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Targeting Withdrawal Time to 6 Minutes can Increase Polyp Detection During Colonoscopy

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Abstract

Objective: To investigate whether increasing the withdrawal time of the endoscope to 6 minutes during colonoscopy can improve the polyp detection rate by an individual endoscopist.

Materials and Methods: We reviewed the procedural data from routine colonoscopies performed in the physical examination department at Buddhist Dalin Tzu Chi General Hospital by a single endoscopist. Two-hundred and sixty-six consecutive patients who underwent colonoscopy from July to December 2006 constituted the "before" group (group 1). A second group of 266 consecutive patients who underwent colonoscopies from July through December 2007 served as the "after" group (group 2). In group 2, the endoscopist attempted to prolong withdrawal of the colonoscope to 6 minutes. The rate of polyp detection was then compared between the two groups.

Results: The withdrawal time was 4.2±1.1 minutes in group 1 and 5.7±1.6 minutes in group 2, respectively ($p<0.001$). More patients in group 2 had at least one polyp than those in group 1 (55.4% *vs.* 42.4%, respectively; $p=0.004$). More patients in group 2 also had at least one adenoma than patients in group 1 (33.9% *vs.* 23.7%, respectively; $p=0.010$). In addition, more adenomas were detected in group 2 than in group 1 (126 *vs.* 85, respectively; $p=0.038$).

Conclusion: Using proper inspection techniques, increasing the amount of time spent using the colonoscope could significantly increase detection rates of polyps and adenomas. (*Tzu Chi Med J* 2009;21(3):222–226)

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1. Introduction

Colonoscopy is now the primary screening test for colorectal neoplasms (1). Previous, researchers have shown that the incidence of colorectal cancer has been reduced by 76–90% following colonoscopy and polypectomy (2). However, the results from other researchers have shown a less significant effect or even no reduction on the incidence of colorectal cancer compared with reference populations (3,4). Part of this difference is attributed to variation in neoplasm detection using colonoscopy.

The results of previous studies have shown that existing polyps were not detected in 5–24% of patients undergoing colonoscopy [5,6]. The reasons for failing to find the polyps included inadequate bowel preparation, hidden location of the polyp, depressed or flat polyps, and, most importantly, suboptimal techniques used by the endoscopist [7]. In these studies, the polyp detection rates varied among different endoscopists. One of the most important factors involved in the detection rate was the amount of time taken to withdraw the colonoscope at the end of the procedure (withdrawal time). Barclay et al studied 12 endoscopists and found that those who had mean colonoscope withdrawal times longer than 6 minutes detected more adenomas than endoscopists who had mean colonoscope withdrawal times shorter than 6 minutes [8]. Simmons et al studied 43 endoscopists and found that longer scope withdrawal times were associated with higher polyp detection rates [9]. However, to the authors' knowledge, no study has examined how increasing colonoscope withdrawal time affects the polyp detection rate by an individual endoscopist. In our study, one endoscopist reported that targeting withdrawal time at 6 minutes improved his polyp detection rate.

2. Materials and methods

We reviewed procedural data from a single endoscopist (Dr Y.H. Hsieh)—all routine colonoscopies were performed in the physical examination department at the Buddhist Dalin Tzu Chi General Hospital. All patients were asymptomatic and underwent colonoscopy after being sedated with propofol. Patients from two periods were enrolled. Two-hundred and sixty-six consecutive patients who underwent colonoscopy from July to December 2006 constituted the "before" group (group 1). After the publication of the study by Barclay et al [8], Dr Hsieh decided to attempt to prolong the colonoscope withdrawal time, using 6 minutes as a goal. The additional time was spent examining the proximal sides of folds, suctioning and cleaning, and achieving adequate distention of the lumen [10]. The other 266 consecutive patients were examined from July to December 2007, and constituted the "after" group (group 2). The study was approved by the Institutional Review Board of Buddhist Dalin Tzu Chi General Hospital.

The endoscopist, Dr Hsieh, has a special interest in colonoscopic techniques and has been regularly recording his procedural data. The following procedure was used. One assistant nurse used two stopwatches to record the procedure times. When the colonoscope was first inserted into the rectum, the endoscopist told the nurse to start both watches. When the cecum was reached, the first watch was stopped and the cecal intubation time was recorded. When the scope was withdrawn from the anus, the second watch was stopped and the total procedure time was recorded. The withdrawal time was calculated by subtracting the intubation time from the total procedure time when no biopsy or polypectomy was completed. The assistant nurse would then immediately report the withdrawal time to the endoscopist.

Procedures were excluded from this analysis when the examination was incomplete (cecum not reached), the bowel preparation was inadequate, or when the patient had prior colonic resection.

Bowel cleansing was accomplished by asking the patients to ingest 45 mL of sodium phosphate at 5:00 PM the night before the procedure and a second dose at 10:00 PM. Propofol was administered by an anesthetist, as tolerated by cardiorespiratory parameters until the patient was asleep but rousable by shaking. Hyoscine butyl bromide 20 mg (Buscopan®; Boehringer Ingelheim GmBH, Ingelheim, Germany) and meperidine 25 mg were given intravenously immediately before the procedure to relax the colon and to improve patient tolerance. Colonoscopic examination was then performed using a standard colonoscope (CF 240I; Olympus Optical Company Ltd, Tokyo, Japan).

The following were analyzed: patient demographics (age, sex, weight, height), polyp detection, polyp size and location, cecal intubation time, total procedure time, propofol dosage, and adequacy of cleansing. Body mass index (BMI) was calculated as body weight by body height squared (kg/m^2). Polyp sizes were estimated at the time of colonoscopy by comparison with open biopsy forceps (6 mm) or the outer sheath diameter of a polypectomy snare (3 mm). Polyp size was classified into three categories: 1–5 mm, 6–10 mm, or >10 mm. Polyp location was classified by the endoscopist as the ascending (including the cecum) colon, transverse colon, descending colon, sigmoid colon, or the rectum. All pathology reports were reviewed to characterize the polyp histology (e.g. hyperplastic, adenomatous, malignant). The quality of bowel cleansing was classified by the endoscopist as: (1) good: dry colon or only a small amount of clear liquid; (2) fair: a large amount of clear liquid fluid or minimal solid stools; (3) poor: significant amount of solid residue; or (4) inadequate: when stool residue precluded complete insertion of the colonoscope.

Power calculations estimated that including 265 patients in each arm of the study would ensure an 80% power of detecting an increase in polyp detection rate of 40–53% (5% significance level, two-sided test). Statistical analysis was performed using SPSS (SPSS Inc., Chicago, IL, USA). All continuous variables were expressed as mean±standard deviation. Student's *t* test and an analysis of variance were used to compare continuous variables where appropriate.

The χ^2 test, with Yates' correction for continuity, was used for comparison of categorical data; Fisher's exact test was used when numbers were small. Logistic regression analysis was used for assessing the impact of other possible confounding variables on the polyp and adenoma detection rate. A p value of <0.05 was considered statistically significant.

3. Results

Sex, age, BMI, history of previous abdominal surgery, and adequacy of bowel preparation were similar in both groups (Table 1). The colonoscopy completion rates were 92.1% in group 1 and 94.4% in group 2, respectively ($p>0.05$). The cecal intubation time (5.8±2.7 minutes *vs.* 5.5±2.4 minutes; $p=0.169$) and total dose of propofol (13.2±3.9 mg *vs.* 13.2±4.5 mg, respectively; $p=0.986$) were comparable in both groups. The withdrawal time was 4.2±1.1 minutes in group 1 and 5.7±1.6 minutes in group 2, respectively ($p<0.001$). The total procedure time was also longer in group 2 than in group 1 (11.3±4.0 minutes *vs.* 12.4±3.2 minutes, respectively; $p<0.001$).

Of those who were intubated to the cecum, more patients in group 2 had at least one polyp than those in group 1 (55.4% *vs.* 42.4%, respectively; $p=0.004$) (Table 2). In addition, more polyps were found in patients in group 2 than in group 1 (250 *vs.* 185, respectively; $p=0.027$).

More patients in group 2 had at least one adenoma than those in group 1 (33.9% *vs.* 23.7%, respectively; $p=0.010$). Of those patients in group 1, 17.1% had one adenoma, 3.3% had two, and 3% had more than two. Of those in group 2, 24.3% had one adenoma, 5.6% had two, and 4.0% had more than two. In addition, more adenomas were detected among patients in group 2 than in group 1 (126 *vs.* 85, respectively; $p=0.038$).

We divided the adenomas according to their size into the following categories: <0.5 cm, 0.5–1.0 cm, and >1.0 cm. More adenomas <0.5 cm were found in group 2 than in group 1 (97 *vs.* 57, respectively; $p=0.012$). The number of adenomas that were 0.5–1.0 cm and >1.0 cm in size was similar in both groups.

The adenomas were also categorized according to their location in the colon. More adenomas were found in the transverse and sigmoid colon in group 2 than in group 1 (39 *vs.* 19 adenomas, respectively; $p=0.012$, and 28 *vs.* 13 adenomas, respectively; $p=0.046$). The number of adenomas found in the ascending colon, descending colon, and rectum were similar in both groups (Table 2).

The pathology of the polyps was correlated with their size. Of the 185 polyps detected in group 1, adenomas were detected in 37.0% (57/152) of polyps 1–5 mm, 85.2% (23/27) of polyps 6–10 mm, and 83.3% (5/6) of polyps >10 mm. Only two tubulovillous adenomas were found in patients in group 1; both were >10 mm. Of the 250 polyps in group 2 patients, adenomas were detected in 45.5% (97/213) of those 1–5 mm, 79.3% (23/29) of those 6–10 mm, and 75.0% (6/8) of those >10 mm. Of the five tubulovillous adenomas found in group 2, three were 5–10 mm and two were >10 mm. No cancer was detected in patients in either group.

Table 1 — Baseline characteristics of patients in both groups*

	Group 1 (n=266)	Group 2 (n=266)	p
Sex			0.183†
Male	96 (36.1)	112 (42.1)	
Female	170 (63.9)	154 (57.9)	
Age (yr)	51.8±10.6	53.6±10.7	0.057‡
Body mass index (kg/m^2)	24.2±3.6	23.9±3.5	0.321‡
Abdominal surgery			0.122†
Yes	69 (25.9)	53 (19.9)	
No	197 (74.1)	213 (80.1)	
Colon preparation			0.581†
Good	168 (63.2)	158 (59.4)	
Fair	78 (29.3)	82 (30.8)	
Poor	20 (7.5)	26 (9.8)	
Completion rate (%)	92.1	94.4	0.388†
Cecal intubation time (min)	5.8±2.7	5.5±2.4	0.169‡
Procedure time (min)	11.3±4.0	12.4±3.2	<0.001‡
Dose of propofol (mg)	13.2±3.9	13.2±4.5	0.986‡
Withdrawal time (min)	4.2±1.1	5.7±1.6	<0.001‡

*Data presented as n (%) or mean±standard deviation; †χ^2 test; ‡Student's t test.

Table 2 — Size and location of polyps found in both groups*

	Group 1 (n=245)	Group 2 (n=251)	p
Total number of patients with at least 1 polyp	104 (42.4)	139 (55.4)	0.004†
Total number of polyps	185	250	0.027‡
Total number of patients with at least 1 adenoma	58 (23.7)	85 (33.9)	0.010†
1 adenoma	42 (17.1)	61 (24.3)	
2 adenomas	8 (3.3)	14 (5.6)	
>2 adenomas	8 (3.0)	10 (4.0)	
Total number of adenomas	85	126	0.038‡
Size of adenoma (cm)			
<0.5	57 (67.1)	97 (77.0)	0.012‡
0.5–1.0	23 (27.1)	23 (18.3)	0.953‡
>1	5 (5.8)	6 (4.7)	0.804‡
Location of adenomas			
Ascending colon	24 (28.2)	26 (20.6)	0.851‡
Transverse colon	19 (22.3)	39 (31.0)	0.033‡
Descending colon	14 (16.5)	13 (10.3)	0.809‡
Sigmoid colon	13 (15.3)	28 (22.2)	0.046‡
Rectum	15 (17.6)	20 (15.9)	0.466‡

*Data presented as n (%); †χ^2 test; ‡Student's t test.

4. Discussion

In this study, we found that meticulous inspection techniques, combined with targeting the withdrawal time to 6 minutes, increased polyp and adenoma detection rates during colonoscopy.

Previously, two cross-sectional studies showed that endoscopists who used longer colonoscopic withdrawal times had higher polyp detection rates than those who used shorter withdrawal times. Barclay et al studied two endoscopists with a wide range of mean withdrawal times (3.1–16.8 minutes), and found that those with a mean withdrawal time of 6 minutes or more had higher rates of detecting any colonic neoplasia (28.3% *vs.* 11.8%, respectively; $p<0.001$) when compared with endoscopists with mean withdrawal times of less than 6 minutes [8]. Simmons et al analyzed the data of 43 endoscopists and found that those with longer mean withdrawal times had higher polyp detection rates ($r=0.76$; $p<0.0001$). These researchers suggested using a withdrawal time of at least 7 minutes [9].

However, two recent longitudinal time-based studies have shown contradictory results. Barclay et al used a digital stopwatch to enforce a minimum 8 minutes withdrawal time. In addition, all participating endoscopists were instructed to optimize their inspection techniques by using adequate insufflation, examining flexures and proximal sides of the haustral folds, and suctioning residual liquid [11]. They found that the overall adenoma detection rate among postintervention subjects was nearly 50% greater than that recorded in baseline subjects (34.7% *vs.* 23.5%, respectively; $p<0.0001$). In contrast, Sawhney et al found that implementing an institution-wide policy of colonoscopy withdrawal time >7 minutes had no effect on the rate of colonic polyp detection, despite nearly 100% compliance with the policy [12]. No attempt was made to change endoscopists' inspection techniques except with regard to withdrawal time in their study. It appears that both adequate withdrawal time and proper inspection techniques are needed for increasing the polyp defection rate.

In our study, we emphasized both optimal inspection techniques and adequate withdrawal time. We did not enforce a minimal withdrawal time. Instead, the 6-minute withdrawal time was used as a target, and the endoscopist was reminded of the time when the endoscopic nurse reported the withdrawal time after completion of each colonoscopy. This method was easy to implement and created a less contrived clinical context. The results showed that we increased the polyp detection rate by 13% and the adenoma detection rate by 11%, with only a 1.5-minute increase in the endoscope withdrawal time. Thus, in addition to using proper inspection techniques, a small investment in endoscope withdrawal time produced a larger yield.

Further analysis of the size of the adenomas showed that longer withdrawal time mainly increased the detection of smaller polyps (1–5 mm). Simmons et al also found that the association of withdrawal time and polyp detection rate decreased with larger polyps (>6 mm) [9]. It is possible that larger polyps are easier to locate and harder to miss. In addition, the relative rarity of larger polyps and the small sample size of our study made the detection of a statistically significant difference unlikely.

When we analyzed the locations of the polyps, we found that more polyps were detected in the

transverse and sigmoid colon when a longer withdrawal time was used. Because of their intraperitoneal location, the transverse and sigmoid colons are usually more tortuous than the ascending and descending colons, which are retroperitoneal (13). Thus, there are more bends and blind spots in these areas, especially when the colon is redundant. It may require more time to scrutinize these colon segments properly.

One limitation of our study was that the two groups were separated by 1 year. It might be suggested that the endoscopist found more polyps in group 2 because he had more experience after 1 year. However, in previous studies, greater endoscopist experience was not associated with a greater polyp detection rate. It was found that greater endoscopist experience was associated with a lower polyp detection rate (8,9).

In conclusion, with proper inspection techniques, a small increase in endoscope withdrawal time during colonoscopy could significantly increase both polyp and adenoma detection rates.

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