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Prolonged length of stay in delayed cholecystectomy is not due to intraoperative or postoperative contributors



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ABSTRACT

Background: Previous studies have reported that same-day laparoscopic cholecystectomy for acute cholecystitis is superior to delayed elective cholecystectomy. Although this practice is ideal, it requires significant hospital resources, particularly for an underprivileged inner-city population at a large, municipal hospital. We sought to evaluate the implementation of same-day laparoscopic cholecystectomy in a large, municipal hospital and assess the possible benefits of decreasing preoperative length of stay (LOS), particularly its effect on operative time and length of stay in patients with acute cholecystitis.

Materials and Methods: This was a retrospective chart review of patients treated for symptomatic gallstone disease between September 2012 and November 2013. Medical records were reviewed, and relevant data points were collected. Univariate and multivariate regressions were performed to assess the correlation between time to operation (<36 h [no delay] or >36 h [delay]) and the main outcomes (operative time and total length of stay). Inclusion criteria were patients age ≥ 18 y who underwent same-admission cholecystectomy and had a diagnosis of cholecystitis on pathology. Eighty-eight patients met all inclusion criteria.

Results: The mean (standard deviation) preoperative LOS was 76.2 (± 48.6) h, the mean operative time was 2.3 (± 1.1) h, and the mean postoperative LOS was 60.3 (± 60.1) h. The average total LOS was 136 (± 79.8) h. Operative times and postoperative LOS were similar for patients in the delay and no delay groups. Patients with >36 h wait before surgery had a total length of stay twice as long as patients with <36 h wait (152 versus 83.3 h; $P = 0.0005$). These findings remained significant when adjusted for age, sex, radiologic findings, number of preoperative tests, and pathology.

Conclusions: Increased preoperative LOS is not associated with a significant increase in operative time. However, it was associated with significantly increased length of stay. Further analysis is needed to explore the potential cost savings of decreasing preoperative LOS.

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Background

Gallstone disease affects approximately 10% of the population in the United States and is one of the leading causes of hospital admission.^{1,2} The standard of care for symptomatic gallstone disease is laparoscopic cholecystectomy (LC) with over 700,000 cholecystectomies performed each year.^{1,2} For patients with acute cholecystitis, 89.0% are admitted to the hospital as an emergency and 67.1% of these patients undergo LC during that admission.³ The timing of surgical intervention has traditionally been determined by duration of symptoms, but recent evidence supports earlier LC, including the day of admission, as a safe practice, regardless of time from symptom onset.^{2,4-12}

Once the decision for laparoscopic cholecystectomy has been made, delays to the operating room (OR) can be many, including the need for further workup or medical optimization, but are often attributable to resource constraints (staffing and OR availability). There are data to support the economic benefit of earlier LC^{13,14} with Gutt *et al.* showing a 46% increase in cost for patients receiving laparoscopic cholecystectomy greater than 24 h after presentation, with most of the cost attributed to longer length of stay in this delayed group.¹³ Therefore, the marginal resource investment required for same-day LC could potentially be offset by the potential savings.

This study evaluated the outcomes of patients who presented to a large, municipal hospital with symptomatic gallstone disease and received same-admission LC. We sought to determine whether prolonged preoperative length of stay (LOS) was associated with worse outcomes, primarily length of operative time, postoperative LOS, and total LOS.

Methods

This was a retrospective chart review of patients treated for symptomatic gallstone disease at Bellevue Hospital Center (BHC), between September 2012 and November 2013. BHC is a large city hospital in New York City with a robust surgical residency program. Inclusion criteria for this study were patients 18 y or older who underwent same-admission cholecystectomy and were diagnosed with cholecystitis on pathology. Patients were excluded if they were younger than 18 y or had a postoperative diagnosis of cholelithiasis without cholecystitis (acute or chronic) on pathology. There were 182 patients in the database, 88 of whom met inclusion criteria for this study.

Medical records were reviewed and the database was created by one investigator (M.B.). Data points included demographics (age, sex, race), medical history (previous emergency room visits, comorbidities), physical examination findings (heart rate, temperature, respiratory rate), diagnostic imaging and findings (ultrasound, computed tomography scans, magnetic resonance imaging scans, endoscopic retrograde cholangiopancreatography), laboratory findings (aspartate transaminase, alanine transaminase, total and direct bilirubin, white blood cell [WBC] count), hospital course (operative time, preoperative length of stay, postoperative length of stay), postoperative

complications, and pathological features and diagnosis. The diagnosis of cholecystitis was based on pathology reports which specified whether the patient had acute cholecystitis, chronic cholecystitis, or acute on chronic cholecystitis (in which the patient's pathology met the criteria for both acute and chronic cholecystitis).

Each patient's triage time, admission time, operation start time, operation end time, and discharge time were abstracted from the electronic medical record system. These data points were used to calculate each patient's preoperative length of stay (pre-op LOS) (triage time to operative time), operative time, postoperative length of stay (operation end time to discharge time), and total length of stay (triage time to discharge time). After initial descriptive statistics, preliminary analyses were conducted treating preoperative LOS as a continuous variable with a normal distribution based on initial exploratory analyses. To better assess clinical relevance and decision making, data were then dichotomized based on time to operation less than or greater than 36 h (pre-op LOS <36 h [no delay] versus pre-op LOS ≥36 h [delay]). Two-sample t-tests and chi-square tests were used to compare differences between the two patient groups. Univariate and multivariate logistic regressions were performed to identify factors predictive of prolonged operative time (defined as greater than the median operative time). A conjugate Bayesian beta-binomial model with a noninformative beta (1,1) prior distribution was used to estimate the probability of complications in the delay group versus the nondelay group in the setting of sparse data.¹⁵ Differences were considered significant if P values were less than 0.05.

This study was approved by the New York University Institutional Review Board and the Research Review Committee at the Central Office of the New York City Health and Hospitals Corporation.

Results

Of the 88 patients included in this study, there were 57 women and 31 men. The average (standard deviation) age was 42 (13.3) y (Table 1). Most patients (68) received an ultrasound (US); 45 patients had a computed tomographic (CT) scan; 21 patients had an endoscopic retrograde cholangiopancreatography (ERCP); three patients had a magnetic resonance cholangiopancreatography (MRCP). Thirty-five patients underwent two preoperative studies (21 received US and CT scan; 8 received CT scan and ERCP; 5 received US and ERCP; 1 received US and MRCP) and seven patients received three preoperative studies (5 received US, CT scan, and ERCP; 1 received US, CT scan, and MRCP; 1 received US, MRCP, and ERCP). Sixty-two patients had an intraoperative cholangiogram (IOC) with laparoscopic cholecystectomy. The average preoperative LOS for the entire cohort was 75.5 (48.9) h (Table 1). The average operative time was 2.3 (1.1) h, and the average postoperative LOS was 59.4 (6.38) h. Nine patients required conversion to an open cholecystectomy after initial laparoscopic attempts.

Results of the univariate linear regression analyses showed that operative time increased by 3.85 min for every

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