# 79 T_h e rectum

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# ANATOMY Surgical anatomy

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The rectum begins where the tinea coli of the sigmoid colon join to form a continuous outer longitudinal muscle layer at the level of the sacral promontory . The rectum follows the curve of the sacrum and ends at the anorectal junction. The pubo- rectalis muscle encircles the posterior and lateral aspects of the junction, creating the anorectal angle (normally 120°). The rectum has three lateral curvatures; the upper and lower are convex to the right, and the middle is convex to the left. On the luminal aspect, these three curves are marked by semicircular folds (valves of Houston). The adult rectum is approximately 12–18 /uni00A0 cm in length and is conventionally divided into three equal parts: the upper third, which is mobile and has a peritoneal covering anteriorly and laterally; the middle third, where the peritoneum covers only the anterior and part of the la teral surfaces; and the low est third, which lies deep in the pelvis below the peritoneal reflection. The lower third of the rectum is separated by distinct fascial layers from the prostate/vagina anteriorly (Denonvilliers' fascia), and from the coccyx and lower two sacral vertebrae posteriorly (Walde yer's fascia) ( Table 79.1 ). These fascial layers are surgically important as they act as barriers to malignant invasion and form the anatomical envelope for total mesorectal excision (TME) to achieve complete oncological clearance of rectal cancer. John Houston , 1802 − 1845, physician, City of Dublin Hospital and Lecturer in Surgery , Dub Charles-Pierre Denonvilliers , 1808 − 1872, Professor of Anatomy and later of Surgery , Paris, France. Heinrich W ilhelm Gottfried Waldeyer-Hartz , 1836 − 1921, Professor of Pathological Anatomy , Berlin, Germany . James Douglas , 1675–1742, Scottish anatomist and Physician Extraordinary to Queen Caroline. Summary box 79.1 Anatomy of the rectum /uni25CF /uni25CF /uni25CF /uni25CF - lin, Ireland.

To appreciate: That carcinoma of the rectum is common and can • present with symptoms similar to benign disease. Careful evaluation is required The principles involved in the management of rectal • pathologies The rectum measures approximately 15 /uni00A0 cm in length It is divided into lower, middle and upper thirds The blood supply consists of superior, middle and inferior rectal vessels The lymphatic drainage follows the blood supply. The principal route of drainage is upwards along the superior rectal vessels to the para-aortic nodes, although the lower rectum can drain to lymphatics along the internal iliac pedicle and lateral pelvic side walls TABLE 79.1 Anatomical relations of the rectum. Relation Anterior Bladder Seminal vesicles and prostate (males) Denonvilliers' fascia Pouch of Douglas and rectovaginal septum (females) Uterus and cervix (females) Ureters Lateral ligaments and middle rectal artery Lateral Obturator internus muscle and side wall of pelvis Pelvic autonomic plexus Levator ani muscle Sacrum and coccyx Posterior Waldeyer's fascial condensation Superior rectal artery and lymphatics Hypogastric nerves

The embryological hindgut forms the upper rectum, while the lower rectum is derived from the cloaca and is surrounded by extraperitoneal connective tissue. The primitive gut tube is suspended dorsally by a mesentery throughout its length, to form the mesorectum. The muscular layers of the

rectum are derived from the mesenchyme that accompanies the endodermal part of the anorectum, with the inner circular layer preceding the outer longitudinal layer in the seventh week of embryonic development. The levator ani muscles and external anal sphincter muscles form within the surrounding mesenchyme and grow to make contact with each other and with bundles of smooth muscle cells from the outer longitudinal layer of the r ectal wall. A layer of undi ff erentiated mesenchyme separates the rectal muscle layers from the levator ani muscle and the muscle layer of the future anal canal.

# BENIGN RECTAL LESIONS Endometrioma

BENIGN RECTAL LESIONS Endometrioma

Endometrioma is rare and may be misdiagnosed as a carcinoma. The focus of the ectopic endometrial tissue produces either a constricting lesion of the rectosigmoid or a tumour invading the rectum from the rectovaginal septum. The latter variety gives rise to a tender submucous elevation of the rectal wall. Endometrioma usually occurs between 20 and 40 years of age. Dysmenorrhoea and rectal bleeding (particularly coinciding with the menses) are the main symptoms. On sigmoidoscopy , endometriosis involving the rectosigmoid junction usually presents as a stricture, with the mucous membrane intact. Hormonal manipulation is the first-line therapy , but sometimes total abdominal hysterectomy and bilateral salpingo-oophorectomy and even bowel resection are required. The laparoscopic approach for resecting deep rectal endometriosis is becoming popular. Isolated endometrial deposits may be treated b y diathermy ablation or local ‘discectomy’ incorporating the rectal wall.

# Blood supply

Blood supply

The superior rectal artery is the direct continuation of the inferior mesenteric artery and is the main arterial supply of the rectum ( Figure 79.1 ). The arteries and their accompanying lymphatics lie within the loose fatty tissue in the mesorectum, surrounded by a sheath of connective tissue (the mesorectal fascia). The middle rectal artery arises on each side from the internal iliac artery and passes to the rectum in the lateral ligaments. It is usually small and often only present on one side, and divides into several branches. The inferior rectal Benjamin Alcock , 1801–?, fi rst Professor of Anatomy , Queen’s College (now University College), Cork, Ireland. Emigrated in 1859 following a resignation dispute over procurement of corpses for dissection. as it enters Alcock’s canal. It hugs the inferior surface of the levator ani muscle as it crosses the roof of the ischiorectal fossa to enter the anal muscles.

Inferior mesenteric artery Middle sacral artery Internal iliac artery Superior rectal artery Middle rectal artery Levator ani muscle Inferior rectal artery Figure 79.1 Blood supply to the rectum. The main blood supply comes from the superior rectal arteries, supplemented by middle rectal arter ies in 20% of cases. The inferior rectal arteries are derived from the pudendal vessels and supply the anal canal and lower rectum.

# CLINICAL FEATURES OF RECTAL DISEASE Symptoms

CLINICAL FEATURES OF RECTAL DISEASE Symptoms

Rectal diseases are common and can occur at any age. The symptoms of many of them overlap. In general, infl ammatory conditions a ff ect younger age groups, while tumours occur in the middle-aged and elderly . Summary box 79.2 Main symptoms of rectal disease /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Bleeding This is often painless and bright red in colour and should be carefully investigated at any age. A l t e r e d b o w e l h a b i t Early morning stool frequency (spurious diarrhoea) is a symp- tom of rectal carcinoma, while blood-stained, frequent, loose stools characterise the infl ammatory diseases.

# Fresh bleeding per rectum Tenesmus Altered bowel habit with Prolapse loose stool Proctalgia (pain) Mucus discharge

Mucus and pus are associated with rectal inflammation. Tenesmus Often described by the patient as ‘I feel I want to go but nothing happens’, this is normally an ominous symptom of rectal cancer, but can occur with other rectal conditions and is a common symptom of rectal prolapse. Prolapse This usually indicates either mucosal or full-thickness rectal wall protrusion from the anus. Internal prolapse or intussus- ception refers to a telescoping of the rectum into itself without protrusion from the anus. Pain: ‘proctalgia’ This is usually a severe and episodic pain resulting from spasm of the levator ani muscle. It may last for a few seconds to minutes then recur, or it can be constant (see Chapter 80

# Clinical features

Clinical features

Carcinoma of the rectum can occur early in life, but the age of presentation is usually above 55 years, when the incidence rises rapidly . Often, the early symptoms are so insignificant that the patient does not seek advice for 6 months or more, and the diagnosis is often delayed in younger patients as the symptoms are attributed to benign causes. Initial rectal examination and a low threshold for investigating persistent symptoms are essential. Summary box 79.8 Early symptoms of rectal cancer /uni25CF /uni25CF /uni25CF Bleeding Bleeding is the earliest and most common symptom. Typically , the bleeding is bright red in colour and painless. It can be mixed with the motions or separate in the toilet bowel. It can be indistinguishable from haemorrhoidal bleeding, which is the most common di ff erential diagnosis, particularly in younger patients. Tenesmus The patient experiences a sensation of needing to evacuate the rectum but is unable to pass a motion. This is an important early symptom and is almost invariably present in patients with tumours of the lower half of the rectum. The patient may endeavour to empty the rectum several times a day (spurious diarrhoea), often with the passage of flatus and a little bloodstained mucus (‘bloody slime’). β Alteration in bowel habit There is frequently a change in bowel habit, with a tendency to more frequent defecation and the passage of looser stool. A patient who has to get up early in order to defecate, or one who passes blood and mucus in addition to faeces (‘early morning bloody diarrhoea’), is usually found to have carcinoma of the rectum. Although a change to looser stools is more common,

Bleeding per rectum Tenesmus Early morning diarrhoea

tion may complain of increasing constipation. Pain Pain is a late symptom, but pain of a colicky character may accompany advanced tumours of the rectosigmoid, owing to a degree of obstruction. Advanced cancers invading outside the mesorectum may infiltrate the prostate or bladder anteriorly or the sacral plexus posteriorly , giving rise to severe, intractable pain. Weight loss Weight loss is also a late symptom and is almost always associ ated with metastatic disease.

# Diagnosis

Diagnosis

The anus should be inspected and the abdomen palpated. If abdominal rigidity or tenderness is present, early laparoscopy or laparotomy is indicated. A water-soluble contrast enema may help in delineating the injury , but a computed tomo- graphy (CT) scan is often preferred and will provide additional information on other pelvic injuries, such as accompanying urethral injury .

# Differential diagnosis

Differential diagnosis

Many colorectal lesions can give rise to diagnostic di ffi culty . For example, it may be di ffi cult to distinguish an inflammatory stricture or amoebic granuloma on macroscopic appearance. Similarly , endometriomas, carcinoid tumours and solitary rectal ulcers can be mistaken for adenocarcinoma. Benign adenomas can be distinguished from malignant lesions based on the appearance of their mucosal ‘pit patterns’, as highlighted with the ‘dye spray’ colonoscopy technique (see Chapter 9 ). Biopsy - and histological analysis remain the mainstay of diagnosis, accepting that there may be diagnostic limitations caused by sampling errors owing to small biopsy samples being unrepre - sentative of the larger lesion. Summary box 79.9 Diagnosis and assessment of rectal cancer /uni25CF /uni25CF /uni25CF /uni25CF

All patients with suspected rectal cancer should undergo: Digital rectal examination Full colorectal visualisation, preferably by colonoscopy with biopsy or CT colonography or barium enema All patients with proven rectal cancer require staging by: Imaging of the chest, abdomen and pelvis, preferably by CT Local pelvic imaging by magnetic resonance imaging (MRI) and/or endoluminal ultrasonography

# Endoluminal stenting

Endoluminal stenting

An increasingly used alternative for patients with an obstruct - ing carcinoma is placement of an endoluminal stent, which can be done endoscopically , often with fluoroscopic guidance. This can be used either as a palliative procedure or to relieve obstruction and permit elective rather than emergency surgery to be undertaken. Only rectosigmoid and upper rectal tumours are suitable for stenting because stent impingement on the anorectum in low cancers causes symptoms of tenesmus (see Chapter 77 ).

# FOREIGN BODIES IN THE RECTUM

FOREIGN BODIES IN THE RECTUM

The variety of foreign bodies that have found their way into the rectum is hardly less remarkable than the ingenuity displayed in their removal ( Figure 79.5 ). The di ffi culty lies in the creation of a vacuum e ff ect when trying to extract the object through the anus. If insurmountable di ffi culty is experi - enced in grasping any foreign body in the rectum, laparotomy or laparoscopy is usually necessary . The object can be pushed from above into the assistant’s fingers in the rectum or removed by means of a rectotomy in a proximal area of the rectum. If there is considerable laceration of the mucosa, a temporary colostomy is advisable. Summary box 79.4 Injuries to the rectum are serious and invariably require surgery /uni25CF /uni25CF /uni25CF

A temporary colostomy is often necessary There is a serious risk of associated necrotising fasciitis, and broad-spectrum antibiotics are mandatory There may be associated bladder or urethral damage

# Full-thickness prolapse

Full-thickness prolapse

Complete rectal prolapse (synonym: procidentia) is less common than the mucosal variety . The protrusion consists of all layers of the rectal wall and is usually associated with a weak pelvic floor and/or chronic straining. The prolapse often commences as an intussusception of the rectum, which descends to protrude outside the anus. The process starts with the anterior wall of the rectum, where the supporting tissues are weakest, especially Burrill Bernard Crohn , 1884–1983, gastroenterologist, Mount Sinai Hospital, New Y ork, NY , USA. in women. It is more than 4 /uni00A0 cm and commonly as much as 10–15 /uni00A0 cm in length ( Figure 79.9 ). On palpation between the finger and thumb, the prolapse feels much thicker than mucosal prolapse and consists of a double thickness of the entir e wall of the rectum. Any prolapse over 5 /uni00A0 cm in length will contain anteriorly , between its layers, a pouch of peritoneum. When large, the peritoneal pouch may contain small intestine or bladder. The anal sphincter is characteristically patulous and gapes widely on straining to allow the rectum to prolapse. Complete prolapse is uncommon in children but may occur as a result of malnutrition. In adults, it can occur at any age, but it is more common in the elderly and sometimes in patients with anorexia nervosa. Women are a ff ected six times more often than men, and it is commonly associated with other ge. In pelvic organ prolapse. In approximately 50% of adults, faecal - incontinence is also a feature. Complications of rectal prolapse include rectal ulceration and bleeding, incontinence and even incarceration with ischaemia and necrosis of the rectum. -

Figure 79.9 Full-thickness rectal prolapse. The whole bowel wall protrudes through the anus.

In the case of a child with abdominal pain, the anus should be examined to exclude rectal prolapse as a cause. This should also be distinguished from intussusception protruding from the /uni00A0 anus. Treatment Surgery is required for full-thickness rectal prolapse, and the operation can be performed via a perineal or abdominal approach. Abdominal operations can be by an open or laparoscopic approach. Abdominal rectopexy , either laparoscopic or open, has a lower rate of recurrence (<10%), but when the patient is elderly and very frail a perineal operation is usually safer and, if necessary , can be performed under regional anaesthetic blockade. As an abdominal procedure risks damage to the pelvic autonomic nerves, resulting in possible sexual dysfunction, a perineal approach may be preferred in young men. Karl Thiersch , 1822–1895, Professor of Surgery , Leip zig, Germany . These procedures have been used most frequently: /uni25CF Thiersch’s operation . In this procedure, a steel wire, or silastic or nylon tape, is placed around the anal canal. It has become largely obsolete owing to problems with chronic perineal sepsis, anal stenosis and obstructed defecation, but may be used to augment perineal repair in cases of severe pelvic floor weakness. /uni25CF Delorme’s operation . In this procedure, the rectal mucosa is stripped circumferentially from the rectum over the length of the prolapse ( Figure 79.10 ). The underlying muscle is plicated with a series of sutures, so that the rectal muscle is concertinaed towards the anal canal. The excess rectal mucosa is excised and a mucosal anastomosis performed. The

resulting e ff ect is to reduce the prolapse as a plicated ring of muscle above the anal canal. This operation may be preferred in patients with short segment full rectal prolapse, but recurrence rates are high, in the region of 30% over 5 years.

(a) (c) (b) (d) Figure 79.10 Delorme’s procedure for rectal prolapse. (a, b) The mucosa is stripped from the muscular gut tube. (c, d) Interrupted sutures are used to plicate the muscular gut tube and reduce the prolapse. The operation is concluded by suturing the mucosa.

/uni25CF Altemeier’s procedure . In this procedure, the rectum is prolapsed through the anal canal and a full-thickness resection performed, incorporating any associated colonic prolapse ( Figure 79.11 ). Restoration of colorectal conti- nuity can be performed by either a hand-sewn or stapled anastomosis. This is the procedure of choice in patients presenting with incarcerated and strangulated prolapse. It is a good alternative perineal procedure to the Delorme’s operation, particularly following recurrence. However, it is often complicated by poor bowel control with faecal soiling secondary to loss of the rectal reservoir. Recurrence rates range from 0% to 20%. The advantages of a perineal approach include minimal postoperative pain, early mobility and low levels of morbidity . However, given the higher recurrence ra tes when compared with the abdominal operations, it is best reserved for patients at high risk of complications when undergoing a major oper- ation. Abdominal approach The principle of all abdominal operations for rectal prolapse is to fix the rectum in its normal anatomical position. Many variations have been described, including inserting a sheet of polypropylene mesh between the rectum and the sacrum, hitching up the rectosigmoid junction with a Teflon sling to the front of the sacrum or simply suturing the mobilised rectum to the sacrum using four to six interrupted non-absorbable sutures – so-called ‘sutured rectopexy’ (Goldberg). Currently , the technique is most often performed laparoscopically , reduc- ing the operative trauma, limiting the time in hospital and broadening its indication for higher risk patients. As an abdominal rectopexy may lead to worsening constipation, some surgeons recommend combining this procedure with resection of the sigmoid colon, so-called ‘resection rectopexy’, but this adds an additional risk because of the anastomosis. An alternative is LVMR, w hich has become increasingly popular in western practice (D’Hoore). In this procedure, the plane between the rectum and vagina William Altemeier , 1910–1983, Professor of Surgery , Cincinnati, OH, USA. Stanley M Goldberg , b. 1923, Emeritus Professor of Surgery , University of Minnesota, Minneapolis, MN, USA. André D’Hoore , contemporary , Professor of Surgery , Catholic University Leuven, Leuven, Belgium. (or prostate) is dissected, and a strip of mesh sutured to the anterior rectum and posterior vaginal vault. The upper end of the mesh is secured to the sacral promontory with sutures or tacks, thus resuspending the rectum and preventing prolapse ( Figure 79.12 ).

# Figure 79.11 Altemeier’s procedure showing (a) a full-

# thickness mobilisation of the prolapse and (b) a hand-sewn coloanal anasto mosis following prolapse resection (courtesy of Ms Ann Hanly, FRCSI, Dublin, Ireland).

# (b) Figure 79.12 (a) Laparoscopic ventral mesh rectopexy: a prosthetic mesh is sutured to the front of the lower rectum and used to resus

pend the rectum by securing the proximal end of the mesh to the sacral promontory. (b) Intraoperative image of a robotic ventral mesh rectopexy showing suturing of the mesh to the anterior rectum after dissection of the rectovaginal septum.

and rectal intussusception has been variously reported between 70% and 80%, with improvement in both constipation and incontinence scores. It is a relatively safe procedure (overall complication rate 10%) with a quick recovery because of the laparoscopic approach. Possible complications include pro- lapse recurrence, bleeding, pelvic pain and dyspareunia. More recently , there has been concern regarding mesh complications when used more generally for pelvic organ prolapse surgery , culminating in the 2020 publication of the Cumberlege Report in the UK. As a result, the use of mesh for vaginal surgery has been restricted. When used for LVMR, mesh complications (infection and erosion) have been reported in 2–4% of cases and are higher when a polyester mesh is used.

# Gastrointestinal stromal tumour

Gastrointestinal stromal tumour

Smooth muscle tumours of the rectum are rare. If the mitotic rate is high, and if there is variation in nuclear number, size and shape, hyperchromasia and frequent bizarre cells, these tumours are likely to metastasise. In these circumstances, they should be classified as malignant gastrointestinal stromal tumours (GISTs) (formerly leiomyosarcomas). The uncertainty in their behaviour means that treatment should, whenever possible, be radical excision.

# Gonococcal proctitis

Gonococcal proctitis

Gonococcal proctitis occurs in both sexes as the result of rectal coitus and, in the female, from direct spread from the vulva. thick pus can be expressed as the proctoscope is withdrawn. In the early stages, the diagnosis can be readily established by bacteriological examination but later, when the infection is mixed, it is more di ffi cult to recognise. Systemic treatment is so e ff ective that local treatment is unnecessary .

# Haemangioma

Haemangioma

Haemangioma of the rectum is an uncommon cause of serious haemorrhage. The symptoms may mimic ulcerative colitis, and the diagnosis is often delayed, or it may be mistaken for a carcinoma. Selective angiography and embolisation may be helpful, but excision of the rectum is sometimes required.

# INJURIES

INJURIES

The rectum or anal canal may be injured in a number of ways, all of which are uncommon: /uni25CF by falling in a sitting posture onto a pointed object; /uni25CF penetrating injury (including gunshots) to the buttocks; /uni25CF sexual assault or sexual activity involving anal penetration; /uni25CF by the fetal head during childbirth, especially forceps assisted.

# Internal rectal prolapse and solitary rectal ulcer

Internal rectal prolapse and solitary rectal ulcer syndrome

Internal rectal prolapse, or intussusception, refers to the invagination of the rectal tube during defecation. The prolapse descends towards the anal canal, where it can act as a blockage to defecation; a condition referred to as obstructed defecation. The patient describes the normal desire to defecate but an inability to satisfactorily evacuate the rectum, having to resort to excessive straining and sometimes digitation. Incomplete evacuation leads to a sensation of tenesmus, requiring repeated returns to the toilet. Intussusception is often accompanied by other structural abnormalities of the rectum, including rectocele and enterocele, which can further add to evacuatory di ffi culty ( Figure 79.8 ). Treatment of internal rectal prolapse is indicated if it can be demonstrated on proctography and correlates with the patient's symptoms of obstructed defecation. Surgical options olapse are the same as those for for treating internal rectal pr external rectal prolapse, namely internal Delorme's procedure (perineal approach) or laparoscopic ventral mesh rectopexy (LVMR) (abdominal approach). Solitary rectal ulcer syndrome (SRUS) may also be another associated manifestation of obstructed defecation syndrome. Classically , SRUS takes the form of an ulcer on the anterior wall of the rectum, situated 6–8 /uni00A0 cm from the anal ver this form, it can be mistaken for rectal carcinoma or inflam matory bowel disease, particularly Crohn's disease. It may heal, leaving a polypoid appearance. Proctographic studies may indicate accompanying rectal intussusception or anterior rectal wall prolapse. Histology will confirm the diagnosis. The condition is di ffi cult to treat. Symptomatic relief from bleeding and discharge may sometimes be achieved by controlling any associated straining with re-coordination of defecation using biofeedback therapy . Transanal stapled resection of the intus susception (STARR procedure) or resuspension of the rectum by abdominal rectopexy may be beneficial, but the results are not as good as for internal or external rectal prolapse. In rare cases, rectal excision may be required with or without stoma.

Figure 79.8 Defecating proctogram with selected images from left to right showing normal pelvic /f_l oor position at rest with development of a small anterior rectocele on evacuation (thick arrow) and a rectoanal intussusception entering the anal canal (thin arrow) (courtesy of Dr Damian Tolan, St James's Hospital, Leeds, UK).

# Introduction

## Introduction

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# Investigation

Investigation

Abdominal examination Abdominal examination is normal in early cases. Occasionally , in patients with stenosing tumours at the rectosigmoid junction, signs of subacute large bowel obstruction may be present, with abdominal distension. If large volume liver metastases are present, an enlarged liver may be palpable along with other signs, such as cachexia. Occasionally , it may be possible to elicit ascites if there is widespread peritoneal dissemination. Rectal examination In many cases where the neoplasm is situated within 7–8 /uni00A0 cm of the anal verge it can be felt on digital rectal examination as an elevated, irregular and hard endoluminal mass. When the centre ulcerates, a shallow depression will be felt with raised and everted edges. An attempt should be made to determine whether the neoplasm is mobile, tethered or fixed, and to estimate the distance of the lower margin from the top of the anal sphincter complex: these factors are important in assessing resectability and methods of reconstruction following excisional surgery . In females, a vaginal examination may be useful if involvement of the posterior vaginal wall is suspected. Digital rectal examination also a ff ords the opportunity to evaluate the anal sphincter complex, which is important in cases where resection and low anastomosis is being considered. Rigid sigmoidoscopy Rigid sigmoidoscopy can be performed in the outpatient clinic and is useful to identify the neoplasm and possibly obtain biopsies. However, it requires the rectum to be empty of faeces and may require a prior rectal enema, which may not be practical in the outpatient setting. As colonoscopy is almost always required to visualise the whole colorectum, it is often easier and safer to obtain biopsies at this time. Colonoscopy A colonoscopy is required in most patients to exclude a synchronous tumour, be it an adenoma or carcinoma. If a proximal adenoma is found, it can be conveniently snared and removed via the colonoscope. If a synchronous carcinoma is present, the operative strategy is likely to change. If a full colonoscopy is not possible, for example when there is a be performed.

# Learning objectives

Learning objectives

To understand: The anatomy of the rectum and its relationship to surgical â€¢ disease and its treatment The pathology, clinical presentation, investigation, â€¢ differential diagnosis and treatment of diseases that affect the rectum

# Liver resection

Liver resection

Single or multiple well-localised liver metastases can now be resected with relatively low mortality and morbidity . Provided the patients are carefully selected, a reasonable long-term survival rate can be achieved (approximately 40%). Such surgery is usually carried out in a specialised liver unit and may be performed synchronously at the time of anterior resection or as a delayed procedure (see Chapter 69 ). Radiotherapy Radiotherapy is now commonly used and may be given preop eratively (neoadjuvant) and less commonly postoperatively (adjuvant). In the neoadjuvant setting, radiotherapy is used to either ‘sterilise’ the operative field in cancers with suspected lymphovascular involvement, or to downstage locally advanced cancers with threatened circumferential resection margins. In the former instance, radiotherapy is often given as a ‘short course’ over 5 days with immediate surgery some 7–10 days later. On occasion, short-course radiotherapy can be combined with a delay before surgery (up to 12 weeks) to allow cancer regression. When radiotherapy is used to downstage a cancer, it is often combined with chemotherapy (chemoradiotherapy) and given over a period of 6 weeks with a 6-week recovery period befor surgery . Some 20% of cancers treated with chemoradiotherapy will show a complete pathological response, with a further 25–30% showing a partial response. Unfortunately , it is not yet possible to determine prior to treatment which patients will respond and therefore to tailor treatment accordingly . Occasionally , radiotherapy is used to palliate unresectable cancers that are causing symptoms due to pain, obstruction or bleeding. Jean Papillon , d. 1993, radiation oncologist, Centre Léon Bérard, Lyon, France. technique, in which intraca vity radiation is directed to the cancer in the form of ‘contact radiotherap y’ or else delivered by brachytherapy techniques. To date, the application of these techniques has been restricted to selected cases, usually in patients unfit for more radical surgery . Chemotherapy Chemotherapy is given either in combination with radio - therapy (chemoradiotherapy) to downstage a cancer prior to surgical resection or else in the postoperative setting to reduce the risk of disseminated disease. 5-Fluorouracil (5-FU)-based regimens remain the first-line therapy and are associated with a 10% improvement in disease-free survival in patients with node-positive rectal cancer. Second-line therapies include oxaliplatin and irinotecan, and biological agents such as cetuximab (see Chapter 12 ). Results of surgery for rectal cancer In specialised centres, the resectability rate for rectal cancer may be as high as 95%, with an operative mortality of less than 5%. Overall, the 5-year survival rate is about 50% and has not changed appreciably over the last decade. Survival rates are influenced by TNM/Dukes’ stage, with node-positive patients doing worse than those with node-negative lesions. However, with the introduction of national bowel cancer screening programmes, there is a shift to an earlier stage of disease presentation and consequently improved survival. Local recurrence Local recurrence after rectal excision represents a complex problem. The patient may be asymptomatic with recurrence diagnosed as part of a surveillance programme, including regular measurements of blood carcinoembryonic antigen - and cross-sectional radiological imaging. The presence of symptoms is often a poor prognostic feature. Persistent pelvic pain, which may radiate down the legs, is indicative of nerve root involvement. Bladder symptoms may

occur or there may be fistulating disease onto the perineum. Most local recurrences are situated extrarectally and are therefore not readily diagnosed on endoscopy examination and biopsy . CT and MRI scan are the best means for detecting local recurrence, but PET-CT is increasingly being used to di ff erentiate metabolically active cancer recurrence from metabolically inactive scar tissue. Local recurrence rates vary between 2% and 25% and are higher after abdominoperineal excision than after sphincter-saving resection. High-quality primary surgery with preservation of e the mesorectal ‘package’ and a clear circumferential resection margin are the most important factors in preventing local recurrence. Overall, 80% of local recurrences develop within 2 years following surgery , are very di ffi cult to treat and should be referred to a centre specialising in exenterative surgery . If the patient is radiotherapy naive then preoperative chemoradio - therapy may be of help. Surgical exenteration o ff ers the only hope of cure.

Figure 79.27 Radical pelvic exenteration, indicating the extent of the dissection and the viscera removed (shaded dark pink). (Redrawn with permission from Keighley MRB, Williams NS. Surgery of the anus, rectum and colon . London: WB Saunders, 1999.)

Association of Coloproctology of Great Britain and Ireland. Guide lines for the management of cancer of the colon, rectum and anus (2017). Colorectal Dis 2017; 19 (S1): 1–97. Baxter NN, Garcia-Aguilar J. Organ preservation for rectal cancer J Clin Oncol 2007; 25 : 1014–20. Brown PJ, Hyland R, Quyn AJ et al . Current concepts in imaging for local staging of advanced rectal cancer. Clin Radiol 2019; 623–36. Cancer Research UK. Bowel cancer statistics . Available from cancerresearchuk.org/health-professional/cancer-statistics/statis tics-by-cancer-type/bowel-cancer rectal prolapse in adults. Cochrane Database Syst Rev 2015; Issue 11, - Art. No. CD001758. Wolthuis AM, Bislenghi G, de Buck van Overstraeten A, D’Hoore A. Transanal total mesorectal excision: towards standardization of . technique. World J Gastroenterol 2015; 21 (44): 12686–95. Wright JP , Albert MR. A current review of robotic colorectal surgery . Ann Laparosc Endosc Surg 2020; 5 . https://ales.amegroups.com/ar - 74 (8): ticle/view/5613 www . -

# Lymphatic drainage

Lymphatic drainage

The lymphatics of the rectal mucosa communicate freely with those of the muscle layers. The usual drainage fl ow is upwards, and only to a limited extent laterally and downwards. For this reason, surgical clearance of malignant disease concentrates mainly on achieving wide resection of proximal lymph nodes. However, if the usual upward routes are blocked, for example by metastatic disease, the fl ow can reverse and it is possible to fi nd involved lymph nodes on the side walls of the pelvis (along the middle rectal vessels) or even in the inguinal region (along the inferior rectal artery).

# Lymphogranuloma venereum

Lymphogranuloma venereum

The modes of infection are similar to those of gonococcal proctitis but, in the female, chlamydial infection spreading from the cervix uteri via lymphatics to the pararectal lymph nodes is common. The proctological findings are similar to those of gonococcal proctitis. The diagnosis of lymphogranuloma venereum should be suspected when the inguinal lymph nodes are greatly enlarged, although nodal enlargement may be subsiding by the time proctitis commences. Acquired immunodeficiency syndrome Acquired immunodeficiency syndrome due to human immunodeficiency virus may present with a particularly florid type of proctitis. In such patients, unusual organisms including Cytomegalovirus , herpes simplex virus and parasites such as Cryptosporidium are often found. Rectal bilharziasis Rectal bilharziasis is caused by Schistosoma mansoni , which is endemic in many tropical and subtropical countries and partic ularly in the Nile Delta. In stage 1, a cutaneous lesion develops at the site of entrance of the cercariae (parasites of freshwater snails). Stage 2 is characterised by pyrexia, urticaria and a high eosinophilia. Both these stages are frequently overlooked. Stage 3 results from deposition of the ova in the rectum (much more rarely in the bladder; see Chapter 83 ) and is manifested by bilharzial dysentery . On examination in the later stages, papillomas are frequently seen. The papillomas, which are sessile or pedunculated, contain the ova of the trematode, the life cycle of which resembles that of Schistosoma haematobium Untreated, the rectum becomes festooned and prolapse of the diseased mucous membrane is usual. Multiple fistulae- are prone to develop. The primary treatment is systemic and should be undertaken by a specialist in tropical medicine.

# Neuroendocrine tumours

Neuroendocrine tumours

Neuroendocrine tumours (NETs) of the rectum constitute 19% of all gastrointestinal NETs. They are classified into well- di ff erentiated (grades 1 and 2) and poorly di ff erentiated (grade 3) tumours. Both tumour mitotic index and Ki-67 expression are important factors for histopathological classification. Grade 3 tumours include both small- and large-cell NETs. wn as The majority of rectal NETs are grade 1, also kno carcinoid tumours, with a relatively good prognosis. These tumours are usually small (1–2 /uni00A0 cm), solitary and clinically indolent; however, grade 3 NETs, while rare, metastasise at an early stage. Treatment depends on the size of the tumour, depth of tumour invasion and the presence or absence of metastasis. Small lesions (1 /uni00A0 cm) can often be treated locally , either endoscopically or transanally . However, larger lesions (>2 /uni00A0 cm) require formal oncological resection. Adjuvant therapy is indicated only for metastatic disease. Globally , colorectal cancer is the second most common malig nancy , being the second most common cancer in women and the third most common cancer in men. It is the fourth most common cause of cancer death after lung, gastric and liver cancer. In western countries the incidence is rising, with an overall 14% increase since the 1970s, with the largest increase (20%) seen in males. Risk factors include diet, obesity , smoking and lack of physical exercise. Most colorectal cancers are due to old age, with around 60% of cases a ff ecting patients 70 years or older. The rectum is the most frequently involved site, accounting for approximately one-third of the cancers.

# PROCTITIS

PROCTITIS

The patient is usually middle-aged and complains of defecatory frequency with the passage of loose motions, often with blood mixed in the stools. Inflammation is sometimes limited to the rectum; in other cases, it is associated with a similar condition in the colon (proctocolitis). The inflammation can be acute or chronic. Although the patient has a frequent, intense desire to defecate, the amount of faeces passed at any time is small. Acute proctitis is usually accompanied by malaise and pyrexia. On rectal examination, there may be tenderness and blood on the glove. Proctoscopy is seldom su ffi cient and sigmoidoscopy is the more valuable method of examination. If the diagnosis is confirmed, colonoscopy with multiple biopsies is mandatory to determine the extent of the inflammatory process. Skilled pathological assessment is required to establish and classify the underlying pathology . Stool cultures should be sent routinely to exclude infective causes. If biopsy and histology are unable to establish an underlying inflammatory aetiology , the condition is frequently termed non-specific proctitis but may herald a subsequent diagnosis of inflammatory bowel disease (ulcer- ative colitis or Crohn’s disease). Treatment is usually medical and tailored to the underlying pathology . Non-specific colitis may be self-limiting, but treat- ment with topical 5-aminosalicylic acid (5-ASA) compounds in the form of suppositories or foam enemas is usually e ff ective. In resistant cases, oral steroids ma y have to be used.

# PROLAPSE Mucosal prolapse

PROLAPSE Mucosal prolapse

The mucosa and submucosa of the rectum may protrude outside the anus for approximately 1–4 /uni00A0 cm. When the prolapsed mucosa is palpated between the finger and the thumb, it is evident that it is composed of no more than a double layer of mucosa. This distinguishes mucosal prolapse the rectum protrudes through the anal canal. In infants The direct downward course of the rectum, owing to the as-yet undeveloped sacral curve, predisposes infants to this condition. In children Mucosal prolapse often commences after an attack of diar rhoea or from loss of weight and consequent loss of fat in the ischiorectal fossa. It may also be associated with cystic fibrosis, neurological disorder, Hirschsprung’s disease, rectal polyps and maldevelopment of the pelvis. Summary box 79.5 Rectal prolapse /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF In adults Mucosal prolapse in adults is often associated with third-degree haemorrhoids, when it is referred to as mucohaemorrhoidal prolapse ( Figure 79.6 ). In the female a perineum damaged at childbirth and in the male straining from urethral obstruction predispose to mucosal prolapse. In old age, both mucosal and full-thickness prolapse are associated with weakness of the Harald Hirschsprung , 1830–1916, Professor of Paediatrics, The Queen Louise Hospital for Children, Copenhagen, Denmark. Edmond Delorme , 1847–1929, Professor of Surgery , V al-de-Grace Military Hospital, Paris, France. - pelvic floor and anal sphincters. Partial prolapse may follow in - ano where a large portion of muscle an operation for fistula- has been divided. Here, the prolapse is usually localised to the damaged quadrant and is seldom progressive. Treatment In infants and young children /uni25CF Digital repositioning . The parents are taught to replace the protrusion, and any underlying causes are addressed. /uni25CF Submucosal injection or banding . If digital repositioning fails after a 6-week trial, injection of 5% phenol in almond oil or rubber band ligation under general anaesthetic can be tried ( Figure 79.7 ). In adults /uni25CF Local treatments . Submucosal injections of phenol in almond oil or the application of rubber bands may be successful in cases of mucosal prolapse. /uni25CF Excision of the prolapsed mucosa . When the prolapse is unilateral, the redundant mucosa can be excised or, if circumferential, an endoluminal stapling technique or internal Delorme’s procedure can be used.

It may be mucosal or full thickness If full thickness, the whole wall of the rectum is included It may begin as a rectal intussusception (internal rectal prolapse) In children, the prolapse is usually mucosal and should be treated conservatively In adults, the prolapse is often full thickness and is frequently associated with constipation and incontinence Surgery is almost always necessary for full-thickness rectal prolapse The operation is performed either via the perineum or via the abdomen Figure 79.6 Mucohaemorrhoidal prolapse of the anorectum. Figure 79.7 Through a proctoscope, a rubber band is applied to an area of mucohaemorrhoidal prolapse.

# Palliative colostomy

Palliative colostomy

This is indicated only in cases giving rise to intestinal obstruc - tion, or where the rectal cancer is not resectable. It can be performed by either an open or laparoscopic approach. In some cases, a defunctioning colostomy is required in advanced cancers to prevent obstruction during downstaging chemora - diotherapy .

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# Pathogenesis

Pathogenesis

Colorectal cancer originates from premalignant precursor lesions in the epithelial lining of the colon or rectum in a stepwise progression that results in increasing dysplasia due to an accumulation of genetic abnormalities. In spontaneous colorectal cancer, as compared with hereditary cancers, this is referred to as the adenoma–carcinoma sequence. Up to 80% of colorectal cancers occur in people with little or no genetic risk. People with inflammatory bowel disease are at an increased risk, which increases with the duration of the disease, and accounts for 2% of cancers each year. Those with a family history in two or more first-degree relatives have a two- to threefold greater risk of disease and this group accounts for about 20% of all cases. A number of genetic syndromes are also associated with higher rates of colorectal cancer. The most common is hereditary non-polyposis colorectal cancer (HNPCC or Lynch syndrome), which accounts for 3% of people with colorectal cancer. Other syndromes include Gardner syndrome and FAP . The most common abnormality found in colorectal cancer is mutation in the Wnt signalling pathway , which increases cell signalling activity . The mutations can be inherited or acquired. The most commonly mutated gene is the APC gene, which results in accumulation of the β -catenin protein. β -catenin activates the transcription of various proto-oncogenes that are responsible for normal cell renewal and di ff erentiation, but when overexpressed can cause cancer. Many other mutations, other than in the Wnt signalling pathway , are also found in colorectal cancer. They include mutations in the TP53 gene, which controls normal cell division and death, and in genes responsible for programmed cell death, such as the gene encoding transforming growth factor (TGF)- and DCC (deleted in colorectal cancer) gene. Other genetic abnormalities include overexpression of oncogenes, including genes encoding the proteins KRAS (Kirsten rat sarcoma homologue), RAF (rapidly accelerated fibrosarcoma) and PI3K (phosphoinositide 3-kinase), which lead to increased cell proliferation, and inactivation of tumour suppressor genes, such as PTEN (phosphatase and tensin homologue), which normally inactivates the PI3K signalling pathway . Henry Thompson Lynch , 1928–2019, physician and geneticist, Omaha, NE, USA, first presented his findings of a family with a strong history of colorectal cancer without polyposis in 1964. Eldon John Gardner , 1909–1989, geneticist, The University of Utah, Salt Lake City , UT , USA, described this syndrome in 1950. exhibit epigenetic alterations – cellular or physiological e ff ects - resulting from external or environmental factors that switch genes on or o ff . Epigenetic alterations can a ff ect hundreds of genes and include changes in the expr ession of microRNAs, hypermethylation or hypomethylation of CpG islands of protein-encoding genes and alterations in histones and chromosomal architecture, all of which can influence gene expression (see Chapter 77 ).

# Pelvic exenteration

Pelvic exenteration

When carcinoma of the rectum has spread to contiguous organs, a more radical operation known as pelvic exenteration can remove these structures en bloc. Thus, in the male, in whom spread is usually to the bladder or prostate, a cystectomy or prostatectomy may be required in combination with anterior resection to achieve complete oncological clearance. In the female, the uterus acts as an oncological barrier, preventing spread from the rectum to the bladder. Accordingly , a hysterectomy can be undertaken in addition to excision of the rectum. The aim is to remove pelvic organs involved in the malignant process and may involve a partial (posterior exenteration, including rectum and posterior vagina/uterus) or complete (including rectum and ur ogenital organs) exenteration ( Figure 79.27 ). Total pelvic exenteration may also be necessary for local disease recurrence. It involves a large excision of the pelvic floor, leaving a sizeable perineal defect that has to be reconstructed using r ectus abdominus or gluteal flaps to fill the ). The empty pelvis. Excision of the bladder will require the formation of an ileal conduit in addition to a colostomy . Following such radical surgery , quality of life (QoL) is a crucial postoperative consideration, and therefore detailed preoperative discussion with patients regarding QoL post procedure is required.

# Polyps relevant to the rectum

Polyps relevant to the rectum

Hyperplastic polyps These are small, pinkish, sessile polyps, 2–4 /uni00A0 mm in diameter and frequently multiple. They are usually an incidental finding, unless larger in size, when full colonoscopy is warranted to exclude hyperplastic polyposis syndrome. Tubular adenomas Tubular adenomas, or mixed tubulovillous adenomas, are the most common type of polyp. They have the potential to turn malignant, particularly if over 1 /uni00A0 cm in diameter. Villous adenomas These have a characteristic frond-like appearance. They may be very large, occupying much of the circumference of the rectum. These tumours have an increased tendency to become malignant. Rarely , the profuse mucus discharge from these tumours, which is rich in potassium, causes electrolyte and fluid losses. Serrated adenomas - These polyps are more commonly found in the right colon but may be present in the rectum. They are typically sessile lesions that have a distinct microscopic architecture and can give rise to cancers through an alternative ‘serrated’ pathway . Familial adenomatous polyposis Familial adenomatous polyposis (FAP) is an autosomal domi - nant inherited condition characterised by the development of multiple rectal and colonic adenomas around puberty . It is due to mutation in the adenomatous polyposis coli ( APC ) . gene, allowing genetic testing in the 75% of families in which a mutation can be identified. A colonoscopy and biopsy will in - ano confirm the diagnosis. As this condition is premalignant, total colectomy is usually recommended within 10 years of disease onset. This may take the form of panproctocolectomy with permanent ileostomy . Rectal preservation may be an option if the rectal polyp load is not too severe, with colectomy and ileorectal anastomosis, but continuous rectal surveillance for synchronous polyps will be required. The alternative, if resto - ration of gastrointestinal continuity is desired, is to undertake restorative proctocolectomy with ileal pouch–anal anastomosis (see Chapter 77 ). Inflammatory pseudopolyps These are oedematous islands of mucosa. They are usually associated with colitis in the UK, but most inflammatory diseases (including tropical diseases) can cause them. They are more likely to cause radiological di ffi culty , as the sigmoido - scopic appearance is usually associated with obvious signs of active or quiescent inflammation. Juvenile polyp This is a bright red, glistening pedunculated sphere (‘cherry tumour’) that is found in infants and children that may persist into adult life. It can cause bleeding or pain if it prolapses during defecation. It often separates spontaneously but can be removed easily with forceps or a snare. A solitary juvenile polyp has virtually no tendency to malignant change but should be treated if symptomatic. Histological features typically consist (a) (c) rectal cuboidal epithelium ( Figure 79.13 ). The rare autosomal dominant inherited syndrome juvenile polyposis does carry an incr eased risk of malignancy . It is characterised by multiple polyps and a positive family history .

Figure 79.13 Microscopic appearance of a juvenile polyp (courtesy of Professor Kieran Sheahan, St Vincent’s University Hospital, Dublin, Ireland). Lesion Mucosa Muscularis mucosa Submucosa Muscularis propria Figure 79.14 Endoscopic mucosal resection. The polyp is identi /f_i ed diathermy snare is passed over the raised lesion (c) to achieve complete excision

# Proctitis due to Crohn’s disease

Proctitis due to Crohn’s disease

Crohn’s disease can occasionally a ff ect the rectum, although classically it is spared. Sigmoidoscopic appearances di ff er from those in non-specific proctitis. The inflammatory process tends to be patchy rather than confluent, and there may be fissuring, ulceration or even a cobblestone appearance. Rectal Crohn’s disease is often associated with severe perineal disease characterised by fistulation, fissuring and haemorrhoids. Proctitis /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Coexistent disease is often present in the rest of the colon or small bowel, or both (see Chapter 75 ).

May be non-speci /f_i c or related to a speci /f_i c infective agent Non-speci /f_i c proctitis usually remains con /f_i ned to the distal bowel but can involve the proximal colon Symptoms include defecatory frequency, loose stools, bleeding and tenesmus Endoscopic assessment with biopsy is required to establish the diagnosis Treatment usually involves medical management

# Proctitis due to specific infections

Proctitis due to specific infections

Clostridium difficile An acute form of proctocolitis caused by infection with C. di ffi cile can follow broad-spectrum antibiotics. A membrane can sometimes be seen on sigmoidoscopy (‘pseudomembranous’ colitis). Bacillary dysentery The appearance is that of an acute purulent proctitis with multiple small, shallow ulcers. Amoebic dysentery The infection is more likely to be chronic, with exacerbations after a long period of symptom improvement. Proctoscopy and sigmoidoscopy are not painful.

# RECTAL POL YPS

RECTAL POL YPS

The rectum, along with the sigmoid colon, is the most frequent site of polyps (and cancers) in the gastrointestinal tract. Adenomatous polyps of the colon and rectum have the potential to become malignant. The chance of developing invasive cancer is enhanced if the polyp is more than 1 /uni00A0 cm in diameter. Removal of all polyps is recommended to allow complete histological diagnosis and exclude carcinoma. This is best done using endoscopic biopsy or snare polypectomy techniques. If one or more rectal polyps are discovered on sigmoidoscopic examination, a colonoscopy must be performed because further polyps are frequently found in the /uni00A0 colon. Theodor Maximilian Bilharz , 1825–1862, Professor of Zoology , Cairo, Egypt. colon. Polyps are described in terms of their appearance (pedunculated, sessile, flat) or histological composition (tubular, villous, tubulovillous).

# Radiation proctitis

Radiation proctitis

Radiation therapy is used in the treatment of cervical, prostate and rectal cancers. It can produce acute radiation proctitis with bleeding, pain, diarrhoea and defecatory frequency . Most symptoms settle within a few weeks, but some patients develop chronic proctitis with symptoms appearing months or even decades after the radiation exposure. Bleeding may require treatment with argon laser photocoagulation performed using a flexible sigmoidoscope.

# Signs

Signs

To examine the rectum the patient is most conveniently posi- tioned in the left lateral or semi-prone (Sims) position. Inspection Visual examination of the anus precedes rectal examination to exclude the presence of anal disease, e.g. fissure or fistula. Evidence of rectal prolapse or abnormal pelvic floor descent can be elicited by asking the patient to strain. Digital examination The index finger used with gentleness and precision remains a valuable test for rectal disease ( Figure 79.2 ). The anal sphincters are assessed for anatomical integrity , resting tone James Marion Sims , 1813–1883, gynaecological surgeon, the State Hospital for Women, New Y ork, NY , USA, introduced this position to give access to the anterior vaginal wall during operations for the closure of vesicovaginal fistula. herniation of the anterior rectal wall into the vagina. Tumours in the lower and middle thirds of the rectum can usually be felt. On removal, the finger should be examined for mucus, pus or blood. It is useful to note the normal, as well as the abnormal, findings on digital examination, e.g. the prostate in the male. Digital findings can be recorded as intraluminal (e.g. blood, pus), intramural (e.g. tumours, granular areas, strictures) or extramural (e.g. enlarged prostate, uterine fibroids). Intramural lesions can be described as fixed, tethered or mobile. Proctoscopy This procedure can be used to inspect the anus, anorectal junction and lower rectum. A lubricated proctoscope is inserted through the anus to provide views of the lower rectum and anal canal ( Figure 79.3 ). Biopsy can be performed of any suspicious areas, provided it is above the sensitive anoderm. Proctoscopy is particularly useful for assessing the presence of haemorrhoids. ). Sigmoidoscopy In the past, the sigmoidoscope was a rigid stainless steel instrument of variable diameter and normally 25 /uni00A0 cm in length, but this has been replaced by disposable plastic instruments. The rectum must be empty for proper inspection. Direct inspection of the rectal mucosa may alert the clinician to inflammation or tumours. This procedure can be performed in the outpatient setting. Flexible sigmoidoscope This is used as a supplement to rigid sigmoidoscopy or when views proximal to the rectum are required ( Figure 79.4 ). The lower bowel needs to be cleaned out with preliminary enemas. In addition to the rectum, the whole sigmoid colon up to the splenic flexure is within visual reach. Flexible sigmoidoscopy

Figure 79.2 Digital rectal examination in the male. Assessment of the anal sphincter complex, lower rectum and prostate. Figure 79.3 Proctoscope for visualisation of the anorectum.

is indicated to investigate underlying causes of fresh rectal bleeding or other bowel symptoms when full visualisation of the colon by colonoscopy is not required. Summary box 79.3 Examination of the rectum /uni25CF /uni25CF /uni25CF /uni25CF

Figure 79.4 Flexible colonoscope. Visual inspection of the Proctoscopy perineum Sigmoidoscopy – rigid and/ or /f_l exible Digital examination

# Stages of progression

Stages of progression

Dukes classified carcinoma of the rectum into three stages ( Figure 79.16 ). Dukes' staging /uni25CF A: The growth is limited to the rectal wall (15%). The prognosis is excellent (>90% 5-year survival). /uni25CF B: The growth extends to the extrarectal tissues, but with out metastasis to the regional lymph nodes (35%). The prognosis is reasonable (70% 5-year survival). /uni25CF C: There are secondary deposits in the regional lymph nodes (50%). These are subdivided into C1, in which the local pararectal lymph nodes alone are involved, and C2, in which the nodes accompanying the supplying blood ves sels to their origin from the aorta are involved. This does not take into account cases that have metastasised beyond the regional lymph nodes or by way of the venous system. The prognosis is poor (40% 5-year survival). A stage D is often included, which was not described by Dukes. This stage signifies the presence of widespread metastases, usually hepatic. Other staging systems have been developed (e.g. Astler–Coller , TNM) to improve prognostic accuracy , with the tumour–node–metastasis (TNM) classification now recognised internationally as the optimum staging classification ( Table 79.2 ). Cuthbert Esquire Dukes , 1890–1977, pathologist, St Mark's Hospital, London, UK. The original Dukes' classification in 1932 gave three stages Ver non B Astler , surgeon, University of Michigan Medical School, Ann Arbor, MI, USA. Frederick A Coller , 1887–1964, pathologist, University of Michigan Medical School, Ann Arbor, MI, USA. - - , A–C.

Figure 79.16 Dukes' classi /f_i cation of colorectal cancer. A, the cancer is con /f_i ned to the bowel wall. B, the cancer penetrates the muscularis propria. C, involvement of the draining lymph nodes. Stage C was later modi /f_i ed: C1, pararectal nodes involved; C2, apical nodes involved. TABLE 79.2 TNM staging of rectal cancer. Tx: Primary tumour cannot be assessed T0: No evidence of primary tumour Tis: Carcinoma in situ , intraepithelial or invasion of lamina propria T1: Tumour invading submucosa T2: Tumour invading the muscularis propria T3: Tumour penetrating the muscularis propria into perirectal fat (mesorectum) T4a: Tumour penetrating visceral peritoneum T4b: Tumour directly invading or adhering to other organs or structures Nx: Regional lymph nodes cannot be assessed N0: No lymph node metastasis and no TD N1: 1–3 lymph node metastases N1a: 1 lymph node metastasis N1b: 2 or 3 lymph node metastases N1c: Submucosal, mesangial or peritoneum-covered paracolorectal TDs in the absence of regional lymph node metastases N2: ≥ 4 lymph node metastases N2a: 4–6 regional lymph node metastases N2b: ≥ 7 lymph node metastases M1: There are distant metastases M1a: Metastases are limited to 1 organ or site (e.g. liver, lung, ovary and extraregional lymph node metastases) M1b: Metastases to more than 1 organ or site M1c: Peritoneal metastases with or without metastases to other organs TD, tumour deposits.

Radiological staging All patients with a diagnosis of rectal cancer should undergo staging CT of the thorax, abdomen and pelvis (TAP) to stage both local and metastatic disease ( Figure 79.17 ). Positron emission tomography (PET) scanning can be helpful in identi- fying metastases if imaging is otherwise equivocal or to identify multiple metastatic foci ( Figure 79.18 ). MRI is the best modality to assess soft-tissue extent of the tumour, the degree of infiltration of the mesorectum

and mesorectal lymph node involvement and to ascertain whether the mesorectal fascia is potentially involved ( Figur e 79.19 These determinations are of great importance in guiding both surgical and oncological management. Histological grading In the great majority of cases, carcinoma of the rectum is an adenocarcinoma, derived from malignant transformation of the columnar rectal epithelium. The more the tumour cells retain normal shape and arrangement (well di ff erentiated), the less aggressive the behaviour. Conversely , the more cells of an undi ff erentiated type, the more aggressive the behaviour. Other poor prognostic features include vascular and perineural invasion, the presence of an infiltrating (rather than pushing) margin and tumour budding. In a small number of cases, the tumour is a primary mucoid carcinoma. The mucus lies within the cells, displacing the nucleus to the periphery , like the seal of a signet ring. Signet ring carcinomas grow rapidly , metastasise early and have a poor prognosis. Summary box 79.10 Pathology and staging of rectal cancer ). /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Figure 79.17 Coronal and axial images from surveillance computed tomography showing a solitary 2.5-cm metastasis in segment 6 of the liver (arrow) in a patient with rectal cancer. (a) (b) Figure 79.18 (a) Initial screening computed tomography (CT) showing a 1.5-cm diameter solid lesion in the right lung, with tomography–CT indicating

# increased metabolic uptake and (c) intestinal origin (courtesy of Dr Damian Tolan, St James’s Hospital, Leeds, UK). (c) (b) positron emission later CT-guided biopsy that con /f_i rmed adenocarcinoma from a lower gastro

Tumours are adenocarcinomas and are well, moderately or poorly differentiated They spread by local, lymphatic, venous and transperitoneal routes Circumferential local spread is the most important and dictates management Lymphatic spread follows the blood supply of the rectum in a cephalad direction via the superior rectal vessels to the para- aortic nodes, but in low rectal cancer it can also involve the lateral pelvic lymph nodes The TNM classi /f_i cation is the internationally recognised staging system

Figure 79.19 Axial and sagittal T2-weighted magnetic resonance images showing a locally advanced high-signal T3 mucinous rectal cancer with involvement of the posterior circumferential resection margin (thick arrows) anterior to the second sacral segment. Note the position of the peritoneal re /f_l ection and the peritoneum in relation to the tumour (thin arrows) (courtesy of Dr Damian Tolan, St James’s Hospital, Leeds, UK).

# Treatment of rectal polyps

Treatment of rectal polyps

All rectal polyps should be biopsied or removed for histological analysis. A range of techniques can be used, depending on polyp size and location. The majority are less than 1 /uni00A0 cm in size, benign and amenable to endoscopic polypectomy . Polyps greater than 1 /uni00A0 cm in size have a 10% chance of malignancy . The di ffi cult polyp can be defined by a range of variables, including the number of polyps, a size greater than 15 /uni00A0 mm or a certain shape, whether with a large pedicle or a flat appearance (see Chapter 72 ). Endomucosal resection (EMR) and endoscopic submucosal dissection (ESD) are techniques to consider when use of biopsy forceps or a snare is not optimal. The resection plane for both EMR and ESD is the superficial submucosal layer. Both techniques utilise an injection into the submucosal layer ( Figure 79.14 ). Importantly , if the mucosa does not lift, this may indirectly indicate deeper invasion of the lesion. A ‘non-lift’ sign may also occur because of fibrosis from previous resection attempts or tattooing (see Chapter 9 ). EMR is typically used for lesions up to 20 /uni00A0 mm in size, although the piecemeal resection for lesions greater than 20 /uni00A0 mm may obviate surgery at the risk of a higher recurrence rate . ESD was created to counter the shortcomings of EMR as en bloc resection allows assessment of both horizontal and (b) (d)

(a) and in /f_i ltration performed (b) to lift it from the underlying muscle layer. A (d) .

deep margins, which is not possible with a piecemeal resection ( Figure 79.15 ). The submucosal injection is performed at the proximal border of the lesion, after which endoscopic knives are used to create an incision and dissect the submucosal layer free. ESD is informally indicated for lesions larger than 20 /uni00A0 mm, when high-grade dysplasia or superficial submucosal invasion is suspected and when other endoscopic techniques have failed. The bleeding risks for EMR and ESD are roughly similar, whether immediate or delayed, with a reported incidence of 1–10%. Larger polyps are more di ffi cult to remove by EMR and may require a transanal procedure, such as transanal endoscopic microsurgery (TEMS). Summary box 79.7 Polyps in the rectum /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Figure 79.15 Endoscopic submucosal dissection of a rectal polyp (courtesy of Dr Noor Mohammed, St James’s Hospital, Leeds, UK). Adenomas are the most frequent histological type Villous adenomas may be extensive and undergo malignant change more commonly than tubular adenomas All adenomas must be removed to avoid malignant change All patients must undergo colonoscopy to determine whether further polyps are present Most polyps can be removed by endoscopic techniques, but sometimes major surgery is required

# Treatment

Treatment

The rectum is examined under general anaesthetic with a finger and a sigmoidoscope. If penetrating injury is confirmed, laparotomy or laparoscopy is required. If an intraperitoneal rupture of the rectum is found, the perforation is closed with sutures and the rectum defunctioned with a stoma. The defunctioned distal segment should be irrigated to remove all residual faecal matter. In the event that the rectal injury cannot be repaired, a Hartmann's procedure may be needed. If the rectal injury is below the peritoneal reflection, wide drainage from below is indicated, with rectal washout and a defunctioning colostomy . Care must be taken to preserve or Henri Albert Hartmann , 1860–1952, Chief of Surgery , Hôtel Dieu, Paris, France. restore anal sphincter integrity during debridement of the perineal wounds. Antibiotic cover must be provided against both aerobic and anaerobic organisms.

Figure 79.5 Foreign body in the rectum as seen on plain abdominal radiograph.

Treatment

Surgical excision of the tumour is the conventional treatment, provided this can be achieved with clear oncological margins and acceptable risk of morbidity and mortality . However, the management of rectal cancer has become increasingly complex because of the various surgical techniques available and the range of neoadjuvant and adjuvant options. Before treatment can be planned, it is necessary to assess both the fitness of the patient and the extent of spread of the tumour. The management needs to be discussed within a multidisciplinary team (MDT) setting involving surgeons, radiologists, oncologists, pathologists and specialty nurses. It is particularly important that the recommendation be documented and discussed with the patient. The ultimate treatment decision is made jointly with the patient, taking their wishes and expectations fully into account. Principles of surgical treatment Radical excision of the rectum, together with the mesorectum and associated lymph nodes, should be the aim in most cases. In the presence of widespread metastases, other means of palliation should be considered, such as endoluminal stenting or external beam radiotherapy , although there may still be a role for palliative resection. The presence of liver metastases does not necessarily rule out the feasibility of cure: the results of surgery for liver metastases have greatly improved, with long-term survival being achieved in over a third of patients (see Chapter 69 ). When a tumour appears to be locally advanced (i.e. invading a neighbouring structure or threatening to breach the circumferential resection margin), the use of neoadjuvant Angelita Habr-Gama , b. 1934, surgeon, Sao Paolo, Brazil. (preoperative) radiotherapy or chemoradiotherap y is usually considered. Long-course chemoradiotherapy is given as five fractions of radiotherapy combined with chemotherapy over a 6-week period. The aim is to downstage the cancer and increase the chances of a complete r esection with clear oncological margins. Alternatively , preoperative 'short-course' (5 days) radiotherapy can be used if the resection margins are not threatened but the cancer is still at high risk for local recurrence (e.g.

perirectal lymph node involvement). Approximately 20% of rectal cancers treated by neo- adjuvant chemoradiotherapy show a complete clinical response with no evidence of residual cancer on clinical examination, biopsy or radiological imaging. There is an increasing trend for such patients to be o ff er ed the option of ‘watch and wait’ (Habr-Gama) in the hope that they may have been cured of the disease and spared the morbidity of resectional surgery . Some 30% of cases will recur on a ‘watch-and-wait’ policy , but most can be salvaged by surgical resection ( Figures 79.20 and 79.21 ). There is also growing enthusiasm for ‘organ-preserving’ surgical techniques in early T1 and even T2 cancers with good prognostic features. This usually involves full-thickness exci- sion of the cancer using TEMS ( Figure 79.22 ). Alternative ‘organ-preserving’ techniques involve the use of brachytherapy and contact radiotherapy , but these are currently reserved for patients unfit for radical resection or as a means of palliation. When radical excision is possible, the aim should be to restore gastrointestinal continuity and continence by preserv- ing the anal sphincter whenever feasible. A sphincter-saving operation (anterior resection) is usually possible for tumour s whose lower margin is ≥ 2 /uni00A0 cm above the anorectal junction. Although in the past removal of the rectum and anus with a permanent colostomy (abdominoperineal excision) was often required for tumours, the introduction of the stapled anasto- mosis and chemoradiotherapy downstaging has enabled many more patients to be treated by a sphincter-saving procedure. The principles of anterior resection involve radical excision of the cancer along with its complete mesorectal the inferior envelope, combined with high proximal ligation of mesenteric lymphovascular pedicle. Once the left colon and rectum have been mobilised, the distal rectum is divided at least 1 /uni00A0 cm (and preferably more) below the distal cancer margin and the specimen removed. Rectosigmoid cancers and those in the upper third of the rectum are removed by ‘high anterior resection’, in which the rectum and mesorectum are taken to a margin of at least 3 /uni00A0 cm distal to the tumour and a colorectal anastomosis is performed. For tumours in the middle and RJ (Bill) Heald , contemporary , surgeon, Basingstoke, UK, and Champalimaud Foundation, Lisbon, Portugal. lower thirds of the rectum, complete removal of the rectum and mesorectum is required, i.e. TME (Heald). Restoration of continuity is usually performed using a stapling technique, which might involve an end-to-end, side-to-end or colopouc h construction in low cancers ( Figure 79.23 ). The retention of at least a part of the rectum in high anterior resection results in better postoperative function, with less risk of anterior resection syndrome, a condition characterised by defecatory urgency , incontinence and incomplete evacuation, secondary to removal of the normal rectal reservoir. In cancers situated below the peritoneal reflection it is usual practice to defunction the anastomosis with a temporary stoma because of the higher risk of anastomotic leak. Although a defunctioning stoma does not prevent anastomotic leak, it does mitigate against septic complications should a leak occur.

# Figure 79.20 T2-weighted magnetic resonance images showing complete response to

chemoradiotherapy in a T3 rectosigmoid cancer involv ing the circumferential resection margin (arrows). Axial images before structure and only minimal extramural /f_i brosis in place of the large tumour (courtesy of Dr Damian Tolan, St James's Hospital, Leeds, UK). Figure 79.21 Endoscopic view of rectal cancer showing complete response after neoadjuvant chemoradiotherapy. Endoscopic view the time of diagnosis. Following neoadjuvant treatment (b) with the site of a tattoo only visible (courtesy of

# Julian Hance, St James’s Hospital, Leeds, /uni00A0 UK).

(a) and after (b) treatment showing normalisation of the rectal wall layer (a) at

(b) Summary box 79.11 Surgery for rectal cancer /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF (b) Preoperative preparation The bowel is usually prepared by mechanical cleansing using a combination of diet, purgatives and enemas to reduce intra - operative contamination and the risk of surgical site infection. While this approach has been used selectively , recent guidelines recommend preoperative bowel preparation.

Figure 79.22 Transanal endoscopic microsurgery. (a) An operating sigmoidoscope is inserted through the anal canal to visualise the lesion and enable passage of a laparoscope and instruments. full-thickness local excision is performed. The defect is closed or, alternatively, may be left open if the peritoneum is not breached. Surgery is the mainstay of curative therapy The primary resection consists of rectal resection performed by TME Early cancers (stages T1 and selected T2) may be suitable for local excision Most cases can be treated by anterior resection, with a colorectal or coloanal anastomosis being achieved with a circular stapling device Low, extensive tumours require an abdominoperineal excision with a permanent colostomy Neoadjuvant chemoradiotherapy can be used to downstage the cancer and reduce local recurrence ‘Watch and wait’ non-operative management is an option for the 20% who have a complete clinical response to neoadjuvant chemoradiotherapy (b) A Figure 79.23 Low anterior resection by the double stapling method. The rectum has been excised and the distal anorectal stump has been transected with a transverse stapling device. A circular stapling device is used to construct either (a) a straight low coloanal anastomosis or (b) a colopouch–anal anastomosis.

operatively to reduce the risk of surgical site infection. In Europe, this usually takes the form of broad-spectrum anti- biotics given intravenously at induction of anaesthesia. In the USA, antibiotic prophylaxis is more frequently administered as a course of oral antibiotics (neomycin and metronidazole) given preoperatively in addition to intravenous antibiotics at the induction of anaesthesia. There is evidence to suggest that this may reduce the risk of septic complications, including anastomotic leak. All patients should be seen by a stoma care nurse preoper- atively and be sited for a temporary or permanent ileostomy and/or colostomy . They must also be counselled as to the com- plications of the procedure, and particularly about the risks of pelvic autonomic nerve damage causing bladder and sexual disturbance, especially impotence in males. Summary box 79.12 Preoperative preparation /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Local operations Early rectal cancers (T1 and good prognosis T2) may be amena- ble to local transanal excision, preserving much of the rectal reservoir and therefore near normal function. Histological analysis of the specimen is then used to assess the adequacy of excision with respect to the probability of positive lymph nodes being left behind. This may range from 10% in T1 cancers to 20% in T2 cancers and clinical judgement, along with in-depth conversation with the patient, is required to determine whether local excision has achieved a su ffi cient chance of oncological cure

or whether a further radical resection is required. Local excision is usually performed with one of the com- mercially available transanal laparoscopic systems or with equipment modified from transanal total mesorectal excision (taTME) procedures (see Transanal total mesorectal exci sion ). A full-thickness ex cision of the lesion is performed and the defect closed with sutures or else left open. There is a limit to the height of lesion that can be resected, with more proximal lesions in the upper rectum being di ffi cult. Anterior resection There has been a move to extend sphincter-saving operations to treat most tumours of the middle and lower thirds of the rectum, thus reducing the abdominoperineal excision rate and the need for permanent colostomy . There is also an increasing trend to use laparoscopic techniques for anterior resection, with patient benefits including less pain, quicker recovery from surgery and improved cosmesis. The evidence suggests that laparoscopic anterior resection is as safe as open surgery in terms of short- and long-term complications and oncological with the da Vinci robotic surgical system (Intuitive Surgical Inc., Sunnyvale, CA, USA) ( Figure 79.24 ). Although this adds significant cost to the procedure, there may be some benefit in terms of a reduced need to convert to open surgery , and -

# Counselling and siting of stomas Correction of anaemia and electrolyte disturbance Type and screen for blood transfusion Bowel preparation Deep vein thrombosis prophylaxis Prophylactic antibiotics (a) (b) Figure 79.24 da Vinci Xi Robotic Surgical System: (a) surgeon con

sole; (b) patient cart. (Reproduced with kind permission from Intuitive Surgical Inc. https://www.intuitive.com/en-us/products-and-services/ da-vinci/systems/. )

approach. The operation performed is the same whether the procedure is undertaken by open, laparoscopic or robotic surgery , with the di ff erence being in the extent of abdominal access trauma (laparotomy wound versus ‘keyhole’ incisions). In open surgery , a midline abdominal incision is made and full laparotomy performed to detect synchronous pathologies, including evidence of intra-abdominal cancer spread. The sigmoid and descending colon are freed by dividing the peritoneal reflection on the left side and then mobilising them to the midline on their mesentery , protecting the left ureter and testicular/ovarian vessels. The splenic flexure is mobilised to gain su ffi cient left colonic length to allow tension-free colorectal anastomosis. Rectal dissection is performed in the embryological planes (TME) with preservation of the autonomic nerves, which course over the pelvic brim (sympathetic nerves) and exit from the pelvic plexuses (parasympathetic nerves) to supply the pelvic floor and the urogenital organs ( Figure 79.25 Once rectal dissection has reached the anorectal junction (low anterior resection), or at least 3 /uni00A0 cm below the cancer (high anterior resection), the rectum is divided, usually with the aid of a stapling device. The mesocolon is divided at the site of the proposed division of the colon and the trunk of the inferior mesenteric artery is ligated and divided at its origin from the aorta (high tie). Resection of the specimen is completed by division of the bo wel at the point to be used for the proximal anastomosis. Restoration of bowel continuity is usually achieved by means of a stapled anastomosis. The simplest way of achieving this is by using a ‘double stapling’ technique, whereby a circular stapling device ( Figur e 79.23 ) is passed transanally to anastomose the stapled ends of the proximal colon and rectal stump. Alternatively , a ‘single stapled’ anastomosis may be performed in which purse-string sutures are applied to the proximal colon and rectal stump and anastomosed using a single firing of a circular stapling device inserted transanally . In cases where the anastomosis is very low (coloanal anastomosis) it may be necessary to perform a hand-sewn anastomosis. Laparoscopic and robotic anterior resection follow the above general principles, but with abdominal access through the use of four or five abdominal ports and carbon dioxide pneumoperitoneum. The dissection usually follows a medial- to-lateral approach, i.e . dissection and high ligation of the vascular pedicle followed by lateral mobilisation of the colon, then rectal resection. A small laparotomy wound is still required to extract the specimen, unless transanal specimen extraction is possible, and restoration of bowel continuity is performed by the usual stapling techniques. Transanal total mesorectal excision taTME builds on the principles of laparoscopic surgery , with an airtight anal device used to provide transanal insu ffl ation and access for laparoscopic instruments. The operation proceeds by placing a purse-string suture below the distal level of the tumour and incising the bowel wall to enter the mesorectal plane. Dissection then proceeds using a ‘bottom-up’ approach to accomplish TME. It is usual for this procedure to be undertaken as a combined operation, with synchronous ‘top-down’ laparoscopic resection by an abdominal operator Prostate Vesicle Neurovascular bundle denonvilliers’ Denonvilliers’ fascia fascia ). The ‘holy plane’ who mobilises the left colon, takes down the splenic flexure and does some of the upper rectal dissection. Initial results have demonstrated that taTME is safe, with short-term oncological outcomes, in terms of pathological quality of the resection specimen and circumferential resec - tion margins, comparable to those of traditional laparoscopic and open techniques . However, concerns have been raised regarding the increased incidence of urethral injuries and the development of multifocal local recurrences. These concerns highlight the critical importance of adequate taTME training, proper case selection, and proctorship with maintenance of high procedural volumes in an MDT setting to help ensure optimal outcomes. Meanwhile, several multicentre randomised controlled trials such as COLOR III and TaLaR are well under way to confirm the long-term oncological safety of taTME. Hartmann’s operation This is an option in elderly

and frail patients in whom there is concern about poor anal sphincter function and postoperative incontinence or the viability of an anastomosis. Colorectal excision follows the same principles as outlined above, but the rectal stump is stapled closed and the proximal colon exterior - ised as a permanent end-colostomy . Abdominoperineal excision of the rectum This operation is still required for some tumours of the lower third of the rectum that are unsuitable for a sphincter-saving

Figure 79.25 Plane of dissection for total mesorectal excision in a male with midrectal cancer. (Reproduced with permission from O'Connell PR, Madoff RD, Solomon MJ (eds). Operative surgery of the colon, rectum and anus , 6th edn. Boca Raton, FL: CRC Press, 2015.)

procedure. Traditionally , the procedure was performed by two surgeons operating simultaneously , one via the abdomen and the other via the perineum, with the patient in the Trendelenburg lithotomy position. More recently , there has been a shift to completing the abdominal procedure first (with the patient in the Lloyd-Davies position, in which the legs are in supports set lower than the lithotomy position), and then placing the patient either in a prone jack-knife or Lloyd-Davies position and completing the operation via the perineum. The aim is to produce a complete resection of the rectum and mesorectum along with cylindrical excision of the extralevator component. This achieves wide excision at the level of the pelvic floor, increasing complete resection rates and reducing local perforation and the risk of local recurrence. The abdominal procedure is carried out laparoscopically or via a midline laparotomy and is performed in the same way as an anterior resection, except that dissection stops before the pelvic floor is reached (at the lev el of the seminal vesicles in men or the cervix in women) to avoid 'coning down' onto the tumour at the level of the pelvic floor. Perineal dissection is achieved through a circumanal incision, which is deepened into the ischiorectal fossae and out towards the attachment of the levator muscles to the pelvic side wall ( Figure 79.26 dissection is extended posteriorly by incising Waldeyer's fascia, which is a thick condensation of pelvic fascia lying between the rectum and the sacrum. Some surgeons routinely remove the coccyx to improve access and surgical margins. Anteriorly , the plane between the rectum and the prostate in the male or between the rectum and the vagina in the female is developed, with particular care to avoid the membranous urethra in the male. A catheter within it should be palpated so that it can be avoided. Friedrich Trendelenburg , 1844–1924, Professor of Surgery , successively at Rostock (1875–1882), Bonn (1882–1895) and Leipzig (1895–1911), Germany . The Trendelenburg position was first described in 1885. Oswald Vaughan Lloyd-Davies , 1905–1987, surgeon, St Mark's Hospital, London, UK. rectum if an advanced anterior tumour is present. Resection is completed when the perineal dissection reaches the abdominal dissection, with the specimen retrieved through the perineal med in the left iliac fossa and wound. An end-colostomy is f or the wounds closed with drains to the pelvis.

Figure 79.26 Separation and division of the pubococcygeus and puborectalis muscles in the course of the perineal phase of an abdom inoperineal excision of the rectum. (Reproduced with permission from O'Connell PR, Madoff RD, Solomon MJ (eds). Operative surgery of the colon, rectum and anus , 6th edn. Boca Raton, FL: CRC Press, 2015.)

# Tuberculous proctitis

Tuberculous proctitis

This is nearly always associated with active pulmonary tuberculosis or tuberculous ulceration of the anus. Submucous rectal abscesses burst and leave ulcers with an undermined edge. A hypertrophic type of tuberculous proctitis occurs in association with tuberculous peritonitis or tuberculous salpingitis. This type of tuberculous proctitis requires biopsy for confirmation of the diagnosis.

# Types of carcinoma spread

Types of carcinoma spread

Local spread Local spread occurs circumferentially rather than in a longi- tudinal direction. After the muscular coat has been penetrated, the growth spreads into the surrounding mesorectum, but is initially limited by the mesorectal fascia. If penetration occurs anteriorly , the prostate, seminal vesicles or bladder become involved in the male; in the female, the vagina or the uterus is invaded. In either sex, if the penetration is lateral, a ureter may become involved, while posterior penetration may reach the sacrum and the sacral plexus. Downward spread for more than a few centimetres is rare. Lymphatic spread Lymphatic spread from a carcinoma of the rectum above the peritoneal reflection occurs almost exclusively in an upward direction. Below that level, the lymphatic spread is still upwards, but when the neoplasm lies within the field of the middle rectal artery , primary lateral spread to the pelvic wall lymphatics occurs in around 20% of cases. Downward spread is exceptional, with drainage along the subcutaneous lymphatics to the groins being confined, for practical purposes, to the lymph nodes draining the perianal rosette and the epithelial lining of the distal 1–2 /uni00A0 cm of the anal canal. Metastasis at a higher level than the main trunk of the superior rectal artery occurs late in the disease. A radical operation should ensure that the high-lying lymph nodes are removed by ligating the inferior mesenteric artery at its origin from the aorta. Atypical and widespread lymphatic permeation can occur with highly undi ff erentiated neoplasms. Venous spread The principal sites for blood-borne metastases are liver (34%), lungs (22%) and adrenals (11%). The remaining 33% are divided among the many other locations where secondary carcinomatous deposits tend to lodge, including the brain. Peritoneal dissemination This may follow penetration of the peritoneal coat by a high-lying rectal carcinoma.

Mucosa Submucosa Muscularis propria Mesentery

# Ulcerative proctocolitis

Ulcerative proctocolitis

Proctitis is present in most cases of ulcerative colitis, and the degree of rectal involvement may influence the type of opera- tive procedure (see Chapter 75 ).

# Venous drainage

Venous drainage

The superior haemorrhoidal veins draining the upper half of the anal canal above the dentate line pass upwards to become the rectal veins; these unite to form the superior rectal vein, which later becomes the inferior mesenteric vein. This forms part of the portal venous system and ultimately drains into the splenic vein. Middle rectal veins exist but are small, unimport- ant channels unless the normal paths are blocked.