



Evaluation of Colonoscopic Procedures Performed in A University Hospital According to International Standards

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Abstract

Aim: Colonoscopy continues to be the most dependable technique for early detection of colorectal cancer, one of the most prevalent cancers globally. To enhance the effectiveness of colonoscopic procedures, various international quality benchmarks have been established. This study aimed to assess whether colonoscopies conducted at the Endoscopy Unit of the Gastroenterology Clinic at Firat University Hospital met internationally recognized quality standards.

Material and Method: This retrospective study analyzed 2,805 colonoscopy procedures performed between 2015 August and 2019 January. International quality indicators were used for evaluation. Due to the lack of recorded procedure times prior to November 2018, the data were categorized into two periods: 2015 August –2018 October and 2018 November –2019 January.

Results: From August 2015 to October 2018, the adenoma detection rate was 36% in males and was 26.4% in females. From November 2018 to January 2019, the adenoma detection rate (ADR) increased to 27.5% in females and 43% in males. The cecal intubation rate was 82% in the earlier period and rose slightly to 84.4% in the latter. Sedation was administered in 91.4% of procedures during the first period and in 98% during the second. Procedure duration, recorded only in the latter period, averaged 13.6 minutes.

Conclusion: The ADR observed in this study align with international benchmarks; however, cecal intubation and colorectal cancer detection rates were below the recommended standards. These findings indicate that procedural improvements are necessary to meet international quality criteria more consistently.

Keywords: Colonoscopy, colorectal cancer, polyp, adenoma detection rate, quality indicators

INTRODUCTION

Colorectal cancers remain a major contributor to global cancer-related illness and death, responsible for about 9.4% of all cancer fatalities. Its global incidence continues to rise, largely due to environmental risk factors associated with changes in lifestyle and dietary habits. Known risk factors include advanced age, smoking, alcohol use, obesity, inflammatory bowel disease, a high-fat diet, exposure to radiation, genetic predispositions, and the presence of adenomatous polyps (1-3).

Improvements in screening programs, combined with the early identification and management of precancerous lesions, have played a significant role in reducing mortality associated with colorectal cancer. Screening strategies aim to identify colorectal lesions at an early stage and to prevent malignant transformation by addressing these

lesions before they progress. Colonoscopy plays a central role in these efforts, as it allows for both the detection and removal of premalignant and malignant lesions in a single procedure (4,5). As a result, the demand for colonoscopy has significantly increased, especially in parallel with the expansion of cancer screening programs. Colonoscopy is considered safe and generally well-tolerated by patients when conducted by skilled practitioners (6,7).

Colonoscopy is not only essential for diagnosing colorectal cancer but is also routinely used to investigate symptoms associated with various colonic disorders. Extensive research has demonstrated that colonoscopy, especially when paired with polypectomy, significantly lowers the incidence and mortality rates of colorectal cancer (8-10). Although colonoscopy remains the gold standard for screening, it has certain limitations. To enhance its effectiveness and minimize inter-operator variability, a

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number of quality indicators have been introduced in recent years (11).

The effectiveness of colorectal cancer screening is closely tied to the adherence to established quality benchmarks during colonoscopic procedures. To this end, the American Society for Gastrointestinal Endoscopy (ASGE) and the European Society of Gastrointestinal Endoscopy (ESGE) have defined specific performance benchmarks. Essential quality metrics for colonoscopy include sedation practices, the adenoma detection rate (ADR), and the cecal intubation rate. Research has shown that improved adherence to these criteria leads to higher polyp detection rates and greater success in identifying and treating precancerous lesions. Therefore, maintaining high compliance with these standards is critical to maximizing the effectiveness of colonoscopy (12-15).

The objective of this study was to evaluate whether colonoscopy procedures performed at the Endoscopy Unit of the Gastroenterology Clinic at Firat University Hospital between August 2015 and January 2019 met internationally recognized quality standards. Additionally, the study aimed to identify any deficiencies and propose strategies to enhance procedural quality.

MATERIAL AND METHOD

Ethical approval of study was obtained on 07 .02. 2019 (approval number: 07) from Firat University Ethics Committee, and all procedures were carried out in line with the principles set forth in the 2013 revision of the Declaration of Helsinki.

In this retrospective study, colonoscopic procedures performed over the last three years in the Endoscopy Unit of the Gastroenterology Clinic at Firat University Hospital were evaluated. The analysis focused on quality indicators for colonoscopy as defined by the ASGE and the ESGE. The markers used in this study included the cecal intubation rate, adenoma detection rate, patient comfort (assessed through sedation), and the duration of colonoscopy withdrawal time.

Out of 5,192 colonoscopy cases reviewed during the specified period, 2,805 patients fulfilled the inclusion criteria and were included in the study. These patients were categorized into two groups: Group 1 included 2,655 individuals who underwent colonoscopy prior to November 2018, and Group 2 included 150 patients who underwent colonoscopy between November 2018 and January 2019. Due to the lack of documented colonoscopy durations prior to November 2018, analyses related to procedural time were limited to patients in Group 2.

Exclusion criteria were applied to patients with a known history of cancer, those diagnosed with polyposis syndromes, and individuals under the age of 50.

Demographic data such as age and gender, as well as histopathological findings of polyps removed during colonoscopy, were obtained from hospital records. Colonoscopy reports were reviewed to assess whether

sedation was administered, the type and dosage of sedatives used, adenoma detection rates, and cecal intubation rates. In procedures performed during the last three months of the study period, detailed data regarding procedure duration and sedation protocols were available and included in the analysis.

Additionally, a subset of 450 patients from earlier procedures (more than three months prior) was selected to evaluate sedation practices, adenoma detection, and procedure duration retrospectively, where possible. The reports were also used to determine whether the terminal ileum was visualized and whether cecal intubation was achieved. For patients in whom polyps were identified, pathology reports were examined to classify the polyps and calculate adenomatous polyp detection rates based on histological findings. Similarly, cases with a diagnosis of cancer during colonoscopy were further evaluated through pathology reports.

All collected data were recorded and analyzed to assess the overall quality of colonoscopy procedures performed in the center. Patients were excluded if they underwent emergency colonoscopy, lacked a clear indication for the procedure, required a sigmoidoscopy instead, or had a specific therapeutic reason for colonoscopy.

Statistical Analysis

IBM SPSS Statistics for Windows, Version 21.0 was used for medical records and analyses (IBM Corp., Armonk, NY). A two-sided p-value of less than 0.05 was regarded as statistically significant in all analyses.

Descriptive Statistics

The distribution of continuous variables was assessed with the Kolmogorov–Smirnov and Shapiro–Wilk tests, complemented by visual evaluations through histograms and Q-Q plots.

Comparative Analysis

Given the retrospective and observational nature of the study, statistical comparisons were made to evaluate potential differences between two patient groups based on the time period of colonoscopy (Group 1: 2015 August–2018 October; Group 2: 2018 November–2019 January).

Due to non-normal data distribution, continuous variables such as age and colonoscopy duration were compared between groups using the Mann–Whitney U test. Categorical variables—including adenoma detection rate, cecal intubation rate, sedation status, and polyp characteristics—Pearson's Chi-Square or Fisher's Exact Test was employed based on expected cell frequencies.

Subgroup Analyses

Stratified analyses were conducted by gender, evaluating the distribution of histopathological types of polyps (tubular, tubulovillous, villous, hyperplastic) and presence of dysplasia. Comparisons between male and female patients were similarly performed using appropriate non-parametric or categorical tests.

Additionally, the impact of premedication (sedation use) on procedural outcomes—such as cecum and terminal ileum visualization—was assessed using comparative categorical analysis.

RESULTS

The study included a total of 2,805 patients, with 1,538 males and 1,267 females. Among these, 2,655 patients underwent colonoscopy between August 2015 and October 2018, while 150 patients underwent the procedure between November 2018 and January 2019. In the earlier group, 1,457 (54.8%) were male and 1,198 (45.2%) were female; in the latter group, 81 (54%) were male and 69 (46%) were female. The mean age of patients in the August 2015–October 2018 group was 64.1 years, compared to 58.3 years in the November 2018–January 2019 group.

Polyps were identified in 1,425 patients who underwent

colonoscopy during the August 2015–October 2018 period. Among them, 762 (53.5%) were male and 663 (46.5%) were female. In the later period (November 2018–January 2019), polyps were detected in 78 patients, with 33 (42%) being male and 45 (58%) female.

Single polyps were detected in 46.7% of patients in the earlier group and in 48.8% of those in the later group, with no statistically significant difference between the groups ($p>0.05$). Histopathological analysis revealed that the most common type of polyp was tubular, with no significant difference between the two groups ($p>0.05$). Regarding polyp location, 43% of polyps in the earlier group and 41% in the later group were situated in the distal colon, with no statistically significant difference ($p>0.05$). Additionally, no significant difference was found in the proportion of polyps smaller than 1 cm (87.1% vs. 83.4%) (Table 1).

Table 1. Distribution of polyp count, type, size, and localization				
August 2015–October 2018			November 2018–January 2019	
Polyp count	N	(%)	N	(%)
1	573	46.7	38	48.8
2	286	23.3	19	24.4
3	153	12.5	8	10.3
4	91	7.6	6	7.7
5	48	3.9		
6	27	2.2	3	3.9
7	18	1.4	1	1.2
8	6	0.4	1	1.2
9	8	0.6		
10 and above	18	1.4	2	2.5
Polyp type				
Tubular	607	42.6	39	46.9
Tubulovillous	203	14.2	13	15.6
Villous	36	2.5	2	2.4
Hyperplastic	579	40.7	29	35.1
Polyp size				
0–1cm	1240	87.1	65	83.4
1cm and above	185	12.9	13	26.6
Localization				
Proximal	384	26.9	25	32
Distal	612	43	41	52.6
Proximal+ distal	429	30.1	12	15.4

When the polyps detected between August 2015 and October 2018 were analyzed separately by gender, tubular adenomas were identified in 41% of women and 43.7% of men, hyperplastic adenomas in 42.1% of women and 39.5% of men, tubulovillous adenomas in 13.9% of women and 14.5% of men, and villous adenomas in 2.3% of men and 3% of women. There was no statistically significant difference observed between male and female participants.

For colonoscopies conducted between November 2018 and January 2019, tubular adenomas were found in 57.1% of women and 41.9% of men, hyperplastic adenomas in 32.3% of women and 36.4% of men, tubulovillous adenomas in 10.7% of women and 18.1% of men, with no statistically significant difference between the groups. Villous adenomas were present in 3.6% of men, but no cases were detected in women (Table 2).

Table 2. Distribution of polyps detected between August 2015 and October 2018 by gender

	2015 August-2018 October				2018 November-2019 January			
	Woman		Male		Woman		Male	
	N	%	N	%	N	%	N	%
Tubular	225	41	382	43.7	16	57.1	23	41.9
Tubulovillous	76	13.9	127	14.5	3	10.7	10	18.1
Villous	16	3	20	2.3	0		2	3.6
Hyperplastic	233	42.1	346	39.5	9	32.2	20	36.4

An analysis of pathology reports from colonoscopies conducted between August 2015 and October 2018 revealed mild dysplasia in 15 patients, moderate dysplasia in 11 patients, and severe dysplasia in 9 patients. All cases of mild dysplasia were associated with tubular adenomas. Among

the patients diagnosed with moderate dysplasia, 4 had tubular adenomas, 4 had villous adenomas, and 3 had tubulovillous adenomas. In the group with severe dysplasia, 5 patients presented with tubular adenomas, 3 with tubulovillous adenomas, and 1 with a villous adenoma (Table 3).

Table 3. Dysplastic polyps detected in colonoscopies performed between 2015 August and 2018 October

	2015 August-2018 October			2018 November-2019 January		
	Mild dysplasia	Moderate dysplasia	Severe dysplasia	Mild dysplasia	Moderate dysplasia	Severe dysplasia
Tubular	15	4	5	2	0	0
Villous	0	4	1	0	0	1
Tubulovillosis	0	3	3	0	0	0

Among the 150 patients who underwent colonoscopy between November 2018 and January 2019, dysplasia was identified in three individuals. Of these, two patients had tubular polyps and one had a villous polyp. The number of high-risk polyps identified was 222 in procedures conducted between August 2015 and October 2018, and 14 in the later period from November 2018 to January 2019. The ADR for procedures between August 2015 and October 2018 was 26.4% in female patients and 36% in male patients. During the period from November 2018 to January 2019, the ADR was slightly higher, reaching 27.5% in females and 43% in males.

In terms of sedation, 91.4% of colonoscopies performed between August 2015 and October 2018 involved the use

of sedation. Of these, 95.4% received a combination of an opioid and a benzodiazepine, 3.8% received only an opioid, and 0.8% were administered a benzodiazepine alone. Between November 2018 and January 2019, the sedation rate increased to 98%, with 98.6% of patients receiving the combined opioid-benzodiazepine regimen and 1.4% receiving opioids alone. Pethidine was the opioid of choice, while midazolam was the preferred benzodiazepine.

The overall colorectal cancer detection rate between August 2015 and October 2018 was 4%, with a breakdown of 3.5% in females and 5.3% in males. Similar rates were observed in the period from November 2018 to January 2019, with detection rates of 4% overall, 2.8% in females, and 4.9% in males (Table 4).

Table 4. Number and proportions of patients who received sedation.

	August 2015-October 2018		November 2018-January 2019	
	N	%	N	%
Total patients sedated	2426	91.4	147	98

Among the colorectal cancer cases identified between August 2015 and October 2018, 115 were adenocarcinomas, two were signet ring cell carcinomas, one was non-Hodgkin lymphoma, two were malignant epithelial tumors, and one was diagnosed as a granular cell tumor. Among the patients who underwent colonoscopy between November 2018 and January 2019, five cases of colorectal adenocarcinoma and one case of renal cell carcinoma metastasis were found.

Cecal intubation was successfully achieved in 2179 out of 2654 colonoscopies (82.1%) performed between August 2015 and October 2018, and in 127 out of 150 procedures

(84.6%) conducted between November 2018 and January 2019. When analyzed by sex, the cecal visualization rate for females and males during the earlier period was 81.9% and 82.1%, respectively. In the later period, these rates slightly increased to 84% in females and 85.1% in males. However, no statistically significant differences were observed between the groups ($p>0.05$).

The terminal ileum was visualized in 60.4% of procedures performed between August 2015 and October 2018, compared to 68% of those conducted between November 2018 and January 2019 (Table 5).

Table 5. Gender distribution of colonoscopies conducted between August 2015 and October 2018				
	August 2015-October 2018		November 2018-January 2019	
Total patients with cecum imaging	2179/2654	82%	127/150	84.6%
Female patient undergoing cecum imaging	982/1198	81.9%	58/69	84%
Male patient undergoing cecum imaging	1197/1457	82.1%	69/81	85.1%

In the comparison between premedicated and non-premedicated patients, the cecal intubation rate was 84.5% in the premedicated group, whereas it was 61% in the non-premedicated group, showing a statistically significant difference between the two groups ($p<0.05$) (Table 6).

Table 6. Patients undergoing terminal ileum imaging		
	August 2015-October 2018	November 2018-January 2019
Patients undergoing terminal ileum imaging	1604/2654	102/150

Additionally, the duration of colonoscopy was recorded for procedures performed between 2018 November and 2019 January, with a mean colonoscopy duration of 13.6 minutes.

DISCUSSION

The ADR is defined as the proportion of colonoscopies in which at least one adenomatous lesion is detected (16). An ADR of 20% or more is typically regarded as an acceptable benchmark for colorectal cancer prevention programs (17). The typical reference for ADR is set at 25%, with 30% for men and 20% for women (14). ADR is currently the only quality indicator with a proven direct correlation to colorectal cancer prevention. A 2014 study by Corley et al. involving 314,872 colonoscopies concluded that a 1% increase in ADR led to a 3% decrease in cancer incidence (18). In a separate study with 500 patients, the ADR for standard colonoscopy was found to be 20.7% (19). Coşkun et al. (20) reported 13.3%, Solakoğlu et al. (21) reported the frequency of colorectal polyps as 11.1% in patients over the age of 18 who underwent colonoscopy for various indications, and Şahintürk et al. (22) reported the prevalence of colorectal polyps as 34.9% in a study of 2512 patients. In our study, between August 2015 and October 2018, the ADR was 26.4% in women and 36% in men. Between 2018 November and 2019 January, this increased slightly to 43% in male and 27.5% in females, which aligns with the figures reported in the literature.

Colorectal polyps and tumors are more commonly found in men than in women. In our study, polyps were more frequently found in men during the colonoscopies performed between August 2015 and October 2018, while polyps were more common in women between November 2018 and January 2019. Tubular polyps, which are the most common type of colon polyp (23), were the predominant histopathological finding in our study. Additionally, the polyps we detected were primarily located in the distal colon, which is consistent with existing studies (24).

Patient discomfort during colonoscopy can be alleviated with sedative drugs. There is significant variation in sedation practices across different centers, with some facilities opting not to use sedation, while

others standardize the use of a combination of benzodiazepines and opiates (25). Some studies have reported a significantly higher ADR when colonoscopies were performed under sedation, while others found no significant impact of sedation on ADR (Bannert et al., 2012; Lee et al., 2014; Zhao et al., 2020) (26-28). In our study, the sedation rate was 91.4% between August 2015 and October 2018. When analyzing the difference between premedicated and non-premedicated patients, we found that cecal intubation was achieved in 84.5% of premedicated patients and only 61% of non-premedicated patients. This suggests that premedication may have contributed to a more thorough examination by extending the duration of the procedure (29). Cecal intubation is crucial for visualizing the entire cecum, including the medial wall from the ileocecal valve to the appendix opening (30). Baxter et al. (31) indicated that; lower cecal intubation rates have been linked to an increased incidence of proximal colon cancer (32). Although cecal intubation can be difficult, it is generally agreed that endoscopists should attain a cecal intubation rate of at least 90% across all procedures, and this rate should be $\geq 95\%$ in screening colonoscopies (33). Cecal intubation rates were of 97% or higher in colonoscopy procedures performed on screening patients would have positive effects on the adenoma detection rate in studies conducted in United States (34-36). Cecal and terminal ileum images are important to confirm completion of colonoscopy (37). In our study, however, the cecal intubation rates were lower than the recommended standards, suggesting the need for improvement.

In terms of colorectal cancer detection, Alsumait et al. (38) identified 442 colorectal cancers from 3701 colonoscopies, with a cancer detection rate of 11.9%. Utku et al. found that 6.2% of patients with fecal occult blood had cancer (39). In our study, the overall colorectal cancer detection rate was 4%, with adenocarcinoma being the most common type. This rate might reflect the reasons patients underwent colonoscopy, as cancer detection rates are often influenced by the clinical indications for the procedure. In a 2012 study by Lieberman et al., the American Gastroenterological Association recommended that patients with more than 10 adenomas undergo control colonoscopy within three years

(40). In our study, however, only 2 out of 10 such patients received follow-up colonoscopies, which did not align with the recommended guidelines.

A limitation of our study was the lack of withdrawal time data for colonoscopies performed before November 2018.

CONCLUSION

In conclusion, this study evaluated whether colonoscopic procedures performed at the Endoscopy Unit of the Gastroenterology Clinic, Firat University Hospital, between August 2015 and January 2019 met internationally accepted quality standards. Although the adenoma detection rates in our study aligned with the literature, we observed that both the cecal intubation and colorectal cancer detection rates fell below the recommended standards. This suggests that while recent improvements have been made, further efforts are required to align with optimal practice standards. We believe these findings will offer useful insights for improving colonoscopy procedures in other healthcare institutions.

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