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Original article

Can We Use the Indication for a Colonoscopy as a Predictor of the Adenoma Detection Rate?

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Abstract

Aim: To determine the adenoma detection rate (ADR) and identify the indications for a colonoscopy that predict adenomas. **Materials and methods:** Cross-sectional study. We included patients older than 18 years who underwent colonoscopy between February and July 2020 at a specialized center in Medellín, Colombia. We estimated the ADR and identified the indications for a colonoscopy, considered predictors for finding adenomas. **Results:** The overall adenoma detection was 21 % (n = 992) and ADR in the screening population was 25 %. The range of 40-49 years contributed 12 % of the total number of adenomas detected, and the male population had a higher incidence (*OR* 1.73; 95 % *CI* 1.25-2.38; p < 0.001). Personal history of polyps (*OR* 1.86; 95 % *CI* 1.25-2.78; p = 0.002) and fecal occult blood (*OR* 2.67; 95 % *CI* 1.12-6.35; p 0.026) are deemed predictors for finding adenomas. LCI filters showed better results in detecting lesions (*OR* 1.43; 95 % *CI* 1.02-2.0). **Conclusions:** The indications for a colonoscopy can predict the probability of detecting adenomas. Male gender, a personal history of polyps, fecal occult blood, and the search for adenomas after the age of 40 are the variables that increase the probability of finding adenomas. The use of LCI filters increases lesion detection. The suggested age to start CRC screening is 40 years.

Keywords

Colonoscopy, adenoma, surveillance, screening.

INTRODUCTION

The adenoma detection rate (ADR) is considered one of the leading quality indicators in colonoscopy[1-3]. It is assessed in asymptomatic individuals or people with an average risk for colorectal cancer (CRC) through colonoscopy[4]. This detection impacts CRC mortality by diagnosing the disease in early and curable stages and is cost-effective[5,6]. Its incidence and mortality have changed because of the starting age of screening through colonoscopy and polypectomy[7].

Differences in ADR have been reported, depending on whether the indication for colonoscopy is screening, surveillance of CRC precursor lesions, or diagnosis of digestive diseases[8-10]. Significant differences by gender have also been found[4].

The present study seeks to establish the ADR and identify those indications for a colonoscopy that predict the possibility of adenomas. Characterization of resected colorectal adenomas is not considered within the scope of this study.

MATERIALS AND METHODS

We conducted a cross-sectional study in a gastroenterology institution in Medellín, Colombia, between February and July 2020. It included all outpatients over 18 years of age admitted for a complete colonoscopy, administering an

informed consent form prior to the procedure. We built an Excel database from the following variables: Age, sex, colonoscopy equipment used, procedure indication, examination scope, Boston scale assessment, the physician performing the examination, and endoscopic and histological results. Data were collected from colonoscopy and pathology reports.

Seven gastroenterologists performed 1,001 colonoscopies in the study period, while an anesthesiologist or sedation physician, as appropriate, was responsible for sedation. Two pathologists with specific training in gastrointestinal histopathology provided the histopathological interpretation.

The colonoscopes used are of high definition: Some with LCI light filters used for detecting adenomas and with BLI filters and magnification to characterize lesions; others with NBI filters also used for characterization.

We verified the cecal intubation rate in each colonoscopy report and estimated the reach to the cecum and terminal ileum. The withdrawal time of the colonoscope from the cecum was six minutes for all cases, following the institutional protocol. The effectiveness of colon cleansing was classified using the Boston scale, which assessed the fecal presence and visibility of the colon in its three segments. Those studies without a record of the Boston scale were treated as missing data.

The ADR was calculated from the proportion of patients with at least one visualized mucosal adenoma. We obtained the histological type of each adenoma and its location by a segment of the colon. Reports of non-adenomatous polyps were excluded from the analysis, as were those studies in which it was not possible to reach the cecum.

The institutional ethics committee approved the conduct of the study, considering it to be of minimal risk since the estimation of the statistics concerned does not constitute an intervention or experiment. This study also contemplates the fundamental principles of research ethics under the Declaration of Helsinki, version 2013[11], and Resolution 008430/1993 issued by the Colombia Ministry of Health[12].

Statistical analysis

We analyzed the data using Excel, version 2019, and Jamovi, version 1.2.25. The adenoma detection rate was calculated for the entire cohort and then for the main examination indications.

Univariate analysis was performed by determining absolute and relative frequencies for qualitative variables. We used the mean and standard deviation (*SD*) as quantitative variables after verifying the assumption of normality. The Chi-square association test was employed for independent samples, and the Odds Ratio (*OR*) was estimated with its respective 95% confidence interval (95% *CI*). We considered a statistically significant *p*-value < 0.05.

A logistic regression model was established to identify the variables that can be considered predictors for detecting adenomas in patients undergoing colonoscopy.

The dependent variable in the model was the detection of adenomas (categorical, yes/no). We made two predictive models: The first only included colonoscopy indications, which were significant in the bivariate analysis ($p < 0.05$). The second additionally gathered demographic variables of interest to the research group. Finally, the model with the best statistical fit was accepted.

RESULTS

We identified 992 eligible patients out of 1,001 patients undergoing colonoscopy between February and July 2020; the nine patients excluded are due to incomplete studies. Sixty-one percent of the population was female, and the average age was 52 years (*SD* 14).

The examination reach to the terminal ileum was obtained in 934 patients and the cecum in 52 for a 99% optimal reach. Colon preparation was assessed using the Boston scale, considering a score ≥ 2 in each segment satisfactory. Eighty-eight percent of the patients were adequately prepared; in 2%, we did not obtain the scale assessment, regarded as missing data in the analysis. No statistically significant differences were found in the detection of adenomas according to the Boston scale (*OR* 0.97; 95% *CI* 0.59-1.60; *p* 0.913).

Adenomas were detected in 208 patients (21%), of which 175 were older than 50 years (84%), and 25 patients (12%) were in the age range of 40–49 years (**Table 1**). When analyzing the presence of adenomas by sex, the ADR in men (28%) was higher than in women (17%), a statistically significant difference (*OR* 1.92; 95% *CI* 1.41-2.62, $p < 0.001$).

Table 1. Detection of adenomas by age range

Age groups	Number of colonoscopies	Number of patients with adenomas	ADR (%)
< 40	208	8	4 %
40-49	160	25	12 %
50-59	289	70	33 %
60-69	214	60	29 %
70-79	96	33	16 %
> 80	25	12	6 %
Total	992	208	100 %

The examination indication variable was categorized into five primary causes. The adenoma detection results were positive fecal occult blood (43%), personal history of polyps in the colon (35%), screening in an average-risk population (aged 50 years with no history) (25%), family history of CRC (13%), and patients under 50 (diagnosis of gastrointestinal symptoms) (9%).

The variables with a statistical significance of $p < 0.05$ in the bivariate analysis were entered into the logistic regression model (**Table 2**).

Table 2. Bivariate analysis to detect adenomas

Variable	p	OR	95% CI	
			Lower	Higher
> 50 years	<0.001	3.96	2.66	5.89
> 40 years	<0.001	8.56	4.15	17.7
Male sex	<0.001	1.92	1.41	2.62
Use of LCI filters	0.002	1.66	1.21	2.29
Positive PH of polyps	<0.001	2.38	1.63	3.50
Positive FOB	0.007	3.00	1.29	6.93
Family history of CRC	0.262	0.550	0.190	1.59
Boston scale	0.913	0.973	0.590	1.60

PH: Personal history; CRR: Colorectal cancer; *CI*: Confidence interval; *LCI*: Linked color imaging; FOB: Fecal occult blood

The variables that predict the detection of adenomas according to the logistic regression model are sex, age >40 years, colonoscope LCI filters, fecal occult blood, and personal history of polyps (**Table 3**).

Table 3. Logistic regression model to detect adenomas

Variable	Coefficient	*p*	*OR*	95% *CI*	
				Lower	Higher
Intercept	-0.923	0.059	0.397	0.152	1.04
Male sex	0.548	<0.001	1.730	1.256	2.38
> 40 years	1.962	<0.001	7.114	3.427	14.77
Positive PH of polyps	0.625	0.002	1.869	1.255	2.78
Positive FOB	0.983	0.026	2.673	1.126	6.35
Use of LCI filters	0.360	0.036	1.433	1.024	2.00

PH: Personal history; *CI*: Confidence interval; LCI: Linked color imaging; FOB: Fecal occult blood.

When analyzing the results of the logistic regression model, the variable that best explains the probability of detecting adenomas is being over 40 years old, with an *OR* of 7.11. Men are 1.7 times more at risk than women. Individuals with a personal history of polyps are 1.86 times more likely to have adenomas than those without them. The positive fecal occult blood significantly increases the risk of adenomas with an *OR* of 2.67. Finally, using LCI filters increases detection likelihood 1.43 times than not using them.

DISCUSSION

Colonoscopy is considered the gold standard for CRC detection. Various indicators assess pre-, intra-, and post-procedural quality[3,13]. One of them is the ADR, defined as the proportion of screening colonoscopies with at least one identified adenoma[14]. The importance of its measurement lies in that as the ADR increases by 1%, the risk of CRC decreases by 3% and mortality by 5%[4,14,15], strongly related to the prevention of interval cancer[16]. Colonoscopy screening and early detection of precursor lesions through polypectomy have proven highly be effective in preventing CRC and its mortality rates. Therefore, it is a general objective to improve the results of these indicators[1,17,18] and define appropriate follow-up periods.

The overall result of detecting adenomas in our population was 21%. However, it is crucial to analyze this behavior according to the most frequent colonoscopy indications: Screening, diagnosis, and surveillance[19].

Firstly, for the average risk population[20], the expected result is to detect adenomas in 25% of cases[4,21]. The primary objective of CRC screening is to identify the disease in early states and locate precancerous lesions in individuals who do not have a history of CRC or polyps[22]. In our screening population, understood as that population undergoing colonoscopy without additional risk factors for CRC, except for age over 50 years, the ADR identified was 25%, consistent with the reported detection goals for this population.

Like other studies, the male gender[23] and being over 40 years old[7,22] were statistically significant risk factors for detecting adenomas. In stratifying the population by age range, this study found that 12% of patients with adenomatous polyps were between 40 and 49 years old (average age of 44 years). Given this finding, adenoma detection was compared from the age of 40 with those older than 50, resulting in a higher detection likelihood from the age of 40 (**Table 2**). The initiation of screening in patients with average risk has been shortening, approaching 45 years old in some studies[7,22]. Data on the prevalence of adenomas between 40 and 49 years of age of up to 5% have been reported[24]. These results are of utmost clinical importance in our environment since they suggest starting the detec-

tion of adenomas ten years earlier than recommended in current practice.

Regarding risk factors, it is widely known that people with a history of CRC in first-degree relatives have twice the risk as to the general population[25,26], probably due to a combination of genetic and environmental factors[27]. Three percent of the patients had this history; however, it was not a predictive factor for detecting adenomas owing to the low representativeness within the population studied.

Other quality indicators for a colonoscopy that determine good detection results are the examination reach to the cecum and adequate cleansing of the intestinal mucosa. A complete assessment was achieved in 99% of the examinations, mainly to the terminal ileum, allowing evaluation of the mucosa during withdrawal. Nonetheless, the comprehensive assessment does not ensure an adequate view since it depends on the degree of preparation of the colon prior to the examination and intraprocedural techniques, such as suitable cleansing and suction, distension of the colon, and inspection of all folds[28]. The level of cleanliness and visibility of the mucosa was assessed with the Boston scale, which favors objective and standardized results[4]. Inadequate preparations, with a 0–1 score in any segment, are associated with an increased risk of missed adenomas[4,29,30]; therefore, the goal is to obtain preparations with 2–3 scores. Despite being indicators of great importance, the reach of the examination and the preparation results were not significant variables to predict adenomas in the logistic regression model in this study.

It is described that no screening test reaches the sensitivity of colonoscopy in detecting precancerous colon lesions, being four times higher than the fecal immunochemical test (FIT), which is the closest one[31] and one of the most used for screening around the world[32]. Patients who undergo colonoscopy with a positive FIT result have a higher prevalence of CRC and higher ADR than a screening colonoscopy[33]. In our environment, FIT is not routinely used as a screening test; however, fecal occult blood (FOB) is frequently observed as an indication for colonoscopy. In cases with positive results, the FOB was more likely to detect adenomas (*OR* 2.67; 95% *CI* 1.12-6.353), which is deemed a significant predictor.

Another intervention to prevent CRC is polypectomy. It reduces the risk of death from CRC in the first ten years after the performance to a level similar to patients without adenomas[5]. The procedure evaluates the malignant potential of any discovered polyp based on the macroscopic and microscopic characteristics of malignancy, such as surface appearance, vascularization, induration, ulceration, polyp size, villus histology, high-grade dysplasia, among others[34]. In our population, a personal history of polyps represented a probability of detecting adenomas 1.86 times higher than those without the history, being a relevant predictor that allows intervention in CRC prevention with polypectomy and suggests that patients with such a condition are candidates for a CRC precursor lesion surveillance program.

Lastly, imaging quality in colonoscopy through devices or techniques[35] is one of the objectives set to reduce the proportion of missed adenomas and impacts the prevention of recurrent adenomas and CRC[36]. Advanced endoscopic imaging technology that emphasizes mucosal color changes (LCI) and vital colorations and provides clearer and brighter images (high definition)[37] should be employed both for screening the average risk population and for CRC precursor lesion surveillance programs, considering the superiority of the image compared to conventional white light[38-40]. However, this imaging does not control the so-called recognition errors or those related to the observer's attention and view[39,41].

Given the epidemiological and nutritional transition of the population in recent years, this study discusses reducing the starting age for CRC screening. It lists those indications for a colonoscopy that are predictors for finding adenomas.

CONCLUSIONS

The indications for colonoscopy can predict the probability of detecting adenomas. Male gender, a personal history of polyps, the presence of occult blood in feces, and the search for adenomas after the age of 40 are the variables that increase the probability of finding adenomas. The use of LCI filters increases the detection of lesions. The suggested age to start CRC screening is 40 years.

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