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Comparison of single- and dual-operator colonoscopy techniques: A retrospective analysis

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ABSTRACT

Objective: The aim of this study was to compare the quality outcomes of single-operator and dual-operator colonoscopy techniques in a large retrospective cohort.

Material and Methods: This retrospective study included 1,642 adult patients who underwent colonoscopy between December 2019 and December 2024 at a tertiary referral center. Procedures were performed by experienced general surgeons using either a single-operator (n=802) or dual-operator (n=840) technique. Adenoma detection rate (ADR), cecal intubation rate (CIR), malignancy detection rate, and withdrawal time (WT) were analyzed. Multivariable logistic regression analyses were performed for ADR and CIR with adjustment for age and sex. A p-value <0.05 was considered statistically significant.

Results: The mean age was significantly higher in the dual-operator group (63.1±11.7 vs. 61.4±12.1 years, p=0.002), and male predominance was also greater in this group (p<0.001). ADR was comparable between the single-operator and dual-operator groups (19.7% vs. 21.1%, p=0.491). Similarly, CIR did not differ significantly (94.3% vs. 96.2%, p=0.084). After adjustment for age and sex, operator technique was not independently associated with adenoma detection [adjusted odds ratio (OR) 1.05, 95% confidence interval (CI) 0.78-1.42; p=0.735] or successful cecal intubation (adjusted OR 1.48, 95% CI 0.89-2.45; p=0.128). Malignancy detection rates were comparable between the groups (3.9% vs. 5.1%, p=0.221). Mean WT was significantly longer in the dual-operator group (4.29±2.47 min vs. 3.45±1.85 min, p=0.001).

Conclusion: In this retrospective cohort, single and dual-operator colonoscopy techniques showed comparable ADR and CIR. After adjustment for age and sex, operator technique was not independently associated with either outcome. Although mean WT was longer in the dual-operator group, this was not accompanied by a higher adenoma detection rate.

Keywords: Adenoma, colonoscopy, colorectal cancer, quality indicators, health care

INTRODUCTION

Colonoscopy is considered the gold standard for the investigation of colorectal disorders, offering diagnostic and therapeutic capabilities. In this regard, colorectal cancer screening programs have utilized colonoscopy for detecting and removing precancerous lesions, thereby controlling incidence and mortality rates of colorectal cancer (1,2).

However, the success of colonoscopy is not only measured by the completion of the procedure, but also by the achievement of quality indicators. The adenoma detection rate (ADR), cecal intubation rate (CIR), and withdrawal time (WT) are considered important parameters in the assessment of the success and safety of colonoscopy, and have been incorporated into the quality assurance process globally (3-5).

In clinical practice, colonoscopy techniques may vary between centers and operators. The two techniques commonly employed in colonoscopy are the one-operator technique, in which the endoscopist performs the colonoscopy independently, and the two-operator technique, in which an assistant aids in scope advancement, while the endoscopist is in charge of the deflection of the scope and visualization. While the one-operator technique is the most commonly employed technique in most countries, including the US and Japan, the two-operator technique is commonly employed in several settings in Europe and Asia, including several European and Asian countries (6).

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Evidence comparing these two techniques is still limited and inconsistent. Some studies indicated that it is possible to transition from two-operator to single-operator colonoscopy without compromising some of the main quality indicators, possibly even increasing some aspects of efficiency. Other studies, including randomized trials, have reported similar ADRs and completion rates for both techniques, suggesting that operator arrangement may not be a key factor for quality performance. These findings underscore the importance of further real-world data, especially regarding large populations, to determine whether this technique impacts some quality indicators in a measurable way (7-10).

The objective of the present study was to evaluate and compare the quality performance of single-operator and dual-operator colonoscopy techniques in a large retrospective cohort of adult patients undergoing colonoscopy at a tertiary endoscopy unit between 2019 and 2024. The primary quality indicators were ADR and CIR, while cancer detection rate and WT were evaluated as secondary outcomes. The study aimed to assess whether these quality indicators differed between the two operator techniques in a real-world clinical setting.

MATERIAL and METHODS

Study Design and Population

This retrospective comparative study included adult patients who underwent colonoscopy between December 2019 and December 2024 at the endoscopy unit of a tertiary referral center.

All procedures were performed by two board-certified general surgeons with more than 20 years of endoscopic experience.

Eligible patients included adults who underwent diagnostic colonoscopy with procedural sedation. Patients in whom cecal intubation was achieved or who had the procedure terminated due to a documented clinical reason were included in the study.

Exclusion criteria included patients with incomplete procedural records, a history of colorectal surgery, or missing data required for the study outcomes.

This study was conducted in accordance with the STROBE reporting guidelines.

A total of 1,642 patients who met the inclusion criteria were included in the study.

Colonoscopy Technique

Colonoscopy procedures were performed using standard video colonoscopy systems under conscious sedation. Two procedural techniques were evaluated:

• Single-operator technique:

The entire procedure, including scope advancement and manipulation, was performed solely by the endoscopist.

• Dual-operator technique:

The endoscopist performed the examination with active assistance from a trained nurse or assistant, who aided in scope advancement and handling under the endoscopist's direction.

Sedation protocols were individualized according to patient characteristics. In younger patients, a combination of midazolam, ketamine, and propofol was commonly used, whereas in older patients sedation was generally limited to midazolam alone to minimize cardiopulmonary risk. All procedures were performed under continuous cardiorespiratory monitoring.

Outcome Measures

The primary outcome measures were:

• ADR

• CIR

Secondary outcome measures included:

• Cancer detection rate (CDR)

• WT

• Demographic characteristics (age, sex)

WT was defined as the duration from cecal intubation to scope removal, excluding time spent on therapeutic interventions.

Ethical Approval

This study was approved by the Institutional Review Board of University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital (approval no: 2025/12-12, date: 05.01.2026). Due to the retrospective nature of the study, the requirement for informed consent was waived. All procedures were conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

Statistical analyses were performed using SPSS software (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation and compared using Student's t-test or the Mann-Whitney U test, as appropriate. Categorical variables were compared using the chi-square test or Fisher's exact test. To account for the significant baseline differences in age and sex between the single-operator and dual-operator groups, multivariable logistic regression analyses were performed for the primary outcomes, ADR and CIR. Operator technique was entered as the main independent variable, with age and sex included as covariates. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. A two-sided p-value <0.05 was considered statistically significant.

RESULTS

In total, 1642 patients undergoing colonoscopy from December 2019 to December 2024 were studied. Of these, 802 (48.8%) were performed using the single-operator method, and 840 (51.2%) were performed using the dual-operator method.

The mean age was significantly higher in the dual-operator compared to the single-operator method (63.1±11.7 years vs. 61.4±12.1 years, p=0.002). Male sex was more prevalent in the dual-operator compared to the single-operator method (p<0.001). Baseline demographic characteristics are summarized in Table 1.

The ADRs were comparable in both groups (19.7% in the single-operator method vs. 21.1% in the dual-operator method, p=0.49). Successful cecal intubation was achieved in 94.3% of the single-operator method and 96.2% of the dual-operator method, with no statistically significant difference (p=0.084).

The mean WT was significantly longer in the dual-operator group than in the single-operator group (4.29±2.47 min vs. 3.45±1.85 min, p=0.001). Malignancy detection rates were comparable in both groups (p=0.221). Procedural outcomes are summarized in Table 2.

After adjustment for age and sex in multivariable logistic regression analyses, operator technique was not independently associated with adenoma detection (adjusted OR 1.05, 95% CI 0.78-1.42; p=0.735) or successful cecal intubation (adjusted OR 1.48, 95% CI 0.89-2.45; p=0.128). The results of the multivariable analyses are presented in Table 3.

Table 1. Baseline demographic characteristics of the study population

Parameter	Single-operator (n=802)	Dual-operator (n=840)	p-value
Age, years (mean ± SD)	61.4±12.1	63.1±11.7	0.002
Male sex, n (%)	488 (60.8)	575 (68.5)	<0.001

SD: Standard deviation.

Table 2. Comparison of colonoscopy quality indicators

Parameter	Single-operator (n=802)	Dual-operator (n=840)	p-value
Adenoma detection rate, n (%)	158 (19.7)	177 (21.1)	**0.491**
Cecal intubation rate, n (%)	757 (94.3)	808 (96.2)	**0.084**
Withdrawal time, min (mean ± SD)	3.45±1.85	4.29±2.47	0.001
Malignancy detection, n (%)	31 (3.9)	43 (5.1)	**0.221**

SD: Standard deviation.

DISCUSSION

In this retrospective study, we evaluated the impact of single and dual-operator methods of colonoscopy on important quality measures for a large number of patients. The results showed that the rate of adenoma detection and CIR were similar for both methods, while WT was significantly longer for the dual-operator method. Importantly, the two groups differed significantly in age and sex distribution. After adjustment for these potential confounders, operator technique was not independently associated with either adenoma detection or successful cecal intubation.

The ADRs found in the study were consistent with previously published data, although they were slightly lower than the benchmark values set by the international guidelines (3,11). However, the absence of significant differences in adenoma detection between the two techniques and the lack of an independent association after adjustment for age and sex suggest that, within the context of this cohort, operator technique was not associated with adenoma detection (12).

In addition, the CIRs in both groups were well above the commonly accepted quality thresholds, similar to those reported in the literature (4,5). Although there are reports suggesting the possible advantage of the dual-operator technique (8), the results are consistent with those showing that experienced endoscopists can attain high CIRs irrespective of the technique (8,9). However, because all procedures in the present study were performed by only two highly experienced surgeons, these findings should not be interpreted as evidence that operator configuration has no effect in other clinical settings or among endoscopists with different levels of experience.

WT was significantly longer in the dual-operator group, though this did not translate to an improvement in detection rates (11,13). In the present cohort, the longer mean WT observed with the dual-operator technique was not accompanied by a higher ADR. This finding should be interpreted cautiously, as WT was not prospectively standardized and may have been influenced by patient characteristics, sedation practices, procedural workflow, and operator-related factors (14).

Table 3. Multivariable logistic regression analysis of the association between operator technique and colonoscopy quality indicators

Outcome	Adjusted OR*	95% CI	p-value
Adenoma detection	1.05	0.78-1.42	0.735
Cecal intubation	1.48	0.89-2.45	0.128

*: Adjusted for age and sex. Single-operator technique was used as the reference category; OR: Odds ratio; CI: Confidence interval.

The significant baseline differences in age and sex between the two groups represent an important potential source of confounding. To address this issue, multivariable logistic regression analyses were performed with adjustment for age and sex. The adjusted analyses showed no independent association between operator technique and either ADR or CIR. Nevertheless, residual confounding from unmeasured variables cannot be excluded because of the retrospective and non-randomized design of the study.

Study Limitations

However, certain limitations need to be taken into consideration. The retrospective design may introduce selection bias. The time taken for withdrawal was not standardized prospectively. Moreover, the study was done in a single center, and hence the results may not be generalized. In addition, all procedures were performed by only two experienced surgeons. Therefore, individual operator experience, technical preferences, and procedural habits may have influenced the observed outcomes, limiting the external validity of the findings. The non-randomized design also prevents causal conclusions regarding the effect of operator technique on colonoscopy quality. Despite adjustment for age and sex, residual confounding by unmeasured clinical or procedural factors remains possible. However, the large sample size and the controlled procedural setting enhance the reliability of the data.

Taken together, our findings indicate that, in this retrospective single-center cohort of procedures performed by experienced surgeons, single- and dual-operator techniques showed comparable ADR and CIR, and operator technique was not independently associated with these outcomes after adjustment for age and sex. These findings should be interpreted as an association rather than evidence of equivalence or absence of a causal effect.

These findings reflect real-world clinical practice and may help guide decision-making in endoscopy units where both techniques are used.

CONCLUSION

In this retrospective single-center cohort, single- and dual-operator colonoscopy techniques showed comparable ADRs and CIRs. Although mean WT was significantly longer in the dual-operator group, this difference was not accompanied by a higher ADR. After adjustment for age and sex, operator technique was not independently associated with adenoma detection or successful cecal intubation. These findings should be interpreted cautiously in view of the retrospective design, potential residual confounding, and the fact that all procedures were performed by two highly experienced surgeons. Further prospective, multicenter studies are needed to determine whether operator configuration influences colonoscopy quality across different clinical settings and levels of operator experience.

Ethics

Ethics Committee Approval: This study was approved by the Institutional Review Board of University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital (approval no: 2025/12-12, date: 05.01.2026).

Informed Consent: Due to the retrospective nature of the study, the requirement for informed consent was waived.

Footnotes

Author Contributions

Surgical and Medical Practices - L.U., Y.Ç., T.K.; Concept - L.U., Y.Ç.; Design - L.U., Y.Ç.; Data Collection or Processing - L.U., T.K.; Analysis or Interpretation - L.U., Y.Ç., T.K.; Literature Search - L.U., Y.Ç.; Writing - L.U., Y.Ç.

Conflict of Interest: No conflict of interest was declared by the authors.

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