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RESEARCH

The association between colonic diverticulosis and colorectal polyps in a retrospective cohort study

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Abstract

Objective This study aimed to investigate the relationship between colonic diverticulosis, colorectal polyps, and colorectal cancer.

Material and methods A total of 648 patients (275 females, 373 males) who underwent complete colonoscopy between January 2016 and June 2020 were retrospectively analyzed. The presence and localization of diverticula, polyps, and cancer were recorded, and the association between diverticular disease and the formation of polyps and cancer was evaluated.

Results Diverticula were identified in 53 patients (8.2%), while 595 patients (91.8%) had no diverticula. Polyps were detected in 148 patients (22.8%), and no polyps were found in 500 patients (77.2%). Adenocarcinoma was diagnosed in 67 patients (10.3%), with no malignancy observed in 581 patients (89.7%). The mean age of patients with polyps was 59.5 years, compared to 53.3 years in those without polyps ($p < 0.001$). Multivariate logistic regression analysis revealed that diverticulum status did not significantly influence the risk of polyp formation, whereas advanced age was identified as a significant risk factor ($p < 0.001$).

Conclusion Advanced age is a significant risk factor for colorectal polyp formation, whereas diverticulosis is not an independent risk factor. These findings highlight the importance of age-based screening strategies for colorectal neoplasia.

Keywords Adenocarcinoma · Colorectal · Diverticulosis · Polyp

Introduction

Advancements in healthcare technologies and economic improvements have significantly increased average life expectancy worldwide. However, lifestyle changes driven by consumerism, sedentary habits, and altered dietary patterns have led to a rise in the prevalence of certain diseases, including gastrointestinal conditions [1].

Colonic diverticulosis is characterized by the protrusion of colonic mucosa and submucosa through weaknesses at

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the points where the vasa recta penetrate the circular muscle layer. While most patients with diverticulosis remain asymptomatic, approximately 15–25% present with complications such as diverticulitis or gastrointestinal bleeding [2]. The prevalence of diverticular disease is below 10% in individuals under 40 years of age but increases to 66% in the seventh decade of life [3, 4]. Similarly, the incidence of colorectal polyps also rises with age [4, 5]. Beyond advanced age, factors such as high intake of saturated fats, low dietary fiber consumption, and prolonged colonic transit time are implicated in the pathogenesis of both colonic polyps and diverticulosis [3, 4, 6].

Both colorectal carcinoma and diverticular disease are associated with chronic inflammation. Histopathological studies reveal that the colonic mucosa in diverticulosis exhibits increased inflammatory cell density and a higher proliferation index compared to healthy individuals [7, 8]. This persistent inflammation, observed even in uncomplicated cases, may contribute to the progression of lesions toward malignancy [9].

Despite shared etiological factors, the association between colonic diverticula and polyps remains inconclusive. While some studies report a correlation between the two [10–12], others fail to demonstrate any significant link [13, 14]. This lack of consensus underscores the need for further research.

This study aims to explore the correlation between colonic diverticula and colorectal polyps. Elucidating this relationship could improve colorectal carcinoma screening programs by identifying patients with diverticula who might benefit from complete bowel imaging. Such an approach could optimize healthcare costs and facilitate the early detection of colorectal cancer. Understanding this relationship could enhance colorectal carcinoma screening strategies by identifying patients with diverticula who may benefit from comprehensive bowel imaging. Current colorectal cancer screening guidelines, including those from the American Cancer Society and the European Colorectal Cancer Screening Network, recommend starting screening at age 50 for average-risk individuals. However, given that diverticulosis is more prevalent in older populations, further research is needed to determine whether diverticular disease warrants earlier or more frequent screening interventions.

Material and methods

This retrospective study included 648 patients who underwent colonoscopy performed by the general surgery department at Ankara Training and Research Hospital between January 2016 and June 2020. Patients were categorized based on the presence and localization of diverticula and polyps, as determined by colonoscopy findings.

Inclusion criteria

Patients aged 18–80 years, vailability of complete retrospective medical data, colonoscopy examinations that reached the ileocecal valve, and adequate bowel cleansing confirmed by procedural notes.

Exclusion criteria

Patients with a history of colorectal surgery, inadequate bowel preparation (assessed by endoscopists based on visualization quality using the Ottawa Bowel Preparation Scale; cases with poor preparation were excluded from the study),

incomplete colonoscopy, patients with a known family history of colorectal cancer, personal history of colorectal cancer, previous colorectal polyps or malignancy, and patients undergoing emergency colonoscopy.

Patients included in the study underwent colonoscopy for routine screening, evaluation of gastrointestinal symptoms (e.g., rectal bleeding, abdominal pain), or follow-up after prior findings. Experienced endoscopists performed colonoscopies, each with a minimum of 5 years of experience and having conducted over 250 colonoscopic procedures. Colonoscopy was performed using a Fujifilm Colonoscope EC-530WM3 with EPX-4450HD HDTV system.

All patients underwent bowel preparation according to the hospital's standard protocol. Three days before the procedure, patients were advised to reduce their intake of fiber-rich foods such as whole grains, nuts, seeds, and high-fiber vegetables. Instead, they followed a diet consisting of low-fiber carbohydrates (e.g., white bread, rice, pasta) and soft-cooked proteins (e.g., chicken, fish, or lean meat), while minimizing fruit and vegetable consumption.

Twenty-four hours before the procedure, a clear liquid diet was recommended, excluding all solid foods. Acceptable liquids included water, clear broths (chicken or beef), sugar-free fruit juices (e.g., apple juice), tea, and coffee without milk or cream. Patients were also instructed to avoid colored beverages (e.g., red or purple liquids).

On the evening before the colonoscopy, patients were required to take Picoprep solution (containing 10 mg sodium picosulfate, 3.5 g light magnesium oxide, and 12 g anhydrous citric acid) mixed with plenty of water. Additionally, an enema was administered 2 h before the procedure.

Differentiation between inverted colonic diverticula and colonic polyps was based on endoscopic appearance and maneuverability. Endoscopic air insufflation and repositioning were used to distinguish diverticula from polyps, as diverticula tend to flatten or disappear with increased insufflation, whereas polyps retain their shape. Colonic polyps were classified using the Paris Classification of Superficial Neoplastic Lesions. Both sessile and pedunculated polyps were recorded. However, laterally spreading tumors (LSTs) were not specifically assessed as a separate category in this study. Given the retrospective nature of the study, there may have been variability in the detection of subtle LSTs, particularly in the right colon (e.g., cecum), which represents a potential limitation.

Statistical analysis

For statistical analysis, we used the Statistical Package for Social Sciences (SPSS), version 23.0 for Windows (SPSS Inc. Chicago, USA). In descriptive statistics, categorical variables are given as numbers and percentages and continuous variables are given as mean ± standard deviation. Continuous variables were tested for conformity to a normal distribution using visual (histogram and probability graphs) and analytical methods (Kolmogorov–Smirnov/Shapiro–Wilk tests). The chi-squared test and the independent groups t-test were used for univariate comparison analyses. We also performed a logistic regression analysis on the data and tried to determine the risk factors for polyps. For all analyses, the level of statistical significance was accepted as $p < 0.05$.

This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cohort studies. The STROBE checklist is provided as supplementary material.

Results

Colonoscopy imaging identified diverticula in 53 patients (8.2%) and no diverticula in 595 patients (91.8%). Polyps were observed in 148 patients (22.8%), while 500 patients (77.2%) showed no polyps. Additionally, adenocarcinoma was detected in 67 patients (10.3%), with no malignancy findings in 581 patients (89.7%) (Table 1).

Table 1 Histopathological findings and localizations

	Number	(%)[a]
Presence of diverticulum ($n = 648$)		
Yes	53	8.2
No	595	91.8
Diverticulum localization ($n = 53$)		
Proximal	9	17.0
Distal	39	73.6
Proximal + distal	5	9.4
Presence of polyp ($n = 648$)		
Yes	148	22.8
No	500	77.2
Polyp localization ($n = 148$)		
Proximal	30	20.3
Distal	98	66.2
Proximal + distal	20	13.5
Presence of adenocarcinoma ($n = 648$)		
Yes	67	10.3
No	581	89.7
Adenocarcinoma localization ($n = 67$)		
Proximal	11	16.4
Distal	56	83.6

[a]Percentage for each column

Among the study population, 275 patients (42.4%) were female, and 373 patients (57.6%) were male. There was no statistically significant difference between patients with and without polyps regarding sex distribution or diverticulum localization. However, a significant association was found between the presence of diverticula and polyp formation ($p = 0.029$).

The mean age of patients with polyps was 59.5 years, compared to 53.3 years for those without polyps, demonstrating a statistically significant difference ($p < 0.001$) (Table 2). Multivariate logistic regression analysis revealed that diverticulum status was not a significant independent risk factor for polyp formation. In contrast, advanced age significantly increased the risk of polyp development ($p < 0.001$). Specifically, each 1-year increase in age raised the risk of polyps by 1.028 times (95% CI 1.014–1.042) (Table 3).

Discussion

The relationship between colonic diverticulosis and colorectal polyps remains an area of debate in the literature. While some studies suggest a correlation between these two pathologies, others report no significant association [15–18]. In a large-scale retrospective study, Abu Baker et al. [15] found an increased risk of colorectal cancer in patients with diverticulosis, whereas Peery et al. [18] reported no significant association between diverticula and colorectal adenomas. Similarly, Levine et al. [17] noted a lower frequency of polyps in colonic regions with diverticulosis, while Ray et al. (16) suggested a potential link between diverticulosis and colorectal neoplasia. These conflicting findings highlight the need for further prospective studies to elucidate the precise relationship between diverticular disease and colorectal polyp formation. The shared etiological factors, such as inflammation, dietary habits, and advanced age, imply a potential link that warrants further investigation.

In our study, the prevalence of diverticulosis was found to be 8.2%, which is notably lower than the 25–47%

Table 2 Comparison of polyp status according to some clinical and pathological characteristics

	Presence of polyp			
	Yes		No	
	Number	(%)[a]	Number	(%)[a]
Sex ($n=648$)				
Female	56	37.8	219	43.8
Male	92	62.2	281	56.2
$p=0.197$[b]				
Presence of diverticulum ($n=648$)				
Yes	19	12.8	34	6.8
No	129	87.2	466	93.2
$\boldsymbol{p=0.029}$[b]				
Diverticulum localization ($n=53$)				
Proximal	3	15.8	6	17.6
Distal	14	73.7	25	73.5
Proximal + distal	2	10.5	3	8.8
$p=0.969$[b]				
	Mean	Sd[d]	Mean	Sd[d]
Age ($n=648$)	59.5	± 14.4	53.3	± 14.7
$\boldsymbol{p<0.001}$[c]				

[a]Percentage for each column

[b]Chi-squared test

[c]Student *t*-test

[d]Standard deviation

Table 3 Multivariate logistic regression analysis results

Variables								95% CI for EXP(*B*)	
		B	S.E	Wald	df	Sig	Exp(*B*)	Lower	Upper
Step 1[a]	AGE	.028	.007	16.047	1	.000	1.028	1.014	1.042
	DIVERTICULUM STATUS	− .391	.314	1.552	1	.213	.676	.366	1.251
	Constant	− 2.420	.544	19.754	1	.000	.089		

[a]Variable(s) entered on step 1: AGE, DIVERTICULUM STATUS

reported in Western countries [11, 19, 20]. Our findings align more closely with those of Tomaoglu, who reported a prevalence of 12.6% in a similar population [21]. This lower prevalence can likely be attributed to dietary differences, particularly the higher consumption of fiber-rich foods in our region compared to Western countries. Such dietary habits may play a protective role against the development of diverticula.

We observed that advanced age significantly increased the risk of colorectal polyps, with each one-year increase in age raising the risk by 1.028 times. This finding aligns with the existing literature, which highlights age as a key risk factor in the etiopathogenesis of colorectal polyp formation [22–24].

While our study demonstrated a statistically significant difference in diverticulum status between patients with and without polyps ($p=0.029$), multivariate logistic regression analysis revealed that diverticulosis was not an independent risk factor for polyp formation. This result is consistent with several studies that found no significant correlation between diverticula and colorectal polyps [25, 26]. For instance, a large-scale study in the Netherlands analyzing 4241 patients' colonoscopy findings reported similar conclusions [26]. Kieff et al. also observed no significant association in their evaluation of 502 patients [6].

Conversely, some studies have suggested a strong correlation between diverticular disease and colorectal polyps [11, 20, 27, 28]. These studies argue that diverticulosis may act as a risk factor for premalignant lesions, necessitating increased vigilance during colonoscopy [29, 30]. The conflicting results in the literature can likely be attributed to differences in study designs (e.g., retrospective vs. prospective), population characteristics, and dietary or cultural factors.

This study has certain limitations that should be acknowledged. First, its retrospective design inherently restricts the ability to establish causation. Second, we did not evaluate the clinical indications for colonoscopy, which may have introduced selection bias. Additionally, family history and personal history of colorectal cancer were excluded from the analysis, which might have influenced the findings.

Moreover, diverticula were identified solely based on colonoscopic findings. While radiographic examinations such as abdominal CT and barium studies have higher sensitivity for detecting diverticula, they were not routinely performed in our cohort. However, in clinical practice, most cases of diverticulosis are diagnosed via colonoscopy, making our results relevant to real-world settings.

Future prospective studies with larger sample sizes and more detailed data collection are necessary to clarify the potential relationship between diverticulosis and colorectal polyps.

Conclusion

This study highlights that advanced age is a significant risk factor for colorectal polyp formation, whereas diverticulosis does not independently contribute to polyp development. These findings provide valuable insights into the etiology of colorectal polyps and suggest that screening programs should prioritize age as a critical factor. Current guidelines recommend screening initiation at age 50 for average-risk individuals; however, given that diverticulosis primarily affects older populations, further research is needed to assess whether earlier screening strategies should be considered for high-risk groups. While our results align with previous studies reporting no direct association between diverticulosis and colorectal polyps, the conflicting evidence in the literature underscores the need for further prospective studies. Future research involving larger, more diverse populations and detailed evaluations of lifestyle and dietary factors will be crucial to fully elucidate this relationship and refine colorectal cancer prevention strategies.

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Data availability The database of this study is open to sharing. It can be obtained from the authors upon request.

Declarations

Approval for this study was obtained and signed informed consent forms were obtained from all patients.

Scientific responsibility statement The authors declare that they are responsible for the scientific content of the article, including study design, data collection, analysis and interpretation, writing, part or all of the outline, preparation and scientific review of the content, and approval of the final version of the article.

Animal and human rights statement All procedures performed in this study were by the ethical standards of the institutional and/or national research committee and the 1964 Declaration of Helsinki and its subsequent amendments or similar ethical standards. No animal or human studies were performed by the authors for this article.

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Competing interest The authors declare no competing interests.

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