Journal of Pediatric Surgery 53 (2018) 1154–1159

Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.elsevier.com/locate/jpedsurg

Short-term outcomes in children undergoing restorative proctocolectomy with ileal-pouch anal anastomosis☆

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ARTICLE INFO

Article history:
Received 16 February 2018
Accepted 27 February 2018

Key words:
Ulcerative colitis
Familial adenomatous polyposis
Restorative proctocolectomy with ileal-pouch anal anastomosis
RP-IPAA
Pediatric
NSQIP

ABSTRACT

Introduction: Patients with familial adenomatous polyposis (FAP) and ulcerative colitis (UC) commonly undergo restorative proctocolectomy with ileal-pouch anal anastomosis (RP-IPAA). We sought to describe patient characteristics and postoperative outcomes in this patient population.
Methods: Using the National Surgical Quality Improvement Program-Pediatric Participant Use Files from 2012 to 2015, children who were 6–18 years old who underwent RP-IPAA for FAP or UC were identified. Postoperative morbidity, including reoperation and readmission were quantified. Associations between preoperative characteristics and postoperative outcomes were analyzed.
Results: A total of 260 children met the inclusion criteria, of which 56.2% had UC. Most cases were performed laparoscopically (58.1%), and the operative time was longer with a laparoscopic versus open approach (326 [257–408] versus 281 [216–391] minutes, $p = 0.02$). The overall morbidity was 11.5%, and there were high reoperation and readmission rates (12.7% and 21.5%, respectively). On bivariate analysis, preoperative steroid use was associated with reoperation (22.5% versus 10.9%, $p = 0.04$). On multivariable regression analysis, obesity was independently associated with reoperation (odds ratio: 3.34 [95% confidence intervals: 1.08–10.38], $p = 0.04$).
Conclusions: Children who undergo RP-IPAA have high rates of overall morbidity, reoperation, and readmission. Obesity was independently associated with reoperation. This data can be used by practitioners in the preoperative setting to better counsel families and establish expectations for the postoperative setting.
Type of Study: Retrospective Comparative Study.
Level of Evidence: Level III.

Patients with familial adenomatous polyposis (FAP) or ulcerative colitis (UC) are often managed with restorative proctocolectomy with ileal pouch anal anastomosis (RP-IPAA) [1–4].

FAP is an autosomal dominant disease that results in increased incidence of colorectal cancer due to mutations with various penetrance in the tumor suppressor *APC* gene [5–7]. Individuals with FAP develop colonic polyps early in childhood that inevitably progress to colorectal malignancy [8,9]. Total abdominal colectomy with or without proctectomy is indicated in these patients to prevent the development of colorectal adenocarcinoma.

UC is an inflammatory bowel disease presenting in a bimodal age distribution [10]. About 20% of patients are diagnosed during childhood and the disease is generally more severe in this patient population [11–13]. Medical management is the first line therapy; however, indications for surgical intervention include toxic megacolon, perforation, medically intractable disease, severe bleeding, and for cancer prevention [10,12].

Although there is an extensive body of literature in adults focusing on RP-IPAA for these diseases, there is a paucity of data on surgical outcomes in pediatric patients. Most reports in the literature are limited to single-institution studies or meta-analyses, limiting their generalizability [14–18]. Therefore, the aim of this study was to describe short-term outcomes in children who undergo RP-IPAA in order to better understand characteristics of patients who undergo this operation, and to find whether there are any significant differences in outcomes between children undergoing RP-IPAA for FAP or UC.

Abbreviations: RP-IPAA, Restorative proctocolectomy with ileal pouch anal anastomosis; UC, ulcerative colitis; FAP, familial adenomatous polyposis; ACS, American College of Surgeons; NSQIP-P, National Surgical Quality Improvement Program-Pediatric; PUF, Participant Use Files; CPT, Current Procedural Terminology; ASA, American Association of Anesthesiologists; BMI, body mass index; LOS, length of stay; OR, Odds ratio.

☆ Disclosure Information: The authors have no relevant disclosures.

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https://doi.org/10.1016/j.jpedsurg.2018.02.075
0022-3468/

1. Methods

1.1. Data and population

Data were extracted from the American College of Surgeons (ACS) National Surgical Quality Improvement Program-Pediatric (NSQIP-P) Participant Use Files (PUFs) from 2012 to 2015. Presently, the NSQIP-P collects 30-day postoperative outcomes in over 100 hospitals in the United States and Canada. Data in the NSQIP-P is collected by chart review by trained clinical reviewers who use standardized definitions of comorbidities and outcomes. Data collected in this database include patient characteristics, comorbidities, preoperative and intraoperative details, and 30-day postoperative morbidity and mortality [19–21].

Patients who underwent a RP-IPAA and who were 6–18 years old were identified using Current Procedural Terminology (CPT) codes 45113, 44158, 44158, 44187, 44626, 45110, 45119, 45120, 45397, and 44211. We chose 6 years as the lower age cutoff in order to exclude patients who were more likely to be undergoing RP-IPAA for congenital diagnoses. Patients who underwent laparoscopic surgery were identified using the 44211 and 45397 CPT codes, or the laparoscopic variable designation in the NSQIP-P PUF.

1.2. Covariates and outcomes

Demographic data (patient age, gender, race, and ethnicity), preoperative diagnosis (FAP or UC), and comorbidities (hematologic or bleeding disorder, use of immunosuppressant medications or presence of immune disease, history of cancer, cardiac risk factors, impaired cognition, American Association of Anesthesiologists (ASA) class, obesity (defined as body mass index (BMI) greater than or equal to 30), and other preoperative characteristics (inpatient status, transfusion within 48 hours prior to surgery, recent weight loss, nutritional support at the time of surgery, preoperative albumin, etc.) were extracted from the NSQIP-P PUFs. BMI was calculated using the weight and height variables recorded in NSQIP. Operative details including case type (elective, urgent, or emergent), surgeon specialty (pediatric versus general surgeon) and operative approach (laparoscopic versus open) were also analyzed. Primary outcomes that were evaluated included operative time, composite morbidity, length of stay (LOS), readmission, reoperation, and mortality. Composite morbidity was defined as having any of the following complications: surgical site infection, wound disruption, pneumonia, unplanned intubation, deep vein thrombus, pulmonary embolism, renal failure/insufficiency, urinary tract infection, cardiac arrest, transfusion greater than 25 mL/kg in first 72 hours, ventricular tachycardia, coma, seizures, sepsis, reoperation, and central line associated bloodstream infection. Reoperation was classified as an adverse event if it appeared to be unplanned (for example, stoma closure was not classified as an adverse event). Readmission included both related and unrelated admissions. Any observations with missing variables were classified as "unknown" and omitted from the multivariable regression.

1.3. Statistical analysis

The primary independent variables of interest were diagnosis (FAP versus UC), obesity, and preoperative steroid use. Associations between these variables in addition to other patient characteristics, operative details, and postoperative morbidity were tested. Chi-squared or Fisher's Exact test were used for categorical variables and Mann–Whitney *U* test for continuous variables. Multivariable logistic regression analysis was used to identify independent risk factors that were associated with composite morbidity, readmission, and reoperation. All statistically significant variables associated (defined as $p < 0.05$) on the bivariate analysis, as well as clinically important variables, were included in the multivariable regression models, and backward stepwise regression was used.

2. Results

Using the NSQIP-PUFs from 2012 to 2015, a total of 260 patients were identified who underwent RP-IPAA. A total of 146 (56.2%) patients had UC, 93 (35.8%) patients had FAP, and the diagnosis was unknown in 21 (8.1%) patients. Demographic patient data and preoperative patient characteristics are included in Table 1. Of note, 134 (51.5%) were female, 215 (82.7%) were white, and, at the time or surgery, 83 (31.9%) patients were 6–12 years old and 177 (61.8%) were 13–18 years old. The majority of cases (151 patients or 58.1%) were performed laparoscopically.

Table 1
Demographic data and preoperative characteristics of patients included in this analysis.

	n (%)
Gender	
Male	126 (48.5)
Female	134 (51.5)
Age	
6–12 years old	83 (31.9)
13–18 years old	177 (68.1)
Race	
White	215 (82.7)
Black	24 (9.2)
Asian	5 (1.9)
Other	2 (0.8)
Unknown	14 (5.4)
Ethnicity	
Hispanic	24 (9.2)
Non-Hispanic	228 (87.7)
Unknown	8 (3.1)
Diagnosis	
Ulcerative Colitis	146 (56.2)
Familial Adenomatous Polyposis	93 (35.8)
Unknown	21 (8.1)
Hematologic or bleeding disorder	2 (0.8)
Immunosuppressant medications or immune disease	26 (10)
History of cancer	1 (0.4)
Cardiac risk factors	5 (1.9)
Impaired cognition	4 (1.5)
Preoperative steroid use	
Yes	40 (15.4)
No	220 (84.6)
History of recent weight loss	
Yes	5 (1.9)
No	172 (66.2)
Unknown	83 (31.9)
On nutritional support at the time of surgery	
Yes	8 (3.1)
No	252 (96.9)
Transfusion within 48 h prior to surgery	
Yes	2 (0.8)
No	258 (99.2)
BMI	
less than 20	104 (40.4)
20–24	63 (24.2)
25–30	56 (21.5)
greater than 30	21 (8.1)
Unknown	15 (5.8)
Albumin	
Greater than or equal to 3.5	13 (5.0)
Less than 3.5	61 (23.5)
Unknown	186 (71.5)
ASA class	
1	13 (5)
2	170 (65.4)
3	77 (29.6)
4	0
5	0
Laparoscopic approach	151 (58.1)
Type of operation	
Pouch plus proctocolectomy	200 (77)
Pouch plus proctectomy	60 (23)
Surgeon specialty	
Pediatric surgeon	234 (90)
General surgeon	26 (10)

BMI – Body mass index, ASA – American Society of Anesthesiologists.