Will purposely seeking detect more colorectal polyps than routine performing during colonoscopy?

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Abstract

**Background & Goals:** We observed that the number of colorectal polyps found intraoperatively was often higher than that encountered preoperatively during elective colonoscopic polypectomy. To evaluate whether more polyps can be detected when they are purposely sought than when they are routinely examined during colonoscopy.

**Materials and methods:** Patients undergoing colonoscopy were randomized into groups A and B. Before colonoscopy was performed, endoscopists were instructed to seek polyps for group A purposely but not for group B. Polypectomy was electively completed. In groups A and B, the cases of elective polypectomy were named groups AR and BR, including groups AR-1 and BR-1, during the first colonoscopy and groups AR-2 and BR-2 during the second colonoscopy for polypectomy, respectively. The following data were calculated: the number of polyps detected (NPD) and the polyp detection rate (PDR) in all cases and the number of polyps missed (NPM) and partial polyp miss rate (PPMR) in the cases of colorectal polyps.

**Results:** A total of 419 cases were included in group A, 421 in group B, 43 in group AR, and 35 in group BR. No significant differences in PDR were found between groups A and B and in PPMR between groups AR-1 and BR-1 ($P < .05$), although PPMR in group AR-1 was higher than in group AR-2 ($P < .05$), similar results were found in PPMR between groups BR-1 and BR-2 ($P < .05$).

**Conclusion:** Purposely seeking for colorectal polyps did not result in more polyps detected compared with routine colonoscopy.

**Abbreviations:**

- ADR = adenoma detection rate
- AI = artificial intelligence
- BBPS = Boston bowel preparation scale
- ICC = interval colorectal cancer
- NPD = the number of polyps detection
- NPM = the number of polyps missed
- PDR = polyp detection rate
- PPMR = partial polyp miss rate
- SPD = the size of polyps detection
- SPM = the size of polyps missed

**Keywords:** colorectal polyps, colorectal cancer, screening colonoscopy

1. Introduction

Colorectal cancer usually originates from a small neoplastic polyp, which gradually increases in size and is accompanied by dysplasia and malignancy. Moreover, missed colorectal polyps in colonoscopy have been progressively recognized as a significant cause of interval colorectal cancer (ICC). Therefore, colorectal polyp detection rate (PDR) or adenoma detection rate (ADR) has gradually become an important parameter for evaluating the quality of colonoscopy. In the endoscopic clinical practice, obtaining the corresponding pathological data of all polyps is difficult; thus, PDR is a more practical approach compared with ADR. Therefore, improving PDR and decreasing polyp miss rate (PMR) have become our aims during colonoscopy. During elective colonoscopic polypectomy, we observed an interesting phenomenon: the number of colorectal polyps found intraoperatively was often higher than that encountered preoperatively. As such, we conducted the present study to determine whether more colorectal polyps can be detected by purposely seeking them compared with routine colonoscopy.
2. Materials and methods

2.1. Grouping and design

From August 9, 2016 to January 5, 2018, patients undergoing colonoscopy were randomized into groups A and B. In group A, the endoscopists were instructed to seek colorectal polyps purposely before performing colonoscopy. In group B, colonoscopy was performed without the above implications. In group A, patients with colorectal polyps for elective endoscopic removal were named as group AR, which was named as group AR-1 during the first colonoscopy. They were named as group AR-2 during the second colonoscopy for polypectomy. In accordance with the above rules, groups BR, BR-1, and BR-2 were named. This study was conducted with the approval of the Weihai Municipal Hospital Ethics Committee. Before the endoscopic procedures were initiated, every patient signed informed consent.

2.2. Inclusion and exclusion criteria

Cases involving emergency colonoscopy, inflammatory bowel disease, history of colorectal surgery, history of colorectal polyp resection, and less than 18 years of age were not enrolled. Colonoscopy cases that did not reach the ileocecal were also excluded.

2.3. Anesthesia

All explorations were performed under intravenous anesthesia with sufentanil followed by propofol. Loss of eyelash reflex indicated successful induction of anesthesia, thereby prompting the endoscopists to commence with the procedures. Colonoscopy and colonoscopic polypectomies were performed by 16 endoscopists.

2.4. Bowel preparation score

Boston bowel preparation scale (BBPS) was used to evaluate bowel preparation.[13–15]

2.5. Parameter acquisition

The following data were prospectively collected: sex, age, weight, height, single/double operating colonoscopy, BBPS, intubation time, withdrawal time, and the number and size of polyps. The characteristics of endoscopists included colonoscopy operation period, average annual colonoscopy cases, and total colonoscopy cases. The number of polyps detected (NPD) and the polyp detection rate (PDR) in all cases and the number of polyps missed (NPM) and partial polyp miss rate (PPMR) in the cases of colorectal polyp were calculated. PDR is defined as the number of cases of colorectal polyps found in every 100 cases of colonoscopy. PPMR is defined as the number of cases of partial polyps missed in every 100 cases of colorectal polyps. PPMR was obviously different from PMR. PMR is defined as the number of cases of colorectal polyps missed in every 100 colonoscopies. The actual total number of polyps in patients involves the number of polyps found pre-polypectomy and polypectomy intraoperatively.

2.6. Statistical analysis

Quantitative variables were expressed as mean ± standard deviation. The t-test was used for testing the significance between quantitative variables, and χ²-test was used to detect the significant differences between qualitative variables. Kolmogorov–Smirnov test was used to verify the normal distribution of quantitative data. Wilcoxon rank sum test was used for non-normally distributed data. P-value less than .05 was considered significant.

3. Results

3.1. General information

A total of 1390 patients met the inclusion criteria, and 550 patients were not included in the study. A total of 419 patients were enrolled in group A, 421 in group B, 43 in group AR, and 35 in group BR.

3.2. Patient features

No differences in terms of sex, age, weight, and height were found between groups A and B, groups AR-1 and BR-1, and groups AR-2 and BR-2 (P > .05). The above data are shown in Tables 1 and 4.

3.3. Endoscopists’ characteristics

In terms of endoscopist’s colonoscopy operation period, average annual colonoscopy cases, and total colonoscopy cases, no differences were found between groups A and B, AR-1 and BR-1, AR-2 and BR-2, AR-1 and AR-2, and BR-1 and BR-2 (P > .05, Tables 1 and 4).

3.4. Colonoscopy operation-related parameters

In terms of single/double operating colonoscopy, withdrawal time, and intubation time, no differences were observed between groups A and B, AR-1 and BR-1, AR-2 and BR-2, AR-1 and AR-2, and BR-1 and BR-2 (P > .05). No significant differences were

Table 1

| Gender | F | M | Age | Weight | Height | ECOP (min) | <5 | 5-10 | ≥10 | EAACC (n) | ETAC (n) |
|--------|---|---|-----|--------|--------|------------|----|------|-----|-----------|----------|
| Group A | 200 | 219 | 52.11 | 68.62 | 166.25 | 63 | 89 | 267 | 347 | 1733 |
| Group B | 192 | 229 | 52.29 | 67.73 | 166.34 | 54 | 94 | 273 | 342 | 1708 |
| Group AR1 | 20 | 23 | 55.56 | 71.92 | 167.33 | 4 | 7 | 32 | 335 | 1676 |
| Group BR1 | 20 | 15 | 53.26 | 73.86 | 168.83 | 3 | 5 | 27 | 383 | 1912 |
| Group AR2 | 20 | 23 | 55.56 | 71.92 | 167.33 | 3 | 6 | 32 | 366 | 1828 |
| Group BR2 | 20 | 15 | 53.26 | 73.86 | 168.83 | 2 | 4 | 29 | 402 | 2010 |

EAACC = endoscopist’s average annual colonoscopy cases, ECOP = endoscopist’s colonoscopy operation period, ETAC = endoscopist’s total colonoscopy cases.
found in BBPS between groups A and B, AR-1 and BR-1, and AR-2 and BR-2 (P < .05). However, significant differences were observed between AR-1 and AR-2 and BR-1 and BR-2 (P < .05, Tables 2 and 4).

### 3.5. PDR, NPD, SPD, PPMR, NPM, and SPM

No significant differences were observed in terms of PDR, NPD, and SPD between groups A and B; PPMR, NPM, and SPM between groups AR-1 and BR-1; and PPMR, NPM, and SPM between groups AR-2 and BR-2 (P < .05). PPMR in group AR-1 was higher than that in group AR-2 (P < .05), and similar results were found in PPMR between group BR-1 and BR-2 (P < .05). The differences in NPD, SPD, NPM, and SPM in AR-1 and AR-2 (P < .05) were not significant. However, significant differences were found in NPD, NPM, and SPM in BR-1 and BR-2 (P < .05). However, no significant differences were found in SPD between groups BR-1 and BR-2 (P < .05). The above data are shown in Tables 3 and 4. Besides, whether the diameter of the

### Table 2

The colonoscopy operation-related parameters in the studied groups.

| Group | CO (s) | DOC (min) | BBPS (score) | IT (min) | WT (min) |
|-------|--------|-----------|--------------|----------|----------|
|       | 0-3 | 4-6 | 7-9 | <5 | 5-10 | 10-20 | 20-30 | ≥30 | <6 | 6-9 | ≥9 |
| Group A | 128 | 291 | 27 | 233 | 159 | 125 | 194 | 76 | 18 | 6 | 146 | 139 | 134 |
| Group B | 110 | 311 | 25 | 209 | 193 | 129 | 188 | 64 | 13 | 7 | 171 | 128 | 122 |
| Group AR1 | 20 | 23 | 3 | 24 | 16 | 14 | 17 | 7 | 3 | 5 | 25 | 4 | 14 |
| Group BR1 | 13 | 22 | 5 | 18 | 12 | 6 | 20 | 8 | 1 | 0 | 8 | 15 | 12 |
| Group AR2 | 18 | 25 | 1 | 9 | 33 | 13 | 20 | 8 | 2 | 0 | 2 | 7 | 34 |
| Group BR2 | 14 | 21 | 0 | 7 | 28 | 10 | 19 | 5 | 1 | 0 | 2 | 8 | 25 |

BBPS = Boston bowel preparation score, CO = colonoscopy operation, DOC = double operating colonoscopy, IT = intubation time, SOC = single operating colonoscopy, WT = withdrawal time.

### Table 3

The polypectomy-related parameters in the studied groups.

| Variable | PDR | NPD | SPD | PPMR | NPM | SPM |
|----------|-----|-----|-----|------|-----|-----|
|          | <0.5 | 0.5-1 | ≥1 | <0.5 | 0.5-1 | ≥1 |
| Group A  | 41.77% | 501 | 157 | 204 | 140 | - |
| Group B  | 42.76% | 494 | 181 | 200 | 113 | - |
| Group AR1 | - | 137 | 30 | 38 | 69 | 44.19% |
| Group BR1 | - | 66 | 8 | 50 | 8 | 57.41% |
| Group AR2 | 202 | 23 | 65 | 114 | 9.30% | 7 |
| Group BR2 | 129 | 23 | 83 | 21 | 8.57% | 3 |

NPD = the number of polyps detection, NPM = the number of polyps missed, PDR = polyp detection rate, PPMR = partial polyp miss rate, SPD = the size of polyps detection, SPM = the size of polyps missed.
polyp was less or greater than 0.5 cm did not lead to significant differences in PDR between groups A and B in NPD and PPMR, NPM, and SPM between groups AR-1 and BR-1 (P > .05, Table 5).

### 4. Discussion

Colorectal polyps are rarely accompanied by symptoms before canceration other than occasional stool abnormalities. Therefore, current research focuses on increasing PDR and decreasing PMR during colonoscopy, thereby reducing the incidence of colorectal cancer and even ICC.[13–16]

Many studies have been conducted on colorectal polyps. Similarly, many instruments and technological innovations, such as the advent of endocuff,[17,18] third eye retroscope,[19,20] high-definition endoscopy,[21–23] full-spectrum endoscopy,[24–27] and a variety of chromoendoscopy,[28–30] have been developed to improve PDR, some endoscopists add a transparent cap in front of the colonoscope[31] or use water-aided colonoscopy.[32–34] In addition, a few reports have focused on the effects of bowel preparation on improving PDR.[35–39] Several studies have explored the correlation between the features of colonoscopy operators, including endoscopists and nurses, and PDR.[40–42] Besides, much research has been devoted to the control of withdrawal time.[43–50]

The above studies explored the objective factors related to colonoscopy. The results showed that several elements, such as adequate bowel preparation and withdrawal time of more than 6 minutes, have contributed to improving PDR.[40]

However, whether endoscopists subjectively affect PDR during colonoscopy and the different levels of focus of the operators that may cause different PDR are factors that must be considered. We often detect new polyps by chance in the second colonoscopy for a polyp was less or greater than 0.5 cm did not lead to significant differences in PDR between groups A and B in NPD and PPMR, NPM, and SPM between groups AR-1 and BR-1 (P > .05, Table 5).

#### Table 5

| Variable | Groups A vs B | Groups AR-1 vs BR-1 | Groups A vs B | Groups AR-1 vs BR-1 |
|----------|---------------|---------------------|---------------|---------------------|
|          | <0.5cm        | ≥0.5cm              | <0.5cm        | ≥0.5cm              |
| NPD      | Z = −1.256    | 0.209               | Z = −0.945    | 0.345               |
| PPMR     | –              | –                   | –              | –                   |
| NPM      | Z = 0.562     | 0.333               | Z = −0.945    | 0.345               |
| SPM      | Z = 1.000     | 0.467               | Z = −0.945    | 0.345               |

NPD = the number of polyps detected, NPM = the number of polyps missed, PPMR = partial polyp miss rate, defined as the number of cases of partial polyps missed in every 100 cases of colorectal polyps, SPM = the size of polyp polys missed.

In our single-center study, PDR and reduction of the rate of polyp missed diagnosis in colonoscopy were not improved by purposely seeking polyps. The current trend in colonoscopy research is artificial intelligence (AI), and its application may serve as a promising direction. We are also conducting research on this topic. We hope that AI can help us observe more colorectal polyps and nip more cases of colorectal cancer in the bud.

### Author contributions

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