The American Journal of Surgery (2016) 212, 808-813

The American Journal of Surgery®

Clinical Science

Hand-assisted laparoscopic vs open colectomy: an assessment from the American College of Surgeons National Surgical Quality Improvement Program procedure-targeted cohort

Cigdem Benlice, M.D., Meagan Costedio, M.D., Luca Stocchi, M.D., Maher A. Abbas, M.D., Emre Gorgun, M.D.*

Department of Colorectal Surgery, Digestive Disease Institute, Cleveland Clinic, 9500 Euclid Avenue, Desk A-30, Cleveland, OH 44195, USA

KEYWORDS:
Colorectal surgery;
NSQIP;
Procedure-targeted database;
Hand-assisted laparoscopic surgery

Abstract

BACKGROUND: Perioperative outcomes of patients who underwent hand-assisted colorectal laparoscopic (HALS) vs open colectomy were compared using recently released procedure-targeted database.

METHODS: Review was conducted using the 2012 colectomy-targeted American College of Surgeons National Surgical Quality Improvement Program database. Patients were classified into 2 groups according to final surgical approach: HALS vs open (planned). Groups were matched (1:1) based on age, gender, body mass index, surgical procedure, diagnosis, American Society of Anesthesiologists score, and wound classification. Multivariate logistic regression analysis was conducted for group comparison.

RESULTS: Of 7,303 patients, 1,740 patients were matched in each group. Open group had higher proportion of patients with preoperative dyspnea ($P = .01$), ascites ($P = .01$), weight loss ($P < .001$), smoking history ($P = .04$), and increased work relative value units ($P < .001$). After adjusting for difference in baseline comorbidities, overall morbidity, superficial, deep, and organ-space surgical site infection, urinary tract infection, ileus, reoperation, readmission, and hospital stay were significantly higher in open group ($P < .05$).

CONCLUSIONS: National Surgical Quality Improvement Program targeted-data demonstrated several advantages of HALS compared with open colonic resection including shorter hospital stay and lower complication rate. Further adoption of HALS technique as a bridge to straight laparoscopy or tool in difficult cases can positively impact the short-term outcomes after colectomy when compared with open technique.

There were no relevant financial relationships or any sources of support in the form of grants, equipment, or drugs.

The authors declare no conflicts of interest.

The study was presented as a "poster presentation" at the Society of American Gastrointestinal and Endoscopic Surgeons Annual Meeting, April 15–18, 2015, Nashville, TN, USA.

* Corresponding author. Tel.: +1-216-444-1244; fax: +1-216-445-8627.

E-mail address: gorgune@ccf.org

Manuscript received October 25, 2015; revised manuscript February 1, 2016

The operative approach used in colorectal surgery has evolved substantially since the introduction of laparoscopic surgery.[1] Laparoscopic colorectal surgery is associated with a number of postoperative recovery benefits including earlier return of bowel function, decreased postoperative pain, and lower complication rate.[2,3] However, despite these established benefits, the rate of adoption of laparoscopic colorectal surgery has been much slower than other abdominal procedures such as cholecystectomy. Several

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http://dx.doi.org/10.1016/j.amjsurg.2016.02.014

factors have contributed to the slow adoption rate including a steep learning curve, technical challenges related to variation in colonic pathology, difficult anatomy related to inflammation or tumors, and a lack of tactile feedback.[4]

Hand-assisted laparoscopic surgery (HALS) was introduced as a viable alternative to straight laparoscopy to help facilitate the spread of minimally invasive surgery. For surgeons proficient in the open technique, HALS offers a hybrid technique allowing surgeons to evolve their laparoscopic skills. HALS enables surgeons to incorporate the use of their hand for manual retraction, dissection, and prompt hemostasis similar to an open operation. In addition to increasing the rate of minimally invasive colorectal procedures, another advantage of HALS compared with straight laparoscopy is lowering the conversion rate to open surgery.[5] Therefore, HALS has been advocated as a useful bridging technique for surgeons acquiring the complex skill sets required for standard laparoscopic surgery.[6]

A number of small studies comparing the outcomes of HALS to open colectomy demonstrated similar benefits of HALS and standard laparoscopy when compared with open.[5,7–9] However, a nation-wide evaluation of the appropriateness of HALS and its short-term outcomes has not been previously reported. The recently released procedure-targeted American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database offers a novel opportunity to directly evaluate the outcomes of various surgical techniques in a large cohort of patients. In this study, we aimed to compare the 30-day postoperative outcomes of patients undergoing HALS vs open colectomy and analyze practice patterns using a procedure-targeted database in a case-matched design.

Patients and Methods

Data collection

The 2012 ACS-NSQIP colectomy-targeted participant user file contains information about 22 procedure-specific variables in addition to generalized multispecialty ACS-NSQIP database from 121 different centers within the United States. These specific colectomy-related variables include details about preoperative assessment, operative information, and postoperative complications.[10] Additional information for each patient was obtained by merging the unique case identifier variable in the colectomy-targeted data set with the larger and more generalized participant user file file. The 2012 ACS-NSQIP database includes more general information about the patients compared with the colectomy-targeted data set, which includes demographic information, comorbid conditions, and 30-day postoperative mortality and morbidity. The data contained within both data sets are collected by ACS-trained and certified clinical reviewers who gather information for each patient abstracting the inpatient and outpatient records at participating NSQIP institutions. The reviewers use strict variable definitions when collecting information to ensure uniformity across participating centers, and periodic auditing is performed to ensure that the data points are accurate.

After obtaining institutional review board approval at the Cleveland Clinic, the 2012 colectomy-targeted ACS-NSQIP database was queried for all patients who underwent elective colectomy according to the final operation performed. This new variable specifies the final technique, as stated in the operative report. Patients with secondary or concurrent procedures, disseminated cancer, and preoperative sepsis were excluded. Patients were classified into 2 groups: HALS and open (planned). The groups were case-matched in a 1:1 ratio based on age category ($<$30, 30 to 39, 40 to 49, 50 to 59, 60 to 69, 70 to 79, and $\geq$80 years), body mass index category ($<$20, 20 to 25, 25 to 30, 30 to 35, 35 to 40, and $\geq$40 kg/m^2), gender, wound classification, type of colonic procedure, final diagnosis, and American Society of Anesthesiologists classification. Surgical procedures were classified as partial colectomy with anastomosis, partial colectomy with low pelvic anastomosis, partial colectomy with removal of terminal ileum and ileocolostomy, total colectomy with ileostomy or ileoproctostomy, and partial colectomy with ileostomy and/or colostomy according to Current Procedural Terminology code system. The final diagnosis was classified as colon cancer, diverticular disease, other benign diseases, Crohn's disease, and ulcerative colitis.

Variables and/or predictors

Intraoperative and postoperative outcomes were analyzed by comparing the HALS and open groups. The study end points were 30-day morbidity rate, length of hospital stay, and operative time. Postoperative complications including 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 (UTI), 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, postoperative ileus, and anastomotic leak were compared between the HALS and open groups.

Statistical analysis

The matched groups were compared with respect to categorical variables using the Pearson's chi-square test. Comparisons with respect to distributions of quantitative variables were performed with the 2-sample t-test or Wilcoxon rank sum test. $P < .05$ was considered statistically significant. After comparing the matched groups in terms of baseline characteristics, comorbidities, and postoperative study outcomes, we conducted multivariate analysis to