

Repeat colonoscopy's value in gastrointestinal bleeding

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Abstract

AIM: To assess the diagnostic yield and clinical value of early repeat colonoscopies for indications other than colorectal cancer (CRC) screening/surveillance.

METHODS: A retrospective review of patients who had more than one colonoscopy performed for the same indication within a three year time frame at our tertiary care referral hospital between January 1, 2000 and January 1, 2010 was conducted. Exclusion criteria included repeat colonoscopies performed for CRC screening/surveillance, poor bowel preparation, suspected complications from the index procedure, and incomplete initial procedure. Primary outcome was new endoscopic find-

ing that led to an endoscopic therapeutic intervention or any change in clinical management. Clinical parameters including age, sex, race, interval between procedures, indication of the procedure, presenting symptoms, severity of symptoms, hemodynamic instability, duration between onset of symptoms and when the procedure was performed, change in endoscopist, withdrawal time, location of colonic lesions and improvement of quality of bowel preparation were analyzed using bivariate analysis and logistic regression analysis to examine correlation with this primary outcome.

RESULTS: Among 19 772 colonoscopies performed during the above mentioned period, 947 colonoscopies (4.79%) were repeat colonoscopies performed within 3 years from the index procedure. Out of these repeat colonoscopies, 139 patient pairs met the inclusion criteria. The majority of repeat colonoscopies were for lower gastrointestinal bleeding (88.4%), change in bowel habits (6.4%) and abdominal pain (5%). Among 139 eligible patient pairs of colonoscopies, only repeat colonoscopies that were done for lower gastrointestinal bleeding and abdominal pain produced endoscopic findings that led to a change in management [25 out of 123 (20.33%) and 2 out of 7 (28.57%), respectively]. When looking at only recurrent lower gastrointestinal bleeding cases, new endoscopic findings included 8 previously undetected hemorrhoid lesions (6.5%), 7 actively bleeding lesions requiring endoscopic intervention, which included 3 bleeding arterio-venous malformations (2.43%), 2 bleeding radiation colitis (1.6%), and 2 bleeding internal hemorrhoids (1.6%), 5 previously undetected tubular adenomas [4 were smaller than 1 cm (4.9%) and 1 was larger than 1 cm (0.8%)], 3 radiation colitis (2.43%), 1 rectal ulcer (0.8%), and 1 previously undetected right sided colon cancer (0.8%). Of the 25 new endoscopic findings, 18 (72%) were found when repeat colonoscopy was done within the first year after the index procedure. These findings were 1 rectal ulcer, 3 radiation colitis, 4 new hemorrhoid lesions, 3 previously undetected tubular

adenomas, and 7 actively bleeding lesions requiring endoscopic intervention. Of all parameters analyzed, only the interval between procedures less than one year was associated with higher likelihood of finding a clinically significant change in repeat colonoscopy (odds ratios of interval between procedures of 1-2 year and 2-3 year compared to 0-1 year were 0.09; 95%CI 0.01-0.74, $P = 0.025$ and 0.26; 95%CI 0.09-0.72, $P = 0.010$ respectively). No complications were observed among all 139 colonoscopy pairs.

CONCLUSION: There is clinical value of repeating a colonoscopy for recurrent lower gastrointestinal bleeding, especially within the first year after the index procedure.

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Key words: Lower gastrointestinal hemorrhage; Recurrent hemorrhage; Colonoscopy; Colonic disease; Diagnostic yield

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INTRODUCTION

Colonoscopy has emerged as the procedure of choice for evaluation of lower gastrointestinal bleeding, colorectal cancer (CRC) screening, and polyp surveillance due to its high diagnostic yield as well as its ability for therapeutic intervention. However, even though colonoscopy is generally safe, it is an invasive procedure that can rarely be complicated by perforation, hemorrhage, infection, and even death^[1-3]. Repeating a colonoscopy unnecessarily is therefore, not only time consuming and resource wasting, but can lead to undue harm.

While the intervals for repeating colonoscopy for CRC screening or for polyp surveillance are well described, the evidence for repeating colonoscopy for other indications such as recurrent lower gastrointestinal bleeding or abdominal pain is sparse and less clear^[4-7]. Previous studies have suggested early colonoscopy for acute lower gastrointestinal bleeding but management in recurrent episodes is not well standardized^[8-13]. Therefore, when patients who recently had a colonoscopy performed present with the same symptoms, the dilemma remains-should we or should we not repeat another colonoscopy?

The objective of this study is to retrospectively assess the diagnostic yield of repeat colonoscopy performed for the same indication within a three year time frame from the original procedure. An additional goal is to identify factors that may help predict when a repeat colonoscopy will produce a clinically significant change. We hypothesized that early repeat colonoscopy for recurrent lower

gastrointestinal bleeding would yield little clinical information beyond the original procedure.

MATERIALS AND METHODS

A retrospective review of patients who had more than one colonoscopy performed within a three year time frame from the time period including January 1, 2001 through January 1, 2010 for the same indication was conducted at our tertiary care referral hospital.

The reason for this three year time frame is because it is the shortest interval recommended for a repeat colonoscopy in individuals without a personal history of CRC/adenomatous polyps, a personal history of inflammatory bowel disease, or a family history of rare genetic diseases such as familial adenomatous polyposis and hereditary non polyposis colon cancer. We believe that the majority of our study population is similar to individuals described, who are average-risk individuals and individuals with family history of CRC/adenomatous polyps.

Exclusion criteria included; patients, whose repeat colonoscopies were done for CRC surveillance, repeat colonoscopy performed due to suspected complications from the initial one such as postpolypectomy bleeding, poor bowel preparation or incomplete first colonoscopy, and patients with missing data.

For eligible patients, data on age, sex, race, intervals between procedures, settings of the procedures (inpatient *vs* outpatient), whether the same endoscopist performed both procedures, a fellow's involvement in the procedure, indication for the procedures presenting symptoms, severity of symptoms, hemodynamic instability, duration between onset of symptoms and when the procedure was performed, findings of the procedures, completion of the procedure (whether cecal intubation was performed), pre-procedure diagnosis, post-procedure diagnosis, complications from the procedures, withdrawal time, location of colonic lesions, quality of bowel preparation, endoscopic intervention performed, and clinical management of the patients after the colonoscopies were collected. After colonoscopies with poor bowel preparation were excluded, the quality of bowel preparation was categorized using arbitrary scale into fair, good and excellent as judged and documented by the endoscopist who performed the procedure. Improvement of the quality of bowel preparation in the repeat procedure was noted and analyzed as one of the clinical parameters. All data were collected by two independent data collectors using one simple data collection form to avoid any collection bias.

Each of these clinical parameters was analyzed to evaluate the possibility of correlation between these variables and clinically significant change. "Clinically significant change" was defined as any new endoscopic finding that altered diagnosis, prognosis, management, or any change that required endoscopic intervention; a change in physical finding only was not considered a "clinically significant change".

This study has been approved by an institutional re-

Table 1 Demographic characteristics of study population (*n* = 139) (%)

Characteristics	Value
Age (yr), mean \pm SD (range)	68.2 \pm 15.2 (20-92)
Sex	
Male	55
Female	45
Race	
African-American	76
Caucasian	14
Hispanic	7
Asian	3
Indication of the procedures	
Lower gastrointestinal bleeding	88.4
Changes in bowel habit	6.4
Abdominal pain	5
Abnormal imaging studies	0.2
Endoscopist performing the procedures	
Same endoscopist	37
Different endoscopist	63
Fellow involvement	
No fellow involvement	48.8
Same fellow involvement	7.9
Different fellow involvement	43.3
Duration between procedures in days, mean \pm SD (range)	171 \pm 31 (3-1085)
Within the first year after the index procedure	45.3
Between 1-2 yr after the index procedure	17.3
Between 2-3 yr after the index procedure	37.4
Setting of the procedures	
Inpatient procedures	50.4
Outpatient procedures	28.4
Outpatient then inpatient setting	9.1
Inpatient then outpatient setting	12.1

view board for human research conduct.

Statistical analysis

The statistical analysis was performed using Statistics and Data, version 11.0 (College Station, Texas, United States). Odds ratios (ORs) were calculated by performing bivariate logistic regression analysis in order to evaluate the association between colonoscopy-related variables and clinically significant change. Statistical significance was set at *P* value of less than 0.05.

RESULTS

Among 19 772 colonoscopies performed during the above mentioned period, 947 colonoscopies (4.79%) were repeat colonoscopies performed within 3 years from the index procedure. Out of these repeat colonoscopies, majority of exclusions were poor bowel preparation (32.52%), different indications (20.48%), and CRC surveillance (17.74%). A total of 139 patient pairs of colonoscopies (1.41%) met the inclusion criteria.

Demographic data of the eligible patients are shown in Table 1. Among 139 eligible pairs of colonoscopies, 27 cases (19.42%) produced a “clinically significant change” as defined above. Only repeat colonoscopies that were done for lower gastrointestinal bleeding and abdominal pain produced endoscopic findings that resulted in a

change in management (25 out of 123 and 2 out of 7, respectively).

However, the number of colonoscopies performed for indications other than lower gastrointestinal bleeding was too small for statistical analysis (9 pairs of colonoscopies for change in bowel habits and 7 pairs of colonoscopies for abdominal pain). Therefore, we analyzed only those performed for recurrent lower gastrointestinal bleeding.

After excluding index procedures with poor bowel preparation, majority of the colonoscopies’ bowel preparation quality were documented using arbitrary scale. 22.0% were excellent, 22.8% were good, 19.9% were fair, and 2.8% were poor. 22.3% were documented as “adequate” and there was no comment on bowel preparation in 10.2% of the procedures.

Out of 123 pairs of colonoscopies done for recurrent lower gastrointestinal bleeding, 25 cases (20.33%) had new endoscopic findings on the repeat procedure that led to a change in management as shown in Table 2.

Of 25 new endoscopic findings, 18 (72%) were found from repeat colonoscopy within the first year after index procedure. These findings were 1 rectal ulcer, 3 radiation colitis, 4 new hemorrhoid lesions, 3 previously undetected tubular adenoma (all were less than 1 cm in size), and 7 actively bleeding lesions requiring endoscopic interventions.

Of all parameters analyzed, Only the interval between procedures less than one year was associated with higher likelihood of finding a clinically significant change in repeat colonoscopy (ORs of interval between procedures of 1-2 year and 2-3 year compared to 0-1 year were 0.09; 95%CI 0.01-0.74; *P* = 0.025 and 0.26; 95%CI 0.09-0.72, *P* = 0.010 respectively), as shown in Table 3. Analysis of correlation between clinical parameters and clinically significant change using either bivariate analysis or logistic regression analysis has shown the same result.

No complications were observed among all 139 repeat colonoscopies studied.

DISCUSSION

The results of this study showed that the diagnostic yield of repeat colonoscopies for recurrent lower gastrointestinal bleeding was 20.33%. Majority of the endoscopic findings were new hemorrhoid lesions, actively bleeding lesions that required endoscopic intervention, previously undetected tubular adenomas, and one cancer. This suggests that repeating colonoscopy for recurrent lower gastrointestinal bleeding appears to have clinical value.

We opted to include new hemorrhoid lesions in “clinically significant change” as they were potential source of bleeding and bear some differential diagnostic value. However, new hemorrhoid in endoscopic findings may be subject to reporting bias. Since documentation of retroflexion maneuver at the rectum was not available in all cases and hemorrhoids are not always of key interest during colonoscopy, it is possible that presence of small

Table 2 New endoscopic findings on the repeat colonoscopy that led to a clinically significant change (*n* = 25)

Findings	Description	Location
8 previously undetected hemorrhoid lesions (6.5%)	2 small hemorrhoid lesions 2 large hemorrhoid lesions	Rectum Rectum
7 actively bleeding lesions requiring endoscopic interventions (5.7%)	4 hemorrhoid lesions with no comment on size 3 arterio-venous malformations	Rectum 2 in ascending colon 1 in descending colon
5 previously undetected tubular adenomas (4.1%)	2 bleeding radiation colitis 2 bleeding internal hemorrhoids 4 smaller-than-1-cm tubular adenomas	Descending colon Rectum 1 in sigmoid colon, 1 in descending colon 2 in ascending colon
3 radiation colitis (2.43%)	1 larger-than-1-cm tubular adenoma	Ascending colon 2 in descending colon 1 in rectum
1 rectal ulcer (0.8%)		Rectum
1 previously undetected cancer (0.8%)	1 large ulcerated mass	Ascending colon

Table 3 Logistic regression analysis of correlation between clinical parameters and clinical significant change

Clinical parameters	Odds ratio	95%CI	P value
Gender (male as reference)	1.83	0.72-4.65	0.205
Age > 60 yr	0.47	0.17-1.28	0.138
Race			
Caucasian (reference)	1.00		
African-American	3.48	0.43-28.4	0.245
Asian	3.48	0.43-28.4	0.245
Hispanic	9.60	0.85-108.7	0.068
Interval between procedure			
< 365 d (reference)	1.00		
365-630 d	0.09	0.01-0.74	0.025
630-1095 d	0.26	0.09-0.72	0.010
Hospital setting			
Inpatient procedures (reference)	1.00		
Outpatient procedures	1.08	0.36-3.23	0.887
Outpatient then inpatient setting	1.26	0.36-4.34	0.718
Inpatient then outpatient setting	1.25	0.34-4.53	0.738
Presenting signs/symptom			
Hematochezia	4.31	0.94-19.7	0.059
Occult heme positive stool	0.64	0.13-3.13	0.583
Anemic symptoms	0.86	0.32-2.30	0.771
Hemodynamic instability	1.40	0.44-8.9	0.599
Location of diverticulosis			
Right-sided (reference)	1.00		
Left-sided	1.78	0.29-11.13	0.535
Pandiverticulosis	0.29	0.36-2.29	0.238
Improved quality of bowel preparation	0.84	0.33-2.17	0.725
Change in endoscopist	0.98	0.39-2.4	0.961
Fellow involvement	2.19	0.87-5.59	0.098
Duration between onset of symptoms and procedure more than 2 d	0.91	0.25-3.25	0.882
Withdrawal time more than 7 min	0.59	0.31-1.14	0.578

hemorrhoids may not be reported at the index colonoscopy.

Even though it is unlikely that previously undetected tubular adenomas were the source of bleeding, but their detection have led to a change in the patients' surveillance protocol, thus they were included in "clinically significant change" as well^[4-7]. However, as previous studies have reported rates of missing adenomas and/or cancer within 3

years as high as 2%-12%^[14-19], missing small polyps during repeat colonoscopy for lower gastrointestinal bleeding is even more likely and expected.

One case of new cancerous lesion within 3 year interval despite good bowel preparation in the index procedure is concerning, but is also not unexpected, especially in the right side colon^[20,21]. As interval cancers and advance adenomas have been described after screening colonoscopy, missing such lesions at the time of urgent colonoscopy during a lower gastrointestinal bleeding episode is understandable. In this case, the interval between procedures was 498 d. Shorter interval cancer detection after screening colonoscopy has been reported^[14,15,22-24].

Logistic regression analysis of clinical parameters showed that the interval between procedures was the only predictive factor for a clinically significant change in repeat colonoscopies. An interval between procedures of less than one year was more likely to find any clinically significant change.

Actively bleeding lesions were of key interest as they can not only reveal the cause of lower gastrointestinal bleeding but also can be promptly treated by endoscopic interventions. Interestingly, all 7 actively bleeding lesions were found in repeat colonoscopy performed within the first year of the index procedure. The reasons for this are unclear. However, severity of bleeding on clinical presentation did not have any significant association with a clinically significant new endoscopic finding, as shown in Table 3.

The decision to repeat colonoscopy should be individualized by clinical judgment on a case-by-case basis. However, since the repeat colonoscopies within the first year after the index procedure have significantly higher yield than remote procedures, we propose that threshold to repeat colonoscopy when bleeding recurs within the first year should be lower than those who rebleed after the first year.

As previously undetected tubular adenomas and cancer were found in a small but potentially important number of patients (4.1% and 0.8%, respectively), we suggest that a colonoscopy performed for lower gastrointestinal

bleeding should not be a substitute for a screening colonoscopy.

Improvement in quality of bowel preparation did not have any statistically significant correlation with clinically significant change. However, this study is limited by small sample size and the grading of the bowel preparation quality was subjective using arbitrary scale, which could be endoscopist-dependent. Even though, index procedures with poor bowel preparation were excluded, it is possible that small lesions could have been missed in good or fair bowel preparation. We suggest that in cases when the bowel preparation was sub-optimal, the decision to repeat colonoscopy should be individualized.

Majority of population included in this study were African-American (76%), who have the highest incidence of sporadic colorectal cancer^[25-27]. This may contribute to the higher rate of previously undetected tubular adenoma and colon cancer than anticipated found in this study. Generalization of these results to other ethnic group should be made with caution.

The reasoning behind the increase in diagnostic yield in repeating colonoscopy within the first year after the index procedure is unclear. Our study was limited by a retrospective design, single-center study, and a small sample size. Also, the number of repeat colonoscopy performed for indications other than recurrent LGIB such as abdominal pain, change in bowel habit, or diarrhea were too small to do any statistical analysis. Clinical use of repeat colonoscopy for these indications remains unknown. Further prospective studies with larger sample size are warranted.

In summary, the diagnostic yield of 20.33% and a low complication rate among repeat colonoscopies performed for recurrent lower gastrointestinal bleeding in our study, the benefit clearly outweighs the risk. These results suggest that there is clinical value of repeating a colonoscopy for this indication. We conclude that the answer to our question, when bleeding recurs, should colonoscopy be repeated, is yes.

COMMENTS

Background

Colonoscopy is the procedure of choice for evaluation of lower gastrointestinal disorder. While the intervals for repeating colonoscopy for colorectal cancer screening are well described, it is not known if repeating colonoscopy for other indications such as lower gastrointestinal bleeding is clinically useful. Moreover, repeating the procedure unnecessarily not only time consuming and resource wasting, but can lead to undue harm.

Research frontiers

Lacking new evidence to support the use of repeat colonoscopy, when patients who recently had colonoscopy preformed present with recurrent lower gastrointestinal bleeding, the dilemma remains-should people or should people not repeat another colonoscopy?

Innovations and breakthroughs

To date, there is no guideline to suggest the proper interval of repeat colonoscopy for the same indication other than for colorectal cancer screening and surveillance. With 20.33% of new endoscopic finding that led to a change in management, authors have validated clinical value of repeat colonoscopy for lower gastrointestinal bleeding. Interestingly, they also found the significant increase in diagnostic yield of early repeat colonoscopy within the first year of the

index procedure.

Applications

With high diagnostic yield of repeat colonoscopy for lower gastrointestinal bleeding, the authors proposed that when lower gastrointestinal bleeding recurs, colonoscopy should be repeated.

Terminology

Clinically significant change is defined as any new endoscopic finding that altered diagnosis, prognosis, management, or any change that required endoscopic intervention

Peer review

This is an interesting single-center retrospective study in which authors evaluate the diagnostic yield of repeat colonoscopy. The results suggest that there is clinical value in repeat colonoscopy for lower gastrointestinal bleeding. High diagnostic yield in the first year of index procedure is intriguing and should warrant further prospective studies.

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