# Pathology of Colorectal Cancer

# 2

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Cancer of the colon and rectum is one of the most common forms of malignancy in developed countries. It accounts for about 10% of all cancer registration in the UK, where the death rate is second only to that of lung cancer. The incidence appears to be rising. The peak incidence is between ages 60 and 79. Fewer than 20% of cases occur before age 50. Unhealthy dietary practices, obesity and physical inactivity are risk factors for colorectal cancer [1, 2].

## 2.1 Histological Classification of Colorectal Cancers

Roughly 25% of colorectal cancers occur in the caecum and ascending colon, 11% in the transverse colon, 6% in the descending colon and 55% in the rectosigmoid.

Histologically, these tumours are typically composed of tall columnar cells but with invasion into the submucosa, muscularis propria or beyond. A minority produce copious extracellular mucin. Carcinoma may also be poorly differentiated, solid tumours without gland formation. Less commonly, foci of neuroendocrine differentiation, signet ring cells or squamous differentiation occur. Carcinomas characteristically incite

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strong desmoplastic stromal responses with mesenchymal inflammation and fibrosis, leading to the firm, hard consistency of most colorectal carcinomas [3].

All colorectal carcinomas begin as in situ lesions; they evolve into different morphological patterns. Tumours in the proximal colon tend to grow as polypoid, exophytic masses that extend along one wall of the caecum and ascending colon and rarely cause obstruction. Carcinomas in the left colon tend to be annular, encircling lesions that produce constriction of the bowel. Colorectal cancers can be classified into the following histological types:

- Adenocarcinoma: this is the most common type of colorectal cancer; virtually 98% of all cancers in the large intestine are adenocarcinomas. It can be divided into three grades based on the degree of tubular or glandular formation.

Grade I accounts for 15–20%well-differentiated tumours. The majority of the tumour form well-organised tubules or glands resembling adenomatous lesion.

Grade II accounts for 60–70% moderately differentiated tumours. The amounts of tubules are between grade I and grade III tumours.

Grade III accounts for 15–20% poorly differentiated tumours. The tumours form distorted and small tubules or no tubular formation.

- Signet ring cell carcinoma: variant of adenocarcinoma with over 50% signet ring cell. This type of carcinoma is prone to metastasis and thus pursues a poor prognosis.
- Mucinous adenocarcinoma accounts for 10% of colorectal cancers and is a variant of adenocarcinoma with over 50% percent of the tumour composed of extracellular mucin.
- Small cell carcinoma accounts for less than 1% of colorectal cancers. This is a type of neuroendocrine carcinoma.
- Undifferentiated carcinoma: rare tumours, have no glandular structures or other features to indicate definite differentiation.
- Squamous and adenosquamous carcinoma: these tumours are extremely rare in the colorectum.
- Lymphomas make 1–3% of gastrointestinal malignancies. Sporadic B-cell lymphomas are the most common forms. These derive from mucosa-associated lymphoid tissue (MALT).
- Carcinoid tumours: uncommon in the colorectum. Rectal carcinoids rarely metastasise, but colonic carcinoids frequently aggressive, because of their endocrine cell origin, many elaborate amines or peptides [1, 3, 5].

## 2.2 TNM Classification

There are two staging systems for colorectal cancer used in the UK, the TNM stage and the Dukes stage. The classification applies to carcinomas; there should be histological confirmation of the disease. The following TNM stage is based on the UICC TNM classification seventh edition [4].

Tx, primary tumour cannot be assessed

T0, no evidence of primary tumour

Tis, carcinoma in situ, intraepithelial or invasion of lamina propria
T1, tumour invades submucosa
T2, tumour invades muscularis propria
T3, tumour invades subserosa or into non-peritonised pericolic or perirectal tissues and pericolorectal tissues
T4, tumour directly invades other organs or structures and/or perforates visceral peritoneum
T4a, tumour perforates visceral peritoneum
T4b, tumour invades other organs or structures
Nx, regional lymph nodes cannot be assessed
N0, no regional lymph node metastasis
N1a, one regional lymph node
N1b, two to three regional lymph nodes
N1c, satellites without regional nodes
N2a, four to six regional nodes
N2b, seven or more regional nodes
Mx, distant metastasis cannot be assessed
M0, no distant metastasis
M1a, one organ
M1b, more than one organ, peritoneum

### 2.2.1 Duke Stages

Dukes A: tumour limited to muscularis propria, nodes negative
Dukes B: tumour spread beyond muscularis propria, nodes negative
Dukes C1: lymph nodes positive but highest node spared
Dukes C2: highest node involved
Dukes D: histological proven distant metastasis [3]

### 2.2.2 Prognostic Factors

The single most important prognostic indicator of colorectal carcinoma is the extent of the tumour at the time of diagnosis, the TNM and Dukes stage. Regardless of the system used, survival at 1, 5 and 10 years is strongly correlated with the stage of disease at the time of surgical resection. Staging can be accurately applied only after the extent of spread is determined by surgical exploration and pathological examination.

- Tumour grade: the better differentiated the tumour is, the more favourable the prognosis is. Poor differentiation predicts nodal metastatic disease.
- TNM and Dukes stage: the higher the stage, the poorer the prognosis.
- Extramural venous invasion: tumour infiltration of lymphatic or venous spaces in the submucosa or extramural spaces is regarded as a significant risk factor for lymph node or distant metastatic disease. The liver is most frequently involved.
- Lymph node metastasis: node-positive patients have significantly worse survival than those with negative nodes.

- Mismatch repair status by immunohistochemistry or microsatellite instability (MSI) testing: if abnormal, it is suggestive of unfavourable prognosis.
- K-RAS mutation: if the mutation is present, the anti-EGFR medications cetuximab (Erbitux) and panitumumab (Vectibix) are not as effective and should not be used [1, 3, 5].

**Key Points**

- Cancer of the colon and rectum is one of the most common forms of malignancy in developed countries.
- Roughly 25% of colorectal cancer occur in the caecum and ascending colon, 11% in the transverse colon, 6% in the descending colon and 55% in the rectosigmoid.
- Histologically, these tumours are typically composed of tall columnar cells but with invasion into the submucosa, muscularis propria or beyond.
- All colorectal carcinomas begin as in situ lesions; they evolve into different morphological patterns.
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## References

1. Mills SE, editor. Sternberg's diagnostic surgical pathology. 4th ed. Baltimore: Lippincott Williams & Wilkins, 2004.
2. Fenoglio-Preiser CM, editor. Gastrointestinal pathology. 3rd ed. Baltimore: Lippincott Williams & Wilkins, 2008.
3. Fletcher CDM, editor. Diagnostic histopathology. 3rd ed. USA: Churchill Livingstone Elsevier, 2007.
4. Sobin L, et al., editors. TNM classification of malignant tumour, UICC international union against cancer. 7th ed. UK: Wiley-Blackwell, 2009.
5. Mitchell R, et al., editors. Robbins and Cotran Pathologic basis of disease. 7th ed. Philadelphia: Saunders Elsevier 2006.