

Clinical and Pathological Characteristics of Mucinous Colorectal Adenocarcinoma: A Comparative Study

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Abstract

Background: Mucinous adenocarcinoma accounts for approximately 5%-15% of all colorectal cancers.

Objectives: The aim of this study was to investigate the clinicopathological characteristics of patients with mucinous colorectal adenocarcinoma.

Patients and Methods: This retrospective study was carried out by reviewing the medical records of 70 mucinous colorectal cancer (MCC) patients who were diagnosed and treated at a tertiary academic hospital between 2005 and 2010. For the comparative analysis, 491 patients with non-mucinous colorectal cancer (NMCC) were included.

Results: Of 561 patients with colorectal adenocarcinoma, 70 patients (12.5%) had the mucinous type. There were 42 (60%) men and 28 (40%) women, with a median age of 55 years old (range 24-81 years) included in the study. We did not find any differences regarding the patients' mean age ($P = 0.408$) and male/female ratio ($P = 0.700$) between the MCC and NMCC; however, there was a predilection for the right colon and sigmoid colon in the MCC, when compared to the NMCC ($P = 0.012$). In addition, the MCC tended to have a larger tumor size ($P = 0.004$), higher histological grade ($P < 0.001$), higher node stage ($P < 0.001$), higher number of dissected nodes ($P = 0.013$), higher number of positive nodes ($P < 0.001$), and a higher rate of perineural invasion ($P = 0.013$) compared to the NMCC.

Conclusions: This study indicates that most clinicopathological characteristics of MCC are different from those of NMCC. In addition, there was an association between the mucinous subtype and adverse pathological features in the patients with colorectal cancer.

Keywords: Colorectal Cancer, Mucinous Adenocarcinoma, Pathology, Characteristics

1. Background

Colorectal cancer is one of the most prevalent and leading causes of cancer deaths worldwide (1). Adenocarcinomas account for the vast majority of colorectal cancers, and they are further classified by histological grade (2). Mucin production is a common histological feature in colorectal adenocarcinomas; however, abundant mucin production, such as that seen in mucinous adenocarcinoma and signet ring adenocarcinoma, is less frequent. Mucinous adenocarcinoma is an adenocarcinoma in which the cancer cells produce greater than 50% extracellular mucin (3, 4), and this histopathological subtype accounts for approximately 5% to 15% of all colorectal cancers (5-8). Most reports indicate that mucinous adenocarcinomas have a propensity to originate from the right colon. They tend to have a larger tumor size and to present at a more advanced stage (3, 4, 6, 9). However, there is a paucity of literature regarding colorectal mucinous adenocarcinoma in Iran (10).

2. Objectives

This study aimed to compare the clinical and patho-

logical characteristics of 70 colorectal mucinous cancers (MCCs) with 491 non-mucinous cancers (NMCCs).

3. Patients and Methods

This retrospective study was carried out by reviewing and analyzing the medical records of all patients with primary colorectal adenocarcinoma, who were diagnosed and treated at the Namazi hospital between 2005 and 2010. Of the 561 patients with colorectal adenocarcinoma, 70 patients had MCC, while the remaining 491 patients had NMCC. All of the patient and tumor characteristics, including the age at presentation, sex, primary tumor location, tumor size, histological type, tumor grade, primary tumor and node stage, surgical margin status, number of lymph nodes dissected, number of involved lymph nodes, lymphatic vascular invasion, and perineural invasion, were extracted from the patients' files. Tumor staging was performed using the seventh edition of the American joint committee on cancer (AJCC) tumor, node, and metastases (TNM) staging system (11). In

this study, we performed a comparative analysis between the MCC and NMCC in terms of the distribution of the clinical and pathological features.

3.1. Statistics

The statistical analyses were carried out using IBM SPSS Statistics version 19.0 (IBM Co. Armonk, NY, USA). The chi-square, Fisher's exact, and Mann-Whitney tests were used for comparing the categorical clinicopathological characteristics as appropriate. In addition, the student t-test was used for comparing the continuous variables, such as the age, tumor size, number of lymph nodes dissected, and number of involved lymph nodes. All of the statistical tests were two-sided, and P values of less than 0.05 were considered to be statistically significant.

4. Results

In the MCC group, there were 42 men and 28 women, with a median age of 55 years old (range 24 - 81 years). In the NMCC group, there were 281 men and 210 women, with a median age of 56 years old (range 18 - 88 years). There were no differences with regard to the patients' mean ages [54.4 (\pm 15) vs. 55.9 (\pm 13.4) ($P = 0.408$)] and male/female ratios [1.5 vs. 1.3 ($P = 0.700$)] between the MCC and NMCC groups. Table 1 represents a comparison of the clinicopathological characteristics between the 70 patients with MCC and 491 patients with NMCC. Accordingly, there was a predilection for the right colon and sigmoid colon in the MCC, when compared to the NMCC ($P = 0.012$).

Table 1. Clinicopathological Characteristics of 70 Patients With Mucinous Colorectal Adenocarcinoma, and 491 Patients With Non-Mucinous Colorectal Adenocarcinoma^a

Characteristics	MCC	NMCC	P Value
Patient number	70 (12.5)	491 (87.5)	
Gender			0.700
Male	42 (60)	281 (57)	
Female	28 (40)	210 (43)	
Age^b	54.4 (15)	55.9 (13.4)	0.408
Primary site			0.012
Right and transverse colon	22 (31)	87 (18)	
Left colon	6 (9)	46 (9)	
Sigmoid colon	18 (26)	99 (20)	
Rectum	24 (34)	259 (53)	
Tumor size, cm^b	5.4 (1.8)	4.7 (2.3)	0.004
Tumor grade			< 0.001
Grade I	35 (50)	336 (68)	
Grade II	23 (33)	132 (27)	
Grade III	12 (17)	23 (5)	
Pathological tumor stage			0.975
T1	1 (1.5)	6 (1)	
T2	15 (21.5)	96 (19.5)	
T3	52 (74)	372 (76)	
T4	2 (3)	17 (3.5)	
Pathological node stage			< 0.001
N0	40 (59)	299 (63.5)	
N1	8 (12)	12 (24)	
N2	20 (29)	59 (12.5)	
Surgical margin status			0.779
Free	64 (94)	460 (95)	
Involved	5 (6)	26 (5)	
Number of dissected nodes^b	8.6 (7.4)	11.2 (10.4)	0.013
Number of positive nodes^b	1.2 (2.4)	2.9 (6.2)	< 0.001
AJCC Stage			0.805
I	13 (19)	83 (17)	
II	28 (40)	219 (46)	
III	24 (35)	157 (33)	
IV	4 (6)	19 (4)	
Lymphatic vascular invasion			0.668
Present	46 (67)	308 (63.5)	
Absent	23 (33)	177 (36.5)	
Perineural invasion			0.048
Present	42 (61)	353 (73)	
Absent	27 (39)	133 (27)	

Abbreviations: AJCC, American joint committee on cancer; MCC, mucinous colorectal cancer; NMCC, non-mucinous colorectal cancer.

^aValues are expressed as No. (%) unless otherwise indicated.

^bValues are expressed as mean (SD).

In addition, the MCC tended to have a larger tumor size ($P = 0.004$), higher histological grade ($P \leq 0.001$), higher node stage ($P \leq 0.001$), higher number of dissected nodes ($P = 0.013$), higher number of positive nodes ($P \leq 0.001$), and higher rate of perineural invasion ($P = 0.013$), when compared to the NMCC. However, we did not find a statistical difference in terms of the surgical margin status, pathological tumor stage (T-stage), AJCC stage, and the presence of lymphatic vascular invasion between the MCC and NMCC.

5. Discussion

Mucinous adenocarcinoma is a distinct histological subtype of colorectal cancer. This pathological entity has been widely investigated in the literature; however, there is very limited research regarding the status of patients with MCC in Iran (10). In the current study, we found that most of the clinicopathological characteristics of those patients with MCC are different from those with NMCC. In one study, Safaee et al. (10) evaluated the clinicopathological characteristics and survival rates of patients with MCC colorectal cancer between 2002 and 2008. They found 1283 patients with colorectal cancer, of which 110 (8.6%) had MCC. The median age at presentation was 50 years, and the right colon was the dominant location for the MCC; however, they did not perform a comparative analysis between the patients with MCC and those with NMCC. In the present study, the median age of the patients with MCC was 55 years old, and we found a higher rate of right colon involvement when compared to NMCC, which is similar to the findings of Safaee et al. (10).

In a similar report, Song et al. conducted a study on 144 (7%) patients with MCC and 1837 patients with NMCC diagnosed between 1994 and 2007. They determined that MCC tends to occur in younger patients, have a large tumor size, and present at a higher nodal and tumor stage (8).

In a recent study, Jimi et al. compared the clinicopathological features of 23 patients with MCC to 403 patients with NMCC. They found statistically different features of the primary tumor location, primary tumor stage (T-stage), peritoneal dissemination, distant metastasis, AJCC TNM stage, and maximum tumor size between the MCC and NMCC (12). Their findings regarding the higher rate of right colon involvement and larger tumor size in the MCC (compared to the NMCC) were consistent with our study results. In a large, institutional-based cohort with a long-term follow-up study, Park et al. investigated a prognostic comparison between MCC and NMCC. They found that MCCs tend to have a larger tumor size, higher preoperative carcinoembryonic antigen (CEA), higher pathological T-stage, more right-sided colon locations, and more common high frequency microsatellite instability (13). Some of their findings, such as the larger tumor size and more right-sided colon locations, were in agreement with our study results.

Maeda et al. investigated the significance of the mucinous component in the histopathological classification

of colon cancer. They evaluated 1038 tumors, of which 877 (84%) were NMCCs, 123 (12%) with (1% - 49%) mucin components, and 38 (4%) were MCCs. They found a larger tumor size and a higher proportion of right-sided tumors in the MCCs when compared to the NMCCs (14). These findings were comparable with our results. In another study, Numata et al. described the clinicopathological features of mucinous adenocarcinoma in Japan. They compared the clinicopathological features of 144 patients with mucinous and 2673 with non-mucinous adenocarcinomas, and found that the patients with MCCs had larger primary tumors, higher pathological T-stages, higher preoperative CEA serum levels, higher rates of nodal and distant metastases, and more metastatic sites (15).

Mekenkamp et al. conducted a study assessing the prognostic impact of mucinous histology in 1010 patients with metastatic colorectal cancer. They found that 99 patients (10%) with MCC were older, with a larger primary tumor size and higher T-stage, compared to the 911 patients with NMCC (9). In one large study, Hyngstrom et al. evaluated the clinical features among patients with mucinous histologies of colorectal adenocarcinoma using data from the national cancer data base (NCDB), including 244794 patients aged 18 - 90 years old with colorectal adenocarcinoma. Of which, 25546 patients (10%) had MCC, which was more frequently right-sided, and associated with a higher stage (6). Moreover, in a population-based study, Du et al. investigated the incidence and survival of MCC patients in Singapore. A total of 627 (4%) of 15762 patients had MCC, and the authors found that the MCC rate was higher in the younger age groups, advanced stages of the disease, and the right colon (16). Verhulst et al. in a systematic review and meta-analysis, reviewed 44 studies including 222256 patients with colorectal cancer. They found that MCC originates more often from the right colon, and is less frequent in male patients. Moreover, the authors did not find a statistical difference in the proportion of stage IV patients at presentation between MCC and NMCC (5). In general, reports from Asian countries have shown a lower incidence of MCC when compared to western countries. No association was found between the patients' age and gender predilection in most of the studies. However, most of the reports showed a larger tumor size, higher proportion of right-sided tumors, and advanced disease stage in MCC, compared to NMCC (7, 8, 16).

This study indicates that most clinicopathological characteristics of MCC are different from those of NMCC, and that there is an association between the mucinous subtype and adverse pathological features in patients with colorectal cancer.

Footnotes

Authors' Contribution: Sare Hosseini: involved in the design, literature review, data collection, writing and revising the manuscript, and approval of the final version; Shadi Zohourinia: involved in the conception, design, lit-

erature review, writing the manuscript, and approval of the final version; Mohammad Zare-Bandamiri: involved in the conception, design, literature review, writing the manuscript, and approval of the final version; Maral Mokhtari: involved in the conception, design, literature review, writing the manuscript, and approval of the final version; Soudabeh Pourhashemi: involved in the conception, design, literature review, writing the manuscript, and approval of the final version; Massood Hosseinzadeh: involved in the conception, design, literature review, writing the manuscript, and approval of the final version; Mohammad Mohammadianpanah: involved in the concept, design, data collection, literature review, writing and revising the manuscript, and approval of the final version.

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