

Location of colorectal cancer: colonoscopy versus surgery. Yield of colonoscopy in predicting actual location



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Bibliography

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ABSTRACT

Background and study aims Recent studies suggest that differences in biological characteristics and risk factors across cancer site within the colon and rectum may translate to differences in survival. It can be challenging at times to determine the precise anatomical location of a lesion with a luminal view during colonoscopy. The aim of this

study is to determine if there is a significant difference between the location of colorectal cancers described by gastroenterologists in colonoscopies and the actual anatomical location noted on operative and pathology reports after colon surgery.

Patients and methods A single-center retrospective analysis of colonoscopies of patient with reported colonic masses from January 2005 to April 2014 (n = 380) was carried. Assessed data included demography, operative and pathology reports. Findings were compared: between the location of colorectal cancers described by gastroenterologists in colonoscopies and the actual anatomical location noted on operative reports or pathology samples.

Results We identified 380 colonic masses, 158 were confirmed adenocarcinomas. Of these 123 underwent surgical resection, 27 had to be excluded since no specific location was reported on their operative or pathology report. An absolute difference between endoscopic and surgical location was found in 32 cases (33%). Of these, 22 (23%) differed by 1 colonic segment, 8 (8%) differed by 2 colonic segments and 2 (2%) differed by 3 colonic segments.

Conclusion There is a significant difference between the location of colorectal cancers reported by gastroenterologists during endoscopy and the actual anatomical location noted on operative or pathology reports after colon surgery. Endoscopic tattooing should be used when faced with any luminal lesions of interest.

Introduction

Colorectal cancer has been suggested to be a multi-pathway disease based on different biomolecular properties [1–3]. Some of these characteristics are more frequent in certain locations, such as high microsatellite instability in tumors of the right colon. Thus, there could also be differences in carcinogenesis and pathology between different parts of the bowel. For example, family history is more strongly associated with risk of proximal colon cancer than rectal cancer, and alcohol consumption is more strongly associated with risk of rectal cancer than colon cancer. Cancers in the proximal colon are more likely than cancers in the distal colon and rectum to be diagnosed in women and to be diagnosed at a later age [4]. Recent studies suggest that differences in biological characteristics and risk

factors across cancer site within the colon and rectum may translate to differences in survival. In particular, proximal colon cancer has been associated with poorer survival than distal colon cancer, but there appears to be little difference in survival for cancers arising in the distal colon versus rectum [5].

Colonoscopy is widely recommended for early detection and prevention of colorectal cancer based on observational and modeling studies [6]. However, it can be challenging at times to determine the precise anatomical location of a lesion with a luminal view during colonoscopy. We hypothesize in our study that there is a significant difference between the location of colorectal cancers described by gastroenterologists in colonoscopies and the actual anatomical location noted on operative and pathology reports after colon resection surgery.

► **Table 1** Demographic characteristics.

Variable	Frequency	Percent
Race		
▪ Caucasians	58	47.15
▪ African Americans	59	47.97
▪ Other	5	4.88
Gender		
▪ Female	68	55.28
▪ Male	55	44.72
Age (mean ± SD)	65.0 ± 12.7	

Patients and methods

We reviewed colonoscopy reports from January 2005 to April 2014 and identified those which described colonic masses. We reviewed pathology reports of biopsies taken from described masses and confirmed those reported as adenocarcinomas. We collected patient demographics including age, gender and ethnicity. We then revised operative reports and pathology reports from those patients that underwent surgical resection.

We compared findings between the location of colorectal cancers described by gastroenterologists during colonoscopies, the anatomical location noted on operative and pathology reports after colon surgery. We classified them according to the colonic segment reported: cecum, ascending colon, hepatic flexure, transverse colon, splenic flexure, descending colon, sigmoid colon, or rectum. Categorical variables were summarized using counts and percentages, and continuous variables were summarized using means and standard deviations. Three comparisons listed below were performed: 1. between the location of colorectal cancers described by gastroenterologists in colonoscopies and the actual anatomical location noted on operative reports by surgeons (endo-surgery); 2. between the location of colorectal cancers described by gastroenterologists in colonoscopies and the location noted by pathology (endopathology); and 3. Between the actual anatomical location noted on operative reports by surgeons and the location noted by pathology (surgery-pathology). The weighted Kappa coefficient was calculated, along with its 95% confidence interval, to estimate the agreement between the two strategies. Then, the absolute difference between the locations described by the two procedures was calculated for each tumor.

Results

We identified 380 colonic masses, of which 158 were confirmed adenocarcinomas. Of these 123 underwent surgical resection. We had a slight female predominance of 63 patients (55.3%) versus 55 males (44.7%). We had equal distribution between Caucasians, 58 (47%), and African Americans, 59 (48%) with 5 (5%) as other races. The mean age was 65 ± 12.7. A summary of the patient characteristics is shown in ► **Table 1**. Of these 123

► **Table 2** Location of colonic adenocarcinomas.

Colonic segment	Endoscopy	Surgery	Pathology
Cecum	18	13	30
Ascending	30	11	20
Hepatic flexure	9	8	3
Transverse	16	16	15
Splenic flexure	3	5	2
Descending	3	2	2
Sigmoid	21	18	19
Rectum	24	24	22
Total	124	97	113

cases, 27 had to be excluded since no specific location was reported on their operative or pathology report.

The location of colonic adenocarcinomas is summarized in ► **Table 2**. A total of 124 confirmed colon adenocarcinomas were found on endoscopy reports of 123 patients who underwent surgical resection. Two lesions were found in 2 different colonic segments in 1 patient. Ninety-six operative reports described the anatomical location of the colonic masses, 27 did not report a specific location. Of the 123 pathology reports reviewed, 112 of them were able to specify the colonic segment where the lesion was found.

The difference between endoscopic and surgical location was 33% (32 cases). When dividing the colon into 8 segments (cecum, ascending colon, hepatic flexure, transverse colon, splenic flexure, descending colon, sigmoid colon, and rectum), 64 cases (67%) had the same location by colonoscopy and the operative note, 22 cases (23%) differed by one colonic segment, 8 cases (8%) differed by two colonic segments and 2 cases (2%) differed by 3 colonic segments.

Overall, colonoscopic and surgical localization had an almost perfect agreement with a weighted Kappa coefficient of 0.843 (95% CI, 0.079–0.896) [7].

The difference in localization between endoscopic and pathology was 30% (34 cases). When dividing the colon into 8 segments (cecum, ascending colon, hepatic flexure, transverse colon, splenic flexure, descending colon, sigmoid colon, and rectum), 78 cases (70%) had the same location by colonoscopy and the pathology report, 26 (23%) differed by 1 colonic segment, 5 (4%) differed by 2 colonic segments, 2 (2%) differed by 3 colonic segments and 1 (1%) differed by 5 colonic segments.

Once again, the agreement between colonoscopy and pathology was almost perfect with a weighted Kappa coefficient of 0.862 (95% CI, 0.812–0.912) [7].

The difference in localization between surgery and pathology was 15% (13 cases). When dividing the colon into 8 segments (cecum, ascending colon, hepatic flexure, transverse colon, splenic flexure, descending colon, sigmoid colon, and rectum), 72 cases (85%) had the same location by the operative

note and the pathology report, 11 (13%) differed by 1 colonic segment, 1 (1%) differed by 2 colonic segments, and 1 (1%) differed by 3 colonic segments.

The agreement between surgery and pathology was almost perfect with a weighted Kappa coefficient of 0.938 (95% CI, 0.904–0.973). [7]

Discussion

We showed in our study that there is a 33% difference in the location of the colon mass as estimated by colonoscopy and the location seen by surgery. Fortunately, the majority of those differences (22%) are within 1 colonic segment, such as colonoscopy estimated to be in the sigmoid colon and surgery estimated to be in the descending colon. However, there were 8% and 2% where the difference was of 2 and 3 colonic segments respectively, which can affect the surgical planning completely. A surgeon may be told that the patient has a descending colon mass when in fact the patient had a transverse colon lesion, which would change the surgical planning completely.

There was also a 30% difference in localization comparing colonoscopy and the surgical pathological report. The great majority (23%) with one colonic segment difference but we observed one case (1%) with a 5-segment difference. It is unclear if this truly represents a difference or perhaps was a miscommunication between the endoscopist and the staff, such as someone stating “ascending colon” and the staff comprehending “descending”, a common occurrence.

We were also surprised to see a 15% difference between the surgical resection specimen and the pathological localization of the lesion. There also the majority of the cases (13%) differed by 1 colonic segment.

There have been several studies supporting the finding that colonoscopy alone is inaccurate to identify the location of the colon mass and should not be used alone for surgical planning, especially if one is planning a laparoscopic approach, where the surgeon cannot feel the colon to identify the mass [8–10]. Colonoscopy incorrectly localized the tumor in these studies between 6% and 21%. Marking of the lesions during colonoscopy, i.e. endoscopic tattooing, improved the surgical localization to 98%. Intraoperative colonoscopy also has a higher localization yield of 100%, however, it does increase the operative time [8]. Importantly, as mentioned above, the incorrect localization can change the surgical plan completely, which can adversely affect the patients [11–14]. Yap et al reported that 4% of his patients had the surgical plans altered secondary to incorrect localization. They identified on multivariate analysis that gastroenterology training and incomplete colonoscopy were associated with an error in localization of the lesion [10]. Shah et al, reported on the use of technique called magnetic endoscope imaging (MEI), where one can obtain an image of the colonoscope inside the patient and, therefore, estimate the location of the lesion within the colon based on the location of the colonoscope, 90% accuracy of the localization using MEI using barium enema as the gold standard, which is also far from ideal [15]. Furthermore, in a recent systematic review of the literature on the topic, Acuna et al proposed the colonoscopic tat-

toeing should be used for tumor localization as it has improved performance characteristics compared for magnetic endoscope imaging, radiological guidance, and pure colonoscopic guidance, improving the accuracy in approximately 5.9% with minimal side-effects [16]. Kanazawa et al, reported that tumor localization by CT colonography (CTC) seems to be superior to optical colonoscopy (OC) 90% vs. CTC at 98% ($P < 0.05$) and invasion depth assessment (OC, 55%; CTC, 73%; $P < 0.05$) [17].

Our study has several limitations. It is a retrospective single-center study in a safety net hospital where we currently do not offer specialized colorectal surgery care. Most of the surgical resections were performed by general surgeons. The colonoscopies were performed by trainees and faculty gastroenterologists. Our trainees perform several procedures independently with faculty support but attending gastroenterologists are always available to confirm cases, especially in the case of colonic masses. We need to acknowledge this as it may be the reason why our discrepancy is higher than the published literature. Many operative reports did not specify the location of the colonic masses, which negatively impact our number of endoscopic findings to compare. Some of the pathology reports were also limited in describing specific colonic segments where lesions were found, since gross colonic samples do not always include anatomic landmarks, making it difficult to determine the exact location of the mass within the colon.

Our study also has several strengths. It is the first one to our knowledge to compare the accuracy in localization among colonoscopy, surgery, and pathology. We were able to demonstrate that even when one compare pathological and surgical localization there is a small but not negligible difference in localization of 15%. We also further stratified the discrepancies and counted the number of colonic segments which can alter the surgical planning and affect patients' outcomes.

Conclusion

Our study reinforces the challenge that endoscopists face when estimating the location of colonic lesions with only a luminal view with limited anatomical landmarks. Based on the published literature, there should be routine use of methods to mark and identify anatomic locations of lesions, such as endoscopic tattooing, when one is confronted with a colonic mass or any endoscopic lesions of interest. Perhaps use of preoperative CT colonography in addition to colonoscopy with tattooing can minimize even more any localization discrepancy. Efforts should be made to improve endoscopic localization of lesions by endoscopists to accurately guide surgical planning and resection and to positively affect patient outcome.

Competing interests

None

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