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Original Research Article

Clinicopathological Profile of Colorectal Carcinoma with Histopathological Grading and Staging

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Abstract

Background: Colorectal Carcinoma is one of the primary gastrointestinal malignancies where histopathological grading and staging are crucial elements in prognosis and treatment planning. This is a retrospective observational study of clinicopathological profile, histological grade and pathological stage of colorectal carcinoma diagnosed at tertiary care centre. Records of 164 patients with biopsy or resection-confirmed colorectal carcinoma from January 2020 to December 2023 were reviewed. The age, sex, presenting symptoms, gross morphology, histological type, grade, lymphovascular invasion, perineural invasion, nodal status and TNM stage were documented.

Results: The mean age was 55.8 +/- 13.9 years, and 58.5% were male. Rectum was the commonest site (38.4%) followed by sigmoid colon (24.4%). Conventional adenocarcinoma (81.7 %), mucinous adenocarcinoma (13.4 %) and signet-ring cell carcinoma (3.0 %) were identified. The majority of the tumors were moderately differentiated (61.0%). 118 resection specimens, most (48.3%) were pT3, and nodal metastasis, lymphovascular invasion, and perineural invasion were seen in 56, 38.1%, and 28.8%, respectively. Poor differentiation, positivity of lymphovascular invasion, positivity of perineural invasion and positivity of nodes were significantly associated with advanced stage (stage III/IV) ($p<0.001$).

Conclusion: The present study highlights the significance of a structured histopathological reporting of CRC, especially grade, depth of invasion, adverse morphological features, and nodal yield.

Keywords: Colorectal Carcinoma, Histopathological Grade, TNM Stage, Adenocarcinoma, Lymphovascular Invasion, Retrospective Study.

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Introduction

Colorectal carcinoma is one of the most prevalent cancers in the world and remains a major cause of cancer-related death [1]. While screening programs have helped to detect the disease early in some populations, many patients still have bleeding, changed bowel habits, obstruction or advanced disease. Not only is the histopathological diagnosis important for the diagnosis of malignancy, but it also provides the information needed for determining surgery, adjuvant therapy and follow-up, which is significant for prognosis [2].

According to the World Health Organization classification of digestive system tumors, there are several histological variants of conventional adenocarcinoma, including mucinous, signet-ring cell and medullary carcinoma [3]. Pathological stage, defined as invasion (T) of the primary tumor, the presence or absence of nodes (N), and the presence or absence of metastasis (M) in routine practice is the most powerful predictor of outcome [4]. Other pathological parameters, including grade, lymphovascular invasion, perineural invasion, tumor budding, margin status and number of evaluated lymph nodes, also play a role in the prognosis and in multidisciplinary decision making [5].

Structured reporting protocols have been known to enhance completeness and consistency of colorectal carcinoma pathology reports [6]. Clinicopathological patterns, however, differ in

various centers due to referral patterns, age distribution, screening availability and surgical practice. Local audit of histological type, grade and stage allows trends to be identified and areas for improvement. This study was undertaken to describe clinicopathological profile of colorectal carcinoma and to assess the distribution of histopathological grade and stage in a tertiary care center.

Materials and Methods

In this retrospective observational study, all patients with colorectal carcinoma who were diagnosed by endoscopy biopsy, colectomy, anterior resection, abdominoperineal resection or metastatic tissue biopsy between January 2020 and December 2023 were included. No cases were included with no primary pathology data for appendiceal carcinoma, anal squamous carcinoma, neuroendocrine tumor or recurrent carcinoma.

The clinical information, such as age, sex, symptoms, tumor site and radiological evidence of metastasis was collected from requisition forms and hospital records. The gross characteristics of the resection specimens were tumour size, margin distance, circumferential involvement and perforation. Tissues were routinely processed and stained with hematoxylin and eosin. Histological type and grade were determined based on the accepted criteria. For resection specimens, there was lymph node assessment available and TNM staging was performed. The data was recorded in excel and analyzed using SPSS 26. Continuous data were expressed as mean ± SD. Categorical variables were presented as frequencies and percentages. The associations between the advanced stage and histopathological parameters were assessed by a chi-square test or Fisher exact test. A p-value <0.05 was considered statistically significant.

Results

A total of 164 patients were included. The age ranged from 24 to 84 years, with a mean of 55.8 +/- 13.9 years. Ninety-six patients were male and sixty-eight were female. Bleeding per rectum was the commonest presenting symptom, followed by altered bowel habits, abdominal pain and anemia. Rectum and sigmoid colon together accounted for nearly two-thirds of tumors.

Conventional adenocarcinoma was the predominant histological type. Mucinous adenocarcinoma was more common in younger patients and right-sided tumors, although this trend did not reach statistical significance. Moderately differentiated tumors were most frequent, while poorly differentiated and signet-ring cell tumors were associated with higher stage. Among 118 resection specimens, pT3 was the most frequent tumor category. Adequate lymph node yield of at least 12 nodes was achieved in 83 cases (70.3%). Nodal metastasis was identified in 56 cases. Stage III was the most common pathological stage, followed by stage II. Advanced stage showed significant association with poor differentiation, lymphovascular invasion, perineural invasion and positive nodes.

Table 1: Demographic and clinical characteristics (Total cases = 164)

Variable	Category	Number (%)
Age group	<40 years	24 (14.6)
Age group	40-59 years	76 (46.3)
Age group	>=60 years	64 (39.0)
Sex	Male	96 (58.5)
Sex	Female	68 (41.5)
Common symptom	Bleeding per rectum	74 (45.1)
Common symptom	Altered bowel habit	52 (31.7)
Common symptom	Obstruction/abdominal pain	38 (23.2)

Table 2: Tumor site, histological type and grade

Parameter	Category	Number (%)
Site	Cecum/ascending colon	22 (13.4)
Site	Transverse/descending colon	20 (12.2)
Site	Sigmoid colon	40 (24.4)
Site	Rectum	63 (38.4)
Site	Rectosigmoid/unspecified	19 (11.6)
Histological type	Conventional adenocarcinoma	134 (81.7)
Histological type	Mucinous adenocarcinoma	22 (13.4)
Histological type	Signet-ring/other	8 (4.9)
Grade	Well differentiated	28 (17.1)
Grade	Moderately differentiated	100 (61.0)
Grade	Poorly differentiated	36 (22.0)

Grade was recorded on the dominant invasive component.

Table 3. Pathological staging and adverse features in resection specimens

Feature	Category	Number (%)
pT category	pT1/pT2	28 (23.7)
pT category	pT3	57 (48.3)
pT category	pT4	33 (28.0)
Nodal status	pN0	62 (52.5)
Nodal status	pN1	34 (28.8)
Nodal status	pN2	22 (18.6)
Pathological stage	Stage I	12 (10.2)
Pathological stage	Stage II	49 (41.5)
Pathological stage	Stage III	51 (43.2)
Pathological stage	Stage IV	6 (5.1)
Lymphovascular invasion	Present	45 (38.1)
Perineural invasion	Present	34 (28.8)

Stage data include 118 resection specimens with nodal assessment.

Discussion

In this study, the most common age group for the onset of colorectal carcinoma was the fifth to the seventh decade of life, and the condition was more prevalent among males than among females, and in the rectosigmoid area. The results are in general agreement with the clinicopathological data and the distribution of colorectal cancer in many tertiary care centers [7,8].

The predominant histological type was conventional adenocarcinoma and a smaller but clinically significant group was the mucinous and signet-ring variants. There are a number of variants recognized by the WHO which include mucinous and signet-ring cell carcinoma, and these variants may be linked to younger age, right-sided location and microsatellite instability or advanced stage in some cohorts [9].

As in most pathology based series, moderately differentiated tumors predominated. However, there was poor differentiation that had stronger correlation with advanced stage, which is why the histological grade is still useful in routine reporting [10]. Grade may not be as strong as TNM stage but is a valuable tool when combined with lymphovascular invasion, perineural invasion, tumor budding and margin status [11].

Nodal positivity rate in the resection specimen was 47.5% and stage III was the most common stage. One of the most important quality indicators is adequate lymph node retrieval, as less than 12 nodes may be understaged [12]. In this study, almost one-third of the specimens were resected with fewer than 12 nodes, suggesting that there is still room for improvement in the handling of surgical specimens and fat clearance.

There was a significant association between lymphovascular invasion, perineural invasion and the advanced stage. These undesirable characteristics indicate aggressive tumor biology and should play a role in multidisciplinary discussions [13]. The weaknesses of this study are its retrospective design, the lack of data from molecular testing and the use of a single-center design, and variable information about the preoperative treatment. Future investigations should incorporate mismatch repair status, tumor budding (scoring) and follow up on survival to link the morphology to clinical outcomes [14,15].

This is clinically relevant as the proportion of distal cancers (rectal & sigmoid) is relatively higher in this cohort, which is associated with more clinical presentations of bleeding and altered bowel habit. Tumors on the right side, on the other hand, can cause anemia or be associated with non-specific abdominal signs and symptoms at a later age. The exact anatomical site is therefore still important for documentation to correlate symptoms, for surgical planning and interpretation of stage distribution [2,4].

A meaningful minority of cases were in younger patients. Colorectal carcinoma is typically a disease of older adults but early onset colorectal cancer (EO CRC) is becoming more common in many populations. For younger patients, a mucinous or poorly differentiated histology should raise a suspicion of hereditary predisposition, mismatch repair status and family history if resources allow [1,14]. The gross morphology also helped with the clinicopathological interpretation. Annular constriction tumors were more common in the left colon/rectum and polypoid or ulceroproliferative growths were more common in more proximal tumors. These are not staging criteria, but they serve as a guide to sampling of the deepest invasive front, margins and associated mucosa.

In this series, association was present with the histological grade. The relationship is biologically plausible as the poorly differentiated tumor is more prone to show infiltrative growth, lymphovascular invasion and nodal spread. Grade is not, however, the only means by which one should interpret it for treatment decisions [5,10].

One of the important modifiable quality indicators is the harvest of lymph nodes. Failure to retrieve nodes may result in understaging and failure to offer a chance for adjuvant therapy. In colectomy and rectal resection specimens, fat clearance, repeated palpation of mesenteric fat, and careful gross examination and communication with surgeons can enhance the yield of nodes [6,12].

The presence of lymphovascular invasion and perineural invasion were not just descriptive findings, but were both significantly correlated with the advanced stage. Their documentation is particularly relevant regarding node-negative cancers as they could help to identify patients with a greater chance of recurrence. The invasive front of the tumor should be carefully examined by pathologists and there should be deeper sections if there are suspicious foci present [11,13].

The study also highlights the increasing demand for ancillary testing. In recent times, the different pathways in the treatment of CRC include mismatch repair immunohistochemistry, RAS/BRAF testing and HER2 testing in certain metastatic CRC cases. In absence of these tests, when morphology flags a case for molecular work-up, it is a strong clinical indication that molecular work-up is indicated [3,14].

Due to the retrospective design of the study, survival analysis had limited application, though many patients are likely to be diagnosed at stage II or III depending on the pathological distribution. The pathway from symptom onset to definitive treatment could be shortened through improving endoscopic access, rapid biopsy turn-around time, and structured reporting. Future institutional audits should provide a correlation between the pathology findings and the recurrence and survival rates [15].

The distribution of pathological stage also has implications for public health. A significant number of cases were stage III, which implies symptoms may have been present for several months prior to colonoscopy or definitive surgery. Routine use of colonoscope in the setting of rectal bleeding, unexplained iron deficiency anemia and altered bowel habits may improve stage at diagnosis [1,2]. In the older reports tumour budding was not systematically recorded and could not be analysed. This is a drawback since budding of tumour cells at the invasive front is now known to be a negative prognostic feature, especially in low stage colorectal carcinoma. When validated workflows are available, a standardized tumor budding score should be included in future reports [10]. Another critical aspect of reporting colorectal cancer is margin status. A circumferential resection margin is particularly critical in rectal cancer as it is a good indicator of local recurrence. This audit only assessed grade and stage, however future datasets should include proximal, distal and radial margin clearance (mm) for all rectal resections [6].

Pathological assessment of treated rectal cancers is different than that of untreated ones. Neoadjuvant chemoradiotherapy may result in fibrosis, mucin pools, acellular necrosis and occasional residual tumor cells. Treatment-response grading was not performed for the current analysis due to incomplete treatment data, but should be added to the analysis in future.

Practical significance of communication between surgeon and pathologist, and between endoscopist and surgeon. Correct location and orientation of the resection of the biopsy site eliminates the chance for error in the location and margin status of the tumor. Joint evaluation of conflicting cases can enhance the accuracy of reporting and clinical decision making [15].

Conclusion

In this tertiary care cohort, colorectal carcinoma most commonly affected the rectum and sigmoid colon, and were mainly conventional moderately differentiated adenocarcinoma. Poorly differentiated, lymphovascular invasion, perineural invasion and nodal metastasis were associated with advanced stage. It is important to report these histopathological findings in a structured fashion in order to ensure accurate staging, prognosis and treatment planning.

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