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Comparison of straight vs hand-assisted laparoscopic colectomy: an assessment from the NSQIP procedure-targeted cohort

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Abstract

BACKGROUND: The perioperative outcomes of patients who underwent straight laparoscopic (LAP) vs hand-assisted laparoscopic (HALS) surgery were compared using a recently released procedure-targeted database.

METHODS: The 2012 colectomy-targeted American College of Surgeons National Surgical Quality Improvement Program database was used and patients were classified into 2 groups according to the final surgical approach: LAP vs HALS. Demographics, comorbidities, and 30-day outcomes were compared.

RESULTS: A total of 7,843 patients met the inclusion criteria. There were 4,656 (59%) patients in LAP colectomy and 3,187 (41%) in HALS colectomy groups. Groups were comparable in terms of preoperative characteristics and demographics. Mean operative time was slightly longer in LAP group (178 ± 86 vs 171 ± 84 minutes, $P < .001$). After covariate-adjustment analysis, the overall morbidity, superficial surgical site infection, and ileus rates remained slightly higher in HALS group.

CONCLUSIONS: Both straight laparoscopic and hand-assisted approaches are used in colorectal surgery and may complement each other in challenging cases. Implementing the best approach to decrease postoperative complication rates and increase use of minimally invasive techniques may play a role in improving patient care and overall quality.

The operative approach used in colorectal surgery has evolved substantially since the introduction of laparoscopic surgery in the 1990s.[1] Laparoscopic colorectal surgery is associated with a number of postoperative recovery benefits over open surgery including, earlier return of bowel function, decreased postoperative pain, and reduced complication rate.[2,3] Despite the well-documented advantages of laparoscopy, the colorectal surgical community has been slow to adopt this approach because of its technically demanding nature and long-steep learning curve.[4] There are a number of reports showing this adoption rate over the last 2 decades. A recently published report using the

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United States Nationwide Inpatient Sample database showed that the proportion of colorectal cancer resections that were performed laparoscopically remained less than 50% in 2010.[5]

Hand-assisted laparoscopic surgery (HALS) was proposed to overcome these challenges preserving the clinical benefits derived from a minimally invasive approach.[6–9] HALS maintains the same manual dexterity and tactile feedback that is possible in open surgery, so it has been advocated as a bridge between open and straight laparoscopic surgery (LAP).[6] A number of reports, including 4 prospective randomized trials, have shown that HALS significantly decreases the conversion rate to open while preserving the short-term postoperative benefits of LAP.[7–11]

The recently developed procedure-targeted American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database offers a novel opportunity to directly evaluate the final surgical approach in patients undergoing colectomy. There have been a number of studies comparing LAP and HALS colectomy in the literature. However, a nation-wide evaluation of the appropriateness of HALS and its short-term outcomes has not previously been reported. In this study, the perioperative outcomes of patients who underwent straight laparoscopic vs hand-assisted laparoscopic colectomy were compared using a recently released procedure-targeted database.

Methods

Data collection

The 2012 ACS-NSQIP procedure-targeted Participant User File contains information about 22 procedure-specific variables for patients who require colectomy, including details about preoperative variables, operative information, and postoperative complications from 121 different centers within the United States.[12] Additional information about each patient was obtained by merging the unique case identifier variable in the colectomy-targeted data set with the larger and more generalized 2012 general and vascular surgery ACS-NSQIP Participant User File. This data set comprises more general information about the patients including; demographic information, comorbid conditions, and 30-day postoperative mortality and morbidity.

The data contained within both databases are collected by ACS–trained and –certified clinical reviewers who obtain information using a variety of methods, including medical record abstraction. The reviewers use strict variable definitions to ensure uniformity across participating centers, and periodic auditing of participating centers is performed to ensure that the data obtained are accurate.[13]

Institutional review board approval was obtained, and the 2012 procedure-targeted ACS-NSQIP database was queried for all patients who underwent elective LAP vs HALS colectomy according to the final surgical approach as stated in the operative report. Patients with a secondary procedure were excluded. Patient demographics, characteristics, and preoperative comorbidities were compared between the groups.

Outcomes

Intraoperative and 30-day postoperative outcomes were analyzed by comparing the LAP and HALS groups. Study end points included 30-day morbidity rate, length of hospital stay, and operative time. Postoperative complications include superficial surgical site infection (SSI), deep SSI, organ space SSI, wound disruption, bleeding requiring transfusion, reoperation, pulmonary embolism, unplanned intubation, progressive renal insufficiency, pneumonia, acute renal failure, urinary tract infection, coma longer than 24 hours, ventilator support for more than 48 hours (ventilator dependency), cerebrovascular accident, cardiac arrest, deep venous thrombosis, sepsis, septic shock, myocardial infarction, prolonged postoperative ileus, and anastomotic leak.

Statistical analysis

The groups were compared with respect to categorical variables using a chi-square or Fisher's exact test, and comparisons with respect to distributions of quantitative variables were performed using the Wilcoxon rank-sum test. P value less than .05 was considered statistically significant. After comparing the groups in terms of baseline characteristics and postoperative study outcomes, we conducted multivariate analyses to compare the groups with respect to outcomes, with further covariate adjustment for variables demonstrating differences between the groups. The multivariate analyses for dichotomous outcomes were performed using logistic regression models that yielded estimates of odds ratios. The multivariate analyses for length of stay and operative time were performed using linear regression models after log transformations of the outcomes, yielding estimates of changes in median values of the outcomes expressed as median ratios. Using log transformations for length of hospital stay and operative time had approximate normal distributions, which improved the accuracy of the parameter estimation for multivariate models. When modeling log-transformed outcomes, we used the term 'median ratio' to describe associations between an independent variable and the outcome. After comparison of groups for the number of complications, multivariate analysis was performed adjusting for covariates, using quasi-Poisson regression. The estimates of odds ratios and median ratios were also obtained from models without the covariate adjustments.

Results

A total of 7,843 patients were identified. Four thousand six hundred fifty-six (59%) patients were included in the