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Is It Necessary to Intubate the Cecum to Examine the Whole Colorectum During Endoscopic Polypectomy?

Authors' Contribution:
Study Design A
Data Collection B
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Manuscript Preparation E
Literature Search F
Funds Collection G

BCDEF **Shuangzhe Yao**
AEF **Chao Sun**
AF **Tao Wang**
AF **Zhongqing Zheng**
AF **Bangmao Wang**

Department of Gastroenterology and Hepatology, Tianjin Medical University General Hospital, Tianjin, P.R. China

Corresponding Author: Bangmao Wang, e-mail: tjmughgi@hotmail.com
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Background: The official guidelines are unclear about whether endoscopic polypectomy should intubate the whole cecum or just intubate the location of the endoscopy inspection. Therefore, the objective of this study was to provide a new perspective of assisting endoscopists make better decisions and decrease the missing detection rate in clinical practice.

Material/Methods: We retrospectively reviewed records of 8923 patients who underwent endoscopic polypectomy, and 394 participants were included after screening by inclusion and exclusion criteria. We collected and analyzed data on the size, shape, and location of polyps and the clinical experience level of endoscopists in this retrospective study.





Results: Among the 394 cases, 152 (38.6%) had additional lesions detected through the second endoscopic polypectomy after the first colonoscopy was performed, showing statistically significant differences between the missing group and non-missing group on actual polyps ($P < 0.05$). No significant differences were detected between the 2 groups ($P > 0.05$) in age, sex, withdrawal time, and examination period. Regarding the location, 50.4% of the missing lesions were found on the relatively proximal colon of the detected polyps in the first colonoscopy. In addition, the level of experience of endoscopists was significantly different between the missing group and the non-missing group ($P < 0.05$).

Conclusions: The characteristics of polyps and the level of endoscopist experience play important roles in the detection of polyps in the colorectum. Moreover, it may be necessary to intubate the cecum to examine the whole colorectum during endoscopic polypectomy.

MeSH Keywords: **Adenoma • Colorectal Neoplasms • Endoscopy, Gastrointestinal**

Abbreviations: **CR** – colorectal cancer; **IBD** – inflammatory bowel disease; **PEG** – polyethylene glycol; **SPSS** – Statistical Package for the Social Sciences; **ADR-plus** – adenoma detection rate-plus; **ADR** – adenoma detection rate; **AMR** – adenoma miss rate; **AA** – advanced adenoma

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Background

Cancer statistics show that colorectal cancer (CRC) is among the top 5 in incidence and mortality among all malignant tumors in China, including 376 000 new cases and 191 000 deaths per year [1]. CRC is also the second leading cause of cancer-related deaths in the United States [2]. Therefore, CRC is a serious threat to human health and is one of the most common malignant tumors worldwide.

Colorectal polyps are protruded lesions on intestinal tract surface, and are closely correlated with CRC [3]. Endoscopic polypectomy is helpful to reducing CRC incidence and mortality [4]. In clinical practice, we often miss some lesions that are always found later in the process of endoscopic polypectomy. In addition, there are no clear explanations in official guidelines [5–7] explicitly explaining whether the endoscopic polypectomy treatment should intubate the cecum, or just intubate the location of the inspection. The present study may help endoscopists conveniently make correct decisions, with the purpose of decreasing the miss rate and increasing efficiency.

Material and Methods

Study population

A retrospective review of the endoscopic database from the Endoscopy Center at Tianjin Medical University General Hospital was conducted. Consecutive, average-risk patients aged 30–80 years who underwent colonoscopy and endoscopic polypectomy from 1 January 2016 to 31 December 2016 were included in this study.

Patients were excluded who had undergone a previous colorectal surgery, had inflammatory bowel disease (IBD), familial polyposis coli, or poor bowel preparation, or were receiving anticoagulation therapy, or were in a poor general condition (American Society of Anesthesiologists grade 3 or 4) [8], or had incomplete colonoscopies (i.e., the endoscope was not intubated the cecum by the first or second endoscopist), or pathologically-proved special type polyps (i.e., neuroendocrine tumor and gastrointestinal stromal tumor). Patients undergoing the first colonoscopy and the second endoscopic polypectomy by the same endoscopist were also excluded. This study was approved by the Institutional Review Board and Ethics Committee of General Hospital, Tianjin Medical University, and all of the patients provided written informed consent for their participation.

Colonoscopy procedure and preparation

Conventional white-light colonoscopies (CF-H260 series; Olympus, Tokyo, Japan) were the standard for all procedures.

The utilization of image-enhanced endoscopic techniques such as narrow-band imaging was at the discretion of the individual endoscopist. Bowel preparation was performed with a 2-liter polyethylene glycol (PEG) lavage that the patient consumed the night before the procedure if the colonoscopy was scheduled in the morning, or 2 liters of PEG in the morning if the colonoscopy was scheduled in the afternoon.

All participants underwent satisfactory bowel preparation for colonoscopy, excluding those who had poor bowel preparation (the valuation criteria are to be not able to detect lesions <5 mm [9]). Oral and written instructions for colonoscopy preparation and the importance of compliance were given by trained nurses. Participants were all given a contact number for any question about bowel preparation. Withdrawal time excluding time needed for polyp removal was also measured. All endoscopists spent at least 6 min for observation during withdrawal.

Demographics and clinical variables

Demographic data were collected, including patient age, sex, and whether it was a first-time or a second-time colonoscopy. The level of endoscopist experience, withdrawal time, and colonoscopy findings were collected as procedural data. Successful cecal intubation was confirmed by endoscopic pictures of the appendiceal orifice, with the surrounding cecal strap fold visible, and of the ileocecal valve [10]. We also collected data on missing polyps, including the size, shape, and location of the whole colorectum.

The level of endoscopist experience was divided into 3 grades: endoscopists with experience less than 5 years of experience were defined as junior-level endoscopists, those with 5–10 years of experience were defined as mid-level endoscopists, and those with over 10 years of experience were defined as senior-level endoscopists.

Statistical analysis

Descriptive statistics of patient characteristics and missing polyp characteristics were reported. Comparisons between groups were done by analysis of results of the Wilcoxon rank sum test and χ^2 tests, as appropriate. A two-sided *P* value <0.05 was considered to be significant.

Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS) software version 21.0.

Table 1. Demographics and clinical data of the missing group lesions.

	hyperplastic/inflammatory polyps	<1.0 cm adenomas	≥1.0 cm adenomas
Age, mean ±SD, y	58.27±9.94	60.59±10.58	53.25±16.62
Sex, Male/Female, n	36/20	53/39	2/2
AM/PM endoscopy, n	41/15	54/38	3/1
Overall, n (%)	56 (36.84)	92 (60.53)	4 (2.63)

Table 2. Comparing missing group with no missing group.

	Age, mean ±SD, y	Sex, n		Examination period, n		Actual polyps amount, mean ±SD (range), n	Withdrawal time, mean ±SD, min
		Male	Female	AM	PM		
Missing group	59.54±10.55	91	61	54	98	4.89±3.41 (2–21)	7.96±1.47
Non- missing group	57.81±11.35	132	110	81	161	3.53±3.27 (1–18)	8.05±1.51
<i>P</i>	0.106	0.284		0.697		0.000	0.438

Results

Participant characteristics

We included 8923 patients who underwent colonoscopy in the preliminary screening, and 631 of them underwent endoscopic polypectomy. Filtering by the inclusion and exclusion criteria detailed above, the remaining 394 participants underwent complete first colonoscopy and second endoscopic polypectomy performed by endoscopists (6 junior-level endoscopists, 10 mid-level endoscopists, and 8 senior-level endoscopists) were included in this study.

The mean age of the participants was 58.48±11.06 years and 66 of them (43.4%) were females. No serious adverse events occurred during all the first-time colonoscopy and the second endoscopic polypectomy.

Characteristics of patients with missing detection

Among the 394 cases, 152 (38.6%) had additional polyps detected by the second endoscopic polypectomy and we called them the missing group. The other 242 cases (61.4%) were referred to as the non-missing group.

Pathology of the missing polyps were the most serious. The missing group was divided into 2 types: hyperplastic/inflammatory polyps and adenomas (less than or greater than 1 cm) (Table 1).

Table 3. Distribution of all the missed polyps.

Location	N (%)
Rectosigmoid colon	117 (50.0)
Descending colon	29 (12.4)
Splenic flexure of colon	20 (8.5)
Transverse colon	21 (9.0)
Hepatic flexure of colon	13 (5.6)
Ascending colon	26 (11.1)
Cecum	8 (3.4)
Overall	234 (100)

Comparison of the 2 groups

Comparison of Wilcoxon rank sum test results between the missing group and non- missing group on actual polyps yielded statistically significant differences ($P<0.001$). However, there is no significant difference between the 2 groups ($P>0.05$) in age, sex, withdrawal time, and examination period (Table 2).

Characteristics of the missing detected lesions

Among the 394 patients, 234 missing lesions were detected, and 50.0% of the missing lesions were found in the rectosigmoid colon. The distribution of all the missing polyps is listed in Table 3. We found that 50.4% of all missing lesions were located in the relatively proximal colon of the detected polyps in the first colonoscopy. Pathologically, 43.1% of the missing

Table 4. Influence of The level-gap of endoscopists for omission.

Level of endoscopists	First colonoscopy <endoscopic polypectomy	First colonoscopy ≥endoscopic polypectomy	Total
Missing group, n	75	77	152
Non-missing group, n	94	148	242
Overall, n	169	225	394

lesions were hyperplastic/inflammatory polyps, and 54.7% were adenomas (<1.0 cm). We found that 91.8% of the missing lesions were flat.

The influence of physician experience level for omission

The levels of experience of the endoscopists were significantly different between the missing group and non-missing group ($P=0.04$) (Table 4).

Discussion

CRC has become a serious threat to human health [11]. Although CRC screening programs were initiated in the industrialized world, the risk of CRC development after a negative colonoscopy (defined as interval carcinomas) remains a problem [12]. It is estimated that ~3–9% of all CRCs are interval cancers and result from missing lesions, incompletely resected neoplasia, and/or new neoplasia [13].

Endoscopic polypectomy plays a significant role in reducing CRC incidence and mortality. However, there is no clear specific information in the official guidelines [5–7] on whether cecal intubation needs to be performed during endoscopic polypectomy.

The present study retrospectively analyzed data of patients who underwent endoscopic polypectomy from 1 January 1 2016 to 31 December 31. There were 394 patients included in this study after filtering by the inclusion and exclusion criteria. Among them, 152 cases with 234 missing polyps were detected by the endoscopic polypectomy, accounting for 38.58% of all cases. Limited to the actual clinical situation and retrospective nature, no data were obtained on whether the lesions in the whole colorectum were missed or not in the non-cecum intubation group. Viewed from the side, we found that 50.4% of the missing lesions were located in the relatively proximal colon (the mouth side) of the detected polyps in the first colonoscopy. Therefore, we believe that it may be necessary to intubate the cecum to examine the whole colorectum during the endoscopic polypectomy.

By comparing the missing group with the non-missing group, we found that patients with more lesions were more prone to

have missing detection. The age, sex, and examination period (morning or afternoon) of patients had no significant effect on the missing rate, suggesting that age, sex, and examination period are not crucial factors affecting accurate diagnosis. In terms of withdrawal time, all patients had more than 6 min of time, in accordance with guidelines, and it made no significant difference in outcome [14]. Thus, it can be seen that the endoscopic physicians should pay more attention to the patients who have more lesions during the treatment because of the potentially higher missing rate. However, this may also be due to the limitation of this study, which was not back-to-back. Apparently, the distribution of the lesions in the colorectal segment may be dispersed along with the increasing number of lesions. The endoscopists may observe the whole colorectum subconsciously in the overall process of endoscopic polypectomy in order to search for the polyps found in the first colonoscopy. No patients had fewer polyps and more missing polyps may be found during the second endoscopic polypectomy. But in turn, the concept of Adenoma Detection Rate-plus (ADR-plus) comes from the “one-and-done” problem.

The adenoma detection rate (ADR) was negatively correlated with the incidence of CRC, and was also negatively correlated with CRC mortality; with a 1% increase in ADR, cancer mortality rate was reduced by 5% [15]. However, the ADR is not a perfect metric as it only ascertains whether at least 1 adenoma is identified. Once the endoscopists found 1 adenoma, their attention may wane because they think they already have a good ADR; this could lead to missing neoplasia (a behavior called “one-and-done”). Therefore, we derived the ADR-Plus by calculating the mean number of adenomas found after the first examination in procedures in which 1 or more adenomas were detected. In this manner, ADR-plus is a true measure of incremental gain after the first adenoma is detected and is independent of the ADR itself [16]. In conclusion, with more polyps, instead of saying “one-and-done”, they should say “more and done” to increase detection of polyps. As a consequence, the endoscopists must intubate the cecum and watch for patients with multi-polyps found in the first colonoscopy.

In the present study, the great majority of missing lesions appeared as the flat form with small diameter. It worth noting that the location of the missing polyps is distributed in

each segment of the colorectum. A pooled analysis of 6 studies showed that adenoma the miss rate (AMR) did not vary by location [17].

It is important to note that 5 advanced adenomas (AAs) were totally missed in our study. AAs are defined as adenomas that are large (≥ 1 cm) or have advanced pathology ($>25\%$ villous components or high-grade dysplasia), and are associated with an even greater risk for developing CRC [9,18]. It strongly reflects the importance of cecal intubation in examining the whole colorectum during endoscopic polypectomy. Furthermore, all type of adenomatous polyps showed hyperplasia; therefore, follow-up monitoring of adenomatous polyps, especially advanced adenomas, will help to reduce the morbidity and mortality of CRC [19].

Finally, we found that the level of experience of endoscopists makes a significant difference in missing detection, suggesting that endoscopists with more experience will detect more polyps during the endoscopic polypectomy. Taking this one step further, under the circumstances mentioned above, it may be necessary to intubate the cecum to examine the whole colorectum during endoscopic polypectomy. This may help endoscopists in making a decision about whether they need to intubate the cecum once again in preparing for endoscopic polypectomy.

Many studies have shown that even in highly experienced colonoscopy services, moderate variation still exists between colonoscopists in terms of their ability to detect colorectal

adenomas and serrated polyps [16,20]. For example, a study of 6681 screening colonoscopies performed by 15 colonoscopists showed that the ADR varied from 17% to 47% [21]. A more recent study from the same group also found variation in ADR among colonoscopists, ranging from 16% to 46% [22]. However, there are very few studies about the distinction of AMR among endoscopists with varying levels of experience, and more such studies are clearly needed.

To avoid missed detection during clinical colonoscopy, endoscopists need to master skills such as insufflating air adequately, cleaning out all debris [23], carefully inspecting the area behind the folds, and changing the patient position for better viewing as necessary [24], especially with long withdrawal time [25].

Conclusions

The characteristics of polyps and the level of endoscopist experience play important roles in the detection rate of polyps in the colorectum. Moreover, it may be necessary to intubate the cecum to examine the whole colorectum during endoscopic polypectomy. However, more back-to-back clinical studies with larger sample sizes are necessary to further determine the best strategy for intubation location during endoscopic polypectomy.

Conflict of interest

None.

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