The Association Between Diverticular Disease of the Colon and Colonic Polyps: A Cross-Sectional Study

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Kenan Buyukasik[1], Aziz Ari[1], Turaj Aghayeva[2], Ekrem Ferlengez[3], Mahmut Said Degerli[4], Omer Akay[5], Mert Guler[6]

[1]Department of General Surgery, Istanbul Training and Research Hospital, University of Health Sciences, 34098 Istanbul, Turkiye
[2]Department of General Surgery, Altunizade Acibadem Hospital, Acibadem University, 34662 Istanbul, Turkiye
[3]Department of General Surgery, Istanbul Oncology Hospital, 34846 Istanbul, Turkiye
[4]Department of General Surgery, Bakirkoy Dr. Sadi Konuk Training and Research Hospital, University of Health Sciences, 34147 Istanbul, Turkiye
[5]Department of General Surgery, Kocaeli City Hospital, 41060 İzmit, Turkiye
[6]Department of General Surgery, Istanbul Gaziosmanpasa Training and Research Hospital, 34255 Istanbul, Turkiye

AIM: This study aimed to evaluate the relationship between colonic diverticular disease (CD) and colonic polyps (CP) in Turkiye, considering age and gender distribution.
METHODS: This retrospective cross-sectional study analyzed patients who underwent total colonoscopy between 1 January 2021, and 1 January 2022. Patients with a history of colon resection, inflammatory bowel disease, or prior polypectomy were excluded. The presence of CD and CP was assessed according to age, gender, and colonic localization [right (R), left (L), bilateral (B)].
RESULTS: A total of 452 patients were included, with 248 (54.9%) males and 204 (45.1%) females. The mean age was 57.7 ± 13.0 years. Among them, 235 were in the patient group [CD (+) and/or CP (+)], and 217 were in the control group. The study found a significant association between CD and CP, particularly among older patients, with rates of CD (+) and CP (+) increasing with age (p = 0.001). Interestingly, CD (+) patients had a lower risk of CP compared to CD (–) patients (p = 0.003). Additionally, male patients exhibited significantly higher CP rates than females.
CONCLUSIONS: Our findings indicate that CD (+) patients have a significantly lower risk of CP (+) compared to CD (–) patients. These results provide valuable insights into the relationship between CD and CP, which may help guide future research.

Keywords: diverticular diseases; colonic polyps; colonoscopy; endoscopy

Introduction

Colonic polyps (CP) are very common in the general population. Screening and managing these with colonoscopy reduces the risk of colorectal cancer [1]. Today, the development of colorectal cancer (CC) is known to occur in 3 ways: Chromosomal instability [change from adenoma to carcinoma (50%–75%)]; mutator genes [Lynch syndrome (3%–5%)] and through serrated adenoma/polyp (15–20%). A 1% increase in adenoma detection rate is associated with a 3% decrease in interval CC incidence. Therefore, early diagnosis, treatment, and determination of related factors of adenomas and/or polyps, which have a leading role in the development of colorectal cancer by colonoscopy, are essential [2].

The literature on colonoscopic evaluations shows an increase in the frequency of colonic diverticular disease (CD) and CP. In the epidemiological development of both diseases, there are common risk factors such as diet low in fiber or rich in saturated fat, age, and gender that play an essential role. Although it is generally hypothesized that there exists a positive correlation between CD and CP, previous studies present contradictory findings. Some research supports that CD is a significant risk factor for CP, while other studies have failed to establish a definitive connection [3–12].

Despite the recognition of these phenomena, there remains a notable lack of clarity regarding the specifics of the interaction between CD and CP. Notably, the existing literature does not clearly delineate whether CD increases the risk for developing CP or if they simply share common etiological factors. Furthermore, the distribution of these conditions with respect to demographic factors such as age and gender in the Turkish population—a country that intersects diverse dietary and genetic backgrounds—has yet to be extensively studied. This study aims to address these gaps by evaluating the relationship between CD and CP within a Turkish cohort, focusing specifically on how age and gender may

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Correspondence to: Kenan Buyukasik, Department of General Surgery, Istanbul Training and Research Hospital, University of Health Sciences, 34098 Istanbul, Turkiye (e-mail: op_dr_kenan@hotmail.com).

influence this association. Through this research, we seek to contribute valuable insights that could guide both clinical practice and future research directions in understanding the complexities of CD and CP.

Materials and Methods

The study has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving human subjects. All procedures were performed in compliance with relevant laws and institutional guidelines, and Istanbul Teaching and Research Hospital have approved them (Date: 22 April 2022, Approval No.: 123). Informed consent was obtained from all patients in the study.

Patient Selection

A total of 1230 patients who underwent total colonoscopy between 1 January 2021 and 1 January 2022 were screened. All patients are from Istanbul Teaching and Research Hospital. After applying exclusion criteria—including a history of incomplete colonoscopies, colorectal surgery, inflammatory bowel disease, and previous polypectomy—452 patients with colonic diverticular disease (+), colonic polyps (+), and regular colonoscopy results were included in the analysis.

Pre-Colonoscopy Preparation and Colonoscopy

The study included screening and/or diagnosis of patients over 18 with symptoms such as constipation, hematochezia, occult bleeding in the stool, weight loss, and abdominal distention, the primary indications of total colonoscopy. For two days before the total colonoscopy, patients were recommended a liquid diet and 2 Phospho-soda ® (monobasic sodium phosphate 21.6 g, dibasic sodium phosphate 8.1 g/45 mL oral laxative) 12 hours before the procedure. Polyethyleneglycol-based solutions were recommended in cases where hyperpotassemia was contraindicated. Intestinal cleansing was evaluated as adequate or insufficient according to the visibility of the colonic mucosa. If bowel cleansing was insufficient, the procedure was repeated. In patients with adequate bowel cleansing, sedoanalgesia was performed with pethidine hydrochloride/midazolam and/or propofol in the presence of 4–5 L/min O_2 following monitoring (Pulse/Blood Pressure/O_2 Saturation). Complete colonoscopy was defined as cecal intubation, appendix orifice, and visible ileocecal valve. Certified surgeons and gastroenterology endoscopists, each with at least five years of experience and a minimum of 2000 total colonoscopy procedures, performed total colonoscopies using PENTAX EC-3890 4.2® endoscopic devices (version X, PENTAX MEDICAL, Tokyo, Japan).

Endoscopic Criteria For Polyp Detection

Colonic polyps were identified using endoscopic criteria during the colonoscopy procedure. However, it is important to note that not all mucosal bulges detected endoscopically are neoplastic. The study relied on the endoscopists' judgment to classify identified polyps as CP (+), which may include both adenomatous and non-adenomatous polyps. Unfortunately, the study did not incorporate histopathological confirmation of the polyps to distinguish between adenomatous and non-adenomatous types.

Study Design

A total of 452 patients in the patient group [CD (+) and/or CP (+)] and the control group with normal colonoscopy were included in the study. The protrusion of the colonic mucosa and submucosa secondary to the weakness in the muscle layer of the colonic wall was defined as CD (+). Independent of histopathological examination, a localized protrusion on the colonic mucosa was defined as CP (+). For anatomical localization, the border of the right and left colon is determined according to the splenic flexure; and divided into three localizations as right colon (R), left (L), and bilateral (B) colon. The age, gender, CD (+/–) and CP (+/–) data of the patients were recorded and compared [4,12,13].

Statistical Analysis

In the descriptive statistics of the data, mean, standard deviation, median, minimum/maximum values, frequency, and ratio values were used. The distribution of variables was assessed using the Kolmogorov-Smirnov test. The Mann-whitney U test was used for the analysis of independent quantitative data. For independent qualitative data, the Chi-square test was applied, and when Chi-square test conditions were not met, Fisher's exact test or Yates' corrected Chi-square test was used. A p-value < 0.05 was considered statistically significant. The statistical analyses were performed using SPSS version 28.0 (IBM Corp., Armonk, NY, USA).

Results

The study included a total of 452 patients, with a mean age of 57.7 years (SD: 13.0; range: 20–84 years). Of these, 54.9% (248) were male and 45.1% (204) were female. The patient group comprised 235 individuals with CD (+) and/or CP (+), while 217 participants served as the control group (Table 1).

Co-occurrence of CD (+) and CP (+) was found in 3.8% of patients. The majority of these cases involved left colonic diverticular disease (LCD) (+) with left colonic polyps (LCP) (+), observed in 14.5% (Table 2). Although there were no significant gender differences in the frequency of CD (+)/CP (+) ($p = 0.532$), the incidence of this co-occurrence increased with age ($p = 0.029$) (Table 3).

Interestingly, when analyzing the relationship between the two diseases, it was noted that the incidence of CP (+) was significantly lower among patients with CD (+) ($p = 0.003$). Further subgroup analysis revealed that LCP (+) was significantly less frequent in patients with LCD (+) ($p = 0.037$)

Table 1. Study groups and distribution of demographic data.

Variables			
Age mean ± SD		57.7	±13.0
Gender n, %	F	204	45.1%
	M	248	54.9%
CD n, %	(–)	381	84.3%
	(+)	71	15.7%
RCD n, %	(–)	449	99.3%
	(+)	3	0.7%
LCD n, %	(–)	397	87.8%
	(+)	55	12.2%
BCD n, %	(–)	439	97.1%
	(+)	13	2.9%
CP n, %	(–)	271	60.0%
	(+)	181	40.0%
RCP n, %	(–)	413	91.4%
	(+)	39	8.6%
LCP n, %	(–)	334	73.9%
	(+)	118	26.1%
BCP n, %	(–)	428	94.7%
	(+)	24	5.3%
Coexistence of CD and CP n, %	(+)	17	3.8%

CD, colonic diverticular disease; CP, colonic polyps; F, female; M, male; SD, standard deviation; LCD, left colonic diverticular disease; RCD, right colonic diverticular disease; BCD, bilateral colonic diverticular disease; LCP, left colonic polyps; RCP, right colonic polyps; BCP, bilateral colonic polyps.

and CD (+) (p = 0.027). Similarly, overall CP (+) rates were lower in LCD (+) patients compared to LCD (–) patients (p = 0.018). However, no significant differences were found in the occurrence of right colonic polyp (RCP) (+) (p = 0.328) or bilateral colonic polyps (BCP) (+) (p = 0.464) between CD (+) and CD (–) patients (Table 2).

In terms of disease presence, CD (+) was observed in 15.7% of patients (71 out of 452), with the majority localized in the left colon (LCD (+) at 12.2%) compared to right colon (right colonic diverticular disease (RCD) (+) at 0.7%) and bilateral colon (bilateral colonic diverticular disease (BCD) (+) at 2.9%) (Table 1). Analysis showed no significant gender differences in CD (+) distribution ($p > 0.05$). However, the detection rate for CD (+) increased significantly with age (p = 0.001), particularly for LCD (+) (p = 0.030) and BCD (+) (p = 0.003) (Table 3).

CP (+) was present in 40.0% of patients (181 out of 452), with LCP (+) occurring most frequently at 26.1% (Table 1). There was a significant increase in the rate of CP (+) with age, particularly among male patients ($p < 0.001$ for overall increase; p = 0.002 specifically for age). The prevalence of LCP (+) and BCP (+) also rose significantly in older males ($p < 0.05$) (Table 3).

Discussion

The relationship between CP and CD is of increasing importance in the context of preventive care for colorectal cancer (CC), especially given the high prevalence of these conditions in the general population [13]. The findings of our study provide valuable insights into the relationship between CD and CP within the Turkish population.

Our results indicate that there is a significant relationship between CD and CP, particularly with increasing age. The notable increase in rates of CD (+) and CP (+) with advancing age emphasizes the importance of regular screening in older adults [14]. This finding aligns with previous literature suggesting that age is a crucial factor in the development of both conditions [15]. Understanding this relationship allows clinicians to better stratify patients based on their risk profile, aiding in the development of targeted screening protocols that prioritize those at higher risk for colorectal conditions.

Moreover, the demonstration that CD (+) patients presented a lower risk of CP (+) compared to CD (–) patients is particularly intriguing. This counterintuitive finding warrants further investigation to elucidate the underlying mechanisms at play. It may suggest that the pathophysiological processes of diverticulosis could be protective against the development of polyps, possibly due to differences in colonic mucosal responses or local inflammation. This new perspective could pave the way for future studies aiming to dissect the complex interplay between these two conditions.

In addition, the observation that male patients exhibited significantly higher rates of CP compared to female patients underscores the need for sex-specific considerations in clinical evaluations. It raises questions about hormonal or lifestyle factors that may contribute to these differences, providing an avenue for future exploration of personalized medicine approaches in managing colorectal health.

While comparisons to worldwide epidemiological evidence are certainly valuable, the focus of this discussion should shift toward how our findings support or refine existing knowledge. Our study reinforces the hypothesis that shared risk factors—such as a low-fiber diet, sedentary lifestyle, and advanced age—play critical roles in the development of both CD and CP [16]. Clinicians should remain mindful that addressing these modifiable risk factors can potentially reduce the incidence of both conditions.

Our study had some limitations: One significant limitation of this study is the inclusion of patients undergoing colonoscopy primarily for symptomatic reasons. This introduces a potential selection bias, as the demographic and health characteristics of symptomatic patients may differ markedly from those in the asymptomatic general population. The incidence of CD and CP among symptomatic individuals is likely to be much higher than in asymptomatic individuals, which could skew our results and impact the observed relationship between CD and CP. An additional limitation lies in the reliance on endoscopic criteria alone

Table 2. Comparison of colonic diverticular disease and colonic polyps by localization.

	CD (–)/(+)	*p*	RCD (–)/(+)	*p*	LCD (–)/(+)	*p*	BCD (–)/(+)	*p*
	% (n)/% (n)		% (n)/% (n)		% (n)/% (n)		% (n)/% (n)	
CP (–)	57.0% (217)/76.1% (54)	$0.003^{\chi 2}$	59.7% (268)/100% (3)	0.407^{Y}	57.9% (230)/74.5% (41)	$0.018^{\chi 2}$	59.5% (261)/76.9% (10)	$0.205^{\chi 2}$
CP (+)	43.0% (164)/23.9% (17)		40.3% (181)/0.0% (0)		42.1% (167)/25.5% (14)		40.5% (178)/23.1% (3)	
RCP (–)	90.8% (346)/94.4% (67)	$0.328^{\chi 2}$	91.3% (410)/100% (3)	1.000^{F}	91.2% (362)/92.7% (51)	0.899^{Y}	91.1% (400)/100% (13)	0.533^{Y}
RCP (+)	9.2% (35)/5.6% (4)		8.7% (39)/0.0% (0)		8.8% (35)/7.3% (4)		8.9% (39)/0.0% (0)	
LCP (–)	71.9% (274)/84.5% (60)	$0.027^{\chi 2}$	73.7% (331)/100% (3)	0.571^{F}	72.3% (287)/85.5% (47)	$0.037^{\chi 2}$	73.8% (324)/76.9 (10)	0.944^{Y}
LCP (+)	28.1% (107)/15.5% (11)		26.3% (118)/0.0% (0)		27.7% (110)/14.5% (8)		26.2% (115)/23.1 (3)	
BCP (–)	94.2% (359)/97.2% (69)	0.464^{Y}	94.7% (425)/100% (3)	1.000^{F}	94.5% (375)/96.4% (53)	0.787^{Y}	94.5% (415)/100% (13)	1.000^{F}
BCP (+)	5.8% (22)/2.8% (2)		5.3% (24)/0.0% (0)		5.5% (22)/3.6% (2)		5.5% (24)/0.0% (0)	

χ^2, Chi-square test; ^{Y}, Yates' corrected Chi-square; ^{F}, Fisher's exact test.

Table 3. Comparison of colonic diverticular disease and colonic polyps by age and gender.

	Age			*p*	Female		Male		*p*
	Min-max	Median	Mean ± SD		Median	Mean ± SD/n-%	Median	Mean ± SD/n-%	
Age					59.0	57.0 ± 13.7	59.5	57.5 ± 12.5	0.802^{m}
CD (–)	20–82	58.0	56.4 ± 13.2	0.001^{m}	173	84.8%	208	83.9%	$0.786^{\chi 2}$
CD (+)	34–84	64.0	62.3 ± 10.7		31	15.2%	40	16.1%	
RCD (–)	20–84	59.0	57.3 ± 13.1	0.758^{m}	204	100%	245	98.8%	0.320^{Y}
RCD (+)	50–67	51.0	56.0 ± 9.5		0	0.0%	3	1.2%	
LCD (–)	20–82	59.0	56.7 ± 13.2	0.030^{m}	178	87.3%	219	88.3%	$0.734^{\chi 2}$
LCD (+)	34–84	63.0	61.3 ± 10.7		26	12.7%	29	11.7%	
BCD (–)	20–84	59.0	57.0 ± 13.0	0.003^{m}	199	97.5%	240	96.8%	$0.624^{\chi 2}$
BCD (+)	48–81	67.0	67.6 ± 9.2		5	2.5%	8	3.2%	
CP (–)	20–83	57.0	55.5 ± 14.1	0.002^{m}	143	70.1%	128	51.6%	<0.001
CP (+)	33–84	61.0	60.0 ± 10.8		61	29.9%	120	48.4%	
RCP (–)	20–84	59.0	57.2 ± 13.2	0.734^{m}	186	91.2%	227	91.5%	$0.893^{\chi 2}$
RCP (+)	34–81	59.0	58.7 ± 10.8		18	8.8%	21	8.5%	
LCP (–)	20–83	59.0	56.5 ± 13.6	0.047^{m}	167	81.9%	167	67.3%	<0.001
LCP (+)	33–84	61.0	59.6 ± 11.1		37	18.1%	81	32.7%	
BCP (–)	20–84	59.0	56.9 ± 13.1	0.014^{m}	198	97.1%	230	92.7%	$0.042^{\chi 2}$
BCP (+)	47–79	65.5	63.7 ± 8.8		6	2.9%	18	7.3%	
CD (–)/CP (–), CD (+)/CP (–) and CD (–)/CP (+)	20–83	59.0	57.0 ± 13.1	0.029^{m}	198	97.1%	238	96.0%	$0.532^{\chi 2}$
CD (+)/CP (+)	55–84	64.5	64.6 ± 6.7		6	2.9%	10	4.0%	

^{m}, Mann-whitney U test; χ^2, Chi-square test (Fischer test); CD, colonic diverticular disease.

for polyp classification without subsequent histopathological verification. This lack of histological analysis raises concerns regarding the potential misclassification of non-adenomatous polyps as adenomatous, which may lead to an overestimation of the prevalence of neoplastic polyps. Another limitation of our study is the lack of multivariate analysis to control for potential confounding factors. Without adjusting for variables that may influence the relationship between CD and CP, our findings should be interpreted with caution. Future studies incorporating multivariate models will be essential to better delineate independent associations and minimize potential biases. Consequently, the findings regarding the association between colonic diverticular disease and colonic polyps should be interpreted with caution due to the uncertainty surrounding the true nature of the identified polyps. Moreover, the findings may not be generalizable to the broader population, as they are based on a cohort that sought medical attention due to specific gastrointestinal symptoms. Future studies should aim to include a more representative sample of the general population, incorporating asymptomatic individuals to provide a clearer understanding of the prevalence and association of CD and CP across diverse demographics. This would help in delineating the true relationship between these conditions, mitigating the effects of selection bias inherent in our current study design.

Conclusions

In conclusion, our study underscores the significant relationship between CP and CD in the Turkish population and highlights the influence of age on the prevalence of

these conditions. The findings suggest that there may be protective mechanisms at play in CD patients that could reduce the risk of developing CP, warranting further exploration into the pathophysiological interactions between these two entities. Additionally, the noted gender disparities in polyp prevalence accentuate the necessity for tailored clinical strategies and personalized approaches in colorectal health care.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Author Contributions

Critical Review: KB, AA, MSD, OA, MG; Study concepts and design: AA, KB, EF; Literature research: MSD, TA, EF; Clinical studies: TA, MSD, EF; Data collection and analysis: MSD, KB, AA, OA, MG; Statistical analysis: AA, MSD, KB; Writing Manuscript: KB, TA, OA, MG. All authors contributed to important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The study has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving human subjects. All procedures were performed in compliance with relevant laws and institutional guidelines, and Istanbul Teaching and Research Hospital have approved them (Date: 22 April 2022, Approval No.: 123). Informed consent was obtained from all patients in the study.

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Conflict of Interest

The authors declare no conflict of interest.

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