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Safety of laparoscopic and open approaches for repair of the unilateral primary inguinal hernia: an analysis of short-term outcomes

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Abstract

BACKGROUND: Primary laparoscopic repair of unilateral inguinal hernias has not achieved widespread recognition mainly because of concerns over safety.

METHODS: Prospective cohort study using the American College of Surgeons National Surgery Quality Improvement Program between 2005 and 2010. Complications in patients undergoing unilateral first-time, elective laparoscopic unilateral inguinal hernia repair (LIHR) were compared with open inguinal hernia repair (OIHR).

RESULTS: Of 37,645 identified patients, 6,356 (16.9%) underwent LIHR and 31,289 (83.1%) underwent OIHR. Both groups had similar 30-day overall complications, major complications, and mortality rates: 62 (1.0%) vs 307 (1.0%), $P = 1.00$; 31 (.5%) vs 173 (.5%), $P = .57$; and 1 (.02%) vs 16 (.05%), $P = .34$, respectively. Using multivariable logistic regression, overall complications showed no difference, OR 1.01 (95% CI .76 to 1.34; $P = .94$), as did major complications, OR .90 (95% CI .61 to 1.34; $P = .62$), although favoring the LIHR group, where OR and CI represent the odss ratio and confidence intervals.

CONCLUSION: These data demonstrate no significant difference between elective unilateral LIHR and OIHR with regard to 30-day morbidity and mortality.

Inguinal hernia repair represents one of the most common general surgical procedures with approximately 800,000 performed annually in the United States.[1] The laparoscopic inguinal hernia repair (LIHR) was first reported in 1982 and the technique was further developed in the early 1990s.[2,3] Despite advances in laparoscopy, open inguinal hernia repair (OIHR) remains the preferred technique.[4] Compared to other laparoscopic procedures,

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American College of Surgeons National Surgical Quality Improvement Program and the hospitals participating in the ACS NSQIP are the source of the data used herein; they have not verified and are not responsible for the statistical validity of the data analysis or the conclusions derived by the authors.

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LIHR has been relatively slow to be adopted and controversy remains over the optimal operative approach to inguinal hernias.

Initial experience with the laparoscopic technique demonstrated higher recurrence rates compared to open repair as well as a higher rates of major complications including death.[5,6] Furthermore, a recent meta-analysis has suggested that higher perioperative morbidity is associated with LIHR.[7] In contrast, other studies have demonstrated that LIHR has similar morbidity and mortality when compared to OHIR.[8,9] Compared to LIHR, OIHR can often be performed under local anesthesia, does not require specialized equipment, or additional surgical training in minimally invasive surgery. However, LIHR has several potential advantages over OHIR including less chronic pain and faster recovery, and current data suggest that recurrence rates are similar between techniques.[7,9] Despite the potential benefits to patients, LIHR has not been widely applied to unilateral inguinal hernia repair but reserved for recurrences and bilateral cases.[10,11] Controversy remains over the safety of LHIR and the potential for increased rates of serious complications such as bowel injury or major vascular injury with the laparoscopic approach.

The objective of this study was to compare the 30-day outcomes of laparoscopic and open unilateral elective inguinal hernia repairs and determine whether the complication rates were higher in the laparoscopic group.

Methods

Study population

The American College of Surgeons National Surgery Quality Improvement Program (ACS NSQIP) is a prospective, multi-institutional, cohort study for collecting rich clinical data on patients undergoing surgical procedures in private sector hospitals across North America. Data are collected on preoperative, intraoperative, and postoperative variables, including 30-day outcomes. ACS NSQIP data methodology and verification have been described in detail elsewhere.[12–17] The study protocol was approved by our Institutional Research Ethics Board.

Inclusion criteria

Study patients included those entered into the ACS NSQIP dataset aged $\geq$18 years old between 2005 and 2010, who underwent elective primary unilateral LIHR and OIHR. Current Procedural Terminology codes for these procedures are 49650 (LIHR) and 49505 (OIHR), respectively.

Exclusion criteria

Exclusion criteria were defined a priori, to identify a homogeneous group of patients undergoing elective unilateral inguinal hernia repair for the first time. Cases identified as recurrent hernias based on International Classification of Diseases-9 coding were excluded. Patients identified as emergency cases, transferred from other acute care hospitals, having an American Society of Anesthesiologists (ASA) class 4 or 5, and admitted patients were excluded. Patients with significant comorbidities such as documented severe chronic obstructive pulmonary disease, dyspnea at rest, myocardial infarction within 6 months, newly diagnosed or worsening angina, documented pre-existing infections, ascites or liver disease, current dialysis, bleeding disorders, and patients on immunosuppressive drugs were excluded. Patients were also excluded if they had concurrent surgical procedures at the time of their hernia repair and whose postoperative diagnosis was not consistent with unilateral hernia repair. Any patients with missing baseline characteristics were excluded and assumed to be at random.

Outcomes of interest

The primary endpoints were the odds ratios (OR) comparing the LIHR with the OIHR group for the following: (1) 30-day overall complications, (2) 30-day major complications, and (3) 30-day mortality. All endpoints were binary outcome variables. Both overall complications and major complications were composite outcomes of the postoperative 30-day complications listed in the dataset, with major complications excluding urinary tract infections (UTIs), superficial wound infections, and postoperative renal insufficiency. Both overall and major complications included mortality as a complication. These composite endpoints included any septic/infectious, bleeding, thromboembolic, cardiorespiratory, and renal complications, as well as prolonged length of stay of $>$30 days. Reoperation within 30 days was excluded from our analysis because we deemed it as an unreliable variable as we could not state for certain the reoperation was related to the initial surgery.

Statistical analysis

Summary statistics were used to define the study population. Univariate analyses using the Chi-squared test or Fisher's exact test where appropriate were performed to compare categorical variables and the t test to compare continuous variables. An unadjusted trend analysis for proportions was used to assess the proportion of inguinal hernia repairs performed laparoscopically over the 5-year study period (2005 to 2010).

Multiple logistic regression was used to examine the relationship between two of our main endpoints, overall complications and major complications (dependent variable) and type of hernia repair (independent variable). A univariate analysis of mortality against procedure type was performed, as there were too few events to perform a multivariate analysis. Modeling for complications was created using a forward stepwise approach with a P value of $<$.2 for the potential confounders of sex, age, body mass index (BMI), ASA classification, diabetes, coronary