Overview of Endoscopic Features of Gastrointestinal Pathology (Colon)

13

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Contents

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Endoscopic Anatomy

- Appreciation of endoscopic anatomical landmarks by the endoscopist is important for accurate localisation and documentation, especially for management of colorectal neoplasia.
- The colon is broadly divided into:
  - Proximal—proximal to the splenic flexure
  - Distal—distal to the splenic flexure
- In the absence of colonoscopic instrument looping, anatomical landmarks that can be identified during colonoscopy are (Fig. 13.1):
  - Rectum
  - Sigmoid colon
  - Descending colon
  - Splenic flexure
  - Transverse colon
  - Hepatic Flexure
  - Ascending colon
  - Cecum
  - Appendiceal orifice
  - Ileocaecal valve
  - Terminal ileum

Colitides

Inflammatory Bowel Disease

Ulcerative Colitis

- Ulcerative colitis (UC) is endoscopically characterised by confluent colonic inflammation

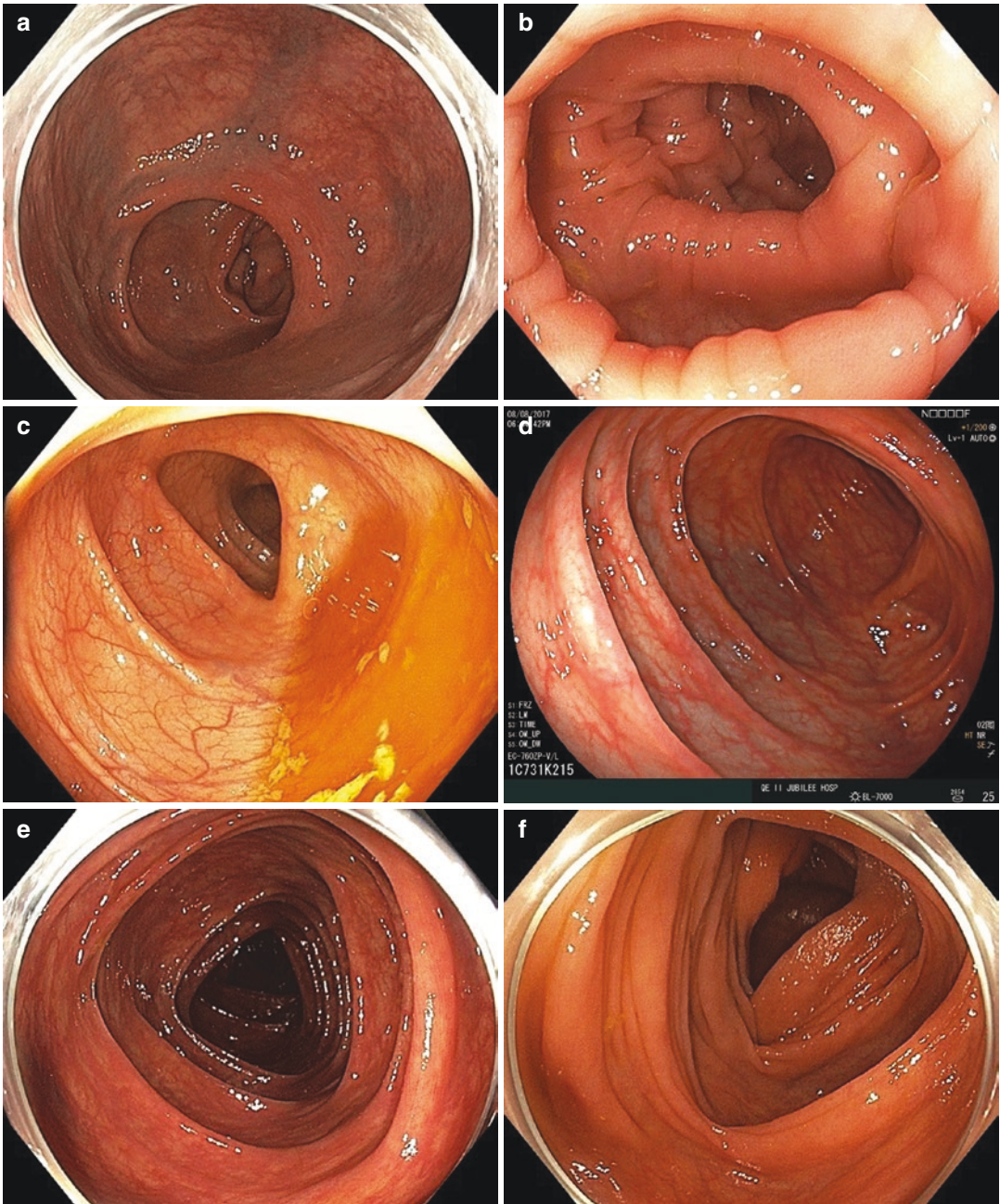**Fig. 13.1** (**a**) Rectum with view of the semilunar rectal folds, also known as "valves of Houston". (**b**) Sigmoid colon at 25 cm from the anal verge characterised by a concentric circular luminal appearance. (**c**) Descending colon at 40 cm from the anal verge characterised by the presence of fluid level when the patient is in the left lateral decubitus position. (**d**) Blue splenic flexure discolouration through the lumen of the proximal descending colon. (**e**) Transverse colon at 55 cm from the anal verge characterised by a triangular-shaped lumen. The image also shows a transparent distal cap attachment on the instrument, which is used to assist in maintaining visualisation while inspecting proximal aspects of colonic folds. (**f**) Ascending colon, with the ileocaecal valve in the distance (top). (**g**) Distal ascending colon and hepatic flexure with the colonoscope tip in retroflexion, to assist visualisation of blind spots on the proximal surfaces of colonic folds and flexures. (**h**) Ileocaecal valve (left) appearing as a semilunar thickened fold. (**i**) Appendiceal orifice. (**j**) Terminal ileum. (**k**) Taenia coli (muscularis externa) can be seen extending longitudinally in the direction of the lumen (bottom)
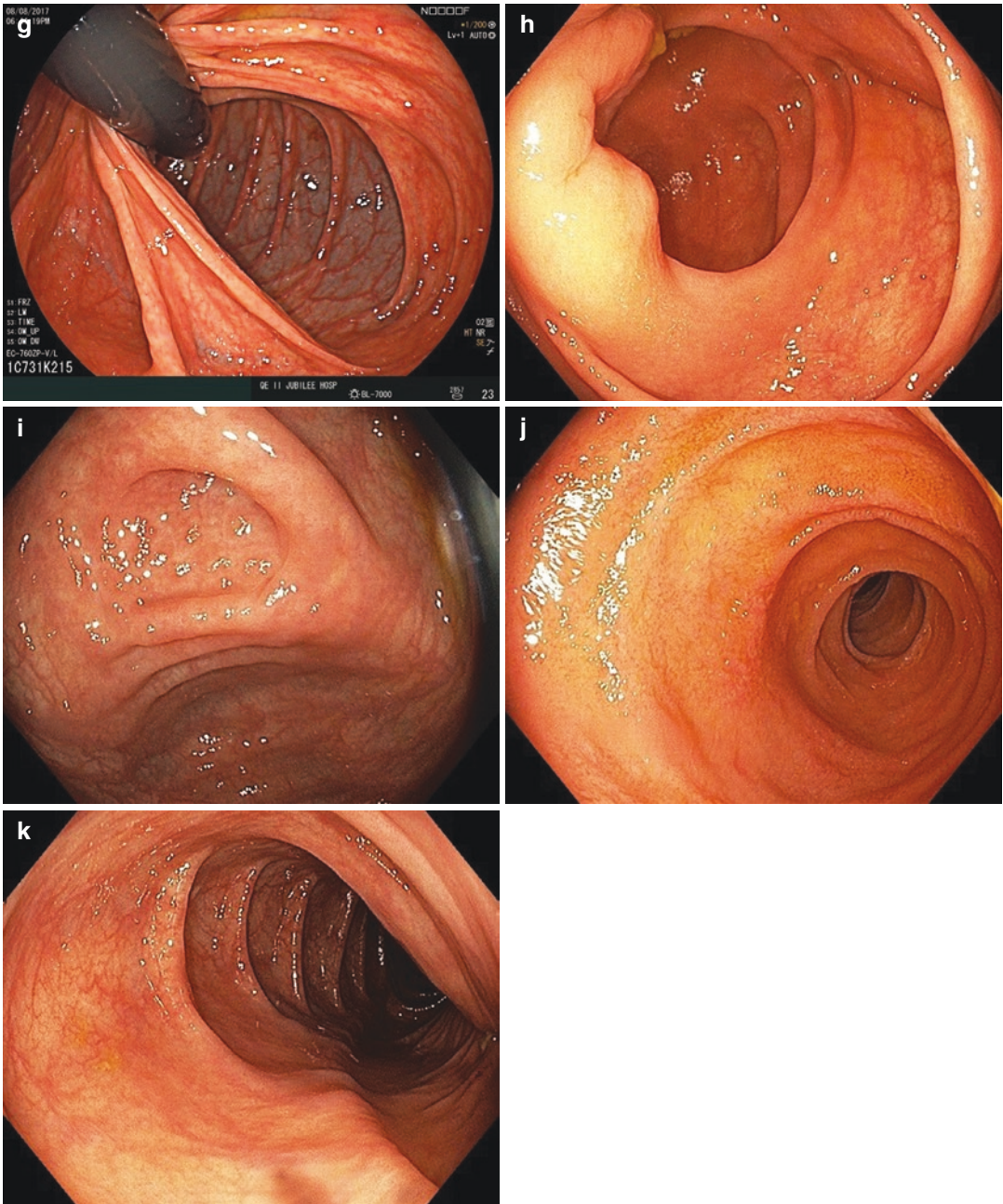
Fig. 13.1 (continued)

starting at the rectum and extending proximally (Fig. 13.3).

• Phenotypically, UC can be classified based on the anatomical extent of colonic inflammation (Table 13.1). The Montreal classification is used during colonoscopy to categorise UC into [1]:

– **E1**, ulcerative proctitis—inflammation is limited to the rectum.

– **E2**, left-sided ulcerative colitis (distal UC)—inflammation does not extend proximally beyond the splenic flexure.

– **E3**, extensive ulcerative colitis (pancolitis)—inflammation extends proximally beyond the splenic flexure.
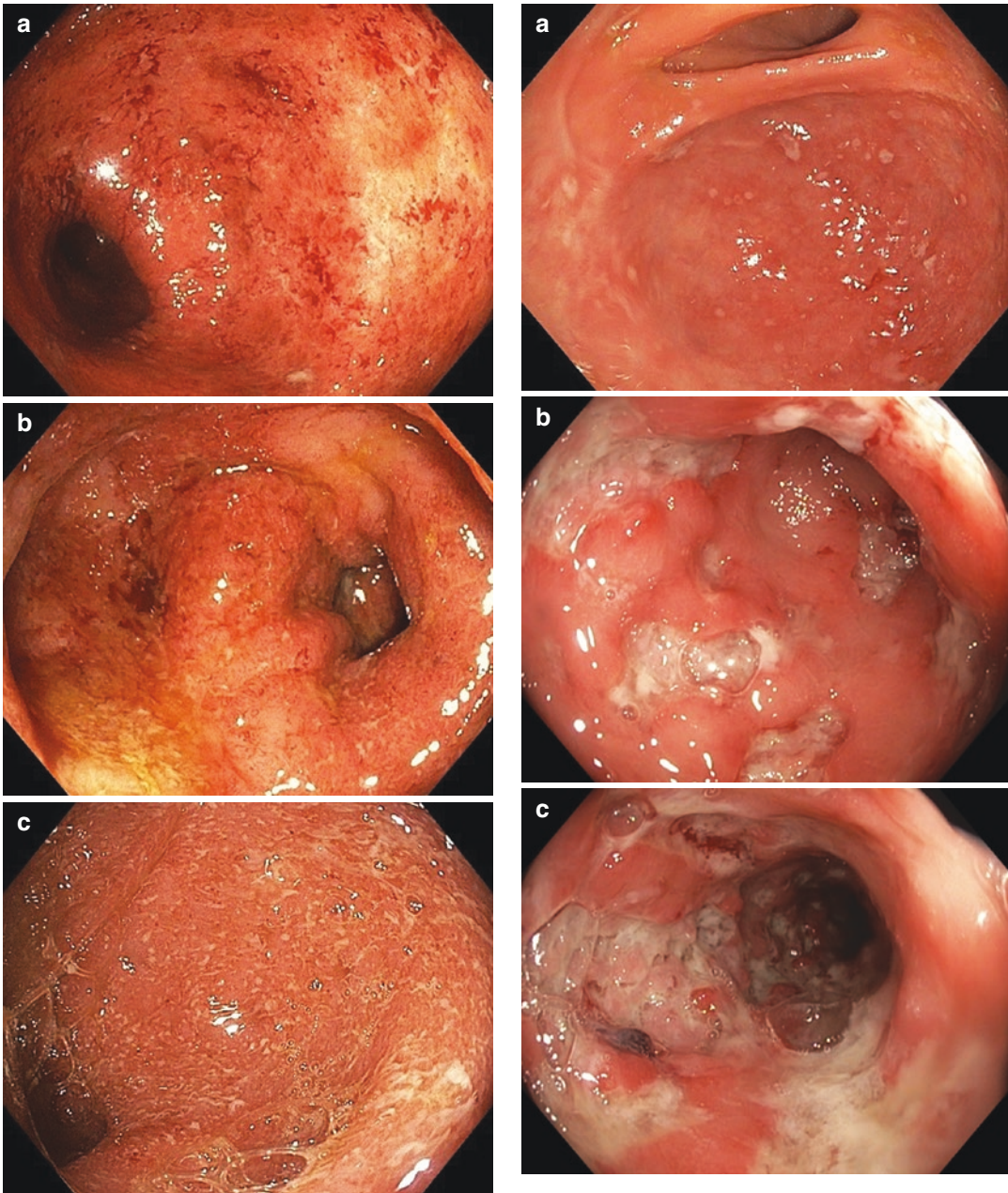
Fig. 13.2 (**a**–**c**) Moderately active ulcerative colitis with diffuse mucosal granularity, oedema, absent vascular markings, erythema, exudates, spontaneous bleeding, and luminal narrowing

Fig. 13.3 (**a**–**c**) Severe active Crohn's colitis with deep linear ulcers, oedema, absent vascular markings, erythema, and luminal narrowing. A guide wire was passed through the stricture prior to balloon dilatation. The stricture was successfully traversed after dilatation

- Additionally, the severity of colonic inflammation is classified clinically as:
  - **S0**, clinical remission—asymptomatic
  - **S1**, mild UC—≤4 bloody or non-bloody stools daily, no systemic illness, and normal ESR
  - **S2**, moderate UC—>4 bloody stools daily with minimal sign of systemic illness or toxicity (Fig. 13.2)
  - **S3**, severe UC—≥6 bloody stools daily, tachycardia (≥90 bpm), temperature ≥37.5 °C, anaemia (Hb < 105 g/L), and ESR ≥30 mm/h

Table 13.1 Mayo Endoscopic score for ulcerative colitis

Score	Severity	Description
0	Normal	Normal or inactive disease
1	Mild	Erythema, reduced mucosal vascular pattern
2	Moderate	Marked erythema, absent mucosal vascular pattern, mucosal friability, erosions
3	Severe	Spontaneous bleeding, ulceration

- Fulminant UC is characterised by >10 bloody stools daily, toxicity, abdominal distention and tenderness, severe anaemia requiring blood transfusion, and colonic dilatation on imaging.
- The severity of colonic inflammation is scored endoscopically using the Mayo endoscopic core as:
  - Normal or inactive disease
  - Mild (erythema, reduced mucosal vascular pattern)
  - Moderate (marked erythema, absent mucosal vascular pattern, mucosal friability, erosions)
  - Severe (spontaneous bleeding, ulceration)

Crohn's Disease

- Crohn's disease (CD) is endoscopically characterised by transmural inflammation (erythema, erosions, deep ulceration, strictures) of the terminal ileum with or without patchy inflammatory areas in the colon with intervening normal colonic mucosa (Figs. 13.4 and 13.5).
- Can affect the any part of the luminal gastrointestinal tract.
- Patients often present with abdominal pain and anaemia.
- The Vienna and Montreal classification is used during colonoscopy to categorise CD (Table 13.2) [1].
- The endoscopic recurrence severity score is used to assess the ileocolonic anastomosis and ileum (Table 13.3).

SCENIC and DALM

In 2015, an international expert multidisciplinary panel including gastrointestinal pathologists developed the International Consensus Statement on Surveillance and Management of Dysplasia in Inflammatory Bowel Disease
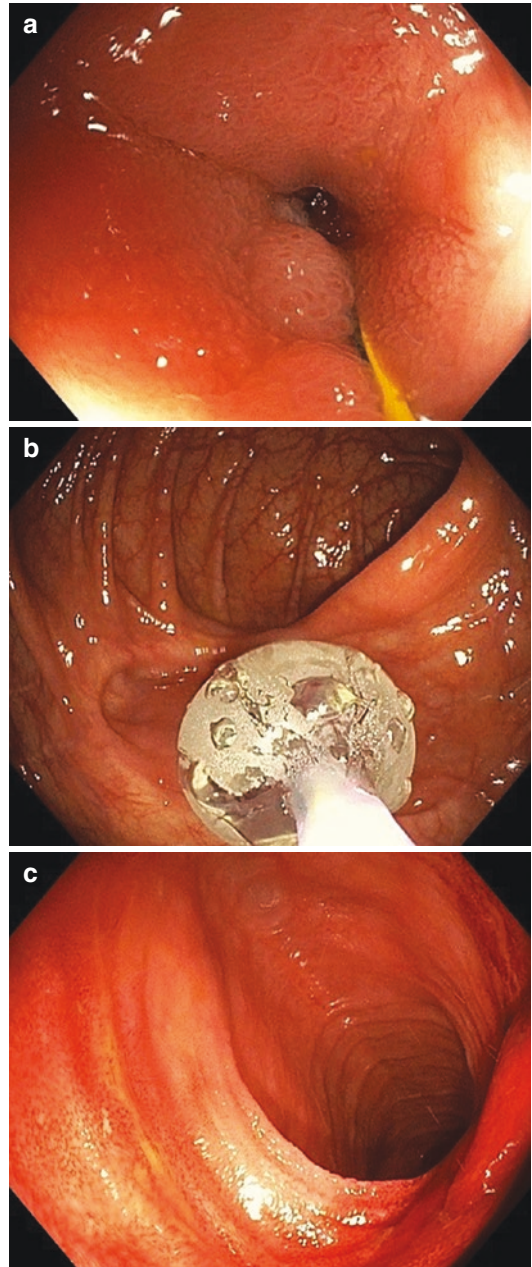

Fig. 13.4 (**a–c**) Severe neo-terminal ileal fibrotic anastomotic stricture in a Crohn's patient following ileocolonic resection. A guide wire was passed through the stricture prior to balloon dilatation. The stricture was successfully traversed after dilatation

(SCENIC) [2, 3]. Some of their key recommendations included:

- To abandon the use of less accurate endoscopic terminology including "dysplasia-associated lesion or mass (DALM)",

Fig. 13.5 Pseudomembranous colitis with typical yellow-white pseudomembranes

Table 13.4 Common bacterial pathogens causing infectious colitis

Clostridium difficile
Shigella
Escherichia coli
Yersinia enterocolitica
Salmonella
Campylobacter jejuni
Clostridium perfringens
Staphylococcus aureus
Vibrio cholerae
Plesiomonas shigelloides
Aeromonas

Table 13.2 Vienna and Montreal classification for categorising Crohn's disease

	Vienna	Montreal
Age at diagnosis	A1 below 40 years	A1 under 16 years
	A2 above 40 years	A2 between 17 and 40 years
		A3 above 40 years
Location	L1 ileal	L1 ileal
	L2 colonic	L2 colonic
	L3 ileocolonic	L3 ileocolonic
	L4 upper	L4 isolated upper disease
Behaviour	B1 non-stricturing, non-penetrating	B1 non-stricturing, non-penetrating
	B2 stricturing	B2 stricturing
	B3 penetrating	B3 penetrating
		P perianal disease

Table 13.3 Endoscopic recurrence severity score for assessing ileocolonic anastomosis in Crohn's disease

Score	Lesions	Endoscopic diagnosis
0	No lesions	No recurrence
1	<5 aphthous ulcers	
2	≥5 aphthous ulcers confined to the ileocolonic anastomosis or 2–5 larger lesions >5 mm	Recurrence
3	Diffuse aphthous ileitis	
4	Diffuse inflammation with larger ulcers or anastomotic narrowing	

"adenoma-like", or "non-adenoma-like" and use "endoscopically resectable" or "nonendoscopically resectable".

- Using chromoendoscopy with targeted biopsy is superior to white-light colonoscopy with random biopsy.
- Confirmation of dysplasia by a specialised gastrointestinal pathologist.

Infectious Colitis

- Infectious colitis is diagnosed by the combination of:
  - Characteristic histologic inflammatory changes on colonic biopsies positive microbiological testing for the culprit organism (Table 13.4) [4].
  - Colonoscopic findings in early disease (within 4–5 days) usually show distal colitis with relative sparing of the rectum. The rectum can be severely affected later in the disease course, which causes endoscopic and histologic confusion for differentiating infectious colitis from ulcerative colitis.
- Colitis due to *Clostridium difficile* shows characteristic yellow-white pseudomembranes known as "pseudomembranous colitis" (Fig. 13.5).

Microscopic Colitis

- Colonoscopic examination is usually normal.
- Occasionally mild mucosal erythema, oedema, or reduced mucosal vascularity can be noted.
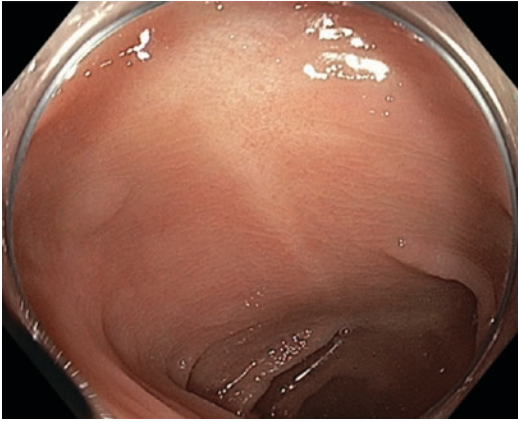- Patients usually present with chronic diarrhoea.

Fig. 13.6 A resolved tram-track sign in a patient with healed ischaemic colitis

Ischaemic Colitis

- Ischaemic colitis often referred to as mesenteric ischaemia can be acute or chronic.
- Endoscopic and histologic features vary according to the phase, severity, and duration of ischaemic injury.
- Anatomical involvement corresponds to the affected vascular territory but commonly affect the splenic flexure and rectosigmoid junction, also known as "watershed areas".
- These features are usually segmental in distribution with an abrupt transition between injured and non-injured colonic mucosa. Endoscopic features can include:
  - Confluent necrosis of colonic wall
  - Colonic wall and colonic folds oedema
  - Mucosal friability, ulceration, and petechial haemorrhage
  - Intraluminal bleeding and clots
  - Segmental distribution with an abrupt transition between injured and non-injured
  - "Colon-stripe" sign (longitudinal ulcer along watershed area) or "double colon-stripe" sign, also known as a "tram-track" sign (Fig. 13.6).
  - Follow-up colonoscopy after resolution of ischaemic injury often shows complete resolution of colitis with healed mucosal scarring.

Radiation Colitis

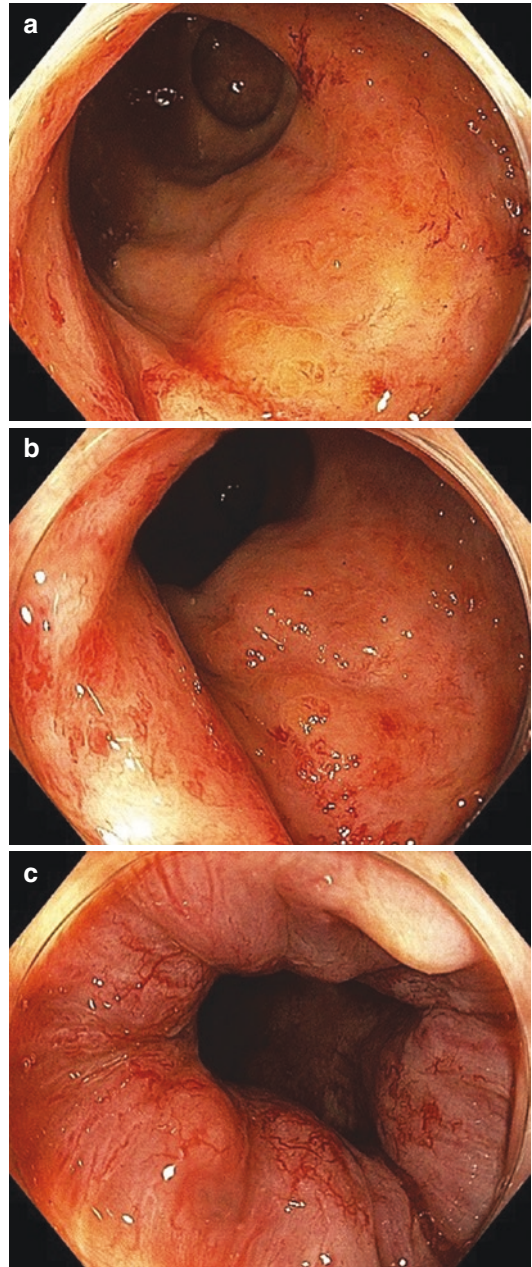- Diffuse mucosal changes caused by radiotherapy.

Fig. 13.7 (**a–c**) Chronic radiation proctitis characterised by neovascularisation with telangiectatic mucosal capillaries, loss of normal vascular background, patchy erythema, and mucosal oedema

- Radiation proctitis can be frequently seen in men following radiation therapy for prostate cancer.
- They appear as an acquired angioectasias and can frequently cause bleeding (Fig. 13.7).
- Treatment with argon plasma coagulation is effective.

Table 13.5 NBI International Colorectal Endoscopic (NICE) classification

|	Type 1	Type 2	Type 3
Colour	Same or lighter than background	Browner relative to background colour arising from vessels	Brown to dark brown relative to background sometimes patchy whiter areas
Vessel	None or isolated lacy vessels coursing across the lesion	Brown vessels surrounding white structures	Has area(s) of disrupted or missing vessels
Surface pattern	Dark or white spots of uniform size or homogenous absence of surface pattern	Oval, tubular, or branched white structures surrounded by brown vessels	Amorphous or absent surface pattern
Most likely pathology	Serrated polyp (hyperplastic or sessile serrated polyp)	Adenoma	Deep submucosal invasive cancer

Colorectal Neoplasia

The latest-generation, high-definition endoscope systems all have built-in electronic image-enhancement technologies that can be used for optical diagnosis of colorectal polyps [5–7]. The most widely used technology is narrow-band imaging (NBI) for differentiating serrated from adenomatous colorectal polyps. Endoscopic imaging has revolutionised real-time management of colorectal polyps during colonoscopy. Historically, large polyps were biopsied initially to exclude the presence of carcinoma before being removed endoscopically. Modern therapeutic approaches advocate avoiding tissue biopsy, which can induce submucosal fibrosis and may compromise the technical success of complete and safe endoscopic removal of colorectal polyps.

The NBI International Colorectal Endoscopic (NICE) classification is a simple and validated classification that can be used in real time to optically diagnose colorectal polyps into serrated, adenomatous, or carcinoma with deep submucosal invasion (Table 13.5) [8–10]. Increasingly, expert colonoscopists can detect focal areas within polyps that may contain invasive cancer. This allows the selection of an appropriate en bloc endoscopic therapy, such as endoscopic submucosal dissection, or piecemeal endoscopic mucosal resection with targeted sampling of potentially invasive regions and submission for separate histologic assessment.

Colorectal Cancer

- Colorectal cancers range in endoscopic morphology from large, fungating, and firm luminal masses to subtle, flat or depressed lesions
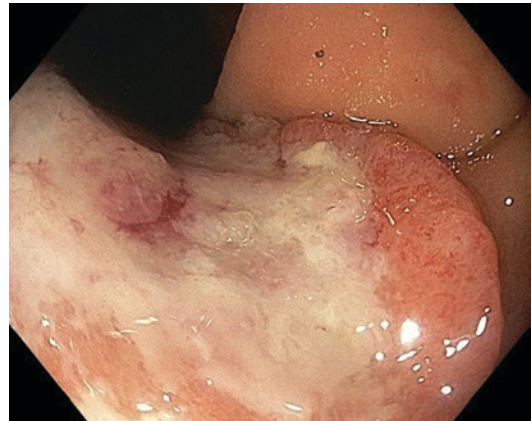
Fig. 13.8 Colorectal cancer

(Fig. 13.8). The endoscopic surface and vascular pattern correlates with the depth of submucosal invasive cancer. Deep (1000μm or greater) submucosally invasive cancers are characterised by a NICE type 3 appearance with disruption or absence of mucosal surface and vascular pattern (Fig. 13.9).
- When large and circumferential, cancers can cause luminal obstruction with inability of the colonoscope to traverse the lesion.

Colorectal Polyps

- The endoscopic morphology of colorectal polyps should be described using the Paris classification (Table 13.6) [11].
- Optical diagnosis using the Kudo pit pattern classification (Table 13.7) requires topical dye spray together with magnifying endoscopy to accurately and reliably differentiate between normal, nonneoplastic, neoplastic, and cancer-
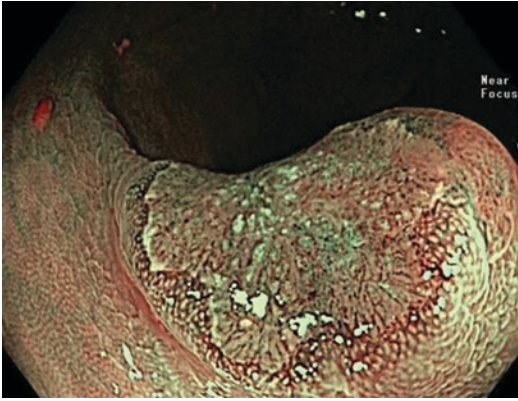
Fig. 13.9 A small malignant polyp (with deep submucosal invasion) showing NICE type 3 under NBI

Table 13.6 Paris classification

Endoscopic appearance	Paris class	Description
Protruded Lesions (>2.5 mm)	Ip	Pedunculated polyp
	Is	Sessile polyp
Flat elevated Lesions (≤2.5 mm)	IIa	Flat elevation of mucosa
	IIb	Flat mucosal change
	IIc	Mucosal depression
Excavated lesions	III	Excavated ulcer

Table 13.7 Kudo pit pattern classification

Kudo type	Endoscopic feature	Most likely diagnosis
Type I	Round	Normal
Type II	Papillary or stellar	Hyperplastic
Type III$_s$	Small round or tubular	Tubular adenoma
Type III$_L$	Large round or tubular	Tubular adenoma
Type IV	Gyrus-like	Villous adenoma
Type V	Nonstructural or amorphous	Submucosal cancer

ous lesions [12]. Electronic imaging using the NICE classification offers a quicker and more convenient approach to optical diagnosis.

- Colorectal polyps have characteristic endoscopic features that are highly predictive of the pathological diagnosis (Fig. 13.10) [8, 13].

Diverticular Disease

- Diverticular disease appears endoscopically as outpouchings of the colonic wall that vary in size and number (Fig. 13.11).

- Occurs most commonly in the sigmoid colon but can be seen throughout the colon.
- Diverticular disease spectrum includes:
  - Asymptomatic diverticular disease
  - Symptomatic uncomplicated diverticular disease
  - Complicated diverticular disease which can manifest as:
    Diverticulitis (acute or chronic)—Microscopic perforation results in localised inflammatory response caused by bacterial overgrowth.
    Diverticular disease-associated colitis—Rare and usually associated with diverticulitis.
    Diverticular bleeding (Fig. 13.12).
    Diverticular perforation (Table 13.8).

The majority of diverticular disease is simple without complications. Complicated diverticular disease can develop peritonitis, sepsis, abscesses, fistula, and bowel obstruction (Table 13.8).

Anorectal

Anorectal Junction

Retroflexion in the rectum conveniently shows the dentate line demarcating transition from colonic mucosa to anal squamous mucosa (Fig. 13.13).

Anal Intraepithelial Neoplasia (Condyloma Accuminata)
- Raised verrucous-like lesions within the dentate line (Figs. 13.14 and 13.15)

Anal Squamous Cell Carcinoma (SCC)
- Endoscopic features vary by stage:
  - Early SCC can be small and appear similar to condyloma acumulatuma
  - Advanced lesions can be large, ulcerated, or fungating.
  - They can be differentiated endoscopically from distal rectal carcinoma by their verrucous appearance, and that they arise from the anal squamous mucosa at or beyond the dentate line (Fig. 13.16).
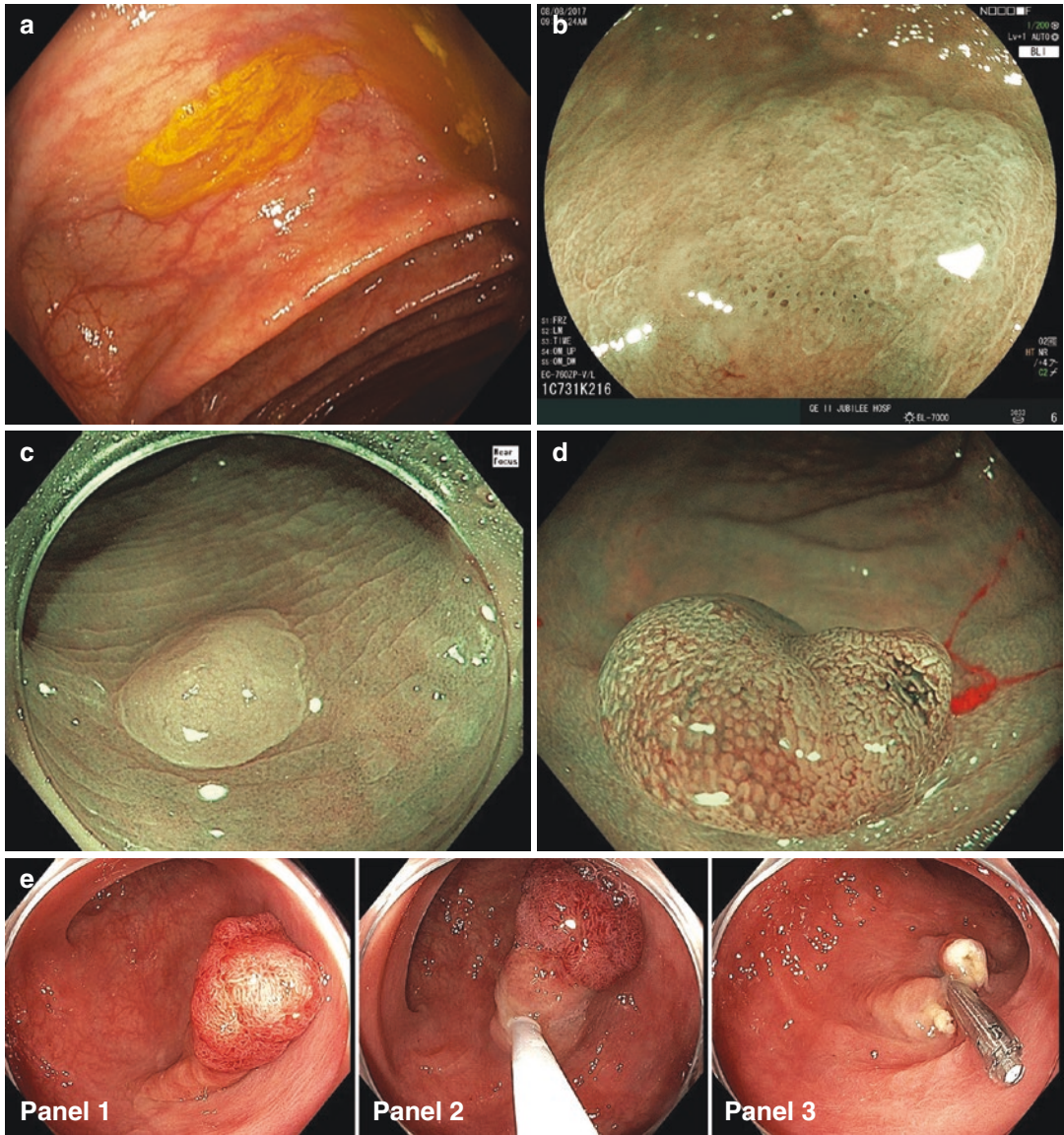
Fig. 13.10 (**a**) Characteristic endoscopic appearance of a sessile serrated adenoma/polyp in the ascending colon. Endoscopic features including flat morphology, indistinct margins, and yellow mucus cap. (**b**) Characteristic endoscopic appearance of a sessile serrated adenoma/polyp with NICE type 1 and open crypts that correlate histologically with dilated mucin filled crypts. (**c**) Hyperplastic polyp under NBI. (**d**) Tubular adenoma under NBI. (**e**) Panels 1–3: A pedunculated polyp in the proximal sigmoid colon removed by snare polypectomy with electrocautery. Resection yields a clear margin of normal tissue; a haemostatic clip was applied to prevent delayed haemorrhage. (**f**) Panels 1–3: A large rectal tubulovillous adenoma removed using endoscopic mucosal resection (EMR). Panel 4: The EMR scar on endoscopic surveillance at 4 months showing no endoscopic evidence of residual adenoma
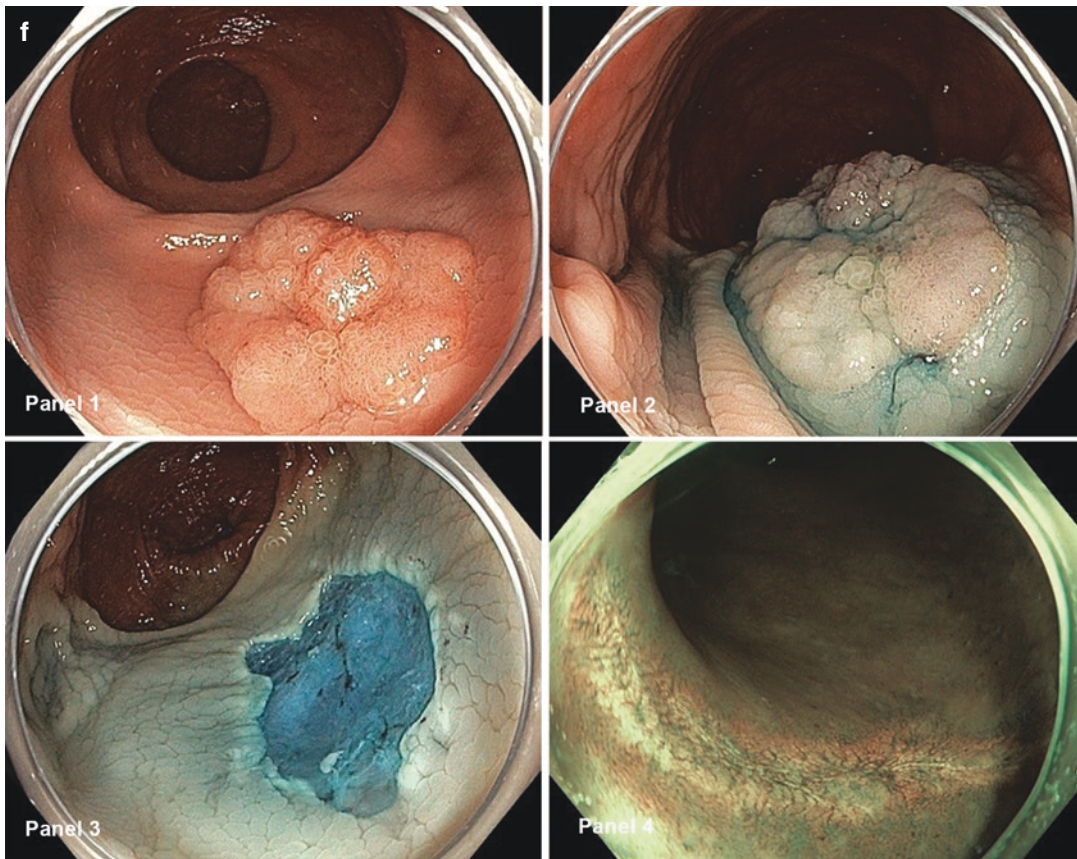
Fig. 13.10 (continued)

Haemorrhoids

They appear as protruded or polypoid vessels in the distal rectum (Fig. 13.17).

Miscellaneous

Melanosis Coli

- Reversible mucosal brown pigmentation of the colon (Fig. 13.18).
- Caused by use of anthraquinone laxatives (Table 13.9).
- Adenomas do not take up the lipofuscin pigment and can be easier to detect in melanosis coli during colonoscopy (Fig. 13.19).

Mucosal Prolapse (Solitary Rectal Ulcer Syndrome)

- Erythematous and/or ulcerated mucosa of the most distal rectum
- Can present with rectal bleeding

Angiodysplasia

- Flat red vascular lesions.
- Under NBI they appear brown or darker in colour than surrounding normal mucosa (Fig. 13.20).
- Often a feeding vessel can be seen.
- Mostly found in the ascending colon and cecum.
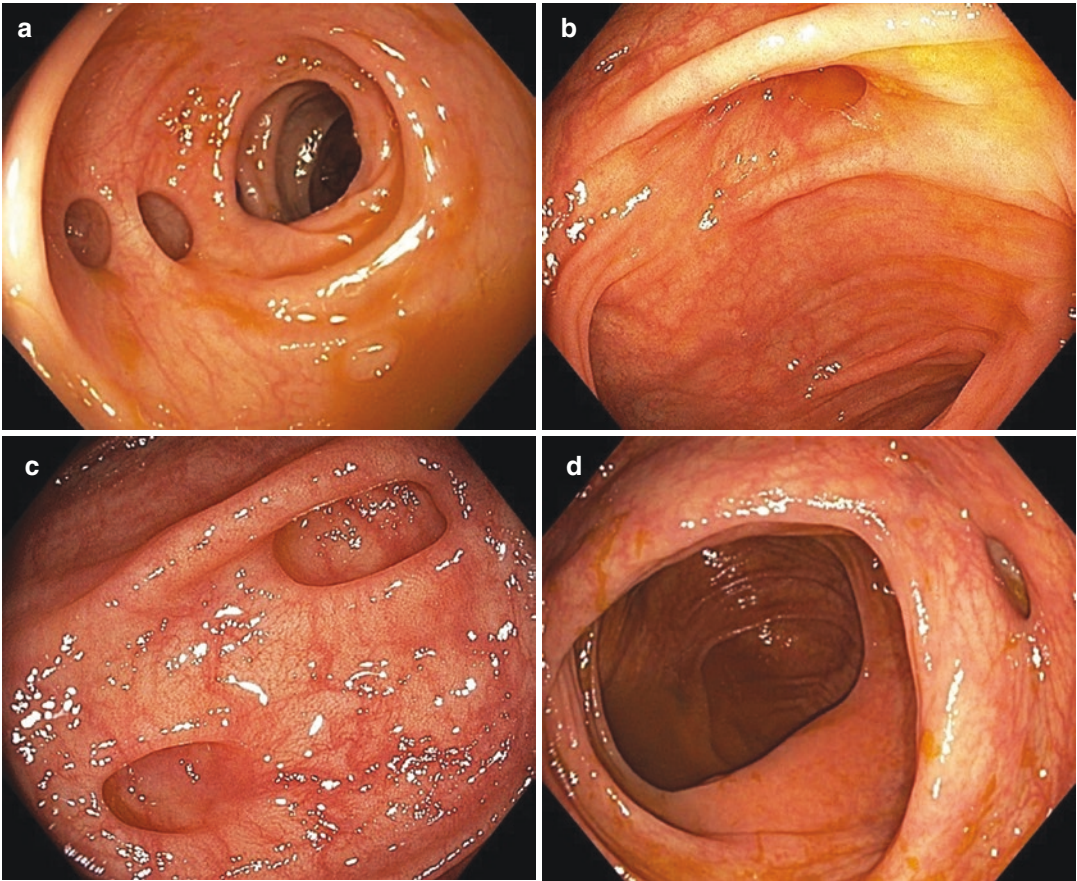
Fig. 13.11 (**a**–**d**) Diverticular disease
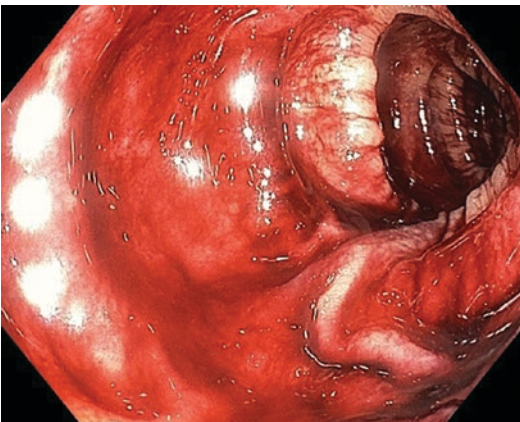
Fig. 13.12 Diverticular bleeding

Table 13.8 Complications of diverticular perforation

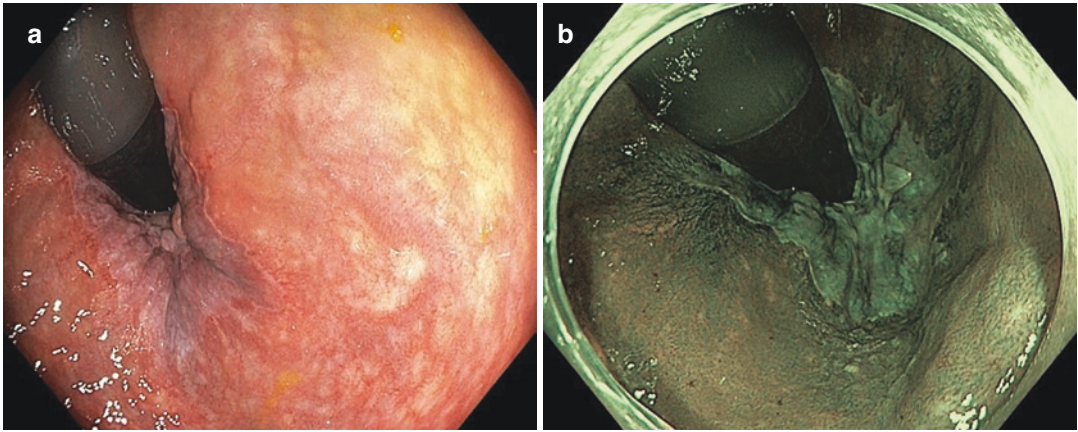| Peritonitis |
| --- |
| Sepsis |
| Abscess |
| Fistula |
| Bowel obstruction |

Fig. 13.13 (**a**, **b**) Rectal retroflexion under white light and NBI showing anorectal junction
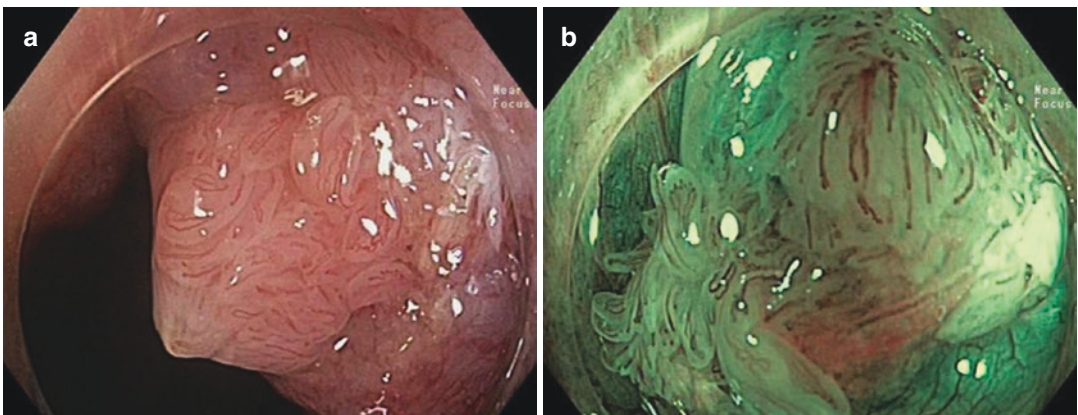
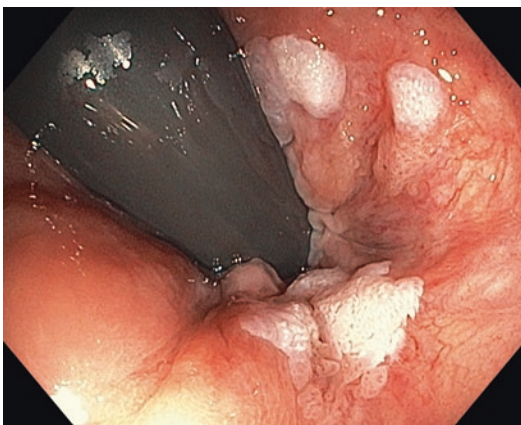**Fig. 13.14** (**a**, **b**) AIN under white-light and narrow-band imaging

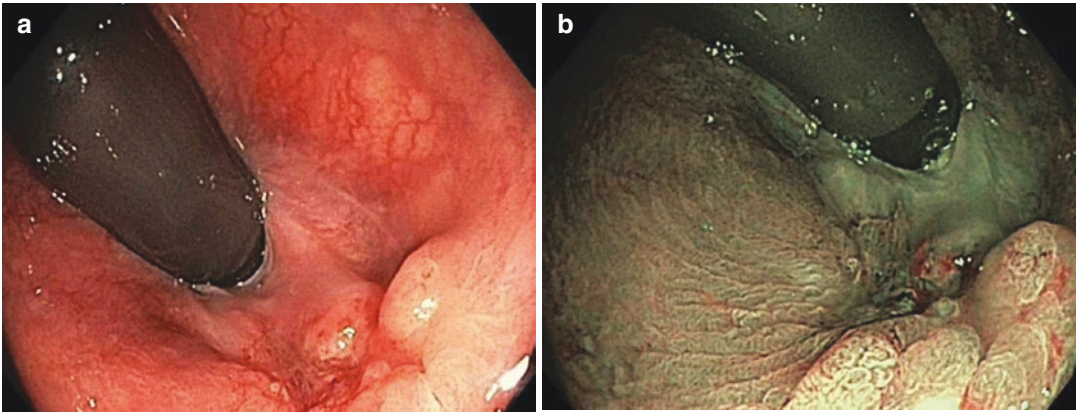**Fig. 13.15** Patient on immunosuppression with clusters of AIN

Fig. 13.16 (**a**, **b**) Ulcerated squamous cell carcinoma in a 79-year-old lady presenting with rectal bleeding seen on rectal retroflexion. The lesion was arising from the anorectal junction and invading the rectal mucosa

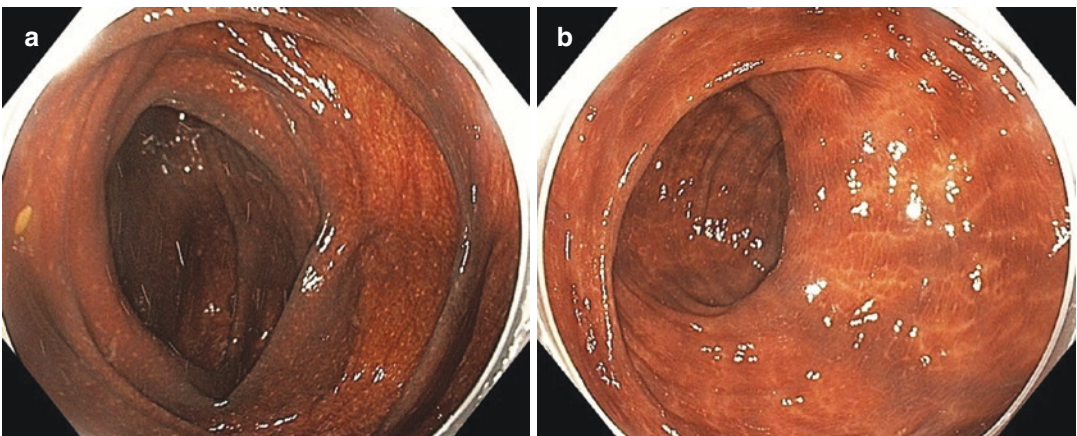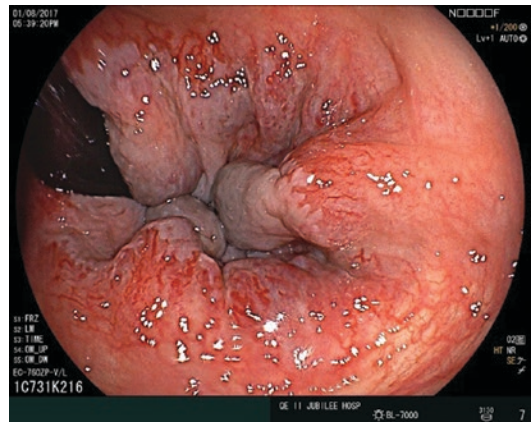**Fig. 13.17** Non-bleeding internal and external haemorrhoids seen on retroflexion view

Fig. 13.18 (**a**, **b**) Melanosis coli

Table 13.9 Anthraquinone laxatives

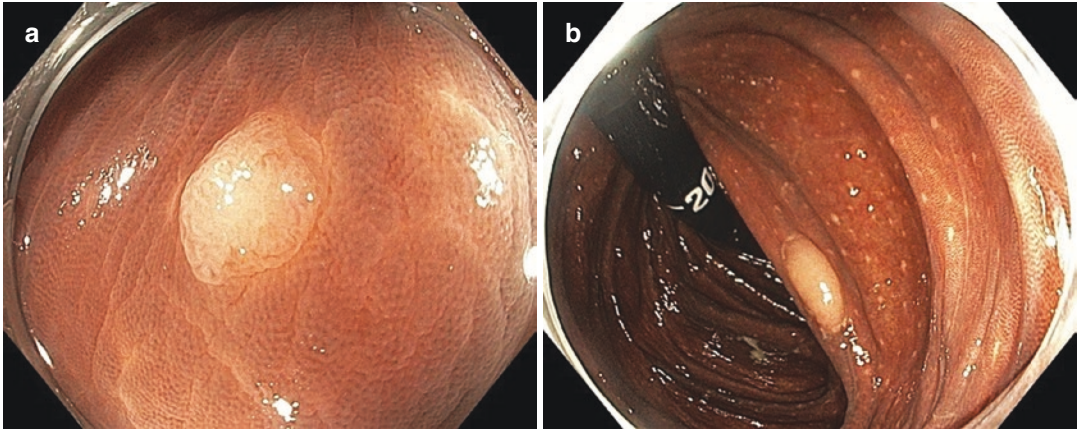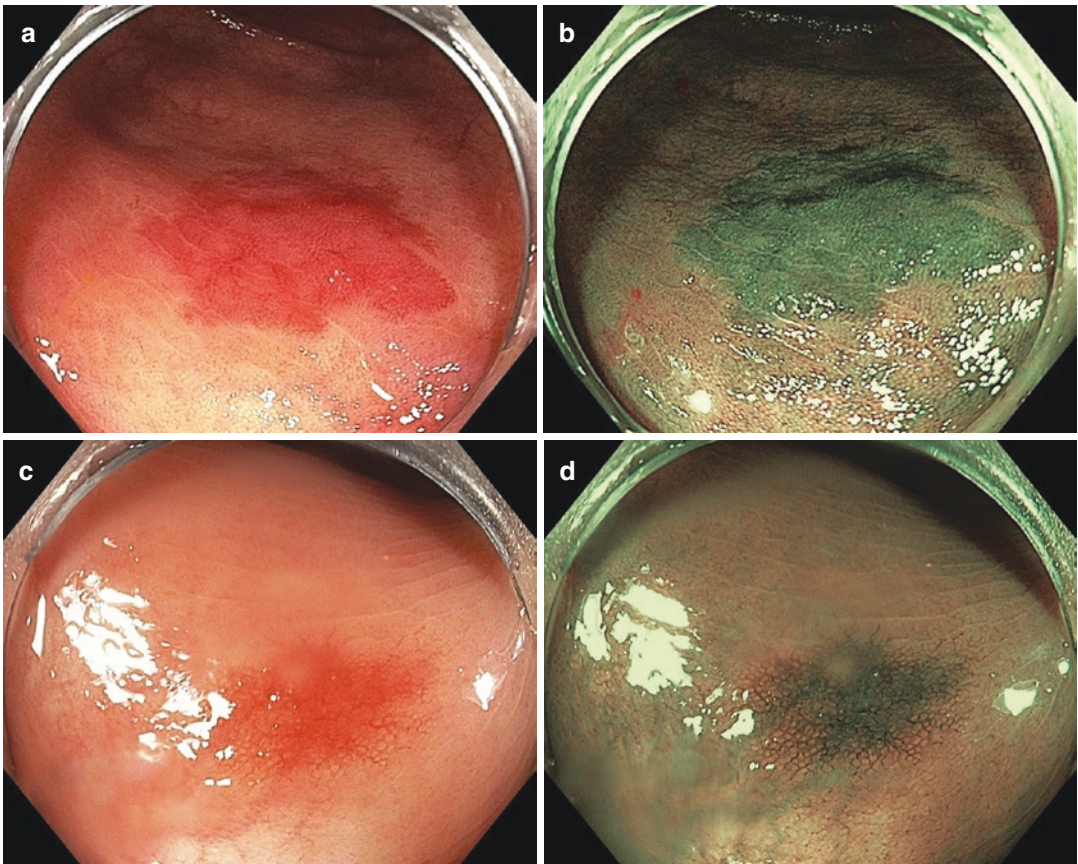| Senna |
| --- |
| Cascara |
| Aloe |
| Rhubarb |
| Frangula |

Fig. 13.19 (**a**, **b**) Adenomas can be easier to detect when melanosis coli is present

Fig. 13.20 (**a–d**) Non-bleeding angiodysplastic lesions of the colon (under white light and NBI)

Fig. 13.21 Lipoma of the ascending colon with smooth surface and yellow discolouration
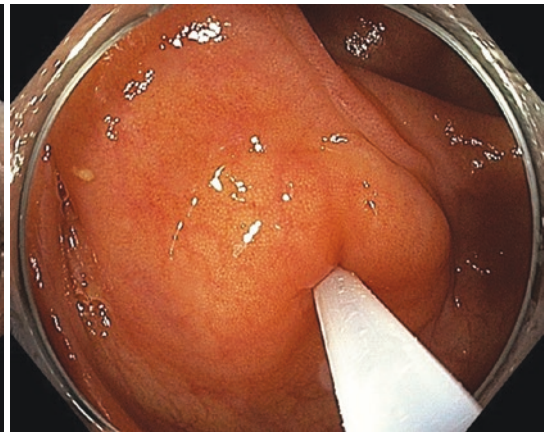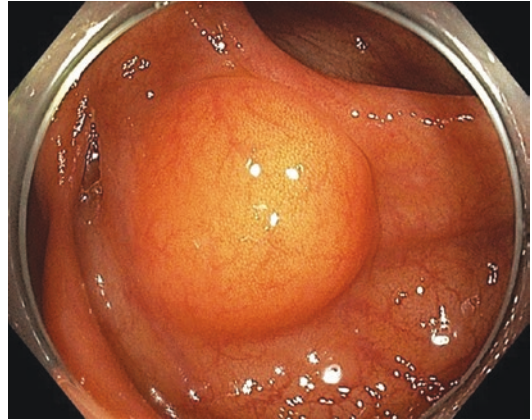

Fig. 13.22 Lipoma "cushion" or "pillow" sign

- Can be an incidental finding during colonoscopy, or patients may present with history of painless intermittent rectal bleeding, haematochezia, or anaemia
- If symptomatic, they can be treated with argon plasma coagulation (APC).

Lipoma

- Smooth sessile lesions
- Normal underlying mucosa with a tinge of yellow discolouration (Fig. 13.21)
- Soft when palpated using endoscopic accessory device, also known as "pillow sign" (Fig. 13.22)

Bowel Preparation-Related Mucosal Changes

- Non-specific
  - Normal
  - Mild patch erythema
  - Mild oedema
  - Small haemorrhages
- Commonly seen in the distal rectum but can be seen throughout the colon

Summary

Effective communication between gastroenterologists and pathologists is important for high-quality patient care. Advances in endoscopic

imaging have improved the endoscopic detection, characterisation, and therapy of gastrointestinal pathology.

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