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Most large colorectal polyps missed by gastroenterology fellows at colonoscopy are sessile serrated lesions

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ABSTRACT

Background and study aims Data on adenoma and sessile serrated lesion (SSL) miss rates for gastroenterology fellows during colonoscopy are limited. We aimed to describe the miss rate of fellows based on a second examination by a colonoscopist with a high rate of detection.

Patients and methods Second- and third-year gastroenterology fellows at a single, tertiary center performed initial examinations. A single experienced attending doctor then performed a complete examination of the colon. We recorded the size and pathology of all lesions found at both examinations and calculated the adenoma and SSL miss rates for fellows.

Results Ten trainees performed 100 examinations. Miss rates for conventional adenomas and SSLs were 30.5 % and 85.7 %, respectively. Among pre-cancerous polyps ≥ 10 mm, 10 of 14 lesions missed were SSLs.

Conclusions While conventional adenoma detection skills of gastroenterology fellows are acceptable, SSL detection is poor.

Introduction

Quantitative measurement of the detection skills of gastroenterology fellows performing colonoscopy is challenging. Fellows are typically supervised by attending doctors during colonoscopy; therefore, lesion detection generally reflects the combined detection efforts of a fellow and an attending [1].

One way to quantitatively assess detection skills is to allow the fellow to perform a complete examination of the colon with resection of all lesions detected and then to have the attending doctor perform a complete second examination of the entire colon. This allows calculation of a miss rate for the fellow. In our experience, using this tandem colonoscopy format is instructive for fellows. Tandem colonoscopy creates an increased appreciation for the challenges of detection during colonoscopy.

This approach can also lead to identification of specific weaknesses among individual fellows or within a group of fellows that could direct additional specific instruction designed to improve detection. In this report, we describe our experience with fellow miss rates and types of lesions not identified in 100 consecutive tandem examinations. The initial colonoscopy was performed by the fellow without interference by the supervising colonoscopist, and then followed by a second examination by a single expert colonoscopist with a known high detection rate for both adenomas and sessile serrated lesions (SSLs).

Patients and methods

The participating gastroenterology fellows were in their second or third year of training at a single major US academic institution. Fellows perform about 200 colonoscopies in their first year.

Ten different fellows performed the initial examinations. We conducted these examinations as an educational and quality control exercise. The Indiana University Institutional Review Board determined that oversight was not required for this data analysis. Patients were selected randomly for inclusion. Fellows were generally not instructed that their performance was going to be assessed in an individual patient. However, inclusion of the patient in the assessment was generally obvious to the fellow from the absence of detailed supervision by the attending doctor. Only cases in which the fellow examined and cleared the entire colon without comment or interruption by the attending doctor were included. In many patients, the attending doctor repeated segmental examinations by the fellow, but none of those patients were included in this report. The fellow was allowed to accept input from any technicians or nurses observing the examination, and all lesions detected by technicians and nurses were counted as detections by the fellow. After retroflexion in the rectum to complete the fellow's examination, either the fellow or the attending doctor reinserted the colonoscope to the cecum. Any lesion detected on the second insertion was counted as a miss for the fellow's examination, as was any lesion detected by the attending doctor on the second withdrawal. The same colonoscope, as well as any add-on attachment such as Endocuff Vision (Olympus Corp., Center Valley, Pennsylvania, United States), were used for both the first and the second examinations.

For each examination, we separately recorded the time for withdrawal (which included time for inspection, cleaning, and biopsy or polypectomy), and the size, shape, and location of each lesion as estimated by the endoscopist. Lesions of the same apparent histologic group and in the same section of the colon were placed in the same bottle for histologic examination in the first colonoscopy. This process was repeated in the second colonoscopy in separate bottles from the first colonoscopy. Lesions in the serrated class located in the rectosigmoid and ≤ 5 mm were noted by the first endoscopist and if detected at the second endoscopy, were not counted as missed lesions.

Outcome definitions

We measured the adenoma miss rate (AMR), defined as the number of conventional adenomas discovered by the attending doctor alone divided by the total number of conventional adenomas discovered during the procedure. Other measures included adenoma detection rate (ADR), defined as the proportion of colonoscopies in which at least one adenoma was found, and adenomas per colonoscopy (APC), defined as total number of adenomas discovered divided by total number of colonoscopies. Similar definitions were used for SSL miss rate, SSL detection rate (SSLDR), and SSL per colonoscopy (SSLPC). We accepted the clinical pathologists' diagnosis of adenoma, SSL, and hyperplastic polyp.

▶ **Table 1** Patient demographics, procedure indications and use of adjuncts during the procedure

Male gender	58
Age, mean (SD, range)	63.5 (11.3, 23–88)
Race	
▪ White	86
▪ Black	8
▪ Unknown/refused	6
Family history of CRC	24
Indication	
▪ Screening	15
▪ Surveillance	43
▪ Large polyp follow-up	25
▪ Previous CRC	7
▪ Therapeutic	5
▪ Cancer syndrome follow-up	4
▪ Diagnostic	1
Endocuff use	75
NBI use	13
Cap use	7

SD, standard deviation; CRC, colorectal cancer; NBI, narrow band imaging.
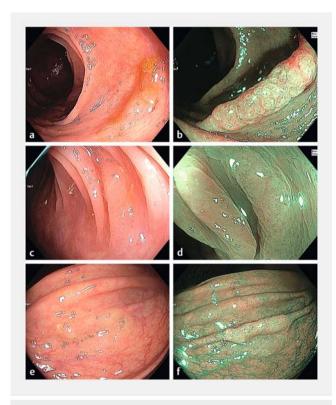
Statistical analysis

We report the descriptive characteristics of colonoscopy procedures, absolute number of lesions detected, fellow miss rates, and detection rates with 95 % confidence intervals (CIs). We used Jeffrey's binomial procedure to calculate the confidence intervals for proportions. We calculated confidence intervals for APC/SSLPC using standard error of the mean. Withdrawal times were compared using related samples Wilcoxon rank test. The level of significance was set at 0.05. All analyses were conducted using SPSS 27 (IBM, New York, United States).

Results

One hundred patients underwent tandem examinations. The average age of the cohort was 63.5 years (standard deviation [SD] 11.3) years and 58 were men. Eighty-six were white and 24 had a family history of colorectal cancer (▶ Table 1). ▶ Table 1 shows indications for the procedures along with the use of adjunct devices during the colonoscopy. The median Boston Bowel Preparation Scale score was 9 (interquartile range [IQR], 9–9). Median withdrawal time for fellows was 17.01 minutes (IQR, 12.2 to 25.0) compared with the attending, 8.36 minutes (IQR, 6.6 to 11.2) ($P < 0.001$). For examinations in which no polyps were removed, median withdrawal time for fellows was 12 minutes (IQR, 9.02 to 12.8) vs. 7 minutes (IQR, 4.4 to 8.5)

▶Table 2 Detection by fellow and attending doctor according to size and histology.

Pathology	Size range	Found by fellow		Additional lesions found by attending doctor		Total
		Splenic flexure or proximal	Distal to splenic flexure	Splenic flexure or proximal	Distal to splenic flexure	
Hyperplastic polyp	1–5 mm	32	48	15	46	141
	6–9 mm	2	15	5	12	34
	≥10 mm	0	1	0	1	2
Sessile serrated lesion	1–5 mm	3	0	7	1	11
	6–9 mm	0	0	4	2	6
	≥10 mm	1	0	7	3	11
Conventional adenoma	1–5 mm	118	35	50	26	229
	6–9 mm	30	18	6	7	61
	≥10 mm	8	3	3	1	15

▶Fig. 1 Three of the large (≥10 mm) sessile serrated lesions missed by gastroenterology fellows during colonoscopy. Each lesion is seen in white light (**a, c, e**) and narrow band imaging (**b, d, f**).

to 77.4). Fellows detected a SSL in three patients (95 %CI, 0.9 to 7.8). The attending doctor detected at least one SSL in 15 patients and the overall SSLDR was 18 (95 %CI, 11.4 to 26.4).

▶Table 2 shows the number of lesions detected in the first colonoscopy and the second colonoscopy according to histology and size. The overall miss rate for conventional adenomas was 30.5 % (95 %CI, 25.5 to 35.8) and for SSLs, 85.7 % (95 %CI, 69.5 to 95.0) (P < 0.001). The miss rate among lesions ≥10 mm was 26.7 % (95 %CI, 9.7 to 51.7) for conventional adenomas vs. 90.9 % for SSLs (95 %CI, 64.7 to 99.0) (P = 0.001). Ten of the 14 precancerous lesions ≥10 mm that were missed were SSLs. Fellows also missed one of two hyperplastic polyps ≥10 mm and half of 34 hyperplastic polyps 6 to 9 mm. SSLs were missed by seven different fellows with no SSL identified in the patients colonoscoped by the other three fellows. SSLs ≥ 10 mm were missed by six fellows with no SSL ≥ 10 mm identified in the patients colonoscoped by the remaining four fellows. **▶Fig. 1** shows three examples of SSLs missed by fellows in the study.

The fellows' APC rate was 2.12 (95 %CI, 1.4 to 2.8) vs. 3.05 (95 %CI, 2.2 to 4.0) for both examinations combined. The SSLPC of the fellows was 0.04 (95 %CI, 0 to 0.1) which increased to 0.28 (95 %CI, 0.1 to 0.4) for both examinations.

Discussion

In this study we found that second- and third-year gastroenterology fellows missed a significant percentage of conventional adenomas, and a striking percentage of SSLs. These data suggest that detection of SSLs may have a longer learning curve than detection of conventional adenomas. Previous studies have suggested that the degree of missing SSLs is higher among experienced endoscopists than the missing of conventional adenomas, particularly in the proximal colon [2, 3]. In addition, SSLs contribute disproportionately to interval cancers [4–9]. Our data suggest that the problem of missing SSLs is

for the attending doctor (P = 0.005). The mean number of first examinations per fellow was 10.

Fellows detected at least one conventional adenoma in 58 patients (95 %CI, 48.2 to 67.3). The attending doctor detected at least one conventional adenoma in 41 patients during the second examination and the overall ADR was 69 (95 %CI, 59.5

present during fellowship, and efforts to correct the problem should be undertaken during fellowship.

The overall miss rate for conventional adenomas in the study is not substantially different from that identified in previous tandem studies of colonoscopy. In two meta-analyses of tandem studies, an overall miss rate for adenomas of 22 % to 26 % was identified [10, 11]. It should be remembered that the absolute miss rate calculated for any detection method will be affected by the detection capacity of the second method. In this case, the second colonoscopy was performed in all cases by an endoscopist with a high detection rate for both adenomas and SSLs [12]. Given this, the miss rate for conventional adenomas by the second- and third-year fellows in this study is not out of line with previous miss rate studies of practicing endoscopists [13–16]. Further, the ADR recorded by the fellows as well as the rate of APC were both relatively high compared to previous studies, suggesting that the conventional adenoma detection skills of the fellows were acceptable for practicing endoscopists. Despite that, the detection of SSLs by gastroenterology fellows was quite poor.

We performed second examinations in this study as an instruction tool for gastroenterology fellows. Anecdotally, the fellows consistently felt that the exercise was valuable for impressing upon them the need to perform careful and detailed withdrawal examinations and to improve their recognition of the subtle lesions. Beyond the value for individual fellows, the exercise indicated the need to create an atlas of serrated class lesions for our gastroenterology fellows to study, to generally improve their skill in detecting these lesions [17].

The strengths of the study include that we performed a second exam of the entire colon rather than segments. Also, the second examination was performed by an endoscopist with a high rate of detection. Absolute rates of missed lesions by fellows could vary if second examinations are performed by multiple attendings with variable detection skills. Use of a single high-detecting attending to perform second examinations will elevate the observed miss rates, but does not diminish the central observation that SSL miss rates by fellows are high compared to AMRs. Limitations include the single-center design, which might limit generalizability.

It is possible that artificial intelligence (AI), which at this writing has just recently been approved by the Food and Drug Administration for use in the United States in clinical practice, will eliminate the need for careful training in lesion detection. This remains uncertain at this time. Some recent data suggest that current AI programs may sometimes have difficulty recognizing subtle SSLs [18].

Conclusions

In summary, we found through use of tandem examinations designed to improve fellow instruction that detection of SSLs by second- and third-year gastroenterology fellows was poor, and substantially worse than detection of adenomas. Special training in detection of SSLs is warranted for gastroenterology fellows, as well as testing of training methods to establish their efficacy.

Competing interests

REL does not have relationships to disclose.
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