cholecystitis, gallstone pancreatitis and obstructive jaundice secondary to choledocholithiasis), and time between index presentation and cholecystectomy. Intra- and post-operative complications data were collected for both ELC and DLC groups. Further analysis in the DLC group included recurrence of gallstone-related symptoms, repeat gallstone-related re-admissions, repeat gallstone-related imaging and length of re-admission hospital stay. The study received approval from the University College London Hospitals NHS Foundation Trust local audit department board (UCLH Audit Committee GIS/06.03.2012).

Statistical Analysis

In statistical analysis, for baseline variables in the ELC and DLC groups, mean and standard error were calculated for continuous variables. For peri-operative outcomes, time to surgery was defined as the time between index presentation and date of cholecystectomy in days. Index hospital stay was defined as the time from index gallstone-related presentation to date of discharge for the first hospital admission. Post-operative stay was the time from cholecystectomy to hospital discharge. Repeat admission days was the total number of days a patient was re-admitted for gallstone-related disease, after the initial index admission. Mean and standard error for peri-operative outcomes were calculated for ELC and DLC groups.

RESULTS

A total of 105 patients were reviewed in the study (Table 2). The mean age (± standard error) of patients in the study was 52.2±1.7 years (range 18-84 years), with 65.7% of the patients being female. Only 7 patients (6.7%) had ELC within the recommended time period (3 cases of acute cholecystitis, 2 cases of biliary colic, 1 case of gallstone pancreatitis, 1 case of obstructive jaundice). The frequency of presentations for acute gallstone disease is shown in Table 2.

The time from index presentation to cholecystectomy was longer in the DLC cohort compared to ELC (119.6±13.3 days vs. 3.4±1.1 days) (Table 3). In the DLC group, eight patients experienced complications. Four patients experienced a bile leak, with one case requiring laparoscopic wash-out. There were 3 cases of choledocholithiasis, all requiring ERCP for biliary decompression.

In the DLC group, 38 patients (38.8%) experienced further gallstone-related symptoms while awaiting laparoscopic cholecystectomy from the time of index presentation. Twenty-five patients (25.5%) returned to the hospital acutely, with five patients returning twice following their initial presentation, and one patient returning three times. The total additional acute hospital presentations was 33, with the breakdown shown in Table 4. The majority of re-presentations were biliary colic, but more serious complications included five cases of gallstone pancreatitis and one case of gallbladder perforation and empyema. Seventeen patients seen in the outpatient clinic between index presentation and DLC reported having biliary colic.

Total additional hospital stay length due to gallstone-related readmissions was 172 days (mean 3.3±7.9 days). Additional gallstone-related imaging was required in 30 patients

Table 1. A summary of recommendations for the timing of early laparoscopic cholecystectomy for different presentations of acute symptomatic gallstones based on European Association for the Study of Liver Diseases (10)

Presentation	Recommendation
Biliary colic	Early <24 hrs of diagnosis
Acute cholecystitis	Early <7 days of onset of symptoms
Acute pancreatitis	Within same admission unless a clear plan is made for definitive Rx within 2 weeks
Obstructive jaundice	± Complications: Within same admission/10 days

Table 2. Demographical data for patients with acute presentations of gallstone-related disease between 2011-2013		
	Early laparoscopic cholecystectomy (n=7)	**Delayed laparoscopic cholecystectomy (n=98)**
Age	41.1±3.6	52.9±1.8
Female	4 (57.1%)	65 (66.3%)
Gallstone presentation		
Acute cholecystitis	3 (42.9%)	33 (33.7%)
Biliary colic	2 (28.6%)	43 (43.9%)
Gallstone pancreatitis	1 (14.3%)	17 (17.3%)
Obstructive jaundice	1 (14.3%)	5 (5.1%)
All values shown are mean ± standard error for continuous variables and frequency with (%) shown for categorical variables		

Table 3. Peri-operative outcomes for patients undergoing ELC and DLC for gallstone-related disease		
	Early cholecystectomy (n=7)	**Late cholecystectomy (n=98)**
Timing of cholecystectomy from index presentation (days)	3.4±1.1	119.6±13.3
Index hospital stay (days)	6.0±0.8	6.0±0.6
Post-operative stay (days)	2.1±0.5	2.2±0.4
Surgical complications	0	8 (8.2%)
Bile Leak[†]	0	4 (4.1%)
Retained Stone[‡]	0	3 (3.1%)
Pancreatitis	0	1 (1.0%)
All values shown are mean ± standard error for continuous variables and frequency with (%) shown for categorical variables, [†]: 1 case of Bile Leak required Laparoscopic washout, 1 case required ERCP and 2 cases required drain insertion [‡]: All 3 cases of retained stones required ERCP, ERCP: Endoscopic retrograde cholangiopancreatography, ELC: Early laparoscopic cholecystectomy, DLC: Delayed laparoscopic cholecystectomy		

Table 4. Re-presentations of gallstone-related disease in patients awaiting delayed laparoscopic cholecystectomy	
	Delayed laparoscopic cholecystectomy (n=98)
Acute cholecystitis	6 (6.1%)
Biliary colic	17 (17.4%)
Gallstone pancreatitis	5 (5.1%)
Obstructive jaundice	2 (2.0%)
Empyema	1 (1.0%)
Perforated gallbladder	1 (1.0%)
Cholecystostomy Leak	1 (1.0%)
Total	**33 (33.7%)**

having DLC (30.3%), including 13 ultrasound scans (13.3%), 5 computed tomographys (5.1%) and 12 magnetic resonance cholangiopancreatographys (MRCPs) (12.2%). Table 5 summarizes the outcomes of the ELC and DLC groups and the additional presentations and imaging for the DLC cohort.

DISCUSSION

In this retrospective study, we found over one-third of patients experienced a recurrence of gallstone-related symptoms while awaiting DLC, with over one-quarter re-presenting to hospital. DLC was associated with an average additional 3.3-day hospital stay due to re-admission, with 30.3% of patients requiring repeat imaging. This study highlights that DLC is associated with increased morbidity and the use of additional healthcare resources.

ELC for symptomatic gallstone-related disease is supported by a growing body of evidence. Though high-quality randomised studies for ELC in biliary colic and gallstone pancreatitis are lacking, the general consensus is the benefits of ELC include reduced hospital stay and reduced re-admissions without increase in intra-operative or post-operative complications (3-5,7,11). In this study, we have observed no increase in surgical complication rate after ELC. Several other studies have shown that ELCs do not have an increased intra- or post-operative complication rate (3-5,7,11). However, surgeons remain reluctant to perform cholecystectomy acutely, citing a lack of experienced surgeons and emergency theatre availability (2).

This study has shown that a delay in cholecystectomy is associated with increased patient morbidity. Over one third of patients experienced gallstone related disease while awaiting cholecystectomy, with significant morbidity, including acute pancreatitis, empyema, and a perforated gallbladder observed.

Table 5. Summary of outcomes of early laparoscopic cholecystectomy and delayed laparoscopic cholecystectomy

	Early cholecystectomy (n=7)	Late cholecystectomy (n=98)
Timing of cholecystectomy from index presentation (days)	3.4±1.1	119.6±13.3
Index hospital stay (days)	6.0±0.8	6.0±0.6
Post-operative stay (days)	2.1±0.5	2.2±0.4
Surgical complications	0	14 (14.3%)
Repeat gallstone symptoms	-	38 (38.8%)
Repeat hospital admissions	-	25 (25.5%)
Repeat hospital stay (days)	-	3.3±0.8
Additional imaging -Ultrasound -CT -MRCP	- - - -	30 (30.6%) 13 (13.3%) 5 (5.1%) 12 (12.2%)

All values shown are mean ± standard error for continuous variables, CT: Computed tomography, MRCP: Magnetic resonance cholangiopancreatographys

In addition to health implications, recurrence of gallstone-related disease generates numerous additional costs in DLC patients. Approximately one quarter of patients were re-admitted to hospital with recurrence of gallstone-related symptoms, associated with, on average, an extra 3.3-day inpatient stay per patient. This additional requirement for acute medical resources, including repeat imaging to re-confirm gallstone related disease, would not be seen in ELC patients.

With the increasing pressures in the current economic climate, the financial benefit of ELC may be the biggest driver for change. Costing analysis has shown ELC is less expensive with a gain in quality adjusted life years (QALYs) (16). Furthermore, a cost-utility model for the NHS predicted that ELC is £820 cheaper per patient than DLC, with a 0.05 QALY gained per patient, amounting to an overall saving of £8.5 million per annum for the NHS (17).

A potential reason for the poor rates of ELC demonstrated here and in other studies (18), is the difficulty accommodating these cases in overbooked emergency theatre operating lists. Mild gallstone disease, in particular biliary colic, could be perceived as low priority when compared to acute presentations from other surgical specialties such as orthopaedics, trauma, and gynaecology. However, this study demonstrates that a delay in cholecystectomy can result in significant morbidity for the patient.

There are several strategies that can be adopted to accommodate ELC into practice. A quality improvement initiative from a district general hospital showed how a multi-disciplinary approach can successfully add ELC onto acute surgical lists (15). The availability of dedicated radiological slots for morning diagnosis of acute gallstone disease, and theatre and anaesthetic staff for afternoon slots, meant rates of ELC increased from 10% to 58% in just 6 months. Alternatively, it has been proposed that ELC cases can be managed on a "Semi-Acute" list. A model from Cockbain et al. (19) proposed a twice weekly-dedicated ELC list. Under this model, patients presenting with an acute gallstone diagnosis would be stabilised and discharged, with a date to return for ELC within one week. This model was associated with significant savings from reduced bed occupancy and less pressure on shared emergency lists.

Study Limitations

Our study has several limitations. Due to its retrospective design, there is a risk of selection bias. Furthermore, there may be underlying unrecorded patient factors influencing the choice of ELC and DLC. As only seven cases of ELC were performed, the true rate of peri-operative complications may be underestimated in this cohort. Additionally, there may be longer- complications in the ELC and DLC groups not captured in the study.

CONCLUSION

Our study demonstrates that delayed laparoscopic cholecystectomy has an impact on patients' health due to the recurrence of gallstone morbidity, as well as an adverse financial impact due to the use of additional acute hospital resources. These findings advocate the use of early laparoscopic cholecystectomy, which is associated with favourable health and financial benefits without affecting surgical complication rates.

Ethics

Ethics Committee Approval: The study received approval from the University College London Hospitals NHS Foundation Trust local audit department board (UCLH Audit Committee GIS/06.03.2012).

Informed Consent: Retrospective study.

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Footnotes

Author Contributions

Concept - M.V., C.Y., K.D.; Supervision - K.D.; Fundings- K.D.; Design - M.V., C.Y., K.D.; Data Collection or Processing - K.D.; Analysis or Interpretation - M.V., C.Y.; Literature Search - M.V., C.Y.; Critical Review - M.V., C.Y., K.D.; Writing - M.V., C.Y., K.D.

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