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Original Article

A study of detection rate and colonoscopic information in 5130 colorectal polyps

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Abstract: Objective: This study aims to help physicians obtain the detection rate and colonoscopic information of colorectal polyps and define the risk profile of neoplastic polyps at a main hospital in China. Method: A total of 15,189 participants who underwent total colonoscopy between January 2000 and September 2015 were studied. A total of 5,130 colorectal polyps were diagnosed. We analyzed the detection rate, anatomical sites, and pathological types among different sex, age, and decade groups. Moreover, we investigated the relationships of anatomical sites vs. pathological types and adenoma vs. adenocarcinoma. Results: Colonoscopic examinations revealed that women demonstrated a lower risk for colorectal polyps (27.75% vs. 38.56%; P=0.000), and detection rate significantly increased with age and decade (by age, 17.04% vs. 40.10% vs. 49.99%; by decade, 13.99% vs. 52.07%; P=0.000). Polyps located mostly in the rectum, and which located in the transverse and ascending colon increased with age. The most common polyp pathology was adenoma, and its proportion in the old-aged group was significantly higher than that in the other groups (51.48% vs. 59.85% vs. 71.53%; P=0.000). A significant difference was observed between adenoma and adenocarcinoma in anatomical sites (P=0.000). Compared with adenoma, adenocarcinoma was more frequently located in the rectum (20.02% vs. 48.75%; P=0.000). Conclusion: Adenoma is more prevalent in high-risk groups for cancer, including old-aged group and men. Therefore, male and old-aged groups may benefit more from colonoscopy in our population than other groups. Adenoma located in the rectum may have a high malignant tendency. Thus, digital rectal examination should be given priority.

Keywords: Colorectal polyp, detection rate, anatomical site, pathological type

Introduction

Colorectal polyps are common in the general population. The reported prevalence of colorectal polyps varies widely between different geographical areas. The estimated incidence rate of colonic polyps is 30% in Western countries and 10%-15% in Asian and African countries [1, 2].

Colorectal polyps are classified histologically mainly as adenoma (neoplastic) or hyperplastic (non-neoplastic) polyps [3]. In general, the prevalence of adenomas and hyperplastic polyps varies among different populations.

Colorectal cancer (CRC) is the third leading cause of death among cancers worldwide [4]. Colon carcinogenesis, a process that takes several years to complete, involves initial hyperproliferation of normal epithelial cells, formation of adenomas, and finally the transition to invasive carcinomas [5]. For a long time, only one pathway of colorectal carcinogenesis was known. Vogelstein [6] described it as the "classical" pathway through the adenoma-adenocarcinoma sequence. Interruption of the adenoma-carcinoma sequence by colonoscopy and polypectomy reduces the incidence of CRC by as much as 90% [7].

In recent years, a new "alternative" pathway through serrated adenoma has been described. Adenocarcinomas developed from serrated lesions were first described by Jass and Smith [8]. Serrated polyps and hyperplastic polyps were not clearly defined worldwide. According to the 2010 WHO classification, serrated polyps are divided into three subgroups, namely, sessile serrated adenoma/polyp, traditional ser-

rated adenoma, and hyperplastic polyp. In recent years, hyperplastic polyp has been considered as benign lesion, although numerous studies have shown the malignant nature of this lesion.

In the present study, we analyzed the detection rate of colorectal polyps among different sex, age, and decade groups; investigated the differences of anatomical sites and pathological types in different sex, age, and decade groups; and determined the corresponding relationships between these factors. This study aimed to determine the detection rate, anatomical sites, and pathological characteristics of colorectal polyps in the Chinese population and define the risk profile of neoplastic polyps at a main hospital in China.

Methods

This retrospective review was conducted in The Second Hospital of Shandong University, China. The Department of Gastroenterology performed all the endoscopic examinations. Withdrawal time was 6-20 min. Inclusion criteria: The patients were more than 18 years old. An endoscopist visualized the cecum in all subjects and documented the examinations by taking photographs of the cecum and/or specimen of the terminal ileum. The quality of bowel preparation was satisfactory.

According to the above criteria, 15,189 participants who underwent total colonoscopy between January 2000 and September 2015 were studied. Colorectal polyp cases were diagnosed by endoscopy. All biopsies were sent to the Department of Pathology for diagnosis.

Patient data, including age, sex, location, and pathology diagnosis, were retrieved from the colorectal polyp lesions. Participants were categorized into different sex groups (male and female), age groups (youth, 18-45 years; middle aged, 46-60 years; old aged, ≥61 years), and decade groups (Group A: January 2000 to December 2009; Group B: January 2010 to September 2015). Colorectal polyp locations were categorized into six sites: ileocecum, ascending colon, transverse colon, descending colon, sigmoid colon, and rectum. The location of multiple polyps was positioned on the site of the largest one. By pathology, polyps contained adenoma, hyperplastic polyp, inflammatory polyp, juvenile polyp, lymphoid polyp, and so on. In our Department of Pathology, serrated polyps were included in hyperplastic polyps. Aside from adenoma and hyperplastic polyps, other types of polyps were infrequent. Thus, polyp diagnosis was categorized into three categories (adenoma, hyperplastic polyps, and other types) in the current study.

We studied the detection rate, anatomical sites, and pathological types among the different sex, age, and decade groups. Furthermore, we investigated the corresponding relationships of anatomical sites vs. pathological types and adenoma vs. adenocarcinoma.

Statistical analysis

Data analysis was performed using SPSS version 16 software. Data were analyzed using χ^2-test. Continuous variables were presented as mean ± standard deviation (SD), whereas categorical variables were shown as percentages. Statistical significance was considered at $P<0.05$.

Results

Detection rates of colorectal polyps among different sex, age, and decade groups

A total of 15,189 participants (8,462 males and 6,727 females) who underwent total colonoscopy between January 2000 and September 2015 were studied. A total of 5,130 colorectal polyp patients (3,263 males and 1,867 females) were diagnosed. The mean age (SD) for the colorectal polyp cases was 53.4 (14.6) years. Colonoscopic examinations revealed that women demonstrated a lower risk for colorectal polyps than men (27.75% vs. 38.56%; P=0.000), and the detection rate of Group A was significantly lower than that of Group B (13.99% vs. 52.07%; P=0.000). The detection rate of colorectal polyps increased with age (17.04% vs. 40.10% vs. 49.99%; χ^2=1263.2, P=0.000), and the difference was statistically significant (**Table 1**).

Anatomical sites of colorectal polyps among different sex, age, and decade groups

Colorectal polyps were mainly located in the rectum (26.11% vs. 29.24%) and the sigmoid colon (25.62% vs. 28.66%) in both males and females. No significant difference was observed in the proportion of polyps at the different sites.

Table 1. The detection rate of colorectal polyps by sex, age and decade groups (N, %)

Detection rate	Sex				Age					Decade			
	Male	Female	χ^2	*P*	Youth	Middle	Old	χ^2	*P*	Group A	Group B	χ^2	*P*
Colorectal polyps	3263 (38.56)	1867 (27.75)	195.531	0.000	983 (17.04)	2279 (40.10)	1868 (49.99)	1263.2	0.000	1021 (13.99)	4109 (52.07)	2458.267	0.000
Others	5200 (61.44)	4860 (72.25)			4786 (82.96)	3404 (59.90)	1869 (50.01)			6277 (86.01)	3782 (47.93)		
Total	8463	6727			5769	5683	3737			7298	7891		

Table 2. The anatomical sites of colorectal polyps by sex, age and decade groups (N, %)

Anatomical sites	Sex				Age					Decade			
	Male	Female	χ^2	*P*	Youth	Middle	Old	χ^2	*P*	Group A	Group B	χ^2	*P*
Rectum	852 (26.11)	546 (29.24)	23.843	0.0002	342 (34.79)	613 (26.90)	443 (23.72)	75.693	0.000	372 (36.43)	1026 (24.97)	94.427	0.000
Sigmoid colon	836 (25.62)	535 (28.66)			266 (27.06)	640 (28.08)	465 (24.89)			297 (29.09)	1074 (26.14)		
Descending colon	408 (12.50)	183 (9.80)			106 (10.78)	251 (11.01)	234 (12.53)			95 (9.30)	496 (12.07)		
Transverse colon	561 (17.19)	260 (13.93)			126 (12.82)	375 (16.45)	320 (17.13)			151 (14.79)	670 (16.31)		
Ascending colon	435 (13.33)	246 (13.18)			86 (8.75)	286 (12.55)	309 (16.54)			73 (7.15)	608 (14.80)		
Ileocecum	171 (5.24)	97 (5.20)			57 (5.80)	114 (5.00)	97 (5.19)			33 (3.23)	235 (5.72)		
Total	3263	1867			983	2279	1868			1021	4109		

Table 3. Pathological types of colorectal polyps by sex, age and decade groups (N, %)

Pathological types	Sex				Age					Decade			
	Male	Female	χ^2	*P*	Youth	Middle	Old	χ^2	*P*	Group A	Group B	χ^2	*P*
Adenoma	2063 (63.22)	1143 (61.22)	3.757	0.153	506 (51.48)	1364 (59.85)	1336 (71.53)	124.194	0.000	501 (49.07)	2705 (65.83)	814.649	0.000
Hyperplastic polyp	784 (24.03)	494 (26.46)			308 (31.33)	607 (26.63)	363 (19.43)			124 (12.15)	1154 (28.08)		
Other types	416 (12.75)	230 (12.32)			169 (17.19)	308 (13.51)	169 (9.05)			396 (38.79)	250 (6.08)		
Total	3263	1867			983	2279	1868			1021	4109		

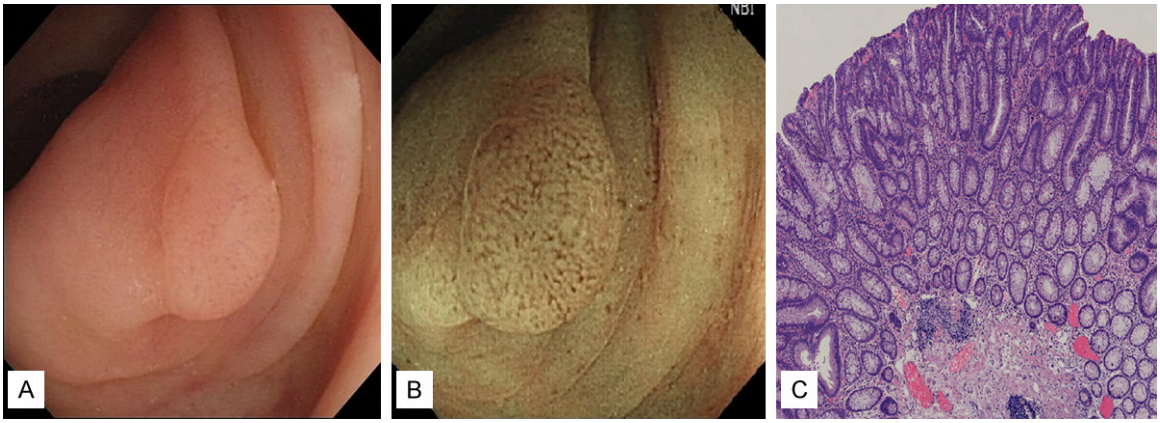

Figure 1. A. White light image of adenoma; B. NBI image of adenoma; C. Pathology image of adenoma.

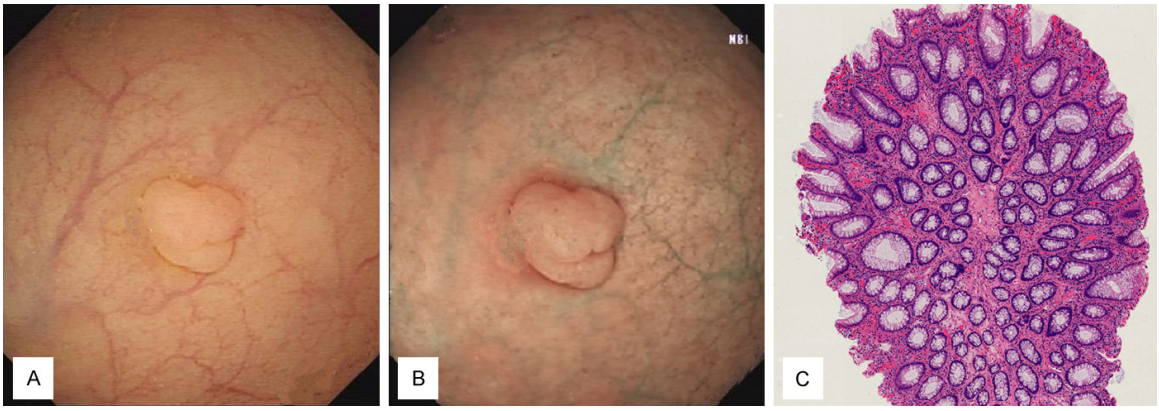

Figure 2. A. White light image of hyperplastic polyp; B. NBI image of hyperplastic polyp; C. Pathology image of hyperplastic polyp.

The most common anatomical site of polyps was the rectum (by age, 34.79% vs. 26.9% vs. 23.72%; by decade, 36.43% vs. 24.97%), followed by the sigmoid colon (by age, 27.06% vs. 28.08% vs. 24.89%; by decade, 29.09% vs. 26.14%) among the age and decade groups. Polyps located in the transverse colon (by age, 12.82% vs. 16.45% vs. 17.13%; by decade, 14.79% vs. 16.31%) and the ascending colon (by age, 8.75% vs. 12.55% vs. 16.54%; by decade, 7.15% vs. 14.80%) increased with age and decade; hence, proximal cases were significantly older than distal cases. The difference in anatomical sites was statistically significant in terms of age and decade ($P<0.05$) (**Table 2**).

Pathological types of colorectal polyps among different sex, age, and decade groups

The most common pathology of polyps was adenoma (**Figure 1**) (by sex, 63.22% vs. 61.22%; by age, 51.48% vs. 59.85% vs. 71.53%; by decade, 49.07% vs. 65.83%), followed by hyperplastic polyps (**Figure 2**), in all groups.

The proportion of various pathologies by sex groups showed no significant difference ($P=0.153$). By contrast, a significant difference existed among the age groups ($\chi^2=124.194$, $P=0.000$). The proportion of adenoma in the old-aged group was significantly higher than that in the other groups (51.48% vs. 59.85% vs. 71.53%; $\chi^2=122.647$, $P=0.000$). However, the proportions of hyperplastic polyp in the old-aged group were lower than those in the other age groups. This finding demonstrated that cases with neoplastic polyps were older than cases with other types. Colorectal polyp pathology showed significant differences among the decade groups ($\chi^2=814.649$, $P=0.000$). The proportion of adenoma in Group A was significantly lower than that in Group B (49.07% vs. 65.83%; $\chi^2=98.026$, $P=0.000$), and the same

Table 4. Relationship of anatomical sites vs. pathological types and difference of adenoma vs. adenocarcinoma (N, %)

Anatomical sites	Polyps					Adenoma vs. Adenocarcinoma			
	Adenoma	Hyperplastic polyp	Other types	χ^2	*P*	Adenoma	Adenocarcinoma	χ^2	*P*
Rectum	642 (20.02)	488 (38.18)	268 (41.49)	308.198	0.000	642 (20.02)	487 (48.75)	340.757	0.000
Sigmoid colon	838 (26.14)	365 (28.56)	168 (26.01)			838 (26.14)	226 (22.62)		
Descending colon	420 (13.10)	119 (9.31)	52 (8.05)			420 (13.10)	82 (8.21)		
Transverse colon	593 (18.50)	152 (11.89)	76 (11.76)			593 (18.50)	92 (9.21)		
Ascending colon	544 (16.97)	91 (7.12)	46 (7.12)			544 (16.97)	83 (8.31)		
Ileocecum	169 (5.27)	63 (4.93)	36 (5.57)			169 (5.27)	29 (2.90)		
Total	3206	1278	646			3206	999		

was observed for hyperplastic polyps (12.15% vs. 28.08%; χ^2=111.077, P=0.000) (**Table 3**).

Relationship of anatomical sites vs. pathological types and difference of adenoma vs. adenocarcinoma

Anatomical sites varied among the pathological types, namely, adenoma, hyperplastic polyps, and other polyp types. Although the rectum was the most common anatomical site in all of the three pathological types, the proportion was significantly different (20.02% vs. 38.18% vs. 41.49%; χ^2=227.533, P=0.000). The second most common site was the sigmoid colon (26.14% vs. 28.56% vs. 26.01%). The sequence of other anatomical sites also differed among the pathological types.

Significant differences in anatomical site were observed between adenoma and adenocarcinoma (χ^2=340.757, P=0.000). Compared with adenoma, adenocarcinoma was more frequently located in the rectum (20.02% vs. 48.75%; χ^2=319.962, P=0.000) (**Table 4**).

Discussion

Colonoscopy is an acceptable and effective procedure advised for screening patients aged older than 50 years [9, 10], which is the age when the risk of CRC begins to increase. This procedure is intended for early cancer detection or cancer prevention by detecting and removing important CRC precursors, such as adenoma and other polyps. The use of colonoscopy for primary screening significantly increased from 2000 to 2015.

The prevalence of colorectal polyp shows marked international variation. The prevalence of adenoma exceeds 60% in Hawaiian Japanese, who have a high risk of colon carcinoma [11]. By contrast, the lowest rate of polyps is reported from Iran (1.6%) [12], with one of the lowest reported rates of colonic malignancy [13]. We analyzed the data of 5,130 cases with polyp diagnosis in a city in China. The detection rate was 33.77% in our study population. This rate was consistent with other Asian data and lower than Western data. Genetic factors and high-fiber diet of individuals in this community may explain the low incidence of colorectal polyps. However, this outcome can be influenced by recent changes, such as the westernization of diet and the reduction in physical activity of individuals.

Previous studies have shown that colorectal polyps are more common in men than in women and increase infrequency with increasing age; in some old-aged groups, the prevalence rate exceeds 50% [14]. This pattern was also observed in our study. We found a significant difference in polyp detection rate among the sex groups (38.56% vs. 27.75%; P=0.000) and age groups (17.04% vs. 40.10% vs. 49.99%; P=0.000). Recent studies have demonstrated an increasing trend of CRC and polyps by decade [15, 16]. In the current study, the detection rate of polyps in Group B was higher than that in Group A (52.07% vs. 13.99%; P=0.000). This result may be attributed to the following aspects, firstly, the use of fat and prevalence of obesity was increasing, secondly, the quality of bowel preparation was improved, thirdly, the withdrawal time was prolonged.

By pathology, autopsy studies reported a 12%-52% prevalence of hyperplastic polyps and a 10%-40% prevalence of adenomas [17]. The corresponding figures in screening colonoscopy studies were 9%-34% and 24%-48%, respec-

tively [18]. In the current study, we determined that the pathological type was related to age. The frequency of adenoma increased with age, reaching 71.53% in the old-aged group, and hyperplastic polyps developed at a younger age than adenomas; however, their frequency showed no significant increase with age. This result agrees with the findings of other studies showing that the prevalence of neoplastic polyps increases with age while that of hyperplastic polyps does not change with age [1, 19]. According to sex group, the male gender increases the risk of adenoma to 63.22%. This result agrees with the findings of other studies showing a higher chance of neoplastic polyps in males than in females [1, 20]. By decade, we found that the incidence rate of adenoma was significantly higher in Group B than in Group A (49.07% vs. 65.83%; P=0.000). This finding is consistent with recent studies. For example, Mehdi Nouraie [21] found that more than 83% of polyps in AAs are adenoma. Meanwhile, the increase in medium risk population undergoing colonoscopies together with better diagnosis of hyperplastic polyps may explain the rising incidence of hyperplastic polyps in recent years (12.15% vs. 28.08%; P=0.000).

The anatomic location of polyps varies internationally. Colonoscopy surveys from China [20] and India [2] indicated a frequency of more than 60% for left side polyps. A study from Germany indicated a 55% incidence rate of distal colon adenoma [22]. In the present study, we reported that the most common anatomical site of colorectal polyps was the rectum, followed by the sigmoid colon; this finding agrees with previous works. Therefore, digital rectal examination should be given priority.

The anatomic distribution of adenoma differs between different geographical areas and races [20]. Hyperplasic polyps are considered as innocuous and benign lesions without playing a significant role in carcinogenesis [23]. However, some current reports have described that large hyperplastic polyps occur on the right side in association with CRC and show a malignant potential [24, 25]. We found that hyperplastic polyps and other polyp types were mostly located in the rectum and the sigmoid colon, whereas the transverse and ascending colon occupied a higher proportion in adenoma than that in others. Compared with adenoma, adenocarcinoma was more frequently located in the rectum (20.02% vs. 48.75%; χ^2=319.962, P=0.000), suggesting that adenoma located in the rectum may have a higher malignant tendency than that in other sites.

This study employed a retrospective data collection approach. Medical charts and pathological reports were the main sources of our data. Overall, the data provided some inherent limitations.

Conclusion

According to our results, we found that adenoma was more prevalent in high-risk groups for cancer, including old-aged group and men. This finding seeks a clear strategy for polyp prevention and removal in China. Male and older-aged groups may benefit more from colonoscopy in our population than other groups. Adenoma located in the rectum may have a high malignant tendency. Thus, digital rectal examination should be given priority.

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Disclosure of conflict of interest

None.

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