Participation of Colon and Rectal Fellows in Robotic Rectal Cancer Surgery: Effect on Surgical Outcomes

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OBJECTIVES: To determine whether involvement of colon and rectal fellows has an effect on short-term surgical and oncological outcomes in robotic rectal cancer surgery.

PATIENTS AND METHODS: From a dataset of 263 robotic-assisted rectal cancer operations, 114 case-matched patients over a 5-year period (January 2010-December 2015) were included in the study. Patients who underwent resection with and without fellow involvement were compared. Cases were matched according to age, body mass index, neoadjuvant therapy, and tumor location. Intraoperative, postoperative, and pathological outcomes were compared between the 2 groups.

RESULTS: There was no difference in tumor grade, type of surgical procedure, presence of an anastomosis, or diverting stoma between groups. In addition, there was no difference in the incidence of intraoperative or postoperative complications between the 2 groups. Estimated blood loss was higher in the fellow group compared to the consultant group (mean difference of 70 mL, $p = 0.007$). For pathological outcomes, there was no difference in surrogate oncological quality indicators, specifically margin positivity and lymph node yield, between the 2 groups. Furthermore, fellow involvement did not adversely affect operative time.

CONCLUSION: This study demonstrates that equivalent short-term surgical and oncological outcomes can be achieved with colorectal fellow participation in the field of robotic-assisted rectal cancer surgery. (J Surg Ed ▮:▮▮▮-▮▮▮. Published by Elsevier Inc on behalf of the Association of Program Directors in Surgery)

KEY WORDS: robotic surgery, training, colorectal fellowship

COMPETENCIES: Practice Based Learning and Improvement, Patient Care, Professionalism

INTRODUCTION

With recent optimization and standardization of robotic total mesorectal excision (RTME) technique, an increasing number of specialist colorectal centers will offer a robot-assisted approach in the surgical management of rectal cancer. Several studies have confirmed feasibility with comparable postoperative and oncologic outcomes.[1,2] Long-term results from the multi-institutional randomized controlled RObotic Versus LAparoscopic Resection for Rectal Cancer trial are awaited, but interim results demonstrate equivalent surgical and oncological outcomes when compared to current surgical techniques.[3]

As robotic colorectal surgery becomes more widely practiced, there will be a necessity to train residents and fellows in robotic techniques. Although many urologic and gynecologic programs incorporate robot-specific training early in residency, it has yet to become widely adopted in general surgery or colon and rectal training programs. Emerging data suggest that the learning curve for RTME is shorter than that for laparoscopic TME.[6] Simulation studies have demonstrated faster skills acquisition times for robotic surgery compared to laparoscopy.[4] In surgeons with laparoscopic surgical experience, it is estimated that robotic proficiency can be obtained after 15 to 25 cases.[5,6] Even for novice laparoscopic surgeons, the learning curve has been shown to be in the region of 25 to 30 cases.[7]

Robotic rectal cancer surgery is being performed with increasing frequency across our enterprise health care system. One of Mayo Clinic's sites hosts an Accreditation Council for Graduate Medical Education (ACGME) colon

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and rectal fellowship program. The fellowship program has had an evolving robotic curriculum for the past 5 years with the goal of achieving proficiency in robotic techniques for colorectal procedures. Little is known about the effect trainees have on surgical outcomes for specific procedures, especially when new technology is introduced into a surgical practice. Two of Mayo Clinic's enterprise sites commonly perform robotic colon and rectal surgery, and only 1 site uses fellows, which allows us the opportunity to assess how the presence of colon and rectal fellows affect short-term robotic rectal cancer outcomes. Therefore, we sought to determine whether involvement of colon and rectal fellows in robotic rectal cancer surgery has an effect on surgical and surrogate oncological outcomes when compared to a similar practice that does not include colon and rectal fellows.

METHODS

From a dataset of 263 robotic-assisted rectal cancer operations, 114 case-matched patients over a 5-year period (January 2010-December 2015) were included in the study. Patients were recruited from 2 Mayo Clinic sites (Jacksonville, Florida and Rochester, Minnesota). Mayo Clinic Rochester has an ACGME-accredited colon and rectal fellowship where fellows are involved in all robotic rectal cancer cases. At Mayo Clinic Florida, there is no colon and rectal fellowship, and all robotic rectal cancer cases were performed solely by consultant surgeons. All surgeons involved in this study are board-certified colon and rectal surgeons and had completed at least 50 laparoscopic pelvic cases and 10 mentored robotic cases. The first 10 cases for each surgeon were excluded to account for the expected learning curve. All operations were performed with the da Vinci Si or Xi Surgical System (Intuitive Surgical Corporation, Sunnyvale, CA).

Surgical Procedure

Robotic port placement was according to surgeon preference; however, a standardized medial-to-lateral approach was undertaken. High ligation of the inferior mesenteric artery and an oncological resection in the TME plane was performed in all cases. Splenic flexure mobilization was performed as necessary. All patients in both centers followed an enhanced recovery protocol that has been previously published.[8]

Robotic Curriculum

Colon and rectal fellows involved in the study are enrolled in the colorectal resident robotics training program, which is a collaboration between the Association of Program Directors in Colon and Rectal Surgery and American Society of Colon and Rectal Surgeons. The curriculum involves a combination of on-campus and off-campus training including online robotic courses and webinars as well as simulation and cadaver-based basic and advanced robotic courses. Over the course of 1 year, fellows are expected to complete a basic technology and clinical training stage as well as log a minimum number of cases and submit 2 full-length videos of robotic rectal surgery with TME.

Data Collection

Patient-related data were retrospectively reviewed through the electronic medical record and the National Cancer Data Base (NCDB). Institutional Review Board approval was granted for this study. Patient demographics analyzed included age, sex, body mass index (BMI), and American Society of Anesthesiology physical status (ASA). Preoperative data included history of prior abdominal surgery, rectal tumor location, and administration of neoadjuvant treatment. Operative data included type of procedure, operative time, estimated blood loss, presence of an anastomosis, and colonic diversion. Operative time was defined as skin incision to skin closure. Only cases in which the fellow spent more than 60% of the total operative time on the console in the role of primary surgeon were included. Fellows performed dissection and ligation of the inferior mesenteric artery as well as mobilization of the TME and stapling of the rectum. Procedures were not performed on a dual console; however, the consultant surgeon has the facility to give guidance by telestration (drawing on the screen that allows what is traced with a finger to be viewed by the person sitting at the surgeon's console).

Perioperative Data

Histopathologic data collected included the lymph node yield; proximal, distal, and circumferential resection margins; and pathological stage according to the Union for International Cancer Control (UICC) system. Postoperative outcomes included length of stay, 30-day complication, and readmission rates. Postoperative complications were recorded and categorized according to the Clavien-Dindo classification[9] with grades I and II considered as minor complications. All patients were placed on an enhanced postoperative recovery protocol.

Case Matching

Patients who underwent resection with fellow involvement (F) were compared to those who underwent surgery without fellow involvement (WF). Patients were matched according to age, BMI, neoadjuvant therapy, and tumor location. Intraoperative and postoperative outcomes were compared between the 2 groups.