The Challenge of Education in Colorectal Cancer Surgery: A Comparison of Early Oncological Results, Morbidity, and Mortality Between Residents and Attending Surgeons Performing an Open Right Colectomy

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OBJECTIVES: Ongoing education in surgical oncology is mandatory in a modern residency program. Achieving acceptable morbidity and mortality rates, together with oncological adequacy, is mandatory. The aim of the study was to compare early surgical outcomes in 2 groups of patients, those operated on by a surgical resident supervised by an attending surgeon and those operated on by 2 attending surgeons.

DESIGN: Data from consecutive patients with right colon cancer undergoing a right hemicolectomy were collected and analyzed. The patients were divided into 2 groups according to the surgeons' credentials: residents supervised by an attending surgeon and 2 attending surgeons. To evaluate the specific case mix of the 2 groups, the Portsmouth-Physiological and Operative Severity Score for enUmeration of Mortality and morbidity (P-POSSUM) was calculated. Observed over expected 30-day morbidity and mortality rates were compared for the 2 groups. The number of lymph nodes retrieved was chosen to determine oncological appropriateness. Duration of the procedures was also recorded.

RESULTS: From January 2008 to January 2012, 139 patients underwent an right hemicolectomy (76 resections performed by surgical residents and 63 by attending surgeons). Patient characteristics according to the P-POSSUM score and cancer stage were equivalent in the 2 groups. Observed over expected mortality and morbidity rates according to P-POSSUM were 0%/3.5% and 21.6%/40.5%, respectively, for the resident group ($p =$ nonsignificant, $p = 0.01$) and 4.7%/5.8% and 25.4%/42.9%, respectively, for the attending surgeons ($p =$ nonsignificant). The node count was 23.6 nodes for residents and 23.1 for the attending surgeons. The length of surgery was 159.9 minutes vs 159.4 minutes for residents and attending surgeons, respectively.

CONCLUSIONS: Surgical oncology training of residents by expert surgeons cannot put patient's safety at risk. Our study showed that oncological accuracy and the 30-day complication rate were equivalent to the standard of care in both groups. Duration of the procedure was not affected by the presence of a trainee. (J Surg 71:254-261. © 2014 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: surgical oncology, training, outcomes, lymph nodes, length of surgery

COMPETENCIES: Patient Care, Medical Knowledge, Professionalism, Practice-Based Learning and Improvement

INTRODUCTION

Modern medicine has dramatically changed over recent decades both in terms of treatment strategy and the technologies involved in patient care. Surgery is also changing faster and faster with the introduction of new equipments and devices. Despite recent trends, surgery still maintains an intrinsic "handcrafted" component. The ancient Greek word for surgeon, "χειρουργός" (*chirurgos*), meaning handmade work, is self-explanatory. This skill needs to be carefully developed in particular during residency training.

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Ongoing education in surgical oncology is mandatory in a modern residency program; in recent years, several models for achieving better surgical confidence and competence have been developed.[1] Nevertheless, "operating room (OR) experience" still remains the best option. In the OR, fully trained surgeons take the residents through procedures, giving them the greatest chance to improve their competence as well as offering direct feedback on what they are doing.[2]

Training surgeons is an exciting experience,[3] but it cannot be done without taking patient safety into serious consideration. Several studies have already demonstrated that the participation of residents in surgical procedures does not affect postoperative mortality and morbidity.[4,5] A study conducted by Mehall and et al.[6] has already demonstrated that complex procedures (i.e., laparoscopic left colectomy) are safe even when performed by senior surgical residents, but to our knowledge, no peer-reviewed studies have investigated the oncological features involved.

Despite the increasing widespread use of the laparoscopic approach, many surgical procedures are still performed with an "old-fashioned" laparotomy. An open right hemicolectomy (RHC) for colonic carcinoma is a well-established technique and is still extensively performed[7] worldwide. Surgical resection of the right colon is a standard operation during surgical training, and it is frequently one of the first steps for abdominal surgical oncologists. Achieving acceptable morbidity and mortality rates together with oncological adequacy is mandatory.

Lymph node (LN) count and analysis of the resection margins are accepted worldwide as indicators for delineating a radical surgical oncology procedure; retrieval and examination of at least 12 LNs during a colonic resection has been established as a quality indicator for colon cancer care.[8] The number of LNs evaluated can be affected by patient variability, neoadjuvant treatments (i.e., chemoradiation), and most of all, the surgical technique (low vs high ligation of the vascular pedicle).[9]

Thirty-day postoperative morbidity and mortality rates are the most frequently accepted parameters for the evaluation of operative safety.[10]

One major limitation of any "crude" morbidity and mortality determination is that it does not include the physiological conditions of the patient and the complexity of the procedures performed. For these reasons, the 30-day complication rate alone is inadequate for estimating the benefits and risks of an operation. In recent years, several risk-predicting scoring systems have been developed for the prediction of postoperative mortality and morbidity, based on individual patient conditions.

Of these systems, the Portsmouth-Physiological and Operative Severity Score for enUmeration of Mortality and morbidity (P-POSSUM)[11-13] and the ColoRectal-POSSUM[14] have been introduced, internationally validated, and adopted in a wide range of patients settings.[12,15-17] These tools can be used as performance indicators to allow comparison among individual surgeons, teams, departments, or hospitals.

The primary end point of the study was to compare oncological effectiveness, obtained with LN retrieval and resection margin analysis, between residents and attending surgeons performing an RHC for colonic carcinoma. The secondary end point was to analyze and compare the observed over expected (O/E) 30-day mortality and morbidity. The length of surgery in each group was also analyzed.

MATERIAL AND METHODS

All consecutive patients with right colon adenocarcinoma who underwent an open RHC in a single surgical unit of a teaching hospital were retrospectively analyzed for the study. The diagnosis was confirmed by preoperative or postoperative pathological examination. Only patients who underwent a formal RHC were analyzed; patients who had undergone palliative by-pass or diverting stoma procedures were not enrolled. Patients undergoing a minor surgical procedure (i.e., ventral hernia repair and cholecystectomy) associated with RHC were not excluded. Colon carcinoma was considered right sided when it was localized between the cecum and the proximal transverse colon.

Patients were additionally divided into 2 groups depending on surgeon credentials. The first group was composed of patients operated on by a surgical resident under the supervision of an attending surgeon (G.U. or G.R.). The second group was composed of patients operated on by the same 2 attending surgeons (all cases operated on by G.U. and G.R.). Surgical cases were defined as "performed by a resident" when the majority of the mobilization, resection, and ileocolonic anastomosis were performed by the trainee.

Data collection included age, gender, surgery setting (emergency vs elective), associated surgical procedure, type of anastomosis performed, American Society of Anesthesiology score, tumor node metastasis and stage, and hospital length of stay. The number of LNs retrieved and the resection margin status were documented by the final pathology report. The length of surgery was calculated by the official OR software currently in use in our hospital.

All patients underwent antibiotic prophylaxis before surgery, although no bowel preparation was carried out.[18] An RHC was performed using a midline laparotomy or a right transverse incision. Standard colonic dissection and resection were routinely performed as described by the Zollinger Atlas of surgery.[19] High vessel ligation of both the ileocolic (at the origin of the superior mesenteric artery) and the right colic arteries and veins was always performed. The proximal branch of the middle colic artery was also ligated and dissected, whereas the middle colonic artery was taken at its base only in cases of an extended RHC. When a side-to-side stapled ileocolonic anastomosis was performed, a 75-mm