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Colonoscopic localization accuracy for colorectal resections in the laparoscopic era

Raymond Yap, M.B.B.S., B.Med. Sci., F.R.A.C.S.*[,1], Damian Ianno, B.Med. Sci., Adele Burgess, M.B.B.S., F.R.A.C.S.

Department of Surgery, Austin Health, University of Melbourne, Melbourne, Victoria, Australia

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Abstract

BACKGROUND: Colonic resection is increasingly performed laparoscopically, where intraoperative tumor localization is difficult. Incorrect localization can have adverse surgical results. This has not been studied in laparoscopic resection. This study aimed to evaluate colonoscopic localization accuracy, contributing factors, and subsequent surgery.

METHODS: Retrospective review of patients who underwent colonic resection after colonoscopy between 2008 and 2013 at a single institution, with subsequent univariate and multivariate analysis.

RESULTS: Of 221 lesions identified, 79.0% were correctly localized. Nine (4.0%) incorrectly localized cases required changes in surgery. Two factors were significant on multivariate analysis: gastroenterology training and incomplete colonoscopy were associated with incorrect localization.

CONCLUSIONS: Colonoscopy is reasonably accurate at localizing lesions. Methods such as tattooing should be used, but error is still possible. Communication between endoscopists and surgeons is vital to minimize the risk of incorrect localization. Emphasis is needed during colonoscopic training of awareness and protocolization of colonoscopic position and methods to improve localization.

Worldwide cases of colorectal cancer in 2012 were estimated to be 1.361 million, with 694,000 deaths each year.[1] Colonoscopy is the primary method of detection of colorectal cancer, and a method of prevention through polypectomy. The sensitivity of detection of colorectal mass lesions is approximately 90% to 95%.[2] Precise colonoscopic localization can be difficult because of the lack of anatomical landmarks, even for the experienced endoscopist. The few previous studies looking at this question have quoted accuracy rates of 80% to 90%,[3–8] however, only one looked at the question with in regards to laparoscopic colorectal surgery and did not investigate possible reasons for incorrect localization.[5]

In an era when laparoscopic-assisted colonic resection is coming into vogue and its benefits versus open surgery[9,10] are clearer, preoperative localization of colorectal cancer has taken on greater importance. Unlike open surgery, where tumors can often be palpated, in the laparoscopic setting, unless the tumor is large or involving the serosal surface, the tumor may not be readily apparent and therefore necessitate intraoperative colonoscopy or open conversion, neither of which is desirable. In both cases, if the tumor is small, or has been colonoscopically removed, then it may be impossible to find again. Indeed a postal survey of laparoscopic surgeons in the United States found at 18 cases where the wrong segment of bowel had been removed.[11]

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* Corresponding author. Tel.: +61 2 9382 2222; fax: +61 2 9382 2890.
E-mail address: raymond.yap@health.nsw.gov.au

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[1] Present address: Department of Surgery, Prince of Wales Hospital, University of New South Wales, Barker St, Randwick, Sydney, 2031, Australia.

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Endoscopic tattooing greatly facilitates the detection of tumors intraoperatively, but sometimes cannot be seen if the dye is injected into the mesenteric side, the colon is adhered to the retroperitoneum or greater omentum.[11] Even with these caveats, there is no certainty that the lesion has been preoperatively tattooed in the first place.[12]

The purpose of this study is to evaluate the accuracy of preoperative colonoscopic localization. Furthermore, goals are to look at the factors leading to incorrect localization and the clinical sequelae of incorrect localization.

Methods

All patients in whom a mass lesion was diagnosed by colonoscopy and subsequently received a colonic resection at the Austin Hospital, Melbourne, Australia between 01/01/2008 and 31/12/2013 were eligible for this study. Patients who had colonoscopy performed at other centers or performed for reasons other than a mass lesion (eg, inflammatory bowel disease) were excluded from analysis.

A retrospective review of inpatient and outpatient records was performed to record demographic data, previous colon surgery, and indication for colonoscopy. Colonoscopic records are produced through an endoscopy software (ProVation MD, Minneapolis, MN). The intraoperative location was recorded by the surgeon on the operation report and used as the true location. These two were then compared as they were recorded, and also with any abdominal computerized tomography (CT) that was done. Endoscopic records were carefully reviewed to identify the endoscopists, endoscopists' level of training, use of sedation, quality of bowel preparation, completeness of the examination, duration of colonoscopy, use of endoscopic tattoo, and distance of mass from the anal verge. All fellows were accredited for colonoscopy and registrars and nurse endoscopists were supervised.

Lesion localization was ascribed to 1 of 9 segments (rectum, rectosigmoid, sigmoid, descending, splenic flexure, transverse, hepatic flexure, ascending, and cecum) within the large intestine spanning from the anus to the cecum. These positions were taken from what was recorded on both endoscopy and operation reports. We note that there is no agreed nomenclature for this but realized that the terms we have selected reflect the nature of our practice. In patients where more than 1 lesion was identified on colonoscopy, all locations were recorded and included in analysis. Operative notes were reviewed with the location of the lesion recorded, and any changes to the intended surgery documented.

In patients whom preoperative CT was performed, location according to CT was analyzed for accuracy and concordance. Only if the radiologist commented that, that a definite lesion was present was it recorded that a lesion was identified. Patient information was coded to remove identifying information during analysis. The data were analyzed with SigmaPlot 12.0 (San Jose, CA). Univariate analysis was performed with Mann-Whitney rank sum and chi-square tests where appropriate. Multivariate analysis was performed with logistic regression on variables identified to be significant on univariate analysis. A P value of less than .05 was deemed statistically significant.

Results

Of all, 210 patients were identified who had both colonoscopy and surgical resection done at our institution, by both gastroenterologists and surgeons. There were a total of 8 gastroenterologists and 6 surgeons involved. Of this, 11 patients had more than 1 mass lesion identified on endoscopy and therefore a total of 221 lesions were analyzed.

Table 1 gives the complete set of patient demographics, characteristics, and lesion location at colonoscopy. Patient mean age was 68.1 years (25 to 92); 130 (61.9%) were male. Most of the patients had not previously had colorectal surgery before colonoscopy (95.5%) and sedation during colonoscopy was used in all but 3 patients (98.6%). Average lesion size was 38.8 mm (5 to 185) and average duration of colonoscopy was 26.5 minutes (±13.9). Complete colonoscopy was achieved in 164 (74.2%) colonoscopies. Most of the incomplete colonoscopies were due an impassable tumor obstructing the lumen (49 of 57, 86.0%). One hundred fifty-two (72%) of the patients had a laparoscopic resection.

All patients underwent preoperative colonoscopic localization with discrepancies in endoscopic and operative locations given in Table 2 and Fig. 1. Of the 221 lesions identified at colonoscopy, 175 lesions matched the intraoperative location, making the accuracy of lesion localization with colonoscopy 79.2%. Forty-six lesions (20.8%) were nonconcordant. To note, no rectal lesions and few caecal (3 of 37, 8.1%) were incorrectly localized.

Table 3 compares concordant and nonconcordant patient groups and potential patient and colonoscopic factors that may influence accurate lesion localization at colonoscopy. There were 2 significant factors that influenced colonoscopic localization in our study which were an incomplete colonoscopy ($P = .005$) and endoscopist training with endoscopists with a surgical background being more likely to correctly localize a colonic lesion ($P = .026$) when compared with gastroenterologists. These were still significant after multivariate analysis ($P = .024$, $P = .028$, retrospectively). Although the background of the clinician proved to be significant, the level of training did not ($P = .18$). Prior colorectal resection was not significantly associated with error in localization (.74). No factors associated with the colonoscopy procedure itself (duration of colonoscopy, preparation quality), lesion size, comment on distance from anal verge, age, or gender were associated with nonconcordant lesions.

Of the 46 lesions where colonoscopy and operative location differed, 17 (37.0%) required changes to the intended surgery with reasons summarized in Table 4. Of those that surgery was changed, 9 of 46 (19.6%) had