

## Regional center for complex colonoscopy: yield of neoplasia in patients with prior incomplete colonoscopy CME

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**Background and Aims:** Incomplete colonoscopy increases the risk of incident proximal colon cancer postcolonoscopy. Incomplete colonoscopy is often followed by barium enema or CT colonography. We sought to describe the yield of completion colonoscopy in a regional center for complex colonoscopy.

**Methods:** This is a retrospective cohort study of 520 consecutive patients referred to a single colonoscopist over a 14-year period for completion colonoscopy after a previous incomplete examination.

**Results:** Colonoscopy was completed to the cecum in 506 of 520 patients (97.3%). A total of 913 conventional adenomas was removed in 277 patients (adenoma detection rate 53.3%). There were 184 adenomas  $\geq 1$  cm in size or with advanced pathology. There were 525 serrated-class lesions removed in 175 patients, including 54 sessile serrated polyps in 26 patients and 41 hyperplastic polyps greater than 1 cm in 26 patients. Nine colorectal cancers were found. We estimated that approximately 57% of the conventional adenomas, 58% of the sessile serrated polyps, 27% of the hyperplastic polyps, and all 9 cancers detected by the completion colonoscopy were beyond the extent of the previous examination.

**Conclusions:** The yield of completion colonoscopy in a cohort of patients with previous failed cecal intubation was substantial. Regional centers for complex colonoscopy can provide high rates of cecal intubation in cases of incomplete colonoscopy and high yields of lesions in these cases. The regional center for complex colonoscopy is an important medical service. (Gastrointest Endosc 2016;83:1239-44.)

Quality guidelines recommend that colonoscopists achieve cecal intubation in at least 90% of all colonoscopies and 95% of screening examinations.<sup>1,2</sup> Interval proximal colon cancer is more common when the cecum is not intubated.<sup>3</sup> When colonoscopy is incomplete, barium enema or CT colonography are commonly used to examine the colon proximal to the extent reached by colonoscopy.

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Capsule colonoscopy has been recently approved by the U.S. Food and Drug Administration for this indication, and initial evidence indicates that capsule colonoscopy performs well for polyp detection in this situation.<sup>4</sup> However, a repeat colonoscopy done by an expert endoscopist avoids radiation exposure and allows for therapy in a single procedure. Our center has the largest reported experience in performing colonoscopy in patients with previous incomplete examinations by other physicians.<sup>5,6</sup> We have described techniques used to achieve a 96% cecal intubation rate in 345 patients referred after failed colonoscopy by other physicians and emphasized the value of water immersion during insertion, particularly in patients with redundant colons.<sup>7-9</sup>

In this report we assess the value of a regional center for complex colonoscopy specifically with regard to completion of previously failed colonoscopies. The impact and benefit of completing colonoscopies in patients with previous incomplete examinations may seem obvious for many patients but has not been described in detail. Increasingly, regional centers for performance of challenging colonoscopies are being described.<sup>10-14</sup> To better understand the impact of a regional center of expertise in colonoscopy on patients with prior incomplete

examinations, we describe the findings of completion colonoscopy in 520 consecutive patients referred after incomplete examinations.

## METHODS

This study is a retrospective examination of a prospectively created database of all patients referred to one of the authors (D.K.R.) for previously incomplete colonoscopy. It was approved by the Institutional Review Board at Indiana University Health Partners on June 12, 2015. From July 2001 to March 2015 all patients referred to a single endoscopist (D.K.R.) after prior unsuccessful attempts at cecal intubation by a gastroenterologist or a surgeon were included. They were identified from a colonoscopy database that contains all patients referred to one of the authors (D.K.R.) because of prior incomplete colonoscopy. The database includes patient demographics, indications, methods of colonoscopy, duration of procedure, extent of prior colonoscopy, and reasons for failure of cecal intubation for the prior colonoscopy. Serrated lesions were those read by the pathologist as sessile serrated polyps (sessile serrated adenomas), hyperplastic polyps, or traditional serrated adenomas.

The approach to colonoscopy in patients with prior failed colonoscopies was previously described and is briefly summarized here.<sup>7,9</sup> Generally, standard adult colonoscopes were used for patients with redundant colons and, since 2008, with water immersion. Overtubes were used in cases in which the above tools were unsuccessful. In patients with angulated or narrowed sigmoid colons as the cause of failed colonoscopy, pediatric colonoscopes were used in most cases, but in some cases a push enteroscope (usually the Olympus SIF-180; Olympus Corp, Center Valley, Pa) or an upper endoscope was used. Again, water immersion was used routinely since 2008. Guidewire exchange was used in some cases if an upper endoscope was used to pass a difficult angulation but unable to reach the cecum.<sup>15</sup> Propofol was used for sedation in most cases, with monitored anesthesia care since February 2010.

Statistical analysis was performed using SPSS version 22 (IBM, New York, NY). Means and standard deviations were calculated for continuous variables. Ninety-five percent confidence intervals were calculated using the efficient-score method corrected for continuity.

## RESULTS

There were 520 consecutive patients with a mean age of 64.2 years (standard deviation, 11.2; range, 17-93); 355 (68.3%) were women. Prior incomplete colonoscopies were performed by gastroenterologists or surgeons. Referrals were made by a gastroenterologist in 370 cases (71.2%), a surgeon in 61 cases (11.7%), a primary physician in 68 cases (13.1%), and self-referred in 21 cases (4.4%).

**TABLE 1. Indications for colonoscopy in 520 consecutive patients referred for incomplete colonoscopy**

Indication	Frequency
Screening or surveillance of polyps	296 (56.9%)
Abnormal CT colonography or barium enema	74 (14.2%)
Therapy of visualized polyp	21 (4.0%)
Surveillance for history of colorectal cancer	13 (2.5%)
Anemia or GI bleeding	99 (19.0%)
Inflammatory bowel disease	17 (3.3%)

**TABLE 2. Reasons for failure to complete prior colonoscopy in 520 patients**

Reason for failure	Frequency
Looping/redundant colon	280 (53.8%)
Sigmoid fixation/angulation	202 (38.8%)
Both sigmoid angulation and looping colon	30 (5.8%)
Issues with sedation	8 (1.5%)

**TABLE 3. Equipment and maneuvers critical to cecal intubation in 505 patients**

Equipment used	Frequency
Adult colonoscope	278 (55.0%)
Pediatric colonoscope	119 (23.6%)
Upper endoscope	35 (6.9%)
Enteroscope	24 (4.7%)
Overtube with any scope	30 (5.9%)
Guidewire exchange	19 (3.8%)

Table 1 shows the indications for colonoscopy other than "prior incomplete colonoscopy." Reasons for failure of prior colonoscopy are shown in Table 2.

Colonoscopy was complete to the cecum (full exposure of the medial wall between the ileocecal valve and the appendiceal orifice) in 506 of 520 patients (97.3%). The mean time to cecal intubation was 13.6 minutes (standard deviation, 9.3; range, 1-57.7). The equipment used for cecal intubation and the maneuvers used are shown in Table 3. Water immersion was used in 352 patients (67.7%). Prior to February 2010, propofol (with or without other sedatives), was administered by registered nurses supervised by the endoscopist ( $n = 127$ ) and by monitored anesthesia care ( $n = 254$ ) after February 2010, in 381 total cases with a success rate in cecal intubation of 97.1% (370/381). Opioids and benzodiazepines were used in the remaining 139 cases, with a cecal intubation rate of 97.8% (136/139).

In total, 913 conventional adenomas were removed in 277 patients, for an adenoma detection rate of 53.3% and

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