Postoperative outcomes with cholecystectomy in lung transplant recipients

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Introduction. *There is a paucity of data on outcomes for lung transplant (LT) recipients requiring general surgery procedures. This study examined outcomes after cholecystectomy in LT recipients using a large database.*
Methods. *The National Inpatient Sample Database (2005–2010) was queried for all LT patients requiring laparoscopic cholecystectomy (LC) and open cholecystectomy (OC).*
Results. *There were a total of 377 cholecystectomies performed in LT patients. The majority were done for acute cholecystitis (*n *= 218; 57%) and were done urgently/emergently (*n *= 258; 68%). There were a total of 304 (81%) laparoscopic cholecystectomies and 73 (19%) OC. There was no difference in age when comparing the laparoscopic and open groups (53.6 vs 55.5 years;* P *= .39). In addition, the Charlson Comorbidity Index was similar in the 2 groups (*P *= .07). Patients undergoing OC were more likely to have perioperative myocardial infarction, pulmonary embolus, or any complication compared with the laparoscopic group. Total hospital charges ($59,137.00 vs $106,329.80;* P *= .03) and median duration of stay (4.0 vs 8.0 days;* P *= .02) were both greater with open compared with LC.*
Conclusion. *Cholecystectomy can be performed safely in the LT population with minimal morbidity and mortality. (Surgery 2015;158:373-8.)*

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Lung transplantation (LT) remains the treatment of choice for select patients with end-stage pulmonary disease.[1,2] As survival after LT continues to improve,[3,4] the number of patients who have undergone LT presenting with surgical pathology will increase. Although the management of gallstone disease in the general population is well-studied and accepted,[5,6] the optimal approach in LT recipients remains controversial. LT recipients require immunosuppression, which can impair wound healing and affect postoperative outcomes.[7] Currently, there is a paucity of data on outcomes for LT recipients with biliary disease, and few guidelines exist for the management of these patients. The goal of this study was to evaluate the outcomes after cholecystectomy in LT recipients using a large, national database.

METHODS

Database. The National Inpatient Sample (NIS) Database was utilized for this study. The NIS database was developed by the Healthcare Cost and Utilization Project and contains data from approximately 8 million hospital stays each year. The database represents a stratified sample of 20% of non-federal hospitals in the United States. The NIS database is the largest publicly available, all-payer, inpatient health care database in the United States.[8] A self-weighting design decreases the margin of error for estimates and delivers population-based estimates. All of our statistical analysis was based on this weighting design as established in previous studies.[9] The NIS is a publically available, deidentified database and was therefore, granted exempt status from our institutional review board.

Study population. Adult recipients of LT who underwent open cholecystectomy (OC) or

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Table I. Patient diagnoses

Diagnosis	*Laparoscopic cholecystectomy* (n = *304*), n (%)	*Open cholecystectomy* (n = *73*), n (%)	P *value*
Acute cholecystitis	159 (52)	59 (81)	<.001
Chronic cholecystitis	19 (6)	0	.02
Gallstone pancreatitis	15 (5)	4 (6)	.77
Choledocholithiasis	35 (12)	5 (7)	.30
Cholelithiasis without cholecystitis	24 (8)	5 (7)	.99
Other diagnoses	51 (17)	0	<.001

**laparoscopic cholecystectomy (LC) between 2005 and 2010 were initially identified by the International Classification of Disease, Ninth Revision (ICD-9) diagnosis and procedure code as established in prior studies.[9] Patients who had undergone LT on a prior admission were initially selected based on diagnosis code for LT (V42.6) and then identified using the procedure codes for OC (51.21, 51.22) and LC (51.23, 51.24). Individuals with a concurrent diagnosis of benign or malignant neoplasm involving the biliary tree, liver, intrahepatic bile ducts, gallbladder, extrahepatic bile ducts, or ampulla of Vater, or who had a cyst or pseudocyst of the pancreas identified by ICD-9 diagnosis codes 211.5, 197.7, 155, 155.0, 155.1, 155.2, 230.8, 156, 156.0, 156.1, 156.2, 156.8, 156.9, or 577.2 were excluded from the analysis. The other diagnoses category in Table I included obstruction of the gallbladder, hydrops of the gallbladder, perforation of gallbladder, fistula of gallbladder, cholesterolosis of gallbladder, and other specified disorders of the gallbladder.

Data and statistical analysis. The primary outcome was inpatient mortality after cholecystectomy. Secondary outcomes included in-hospital complications, duration of stay, and cost. Common postoperative complications were identified by ICD-9 codes as established in previous studies.[9] Continuous and categorical variables were compared with Student's *t* test and Chi-square analysis. All continuous variables are presented as mean values ± standard deviation. Weighted frequencies and weighted multiple variable logistic regression analysis using clinically relevant variables were used to examine postoperative complications. In our multiple variable logistic regression analysis, we corrected for disease severity index. Disease severity index is determined by the NIS database using the 3M All Patient Refined Diagnosis Related Groups, which estimates the severity of illness and risk of mortality. Patients are assigned to severity and mortality subclasses according to a sophisticated clinical logic that evaluates comorbidities, age, procedure, and clinical diagnosis. Disease severity index is widely used throughout the United States for adjusting data for severity of illness and risk of mortality in patients undergoing surgery[8] Odds ratios with 95% CIs were presented for each covariate. Data was analyzed using SAS 9.2 software (SAS Institute, Cary, NC).

RESULTS

There were a total of 377 cholecystectomies performed in LT recipients during the study period. Of these, 304 (81%) were LC and 73 (19%) were OC.

Baseline patient characteristics. A comparison of baseline patient characteristics is shown in Table II. The 2 groups were not different with respect to age (53.6 vs 55.5 years; $P = .39$) or Charlson Comorbidity Index (2.69 vs 3.49; $P = .07$). The LC group was more likely to have an elective admission compared with the OC group (38% vs 21%; $P = .002$). The LC group was less likely to be male (44% vs 67%; $P < .001$), less likely to be white (66% vs 86%; $P < .001$) or black (0% vs 14%; $P < .001$), and more likely to be Hispanic (17% vs 0%; $P < .001$). The LC group was less likely to have private insurance (33% vs 49%; $P = .049$) or Medicare (59% vs 59%; $P = .049$) and more likely to have Medicaid (8% vs 0%; $P = .049$). The number of LC done at hospitals with a large bed capacity was not different from the OC group (70% vs 64%; $P = .40$).

A summary of patient diagnoses is shown in Table I. Although acute cholecystitis was the most common primary diagnosis in both groups, the OC group was more likely to carry this diagnosis (52% vs 81%; $P < .001$). The LC group was more likely to have a primary diagnosis of chronic cholecystitis (6% vs 0%; $P = .03$) or some other diagnoses (17% vs 0%; $P < .001$). There was no difference in patients with a diagnosis of choledocolithiasis (12% vs 7%; $P = .29$), cholelithiasis without cholecystitis (8% vs 7%; $P = .99$), or gallstone pancreatitis (5% vs 6%; $P = .77$).