9 Gastrointestinal endoscopy

- SAFE SEDATION
- Single- double-balloon enteroscopy
- THE MODERN ENDOSCOPY UNIT Organisation
- Therapeutic colonoscopy
- Therapeutic endoscopic retrograde cholangiopancrea
- Therapeutic endoscopic retrograde cholangiopancreatography
- Therapeutic oesophagogastroduodenoscopy
- UNDERGOING ENDOSCOPY
- UPPER GASTROINTESTINAL ENDOSCOPY
- Urgent endoscopy for gastrointestinal bleeding in
- Urgent endoscopy for gastrointestinal bleeding in the anticoagulated patient
- Urgent endoscopy for gastrointestinal bleeding in

Aspirin

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- Early attempts at colonoscopy were hindered by poor technique and limitations of available instruments. The ability to steer an endoscope around the entire colon and into the terminal ileum was made possible by the development of fully flexible colonoscopes with >90° angulation of the tip. Advances in - bowel preparation have enhanced mucosal visualisation. Understanding two key technical aspects of colonoscopy allows a greater caecal intubation rate and ileal intubation tic with minimal discomfort using light sedation. The first is that continued inward pressure of the endoscope results in loop formation within the mobile sigmoid and transverse colon, which in turn leads to paradoxical movement and loss of fine tip control. The second is that pulling back the scope regularly with appropriate torque to ensure a straight passage through the sigmoid colon and around the splenic flexure greatly aids the completion of right-sided examination. Endoscopic navigation systems such as Scope Guide (Olympus) and Scope Pilot (Pentax) can help to characterise the nature of the loop, allowing for more accurate loop reso - lution techniques. Increasing the sti ff ness of the colonoscope, tar geted abdominal pressure and regular patient position change are also important aids to successfully reaching the caecum. It is expected that the caecum should be r eached in at least 90% of colonoscopies and is confirmed by the presence of the appendiceal orifice, the triradiate fold, the ileocaecal valve and preferably terminal ileal intubation (Figure 9.14). Historically , air was used to insu ffl ate the bowel, but carbon dioxide is now preferred owing to better patient tolerance and lower risk of perforation. Recent evidence has suggested that using water alone to distend the colon ma y reduce patient dis - comfort further. The ability to take mucosal biopsies and resect polyps ensures that colonoscopy is the most appropriate investigation - for the majority of patients. In selected groups, CT colonog raphy and colon capsule endoscopy provide an alternative route for investigating colonic pathology , though these are limited by the inability to acquire tissue. Accordingly , colonoscopy remains the cornerstone of most colorectal cancer (CRC) screening programmes globally , whether it is used as the initial screen ing modality or following a faecal immunochemical test (FIT). Johann Conrad Peyer , 1653–1712, Professor of Logic, Rhetoric and Medicine, Scha ff hausen, Switzerland, described the lymph follicles in the intestine in 1677. detected and hence decrease mortality , as well as to identify and remove adenomatous polyps prior to the development of overt cancer. Higher adenoma detection rates (ADRs) are er rates of interval cancers and, as such, associated with lo w the ADR is an important indicator of colonoscopy quality . ADRs can be improved with measures such as a longer time taken on withdrawal from the caecum, optimal bowel prepa - ration, patient position changes and a ‘second look’ of the right colon by changing patient position or by retroflexing the colonoscope. Distal attachments, such as a transparent cap or TM , can improve ADRs further. an Endocu ff Vision Summary box 9.7 Indications for colonoscopy /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

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Approximately 1% of medical negligence claims in the USA relate to the practice of endoscopy . Many of these could have been avoided by a careful explanation of the procedure, including an honest discussion of the risks and benefits. Therefore, obtaining informed consent is a cornerstone of good endoscopic practice. It preserves a patient’s autonomy , facilitates communication and acts as a shield against future complaints and claims of malpractice. The most important aspect of the consent procedure is that a patient understands the nature, purpose and risk of a partic - ular procedure, in addition to potential alternatives. Current guidelines w ould suggest that a patient should be informed of minor adverse events with a risk of more than 10% and serious events with an incidence of more than 0.5%. The ke y risks . British of endoscopy are summarised in Summary box 9.2 Society of Gastroenterology Guidelines for Consent have been published (see Further reading). - Summary box 9.2 The risks of endoscopy /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF -

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disadvantages of the currently available modalities to endoscope the small intestine. Technique Advantages Disadvantages Some discomfort Conventional Simple technique with Can only access enteroscopy wide availability proximal small bowel Full range of therapeutics available Performed under sedation No biopsies Capsule Able to visualise the Not controllable and no endoscopy entire small bowel accurate localisation Preferable for patients Variable transit No sedation Incomplete studies Painless owing to battery life Not suitable for patients with strictures Large capsule to swallow Requires admission Able to visualise the Double-/ Specialist centres only entire small bowel single-balloon Complications include Full range of enteroscopy perforation therapeutics

Complications associated with endoscopic retrograd

Complications associated with endoscopic retrograde cholangiopancreatography

The same risks associated with other endoscopic procedures also apply to patients undergoing ERCP , but risks may be increased because of the increased patient frailty and high sedation levels required. Complications specific to ERCP include duodenal perforation (1.3%), haemorrhage (1.4%) after sphincterotomy , pancreatitis (4.3%) and sepsis (3–30%); the mortality rate approaches 1%. It is important to remember that postsphincterotomy complications may be retroperitoneal and CT scanning should be performed in patients with pain, tachycardia or hypotension post procedure. Although normally mild, post-ERCP pancreatitis can be severe with extensive pancreatic necrosis and is associated with a significant mortality rate (Table 9.5). Where there is no contraindication, patients under going ERCP should receive per-rectal indometacin or diclofenac immediately before or after the procedure to reduce the risk of post-ERCP pancre atitis. Ruggero Oddi , 1866–1913, anatomist and physiologist, Perugia, Italy , wrote about the structure and function of the ampullary sphincter in 1887, when still a student. He struggled in later life with drug addiction. - - - -

De /f_i nite Suspected SOD Young age Normal bilirubin Prior ERCP-related pancreatitis Dif /f_i cult cannulation Pancreatic duct contrast injection Pancreatic sphincterotomy Balloon dilatation of biliary sphincter Possible Female

sex Low volume of ERCPs performed Absent CBD stone CBD, common bile duct; ERCP , endoscopic retrograde cholangio

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Complications of colonoscopy

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Figure 9.19 Malignant colonic obstruction can be palliated or tem porarily relieved by insertion of a self-expanding metal stent (arrow). ‘Ragged’ edge suggesting invasion of adventitia Tumour Muscularis propria Figure 9.20 Endoscopic ultrasound image of an oesophageal tumour invading into the wall.

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Diagnostic upper gastrointestinal endoscopy is a safe proce dure with minimal morbidity as long as appropriate patient selection and safe sedation practices are embedded in the unit’s policy . The rate of serious complications is approximately 1:10 /uni00A0 000. The majority of adverse events relate to sedation and patient comorbidity . Particular caution should be exer - cised in patients with recent unstable cardiac ischaemia and respiratory compromise. Perforation can occur at any point in the upper gastrointestinal tract, including the oropharynx. It is rare during diagnostic procedures and is usually associated with inexperience. Perforation is more common in therapeutic endoscopy , particularly oesophageal dilatation and EMR/ESD for early malignancy . Early diagnosis significantly improves outcome and can potentially be managed endoscopically with clips or endoscopic suturing. Prompt management includes radiological assessment using CT/water-soluble contrast studies, strict nil by mouth, intravenous fluids and antibiotics and early review by an expe - rienced upper gastrointestinal surgeon. Summary box 9.5 Symptoms of endoscopic oesophageal perforation /uni25CF /uni25CF - /uni25CF /uni25CF /uni25CF /uni25CF low-

Figure 9.9 A self-expanding metal stent may alle

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ENDOSCOPIC ASSESSMENT OF THE SMALL BOWEL Introduction and indications

The requirement to visualise, biopsy and treat the small bowel is far less than in the stomach, biliary tree or colon, resulting in a time lag in technological advances. The most frequent indication is investigation of gastrointestinal blood loss, which may present with either recurrent iron deficiency anaemia - (occult haemorrhage) or recurrent overt blood loss per rectum (cryptic haemorrhage) in a patient with normal OGD (with include the investigation of malabsorption; the exclusion of cryptic small bowel inflammation such as Crohn’s disease in patients with diarrhoea/abdominal pain and evidence of an inflammatory response; targeting lesions seen on radiological investigations; and surveillance for neoplasia in patients with inherited polyposis syndromes. A standard enteroscope is able to reach and biopsy lesions detected in the proximal small bowel; however, even in the most experienced hands this is limited to approximately 100 /uni00A0 cm dis tal to the pylorus, although the use of a sti ff ening overtube may increase this somewhat. The procedure takes approximately 45 /uni00A0 minutes and may be uncomfortable, requiring high doses of sedation with the attendant incr eased risk of perforation and sedation-related morbidity . Therefore, until recently , barium follow-through or entero clysis were the most e ff ective imaging modalities to visualise the distal duodenum, jejunum and ileum. Obviously , these techniques do not give true mucosal views, and outside spe cialist centres their decreasing use has led to diminished expertise and a reduced diagnostic yield. There have been rapid advances in axial radiological techniques such as MRI and CT enterography , which demonstrate excellent diagnos tic accuracy in this area (see Chapter 8). However, although these techniques may yield information about vascularity and bowel wall thickening, they do not allow direct mucosal views, have no biopsy capability and have limited scope in ter therapeutics. Historically , if an area of interest was outside the reach of a standard enteroscope, direct access via enterotomy under either laparoscopic or open surgery was required. Two major clinical advances have revolutionised small bowel diag nosis and therapeutics. First, the development of the capsule endoscope allows diagnostic mucosal views of the entire small bowel to be obtained with minimal discomfort in unsedated patients. Second, the novel technique of single-/doub balloon enteroscopy allows endoscopic access to the entire small bowel for biopsy and therapeutics (Table 9.4).
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This procedure involves the use of a side-viewing duodenos - cope, which is passed through the pylorus and into the second part of the duodenum to visualise the papilla. This is then cannulated, either directly with a catheter or with the help of a guidewire (Figure 9.13). Occasionally a small precut is required to gain access. By altering the angle of approach - one can selectively cannulate the pancreatic duct or biliary tree, which is then visualised under fluoroscopy after contrast injection. The significant range of complica tions associated with this procedure and improvements in radiological imaging using magnetic resonance cholangiopancreatography (MRCP) have rendered much diagnostic ERCP obsolete, and thus most procedures are currently performed for therapeutic purposes. There is still a role for accessing cytology/biopsy specimens. ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY

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As approximately 2% of the population has diabetes, manag ing glycaemic control before and after endoscopy is an essential aspect of endoscopic practice. Each unit should develop a policy for managing diabetic control during endoscopy . Factors influencing management include the type of diabetes procedure that is planned, the preparation/recovery time and the history of diabetes control in the individual patient. Thus, a patient with poorly controlled insulin-dependent diabetes undergoing colonoscopy will require more input than a patient with type 2 diabetes on oral hypoglycaemic medication under going upper gastrointestinal endoscopy . All patients should bring their own medication to the unit and should be advised not to drive in case there is an alteration in their glycaemic control. Most patients can be managed using clear protocols on an outpatient basis; however , elderly patients and those with brittle control should be admitted. In general, patients with diabetes should be endoscoped first on the morning list. In complex cases the diabetes team should be involved. The majority of endoscopies can be performed safely without the need for routine antibiotic prophylaxis. However, given that certain endoscopic procedures are associated with a significant bacteraemia (Table 9.2), there are several specific situations where antibiotic cover is required to prevent either bacterial endocarditis, infection of surgical prostheses or systemic sepsis. In general, the risk of infection relates to the level of bacteraemia and the risk of the underlying medical condition. Traditionally , patients with a previous history of endocarditis or a metallic heart valve received antibiotic prophylaxis for all endoscopic procedures, and some national guidelines still reflect this. However, in 2009 UK guidelines changed in response to the low reported incidence of infective endocarditis in this patient group undergoing endoscopy . Patients with severe neutropenia may also require antibiotic prophylaxis for endoscopy . The antibiotic regime used will depend on local guidelines. - , the Procedures such as endoscopic percutaneous gastrostomy are associated with a significant incidence of wound or stoma infection, particularly if inserted for malignancy . Antibiotic - prophylaxis reduces this complication and a single intravenous injection of co-amoxiclav should be administered before the procedure. Antibiotics are routinely used during endoscopic manipulation of an obstructed biliary tree in which it is unlikely that complete drainage will be achieved or there is significant comorbidity . When cystic cavities are aspirated at EUS, a one- o ff dose of a broad-spectrum antibiotic (e.g. co-amoxiclav) is recommended to prevent cyst infection.

TABLE 9.2 Approximate incidence of bacteraemia in immunocompetent individuals following various procedures involving the gastrointestinal tract. Procedure Incidence of a bacteraemia (%) Rectal digital examination 4 Proctoscopy 5 Barium enema 11 Tooth brushing 25 Dental extraction 30–60 Colonoscopy 2–4 Diagnostic upper gastrointestinal endoscopy 4 Sigmoidoscopy 6–9 ERCP (no duct occlusion) 6 ERCP (duct occluded) 11 Oesophageal varices band ligation 6 b Oesophageal

varices sclerotherapy 10–50 Oesophageal dilatation/prosthesis 34–54 Oesophageal laser therapy 35 EUS +/ − /f_i ne-needle aspirate 0–6 ERCP , endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasound. a Summary of published data. b Higher after emergency than after elective management.

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Elective endoscopy in patients on anticoagulants a

Elective endoscopy in patients on anticoagulants and antiplatelet agents

Endoscopic procedures vary in their potential to produce significant or uncontrolled bleeding. Diagnostic oesophagogas troduodenoscopy (OGD), colonoscopy , enteroscopy , diagnostic EUS and endoscopic retrograde cholangiopancreatography (ERCP) without sphincterotomy are considered low risk, as is mucosal biopsy . High-risk procedures include polypectomy , endoscopic sphincter otomy , stent placement and procedures with the potential to produce bleeding that is inaccessible or uncontrollable by endoscopic means, such as dilatation of benign or malignant strictures, percutaneous gastrostomy insertion and EUS-guided fine-needle aspiration. Likewise, the probability of a thromboembolic complication during Wenzel Treitz , 1819–1872, Professor of Pathology , Prague, Czech Republic. depends on the underlying medical condition (Table 9.3). -

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- Over the last 50 years, endoscopy has become a powerful - diagnostic and therapeutic tool. However, its development required two obvious but formidable barriers to be overcome. - First, the gastrointestinal tract is rather long and tortuous and, second, no natural light shines through the available orifices! Therefore, successful visualisation of anything beyond the - distal extremities requires a flexible instrument with an intrinsic light source that can transmit images to the operator. The breakthrough was the discovery that images could be transmitted using flexible quartz fibres. Although this was first described in the late 1920s, it was not until 1954 that Hopkins built a model of a flexible fibre imaging device. The availability of highly transparent optical quality glass led to the development in 1958 of the first flexible fibreoptic gastroscope by Larry Curtiss, a graduate student in physics, and Basil Hirschowitz, a trainee in gastroenterology . Over the next 30 years, the fibrescope evolved to allow exam ination of the upper gastrointestinal tract, the biliary system and the colon. In parallel with advances in diagnostic ability , a range of therapeutic procedures was developed (Table 9.1 Although the fibreoptic endoscope has been the workhorse of many endoscopy units ov er the last three decades, its obsoles cence was guaranteed by the invention of the charge-coupled device (CCD) in the 1960s, which allowed the creation of a digital electronic image, permitting endoscopic images to be processed by a computer and transmitted to television screens. T hus, the modern endoscope was born (Figure 9.1). Larry E Curtiss , physicist, University of Michigan, Ann Arbour, MI, USA. Basil I Hirschowitz , 1925–2013, Professor of Medicine, University of Alabama, Birmingham, AL, USA. tinue with the replacement of much diagnostic endoscopy with capsule endoscopy and virtual imaging. Enhanced resolution with high-definition operating systems, dye and digital chromo - endoscopy and e ven histological-grade images have increased the diagnostic yield of surveillance procedures. EUS allows diagnosis and therapy to extend beyond the mucosal surface of the intestine. Endoscopy has become increasingly therapeu - tic and historical divisions betw een medicine, radiology and surgery will become progressively blurred. As the complexity of the procedures increases, the distinction between special - ist and general endoscopists will become mor e definite. This reinforces the need for all endoscopic practitioners to have a detailed understanding of the units in which they work and the instruments that they use.

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Endomicroscopy delivers histological mucosal de /f_i nition Figure 9.1 Photograph of a standard gastroscope and colonoscope.

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Indications for oesophagogastroduodenoscopy

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A full assessment of the role of OGD is outside the scope of this chapter. It will vary with local circumstances and the availability of alternative diagnostic techniques. OGD is usually appropriate when a patient’s symptoms are persistent despite appropriate empirical therapy or are associated with warning signs such as intractable vomiting, anaemia, weight loss, dysphagia or bleeding. It is also part of the diagnostic work-up for patients with anaemia, symptoms of

• Diagnostic procedures +/– biopsy • Biliary or pancreatic stenting • Device-assisted enteroscopy without polypectomy Continue warfarin Warfarin Check INR 1 week before endoscopy • If INR is within therapeutic range continue usual daily dose • If INR is above

therapeutic range but <5 reduce daily dose until INR returns to therapeutic range High-risk procedure • Polypectomy • ERCP with sphincterotomy • EMR/ESD • Dilatation of strictures Warfarin Low-risk condition High-risk condition • Prosthetic metal heart valve in mitral or aortic • Xenograft heart valve position • AF without high-risk factors • Prosthetic heart valve and AF (CHADS ≤4) 2 • AF and mitral stenosis • >3 months after VTE • AF with previous stroke/TIA and 3 or more of: • Congestive cardiac

failure a • Hypertension • Age >75 years • Diabetes mellitus • AF and stroke/TIA within 3 months • <3 months after VTE • Previous VTE on anticoagulation Stop warfarin for 5 days before Stop warfarin for 5 days before endoscopy • Check INR prior procedure to ensure • Start LMWH 2 days after stopping warfarin INR <5 • Omit LMWH on day of procedure • Restart warfarin evening of the procedure • Restart warfarin evening of the procedure with usual daily dose with usual daily dose • Check INR 1 week later to ensure • Continue

LMWH until INR adequate adequate anticoagulation Low-risk condition • Ischaemic heart disease without coronary stent • Cerebrovascular disease • Peripheral vascular disease Stop clopidogrel, prasugrel or ticagrelor 7 days before endoscopy • Continue aspirin if already prescribed • Restart clopidogrel, prasugrel or ticagrelor 1–2 days after procedure Figure 9.2 British Society of Gastroenterology and European Society of Gastrointestinal Endoscopy 2021 guidelines for management of

endos copy in patients on antiplatelet or anticoagulant therapy. AF , atrial /f_i brillation; CHADS, score for stroke risk assessment in atrial /f_i brillation; DOAC, direct oral anticoagulant; eGFR, estimated glomerular /f_i ltration rate; EMR, endoscopic mucosal resection; ERCP , endoscopic cholangiopancreatography; ESD, endoscopic submucosal dissection; EUS, endoscopic ultrasound; INR, international normalised ratio; LMWH, low molecular weight heparin; PEG, percutaneous

endoscopic gastroenterostomy; TIA, transient ischaemic attack; VTE, venous thrombo a embolism. Blood pressure >140/90 mmHg or on antihypertensive medication. c Depends on haemorrhagic and thrombotic risk; consider extending interval for ESD. (Adapted from Veitch • Oesophageal, enteral or colonic stenting • EUS without sampling or interventional therapy DOAC • Dabigatran Omit DOAC on • Rivaroxaban morning of the • Apixaban procedure • Edoxaban • Therapy of varices • PEG • EUS-

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condition • Coronary artery stents Discuss strategy with consultant interventional cardiologist • Consider temporary cessation of P2Y12 receptor antagonist if: • 6–12 months after insertion of drug-eluting coronary stent • >1 month after insertion of bare metal coronary stent • Continue aspirin

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b Previous VTE on anticoagulation and target INR now 3.5. et al . 2021.)

malabsorption and chronic diarrhoea. However, increasing ease of access to OGD with the availability of ‘open access’ endoscopy has resulted in a significant number of unnecessary procedures being performed in young patients with dyspepsia or gastro-oesophageal reflux disease (GORD). This has led to a number of international gastroenterology societies proposing guidelines for the management of dyspepsia and GORD, including the empirical use of acid suppression and non-invasive H. pylori tests, such as urease breath tests and stool antigen assay (e.g. the National Institute for Health and Care Excellence guidelines on dyspepsia: https://www .nice.org.uk/ guidance/cg184/chapter/1-recommendations). In addition

(c) Figure 9.3 A normal upper gastrointestinal endoscopy showing the gastro-oesophageal junction the gastric antrum (c) and the second part of the duodenum (a) Figure 9.4 Grade 2 oesophageal varices (a) , which can be treated by the application of bands to ligate the vessel and reduce blood /f_l ow (d) (a) , the gastric fundus in the ‘J’ position (b) , (d) . (b) (b) .

the surveillance of neoplasia development in high-risk patient groups, such as those with genetic conditions such as familial adenomatous polyposis and premalignant conditions such as Barrett’s oesophagus (see Chapter 66). Indications for oesophagogastroduodenoscopy

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(c) Figure 9.3 A normal upper gastrointestinal endoscopy showing the gastro-oesophageal junction the gastric antrum (c) and the second part of the duodenum (a) Figure 9.4 Grade 2 oesophageal varices (a) , which can be treated by the application of bands to ligate the vessel and reduce blood /f_l ow (d) (a) , the gastric fundus in the ‘J’ position (b) , (d) . (b) (b) .

the surveillance of neoplasia development in high-risk patient groups, such as those with genetic conditions such as familial adenomatous polyposis and premalignant conditions such as Barrett’s oesophagus (see Chapter 66). Indications for oesophagogastroduodenoscopy

A full assessment of the role of OGD is outside the scope of this chapter. It will vary with local circumstances and the availability of alternative diagnostic techniques. OGD is usually appropriate when a patient’s symptoms are persistent despite appropriate empirical therapy or are associated with warning signs such as intractable vomiting, anaemia, weight loss, dysphagia or bleeding. It is also part of the diagnostic work-up for patients with anaemia, symptoms of

• Diagnostic procedures +/– biopsy • Biliary or pancreatic stenting • Device-assisted enteroscopy without polypectomy Continue warfarin Warfarin Check INR 1 week before endoscopy • If INR is within therapeutic range continue usual daily dose • If INR is above therapeutic range but <5 reduce daily dose until INR returns to therapeutic range High-risk procedure • Polypectomy • ERCP with sphincterotomy • EMR/ESD • Dilatation of strictures Warfarin Low-risk condition High-risk condition • Prosthetic metal heart

valve in mitral or aortic • Xenograft heart valve position • AF without high-risk factors • Prosthetic heart valve and AF (CHADS ≤4) 2 • AF and mitral stenosis • >3 months after VTE • AF with previous stroke/TIA and 3 or more of: • Congestive cardiac failure a • Hypertension • Age >75 years • Diabetes mellitus • AF and stroke/TIA within 3 months • <3 months after VTE • Previous VTE on anticoagulation Stop warfarin for 5 days before Stop warfarin for 5 days before endoscopy • Check INR prior procedure to ensure •

Start LMWH 2 days after stopping warfarin INR <5 • Omit LMWH on day of procedure • Restart warfarin evening of the procedure • Restart warfarin evening of the procedure with usual daily dose with usual daily dose • Check INR 1 week later to ensure • Continue LMWH until INR adequate adequate anticoagulation Low-risk condition • Ischaemic heart disease without coronary stent • Cerebrovascular disease • Peripheral vascular disease Stop clopidogrel, prasugrel or ticagrelor 7 days before endoscopy •

Continue aspirin if already prescribed • Restart clopidogrel, prasugrel or ticagrelor 1–2 days after procedure Figure 9.2 British Society of Gastroenterology and European Society of Gastrointestinal Endoscopy 2021 guidelines for management of endos copy in patients on antiplatelet or anticoagulant therapy. AF , atrial /f_i brillation; CHADS, score for stroke risk assessment in atrial /f_i brillation; DOAC, direct oral anticoagulant; eGFR, estimated glomerular /f_i ltration rate; EMR, endoscopic

mucosal resection; ERCP , endoscopic cholangiopancreatography; ESD, endoscopic submucosal dissection; EUS, endoscopic ultrasound; INR, international normalised ratio; LMWH, low molecular weight heparin; PEG, percutaneous endoscopic gastroenterostomy; TIA, transient ischaemic attack; VTE, venous thrombo a embolism. Blood pressure >140/90 mmHg or on antihypertensive medication. c Depends on haemorrhagic and thrombotic risk; consider extending interval for ESD.

(Adapted from Veitch • Oesophageal, enteral or colonic stenting • EUS without sampling or interventional therapy DOAC • Dabigatran Omit DOAC on • Rivaroxaban morning of the • Apixaban procedure • Edoxaban • Therapy of varices • PEG • EUS-guided sampling or with interventional therapy • Oesophageal or gastric radiofrequency ablation DOAC Clopidogrel • Dabigatran • Apixaban Prasugrel • Rivaroxaban • Edoxaban Ticagrelor Take last dose of drug 3 days before

endoscopy • For dabigatran with CrCI (eGFR) 30–50 mL/min take last dose 5 days before procedure • In any patients with rapidly deteriorating renal function a haematologist should be consulted • Restart DOAC 2–3 days after c procedure b endoscopy High-risk condition • Coronary artery stents Discuss strategy with consultant interventional cardiologist • Consider temporary cessation of P2Y12 receptor antagonist if: • 6–12 months after insertion of drug-eluting coronary stent • >1 month after insertion of bare metal

coronary stent • Continue aspirin

retrograde

b Previous VTE on anticoagulation and target INR now 3.5. et al . 2021.)

malabsorption and chronic diarrhoea. However, increasing ease of access to OGD with the availability of ‘open access’ endoscopy has resulted in a significant number of unnecessary procedures being performed in young patients with dyspepsia or gastro-oesophageal reflux disease (GORD). This has led to a number of international gastroenterology societies proposing guidelines for the management of dyspepsia and GORD, including the empirical use of acid suppression and non-invasive H. pylori tests, such as urease breath tests and stool antigen assay (e.g. the National Institute for Health and Care Excellence guidelines on dyspepsia: https://www .nice.org.uk/guidance/cg184/chapter/1-recommendations). In addition

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the surveillance of neoplasia development in high-risk patient groups, such as those with genetic conditions such as familial adenomatous polyposis and premalignant conditions such as Barrett’s oesophagus (see Chapter 66).

Instrument decontamination

Instrument decontamination

Endoscopes will not withstand steam-based autoclaving and therefore require high-level disinfection between cases to prevent transmission of infection. Although accessories may be autoclaved, best practice requires the use of disposable single-use items whenever possible. All equipment should be decontaminated to an identical standard whether for use on immunocompromised/infected patients or not. This process involves two equally important stages: first, removal of physical debris from the internal and external surfaces of the instrument and, second, chemical neutralisation of all microbiological agents. A variety of agents are available and endoscopists should familiarise themselves with the agent in use in their department. In 2020 the British Society of Gastroenterology updated its guidelines for decontamination of endoscopes (see Further reading). Care should be applied to the decontamina tion of duodenoscopes because of reports of transmission of multiresistant bacteria (Summary box 9.1). Summary box 9.1 Disinfection of endoscopes /uni25CF /uni25CF /uni25CF /uni25CF There are currently no reliable means of decontaminat ing scopes from contact with prion-associated conditions such as variant Creutzfeldt–Jakob disease (vCJD), although risk of transmission of this is considered very low . If an ‘invasive’ procedure (where gut m ucosa is breached and an unsheathed accessory withdrawn through the endoscope working chan nel) is conducted in a patient with known or possible vCJD, the endoscope needs to be quarantined after use. The perfor mance of an invasive procedure in a patient at risk of vCJD owing to receipt of pooled plasma concentrates is no longer Hans Gerhard Creutzfeldt , 1885–1964, neurologist, Kiel, Germany . Alfons Marie Jakob , 1884–1931, neurologist, Hamburg, Germany . - su ffi cient, but the endoscope should be decontaminated sep - arately from others with a single-use disinfectant. There is no longer a requirement to quarantine the endoscope pr ovided that routine traceability data can be demonstrated.

All channels must be brushed and irrigated throughout the disinfection process All instruments and accessories should be traceable to each use, patient and cleaning cycle All staff should be trained and protected (particularly if glutaraldehyde is used in view of its immune-sensitising properties) Regular monitoring of disinfectant power and microbiological contamination should be performed

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Introduction

INTRODUCTION

The gastrointestinal tract has a myriad of functions, such as digestion, absorption and excretion, as well as the synthesis of an array of hormones, growth factors and cytokines. In addi tion, a complex enteric nervous system has evolved to control its function and communicate with the central and peripheral nervous systems. Finally , as the gastrointestinal tract contains the largest sources of foreign antigens to which the body is exposed, it houses well-developed arms of both the innate and acquired immune systems. Therefore, it is not surprising that malfunction or infection of this complex organ results in a wide spectrum of pathology . However, its importance in disease pathogenesis is matched only by its inaccessibility to traditional examination. Few discoveries in medicine have contributed more to the practice of gastroenterology than the development of diagnostic and therapeutic endoscopy . Although spectacular advances in radiology have occurr ed recently with the intro duction of multislice spiral computed tomography (CT) and magnetic resonance imaging (MRI), the ability to take tar geted mucosal biopsies remains a unique strength of endos copy . Historically , radiological techniques were required to image areas of jejunum and ileum inaccessible to the stan dard endoscope; ho wever, the introduction of both capsule endoscopy and single-/double-balloon enteroscopy allows both diagnostic and therapeutic access to the entire gastro intestinal tract. Image enhancement with techniques such as chromoendoscopy , magnifica tion endoscopy and narrow band imaging allows increased resolution a t the mucosal level and increases diagnostic yield. Endoscopic ultrasound (EUS) can examine all layers of the intestinal wall as well as extraintestinal structures. Finally , experimental techniques such as confocal Harold Horace Hopkins , 1918–1994, Professor of Applied Optics, The University of Reading, Reading, UK. laser endomicroscopy give resolution at a level compatible with standard histology . The advances in the diagnostic accuracy of endoscopy lend themselves to disease surveillance for specific patient groups as well as population screening for gastrointesti - - nal malignancy . Likewise, there has been a rapid expansion in the therapeutic capability of endoscopy with both luminal and extraintestinal surgery being performed via endoscopic access. As in all areas of interventional practice, competent endoscopists must match a thorough grounding in anatomy and physiology with a clear understanding of the capabilities and limitations of the rapidly advancing techniques a vailable. Perhaps most importantly they must appreciate all aspects of patient care, including preprocedural management, commu - nication before and during the procedure and the manage - ment of endoscopic complications. This chapter aims to guide the reader through these areas in addition to introducing the breadth of procedur es that are currently performed. -

The indications for diagnostic and therapeutic endoscopic • procedures including endoscopic ultrasound The recognition and management of complications • Novel techniques for endoscoping the small bowel • Advances in diagnostic ability •

Learning objectives

Learning objectives

To gain an understanding of: The role of endoscopy as a diagnostic and therapeutic • tool The basic organisation of an endoscopy unit and its • equipment Consent and safe sedation • Special situations: the key points in managing endoscopy • in at-risk patients Learning objectives

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Optical diagnosis and image enhancement

Optical diagnosis and image enhancement

With the assistance of advanced imaging techniques, endosco - pists are now able to characterise colorectal polyps with high diagnostic accuracy . This begins with a white light assessment: polyps larger than 2 /uni00A0 cm with a large sessile component or a depressed region have the highest risk of containing cancer. Application of advanced imaging tec hniques can improve diagnostic accuracy further (Figure 9.15). Dye-based chromoendoscopy involves topical application of stains or pigments to improve mucosal characterisation. Several agents have been described, which can broadly be cate - gorised as absorptiv e (vital) stains, such as methylene blue, and contrast (reactive) stains, such as crystal violet and indigo car - mine. These highlight the mucosal pits, which can aid optical diagnosis; di ff erent lesions demonstrate specific pit patterns. Dye c hromoendoscopy is still widely used and remains the recommended method of dysplasia detection in inflammatory bowel disease . - Narrow band imaging (NBI; Olympus) relies on opti - cal filter technology that radically improves the visibility of

(a) and,

capillaries, veins and other subtle tissue structures by optimis ing the absorbance and scattering characteristics of light. NBI uses two discrete bands of light: one blue at 415 /uni00A0 nm and one green at 540 /uni00A0 nm. Narrow band blue light displays superficial capillary netw orks, whereas green light displays subepithelial vessels; when combined they o ff er an extremely high contrast image of the tissue surface. Similar modalities such as i-Scan (Pentax) and Blue Light Imaging (BLI; Fujifilm) are also avail able. Dye-based and digital enhancement, particularly when combined with magnification endoscopy , can di ff erentiate between hyperplastic, serrated, adenomatous and malignant pathology . Combining this with a detailed white light assess - ment allows endoscopists to determine endoscopic resectabil - ity , avoiding more extensive surgery in some cases.

(b) (c) Figure 9.15 Endoscopic diagnostic accuracy can be improved by novel endoscopic

techniques. This duodenal adenoma can be seen with conventional white light (a) (arrow), but its full extent is more clearly delineated using narrow band imaging (b) or chromoendos copy with indigo carmine (c) . (b) Figure 9.16 Colonoscopy is the most appropriate investigation to detect colonic polyps (a) , which can be removed by snare polypec

tomy during the same procedure, leaving a clean polyp base (b) .

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SAFE SEDATION

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If performed competently the majority of diagnostic endos - copies and colonoscopies can be performed without sedation or with pharyngeal anaesthesia alone. However, therapeutic - procedures may cause pain and patients are often anxious; thus, in most countries seda tion and analgesia are o ff ered - to achieve a state of conscious sedation (not anaesthesia). Medication-induced respiratory depression in elderly patients or those with comorbidities is the greatest cause of endoscopy- essential. The involvement of anaesthetists to advise on appropriate protocols is recommended. Endoscopy in certain situations (particularly paediatric endoscopy) requires a general anaesthetic /uni00A0 – /uni00A0 this should only be undertaken by appropriately trained sta ff with adequate equipment available. Summary box 9.3 Sedation in endoscopy /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Pharyngeal anaesthesia may increase the risk of aspiration in more heavily sedated patients Comorbidities must be identi /f_i ed so that sedation can be individualised All sedated patients require secure intravenous access Benzodiazepines reach their maximum effect 9–20 /uni00A0 minutes after administration /uni00A0 – /uni00A0 doses should be titrated carefully, particularly in the elderly or those with comorbidities Coadministration of opiates and benzodiazepines has a synergistic effect; opiates should be given /f_i rst and doses need to be reduced The use of supplementary oxygen is essential in all sedated patients Sedated patients require pulse oximetry to monitor oxygen saturation; high-risk patients or those undergoing high-risk procedures also require blood pressure and electrocardiogram monitoring A trained assistant should be responsible for patient monitoring throughout the procedure Resuscitation equipment and sedation reversal agents must be readily available The use of anaesthetic agents such as propofol for complex procedures requires specialist training The half-life of benzodiazepines is 4–24 /uni00A0 hours /uni00A0 – /uni00A0 appropriate recovery and monitoring is essential. Postprocedural consultations may not be remembered, and patients must be advised not to drink alcohol or drive for 24 /uni00A0 hours

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Single- double-balloon enteroscopy

Single-/double-balloon enteroscopy

This technique allows the direct visualisation of and ther - apeutic intervention for the entire small bowel and may be attempted via either the oral or rectal route. Double-balloon enteroscopy involves the use of a thin enteroscope and an overtube, which are both fitted with a balloon. The procedure is usually carried out under general anaesthesia but may be undertaken with the use of conscious sedation. The enteroscope and overtube are inserted through either the mouth or anus and steered to the proximal duodenum/ terminal ileum in the conventional manner. Following this the endoscope is advanced a small distance in front of the overtube and the balloon at the end is inflated. Using the assistance of friction at the interface between the enteroscope and intestinal wall, the small bowel is accordioned back to the overtube. The overtube balloon is then deployed and the enteroscope balloon is deflated. The process is then continued until the entire small bowel is visualised (Figure 9.12). In single-balloon enteroscopy , devel oped more recently , an enteroscope and overtube are used, but only the overtube has a balloon attached. A full range of therapeutics including diagnostic biopsy , polypectomy , APC and stent insertion are a vailable for balloon enteroscopy . Some experts advocate routine capsule endoscopy before balloon enteroscopy in an attempt to localise any lesions and plan whether oral or rectal access is more appropriate. The Summary box 9.6 Current established indications for single-/double- balloon endoscopy /uni25CF /uni25CF /uni25CF indications for single-/double-balloon endoscopy are given in Summary box 9.6 .

(b) (d) Battery Optical dome Lens Transmitter Light-emitting diode (LED) Antenna Processor Bleeding from the gastrointestinal tract of obscure cause Iron de /f_i ciency

anaemia with normal colonoscopy and gastroscopy Visualisation of and therapeutic intervention for abnormalities seen on traditional small bowel imaging/capsule endoscopy Figure 9.11 Complete diagnostic visuali

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sal pictures can be achieved, here showing angioectasias (arrow) (c) and small bowel . Crohn’s disease (d)

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Single-/double-balloon enteroscopy

This technique allows the direct visualisation of and ther - apeutic intervention for the entire small bowel and may be attempted via either the oral or rectal route. Double-balloon enteroscopy involves the use of a thin enteroscope and an overtube, which are both fitted with a balloon. The procedure is usually carried out under general anaesthesia but may be undertaken with the use of conscious sedation. The enteroscope and overtube are inserted through either the mouth or anus and steered to the proximal duodenum/ terminal ileum in the conventional manner. Following this the endoscope is advanced a small distance in front of the overtube and the balloon at the end is inflated. Using the assistance of friction at the interface between the enteroscope and intestinal wall, the small bowel is accordioned back to the overtube. The overtube balloon is then deployed and the enteroscope balloon is deflated. The process is then continued until the entire small bowel is visualised (Figure 9.12). In single-balloon enteroscopy , devel oped more recently , an enteroscope and overtube are used, but only the overtube has a balloon attached. A full range of therapeutics including diagnostic biopsy , polypectomy , APC and stent insertion are a vailable for balloon enteroscopy . Some experts advocate routine capsule endoscopy before balloon enteroscopy in an attempt to localise any lesions and plan whether oral or rectal access is more appropriate. The Summary box 9.6 Current established indications for single-/double- balloon endoscopy /uni25CF /uni25CF /uni25CF indications for single-/double-balloon endoscopy are given in Summary box 9.6 .

(b) (d) Battery Optical dome Lens Transmitter Light-emitting diode (LED) Antenna Processor Bleeding from the gastrointestinal tract of obscure cause Iron de /f_i ciency anaemia with normal colonoscopy and gastroscopy Visualisation of and therapeutic intervention for abnormalities seen on traditional small bowel imaging/capsule endoscopy Figure 9.11 Complete diagnostic visuali

sation of the small bowel can be achieved with capsule endoscopy (a) . The structure of the capsule is

shown in (b) . Clear muco

sal pictures can be achieved, here showing angioectasias (arrow) (c) and small bowel . Crohn’s disease (d)

THE MODERN ENDOSCOPY UNIT Organisation

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A well-designed endoscopy unit sta ff ed by trained endoscopy nurses and dedicated administrative sta ff is essential to support good endoscopic practice and training. Clinical governance with regular appraisal and assessment of performance should be embedded within the unit’s philosophy . Endoscopist train - ing demands particular attention, with a transparent process of skills- and theory-based education centred on practical experi - - ence and dedicated training courses. Experienced supervision of all trainees is essential until competency has been obtained and assessed by an appropriately v alidated technique, such as). dir ect observation of practical skills (DOPS) and review of procedure logbooks. All endoscopists should record diagnostic - and therapeutic procedure numbers and markers of compe - tency such as colonoscopy completion rates, polyp detection rates, mean sedation use and complication rates. Central to this ovides outcome is an e ffi cient data management system that pr analysis for all aspects of endoscopy , including adherence to guidelines, near misses, patient satisfaction, decontamination processes and scope tracking, as well as the more obvious completion and complication rates. In the UK the Joint Advisory Group (JAG) provides guid - ance for endoscopist competence assessment and operates a certification system of individual endoscopic competencies, based on procedure numbers, key performance indicators (e.g . caecal intubation rate, adenoma detection, sedation levels, complications), course attendance and peer assessment. THE MODERN ENDOSCOPY UNIT Organisation

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Therapeutic colonoscopy

Therapeutic colonoscopy

The most common therapeutic procedure performed at colo - noscopy is resection of colonic polyps (Figure 9.16). Retrieved specimens can be assessed for risk factors for neoplastic progres - - sion and an appropriate surveillance strategy determined (https://www .bsg.org.uk/wp-content/uploads/2019/09/201. full_.pdf). Non-pedunculated polyps up to 15 /uni00A0 mm should be removed by cheese wiring with a dedicated ‘cold’ snare. Stalked polyps can be resected using ‘hot’ snare polypectomy . thermy is used with either a ‘cut’, ‘coagulation’ or a Here, dia blended current. Postpolypectomy bleeding can be prevented - by preinjection of the stalk with adrenaline, or with application ® . of endoclips or an Endoloop

-

Non-pedunculated polyps of between 10 and 19 /uni00A0 mm can be removed en bloc by EMR, which involves lifting the polyp from the muscularis propria with a submucosal injectate to prevent iatrogenic perforation (Figure 9.17). Lesions >20 /uni00A0 mm can be removed with piecemeal EMR (pEMR); on completion, thermal ablation (with either APC or coagulation) is applied to the edge of the resection site to prevent adenoma recurrence. , which is typically performed An alternative to pEMR is ESD with a knife rather than a snare. This technique involves the injection of a submucosal solution, followed by a circumfer ential incision and submucosal dissection, with coagulation of blood vessels that are encountered. This enables an en bloc resection of large polyps and superficial submucosal cancers. Although technically challenging with a steep learning curve, benefits include a more accurate histopathological assessment and lower adenoma recurrence rates. APC and alternative thermal therapies such as heater probes are also used in the treatment of symptomatic angioec - tasias of the colon (Figure 9.18). Laser photocoagulation may be used to debulk colonic tumours not suitable for resection. As with benign oesophageal strictures, TTS balloons can be - used to dilate short (<5 /uni00A0 cm) colonic strictures. The dilata - tion of sur gical anastomoses gives the most durable benefit as inflammatory strictures tend to recur even if intramucosal steroids are injected at the time of the dilatation. Finally , the colonoscopic placement of self-expanding metal stents may provide excellent palliation of inoperable malignant strictures (Figure 9.19) and may also play an invaluable role in decom - pressing an obstructed colon to allow planned as opposed to emergency surgery .

(c) Figure 9.17 Large sessile polyps (a) can be removed by endoscopic

muco

sal resection. First the polyp is raised on a bed of injected saline containing dye (b) . This ensures that there is no submucosal invasion and protects from transmural perforation. A snare is closed around the polyp (c) , which is then resected leaving a clean excision base (d) . Figure 9.18 A large angioectasia of the colon. If this results in symptomatic anaemia, it should be obliterated with argon plasma coagulation. (d)

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Therapeutic endoscopic retrograde cholangiopancrea

Therapeutic endoscopic retrograde cholangiopancreatography

It is essential to ensure that patients have appropriate assess - ment prior to therapeutic ERCP , which is associated with a significant morbidity and occasional mortality . All patients require routine blood screening including a clotting screen. Both cardiac and oxygen saturation monitoring are required during the pr ocedure because of the high level of sedation that is often required. The most common indication for therapeutic ERCP is relief of biliary obstruction due to gallstone disease or benign or malignant biliary strictures. The preprocedural diagnosis can be confirmed by contrast injection, which will clearly di ff erentiate the filling defects associated with gallstones and the luminal narrowing of a stricture. If there is likely to be a delay in relieving an obstructed system, percutaneous drainage may be required. The cornerstone of gallstone retrieval is an adequate biliary sphincterotomy , which is normally performed over a well-positioned guidewire using a sphincterotome connected to an electrosurgical unit. Most g allstones <1 /uni00A0 cm in diame ter will pass spontaneously in the days and weeks following a sphincterotomy , but most endoscopists prefer to ensure duct clearance at the initial procedure to reduce the risk of impaction, cholangitis or pancreatitis. This can be achieved by trawling the duct using a balloon catheter or by extraction using a wire basket. If standard techniques fail, large or awk - wardly placed stones can be crushed using mechanical litho - tripsy . If adequate stone extraction cannot be achieved at the initial ERCP it is imperative to ensure biliary drainage with the placement of a removable plastic stent while alternative options are considered. T hese include surgery , endoscopically directed shockwaves under direct choledochoscopic vision and extracorporeal shockwave lithotripsy with subsequent ERCP - to remove stone fragments.

Endoscope balloon deflated 4 Figure 9.12 The technique of double-balloon enteroscopy is per

formed with an adapted enteroscope Overtube advanced along and overtube, both of which have endoscope. Overtube balloon in /f_l atable balloons at their tip. inflated (a) Figure 9.13 During endoscopic retrograde cholangiopancreatography a side-viewing duo

denoscope is positioned opposite the papilla, which can then be cannulated using either a catheter or a guidewire (a) . Contrast is injected to achieve a cholangiogram (b) . Endoscope advanced Endoscope balloon inflated. deeper into intestine Overtube balloon deflated 6 5 Endoscope–overtube pulled Endoscope balloon deflated. back to straighten path Endoscope advanced again through intestine (b)

similar to those used in angioplasty inserted over a guidewire under fluoroscopic control. It is traditional to insert a tempo rary plastic stent to maintain drainage as several attempts at dilatation may be required. Self-expanding metal stents are most commonly used for the palliation of malignant biliary obstruction and are also normally inserted after a modest sphincterotomy . Corr ect stent placement can normally be con firmed by a flow of bile after release and by the presence of air in the biliary tree on follow-up plain abdominal radiographs. Stent malfunction, associated with recurrent or persistent bio chemical cholestasis, may be due to poor initial stent position, stent migra tion, blockage with blood clot or debris or tumour ingrowth. A repeat procedure is required to assess the cause, which can usually be r emedied by the insertion of a second stent through the original one. In addition to the standard techniques discussed above, ERCP is also used for pancreatic disease and the assessment of biliary dysmotility (sphincter of Oddi dysfunction) using manometr y in specialist centres. Indications include pancre atic stone extraction, the dilatation of pancreatic duct stric tures and the transgastric drainage of pancreatic pseudocysts. To minimise the risks of subsequent pancreatitis, pancreatic sphincterotomy is most

safely performed after the placement of a temporary pancreatic stent to prev ent stasis within the pancreatic duct. Visualisation and sampling of biliary lesions is becom ing easier and more e ff ective with the development of newer through-the-duodenoscope cholangioscopes that allow direct visualisation and instrumentation of the biliary and pancrea ducts. Therapeutic endoscopic retrograde cholangiopancreatography

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Therapeutic oesophagogastroduodenoscopy

Therapeutic oesophagogastroduodenoscopy

Appropriate patient selection and monitoring are essential to minimise complications. The most common therapeutic endo scopic procedure performed as an emergency is the control of upper gastrointestinal haemorrhage of any aetiology . Band ligation has replaced sclerotherap y in the management of oesophageal varices (Figure 9.4), whereas sclerotherapy using thrombin-based glues can be used to control blood loss from gastric and duodenal varices. Injection therapy with adrenaline (epinephrine) coupled with a second haemostatic technique such as thermal coagula tion or endoclip application is the technique of choice for a peptic ulcer with active bleed ing or high-risk stigmata of haemorrhage (Figure 9.5). Such high-risk bleeds should be followed by 72 /uni00A0 hours of intravenous proton pump inhibition. Chronic blood loss from angioectasia is most safely treated with APC because of the controlled depth of burn compared with alternative thermal tec hniques (Figure 9.6) . Haemostatic powders provide a further way to arrest bleeding; these work best for di ff use bleeding or as salvage therapy . Norman Rupert Barrett , 1903–1979, sur geon, St Thomas’s Hospital, London, UK. - - Benign oesophageal and pyloric strictures may be dilated under direct vision with through-the-scope (TTS) balloon dila - tors or the more traditional guidewire-based systems such as Savary–Gilliard bougie dilators (Figure 9.7) . On occasion, more di ffi cult benign strictures can be treated by the insertion of a fully covered removable stent, or with a biodegradable stent. Likewise, the non-relaxing lower oesophageal sphincter associated with achalasia can be treated by pneumatic balloon

(a) (b) (c) (d) Figure 9.6 The classic appearance of gastric antral vascular ectasia, which is often treated with argon plasma coagulation. Figure 9.5 A gastric ulcer with active bleeding (a) is initially treated with adrenaline injection to achieve haemostasis (b) . Two haemoclips are then applied to prevent rebleeding (c and d) .

dilatation with a 30- to 40-mm balloon. Endoscopic dissection techniques (see Therapeutic colonoscopy) are now being employed to treat achalasia by natural orifice myotomy (pero ral endoscopic myotomy; POEM) with good follow-up results. An alternative in unfit patients is injection of botulinum toxin into the lower oesophageal sphincter, although this has a lim ited (3–6 /uni00A0 months) duration of benefit. There are a limited n umber of endoscopic techniques available to reduce gastro-oesophageal reflux, which rely on tightening the loose gastro-oesophageal junction by plication, by the applica tion of radiofrequency ablation or by mucosal resection techniques.

These may have a role in some patients but are yet to demonstrate benefit over surgical fundoplication. Endoscopic bariatric therapies, such as intragastric bal loons, sleeve gastroplasty and duodenal resurfacing, may all provide alternatives to more established surgical options. In contrast, there is clear evidence that the insertion of a percu taneous endoscopic gastr ostomy (PEG) tube enhances nutri - tional and functional outcome in patients unable to maintain oral nutritional intake (Figure 9.8). PEG insertion is often a - prelude to treatment of complex orofacial malignancy and y be used to support nutrition in patients with alternative ma malignant, degenerative or inflammatory diseases. - The deployment of self-expanding metal stents with or without a co vering sheath inserted over a sti ff guidewire leads to a significant improvement in symptomatic dysphagia and quality of life in patients with malignant oesophageal and gastric outlet obstruction (Figure 9.9) . Covered stents are the mainstay of treatment for benign or malignant tracheo - oesophageal fistulae. It is now possible to endoscopically manage early oesoph - - ageal and gastric neoplasia with endoscopic m ucosal resec - tion (EMR) or endoscopic submucosal dissection (ESD). These techniques require specialist training but have allowed -

Figure 9.7 A pyloric stricture (a) can be dilated using a through-the-scope balloon under direct vision to minimise complications (b) . (a)

Figure 9.8 A schematic diagram of percutaneous endoscopic gastrostomy insertion. A standard endos

copy is performed to ensure that there are no contra

indications to gastr ostomy insertion. The stomach is insuf /f_l ated with air and a direct percutaneous needle puncture made at a point where the stomach abuts the abdominal wall. Lignocaine (c) is infused on withdrawal (a) . A trocar is inserted and a wire passed into the stom

ach, which can be caught with a snare (b) . The scope is withdrawn, pulling the wir e out through the mouth, at which point it is attached to the gastrostomy tube (c) . The gastrostomy is pulled

through into the stomach and out through the track created by the trocar inser

tion (d) . (b) (d)

endoscopic management of mucosal lesions that were previ ously subject to surgical intervention (Figure 9.10). A prime example has been improved endoscopic treatment of Barrett’s high-grade dysplasia and early oesophageal adenocarcinoma. Destruction of residual Barrett’s epithelium in cases of or high-grade dysplasia is possible with endoscopic ablation, and has been shown to reduce risk of progression to cancer. The most commonly used technique for this purpose is radio-frequency ablation, where 360° ablation can be achieved with a balloon catheter, or more focused ablation with smaller probes. Cryotherapy and APC can also be used for ablation, but photodynamic therapy is now used much less often.

Figure 9.10 Novel upper gastrointestinal therapeutic uses of oesoph agogastroduodenoscopy include the use of endoscopic mucosal resection to remove early gastric cancer leaving a clean base.

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dilatation with a 30- to 40-mm balloon. Endoscopic dissection techniques (see Therapeutic colonoscopy) are now being employed to treat achalasia by natural orifice myotomy (pero ral endoscopic myotomy; POEM) with good follow-up results. An alternative in unfit patients is injection of botulinum toxin into the lower oesophageal sphincter, although this has a lim ited (3–6 /uni00A0 months) duration of benefit. There are a limited n umber of endoscopic techniques available to reduce gastro-oesophageal reflux, which rely on tightening the loose gastro-oesophageal junction by plication, by the applica tion of radiofrequency ablation or by mucosal resection techniques. These may have a role in some patients but are yet to demonstrate benefit over surgical fundoplication. Endoscopic bariatric therapies, such as intragastric bal loons, sleeve gastroplasty and duodenal resurfacing, may all provide alternatives to more established surgical options. In contrast, there is clear evidence that the insertion of a percu taneous endoscopic gastr ostomy (PEG) tube enhances nutri - tional and functional outcome in patients unable to maintain oral nutritional intake (Figure 9.8). PEG insertion is often a - prelude to treatment of complex orofacial malignancy and y be used to support nutrition in patients with alternative ma malignant, degenerative or inflammatory diseases. - The deployment of self-expanding metal stents with or without a co vering sheath inserted over a sti ff guidewire leads to a significant improvement in symptomatic dysphagia and quality of life in patients with malignant oesophageal and gastric outlet obstruction (Figure 9.9) . Covered stents are the mainstay of treatment for benign or malignant tracheo - oesophageal fistulae. It is now possible to endoscopically manage early oesoph - - ageal and gastric neoplasia with endoscopic m ucosal resec - tion (EMR) or endoscopic submucosal dissection (ESD). These techniques require specialist training but have allowed -

Figure 9.7 A pyloric stricture (a) can be dilated using a through-the-scope balloon under direct vision to minimise complications (b) . (a) Figure 9.8 A schematic diagram of percutaneous endoscopic

gastrostomy insertion. A standard endos

copy is performed to ensure that there are no contra

indications to gastr ostomy insertion. The stomach is insuf /f_l ated with air and a direct percutaneous needle puncture made at a point where the stomach abuts the abdominal wall. Lignocaine (c) is infused on withdrawal (a) . A trocar is inserted and a wire passed into the stom

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tion (d) . (b) (d)

endoscopic management of mucosal lesions that were previ ously subject to surgical intervention (Figure 9.10). A prime example has been improved endoscopic treatment of Barrett’s high-grade dysplasia and early oesophageal adenocarcinoma. Destruction of residual Barrett’s epithelium in cases of or high-grade dysplasia is possible with endoscopic ablation, and has been shown to reduce risk of progression to cancer. The most commonly used technique for this purpose is radio-frequency ablation, where 360° ablation can be achieved with a balloon catheter, or more focused ablation with smaller probes. Cryotherapy and APC can also be used for ablation, but photodynamic therapy is now used much less often.

Figure 9.10 Novel upper gastrointestinal therapeutic uses of oesoph agogastroduodenoscopy include the use of endoscopic mucosal resection to remove early gastric cancer leaving a clean base.

Therapeutic oesophagogastroduodenoscopy

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UNDERGOING ENDOSCOPY

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Many patients undergoing endoscopy may be taking a medica tion that interferes with normal haemostasis, such as warfarin, heparin, direct oral anticoagulants, clopidogrel or aspirin. The key points to remember when managing anticoagulants in patients undergoing endoscopy are given in Summary box /uni00A0 9.4 . Summary box 9.4 Managing anticoagulants in patients undergoing endoscopy /uni25CF /uni25CF /uni25CF

It is important to recognise and understand: The risk of complications related to the underlying gastrointestinal disease from anticoagulant therapy The risk of haemorrhage related to an endoscopic procedure in the setting of anticoagulant therapy The risk of a thromboembolic/ischaemic event related to interruption of anticoagulant therapy

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UPPER GASTROINTESTINAL ENDOSCOPY

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OGD is the most commonly performed endoscopic procedure. Excellent visualisation of the oesophagus, gastro-oesophageal junction, stomach, duodenal bulb and second part of the duodenum can be obtained. Retroversion of the gastroscope in the stomach is essential to obtain complete views of the gastric cardia and fundus (Figure 9.3). Traditional forward-viewing endoscopes do not adequately visualise the ampulla, and a side-viewing scope should be used if this is essential. Likewise, - although it is possible to reach the third part of the duodenum with a standard 120-cm instrument, a longer enteroscope is required if views beyond the ligament of Treitz are r equired. In addition to clear mucosal views, diagnostic endoscopy allows mucosal biopsies to be taken, which may either undergo processing for histological examination or be used for near-patient detection of Helicobacter pylori infection using a commercial urease-based kit. In addition, brushings may be taken for cytology and aspirates for microbiological culture. - UPPER GASTROINTESTINAL ENDOSCOPY

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Urgent endoscopy for gastrointestinal bleeding in

Urgent endoscopy for gastrointestinal bleeding in the anticoagulated patient

The risk of clinically significant gastrointestinal bleeding in patients on warfarin is increased, particularly in patients with a past history of similar events, if the international normalised ratio (INR) is above the therapeutic range or if the patient is taking concomitant aspirin/non-steroidal anti-inflammatory drugs (NSAIDs). In these situations, the risk of reversing the anticoagulation must be weighed against the risk of ongoing haemorrhage. If complete reversal is not appropriate, correc tion of the INR to approximately 1.5 is usually su ffi cient to allow endoscopic diagnosis and therapy . Anticoagulation can often be resumed 24 hours after successful endoscopic therapy (Figure 9.2).

Urgent endoscopy for gastrointestinal bleeding in the anticoagulated patient

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