Chapter 3 Oesophagus, Stomach and Duodenum

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Multiple Choice Questions

[*Each single best answer (SBA) question comprises a stem and a number of answers. You are asked to decide which single item represents the best answer to the question.*]

1. One of the following statements is incorrect in relation to "dysphagia"

a) Relates to pain on swallowing
b) Is an "alarm" symptom
c) Can be due to neurological disorders
d) May be associated with pulmonary disease
e) Can be initially investigated with an upper gastrointestinal endoscopy

[Best Answer = a]

Explanation

Dysphagia is defined as difficulty in swallowing, whilst pain on swallowing is termed odynophagia. Causes can be subdivided into intraluminal (foreign body), mural (carcinoma, benign stricture, scleroderma), extramural (goitre, mediastinal lymph nodes, cardiomegaly) or, least frequently, neurological (stroke) conditions. Dysphagia is considered to be an "alarm" symptom since it may indicate the presence of carcinoma of the oesophagus. If dysphagia results in an inability to swallow liquids or saliva, the patient may aspirate fluid into their respiratory tract. The initial investigation is that of an upper gastrointestinal endoscopy followed by a barium swallow if it is normal.

2. Achalasia

a) Is caused by *Trypanosoma cruzi*
b) The initial investigation of chioce is a barium swallow
c) Is a risk factor for adenocarcinoma of the oesophagus

d) May be successfully treated with diet and drugs
e) Perforation of the oesophagus is a risk of surgery

[Best Answer = e]

Explanation

Achalasia of the cardia results from disintegration or absence of Auerbach's myenteric plexus but the cause is not known. A similar pathophysiology exists in Chagas disease which is caused by infection with *Trypanosoma cruzi*. A barium swallow will detect changes in established achalasia — gross distension and tortuosity of the oesophagus as well as a tapering constriction at the lower end (bird's beak). However, the earliest changes are found using oesophageal manometry — lack of peristalsis, high resting pressure and incomplete relaxation of the lower oesophageal sphincter. The condition is a risk factor for squamous cell carcinoma of the oesophagus. Dietary modification and drugs have no role to play in the management of the condition which is treated by either balloon dilatation or surgery (Heller's myotomy). Oesophageal perforation is a risk of both these procedures.

3. Pharyngeal pouch

a) Is a true diverticulum
b) Is a traction diverticulum
c) May present with halitosis
d) Is best diagnosed with upper gastrointestinal endoscopy
e) Usually requires open surgery

[Best Answer = c]

Explanation

A pharyngeal pouch or Zenker's diverticulum is a false pulsion diverticulum occurring through Killian's dehiscence between the inferior constrictor and cricopharyngeus. Collection and stasis of recently swallowed food within the pouch can result in halitosis. It may also present as a mass in the left side of the neck. A barium swallow is the safest way

to diagnose the condition since an endoscopy can result in perforation. A linear stapler inserted endoscopically can be used to treat the pouch.

4. Which of the following statements relating to oesophageal cancer is incorrect?

a) Is usually diagnosed at an early stage
b) Risk factors include smoking and alcohol
c) Treatment may include radiotherapy or chemotherapy
d) Is predominantly adenocarcinoma in the United Kingdom
e) Dysphagia and weight loss are poor prognostic signs

[Best Answer = a]

Explanation

Unfortunately it often presents late. The two major histological types of oesophageal cancer are squamous cell carcinoma (SCC) and adenocarcinoma (AC). Whilst worldwide SCC is the more common (China, Iran, South Africa), AC is more prevalent in the West and is increasing in incidence. Risk factors include alcohol, tobacco, achalasia, scleroderma, vitamin A and C deficiencies, dietary toxins for SCC, and gastro-oesophageal reflux disease (GORD), Barrett's oesophagus for AC. Oesophageal cancer often only presents with symptoms (progressive dysphagia, regurgitation, cough, hoarseness, pain, weight loss, and fatigue) when locally advanced. Depending upon the stage of the disease surgery, chemotherapy and radiotherapy are all possible treatment modalities.

5. Hiatus hernia

a) Is an uncommon finding
b) Is caused by stomach herniating through the membranous part of the diaphragm
c) The rolling type is more commonly associated with reflux
d) The rolling or paraoesophageal type is best managed conservatively
e) Often co-exists with diverticular disease and gall stones

[Best Answer = e]

Explanation

Hiatus hernia is common, especially in women, and with advancing years. It results from herniation of the stomach through the oesophageal hiatus of the diaphragm due to laxity of the crura. There are two main types — sliding (80%) and rolling (20%). The sliding type is more likely to be related to symptoms of gastro-oesophageal reflux (i.e. heartburn and regurgitation), while the rolling type may cause pain due to incarceration, ischaemia and gangrene. A sliding hiatus hernia usually can be treated conservatively, but a rolling type needs surgical correction to prevent potentially life-threatening complications. Saint's triad includes the presence of gallstones, diverticular disease and hiatus hernia in the same patient.

6. Oesophageal varices

a) May occur after portal vein thrombosis
b) Commonly bleed after vomiting and retching
c) Are the most common cause of upper gastrointestinal haemorrhage in cirrhotic patients
d) Should be treated on diagnosis
e) Often require surgical procedures to prevent major bleeding

[Best Answer = a]

Explanation

Oesophageal varices result from portal venous hypertension, causes of which include cirrhosis of the liver due to alcohol abuse, portal vein thrombosis, schistosomiasis and hepatic vein thrombosis (Budd-Chiari syndrome). Large submucosal veins appear at the lower end of the oesophagus which can bleed after minimal trauma from passing food boluses. Even in cirrhotic patients the most common cause of upper gastrointestinal haemorrhage is from peptic ulceration. Small varices do not need treatment but larger ones may require a B-blocker and banding to prevent bleeding. Treatment for haemorrhage includes resuscitation, tamponade with a Minnesota or Sengstaken tube, or

transjugular intrahepatic portosystemic shunting (TIPS). Surgery is rarely required. Child's criteria considers encephalopathy, ascites, bilirubin, albumin and prothrombin ratio in the patient with cirrhosis.

7. Regarding peptic ulceration

a) *Helicobacter pylori* is a Gram-positive bacillus
b) The duodenum is more commonly affected than the stomach
c) Zollinger-Ellison syndrome is associated with gastric hyposecretion
d) H2 receptor antagonists will heal 50% of duodenal ulcers within eight weeks
e) Gastric ulcers are rarely malignant

[Best Answer = b]

Explanation

Helicobacter pylori is a flagellated Gram-negative bacillus and is thought to be associated with 90% of duodenal ulcers and 80% of gastric ulcers. Other risk factors include cigarette smoking, alcohol, NSAIDs and stress. Duodenal ulcers occur more commonly than gastric ulcers. A gastric cancer may initially present as a gastric ulcer. Zollinger-Ellison syndrome results from a rare gastrin-secreting tumour that produces severe peptic ulceration extending into and even beyond the second part of the duodenum. Medical treatment of peptic ulceration includes H2 receptor antagonists (cimetidine, ranitidine, famotidine), proton pump inhibitors (omeprazole, lansoprazole, pantoprazole, rabeprazole, esomeprazole) and *Helicobacter pylori* eradication. H2 receptor antagonists will heal 90% of duodenal ulcers within eight weeks and triple therapy can eradicate *Helicobacter pylori* in 80% of patients within one week. Surgery is rarely indicated.

8. Gastric cancer

a) Is increasing in incidence
b) Is not associated with *Helicobacter pylori* infection
c) Is best treated by radiotherapy or chemotherapy

d) May present with a Krukenberg tumour
e) Fundal lesions are more common than antral lesions

[Best Answer = d]

Explanation

The incidence of gastric cancer is 23 per 100,000 per year with a peak during the fifth and sixth decades. Risk factors include *Helicobacter pylori* infection, blood group A, high salt and nitrate intake, and deficiency of vitamins A, C and E. Treatment usually consists of neoadjuvant chemotherapy followed by surgery and then a course of adjuvant chemotherapy. Transcoelomic spread to the ovaries results in a Krukenberg tumour. Antral lesions are more common than fundal lesions, leading to symptoms of gastric outlet obstruction (early satiety and vomiting).

9. Intrinsic factor

a) Is a polysaccharide
b) Is produced by the parietal cells in the pancreas
c) Acts in the terminal ileum
d) Is important in the absorption of folic acid
e) Deficiency can be treated with oral vitamin B12

[Best Answer = c]

Explanation

Intrinsic factor is a glycoprotein secreted by the parietal cells present in the gastric body mucosa. It is necessary for the absorption of vitamin B12 (cyanocobalamin). Vitamin B12 binds to intrinsic factor in the intestinal lumen and allows its transfer across the terminal ileum into the blood stream. Any state in which the parietal cells are absent (e.g. gastrectomy) or not functioning properly (e.g. pernicious anaemia) can result in reduced secretion of intrinsic factor and thus vitamin B12 deficiency. Vitamin B12 must be administered intramuscularly in such patients.

10. One of the following statements is incorrect in relation to Coeliac disease

a) It results from dietary lactose intolerance
b) It is associated with raised serum anti-endomysial and anti-gliadin antibodies
c) Small bowel histology usually shows villous hypertrophy
d) Increases the risk of small bowel lymphoma
e) Can be effectively treated with a gluten-free diet

[Best Answer = a]

Explanation

Coeliac disease is a malabsorption syndrome and results from a congenital absence of gluten hydrolase in the small bowel mucosal cells. There is intolerance to gluten, a protein present in wheat, rye, barley and oats, resulting in the build-up of the metabolite gliadin in the mucosal cells. Small bowel mucosal villous atrophy ensues which can be seen in biopsies taken at endoscopy. Coeliac disease increases the risk of small bowel lymphoma but can be treated by adherence to a gluten-free diet.

11. Small bowel obstruction

a) In the United Kingdom, is most often due to an obstructed hernia
b) Causes absent bowel sounds, colicky abdominal pain and diarrhoea
c) Abdominal distension is seen in all patients
d) Often requires aggressive intravenous fluid resuscitation
e) All cases can be managed conservatively for the initial 24 hours

[Best Answer = d]

Explanation

The incidence of small bowel obstruction increases with the frequency of abdominal surgery. Therefore in the developed world (e.g. Europe, North America) the most common cause is adhesions from previous abdominal surgery, in underdeveloped countries it is

obstructed hernia. Colicky abdominal pain is the cardinal symptom with vomiting being present in all but very distal small bowel obstruction associated with distension and absolute constipation. The more proximal the lesion, the earlier vomiting occurs. Abdominal distension may be absent in a proximal obstruction. The vomiting and intestinal ileus can result in huge fluid shifts and electrolyte disturbances which will require many litres of intravenous fluid to correct. Whilst many cases of adhesional obstruction will settle with conservative management (i.e. nasogastric tube, intravenous fluids), those that develop pain, pyrexia, tachycardia and signs of peritonism will need surgery.

12. Meckel's diverticulum

a) Occurs in 10% of the population
b) Will be found in the mesenteric border of the small intestine
c) Consists of mucosa without a muscle coat
d) A fibrous band between its apex and the liver can result in intestinal obstruction
e) Heterotopic gastric mucosa can ulcerate and cause a brisk gastrointestinal bleed

[Best Answer = e]

Explanation

A Meckel's diverticulum is a remnant of the intestinal end of the vitello-intestinal duct. It is present in about 2% of the population, is two inches long and arises from the anti-mesenteric border of the ileum, two feet proximal to the ileo-caecal valve. It is a true diverticulum containing all layers of the bowel. In 10% of cases a fibrous band, the remainder of the vitello-intestinal duct, connects it to the umbilicus and may be a cause of intestinal obstruction. Fifty per cent of symptomatic Meckel's diverticula contain heterotopic tissue. If this is parietal cell gastric mucosa, peptic ulceration and associated complications can occur.

13. Carcinoid tumour

a) Most commonly affect the colon
b) Symptoms of carcinoid syndrome usually occur before metastases have arisen
c) Carcinoid syndrome occurs once lung metastases have occurred
d) Urinary 5-HIAA is elevated in patients with carcinoid syndrome
e) Surgery is deemed inappropriate once the tumour has metastasised

[Best Answer = d]

Explanation

The appendix is the most common site of gastrointestinal carcinoid formation followed by the small bowel. Whilst one third of the tumours will have metastasised at presentation, only 10% of patients present with carcinoid syndrome. Usually the secretory products (e.g. 5-hydroxytryptamine, prostaglandins, kinins) of the tumour are inactivated by the liver, but liver metastases are able to secrete directly into the systemic circulation causing carcinoid syndrome. The symptoms consist of periodic facial flushing, diarrhoea, and asthmatic attacks whilst the majority of patients with the syndromes have elevated levels of 5-hydroxyindoleacetic acid (5-HIAA). Treatment of carcinoid tumours involves radical excision of all the accessible tumour. Partial hepatic lobectomy can be employed if metastases are localised.

14. Initial treatment of an enterocutaneous fistula includes

a) Enteral nutrition
b) Neostigmine
c) Laparoscopic resection
d) Skin grafting
e) Octreotide

[Best Answer = e]

Explanation

Although 90% of enterocutaneous fistulae are a complication of surgery, some may occur spontaneously (e.g. Crohn's disease). Fistulae are classified according to the amount of fluid lost through them — "high output" or "low output". Treatment includes maintaining fluid and electrolyte balance, control of sepsis (antibiotics) and ensuring adequate drainage, nutritional support (total parenteral nutrition), exclusion of distal obstruction (may require surgery), and skin care. The volume of gastrointestinal secretions can be reduced using octreotide, a somatostatin analogue.

15. Gallstone ileus

a) Results from a gallstone impacting at the ileo-caecal junction
b) Is a rare cause of large bowel obstruction
c) Air in the biliary tree can sometimes be seen on plain radiographs
d) Is treated by cholecystectomy
e) At surgery the gallstone is simply milked into the caecum

[Best Answer = c]

Explanation

Gallstone ileus is a rare cause of small bowel obstruction arising from the passage of a gallstone through a cholecystoduodenal fistula. The stone classically impacts at the narrowest part of the small bowel some two feet proximal to the ileo-caecal junction. This is the point at which the vitello-intestinal duct would have joined the ileum. Air can pass from the duodenum through the fistula into the biliary tree (aerobilia) and may be evident on plain chest and abdominal radiographs. At surgery an enterotomy is made proximal to the point of impaction and the gallstone removed through it. The cholecystoduodenal fistula can usually be left alone.

Case Studies

Case 1

A 64-year-old man presents with a three-month history of difficulty swallowing. Initially he had problems with meat and bread however more recently he has experienced difficulty with liquids. He has lost 10 kg in weight over that period.

a) What are the causes of dysphagia?
b) What are the symptoms and signs of oesophageal cancer?
c) How should this patient be investigated?
d) What is the surgical management of oesophageal cancer?
e) What is the role of chemotherapy and radiotherapy in the treatment of oesophageal cancer?
f) What are the complications of oesophagectomy?

Answers

a) Obstructive causes of dysphagia may be caused by luminal or extraluminal causes. Luminal — oesophagitis, webs and benign or malignant strictures. Extraluminal — Zenkers diverticulum, mediastinal masses, enlarged thyroid, vertebral osteophytes, aberrant right subclavian artery, left atrial hypertrophy, aortic aneurysm or right sided aorta. Oesophageal motility may cause dysphagia — muscle weakness, achalasia, diffuse oesophageal spasm and systemic sclerosis.
b) Early oesophageal cancer is often asymptomatic with no physical signs. More advanced cancer can result in progressive dysphagia initially to solids, then to liquids, regurgitation, aspiration, hoarseness, pain, weight loss and fatigue. Signs of metastatic disease include supraclavicular lymphadenopathy, hepatomegaly, recurrent laryngeal nerve palsy and bronchopulmonary complications.
c) An urgent upper gastrointestinal endoscopy is mandatory. This enables localisation of the tumour position and biopsies for histological confirmation. Once the diagnosis of oesophageal carcinoma (adeno or squamous cell) has been made the patient's disease needs to be staged. A CT scan of the chest, abdomen and pelvis will determine the presence of distant metastases (M stage)

and lymph nodes (N stage). An endoscopic ultrasound scan will determine the stage of the tumour (T stage) and local lymph nodes (N stage). Bronchoscopy may also be considered if airway involvement is suspected. The general fitness of the patients to be assessed prior to definitive treatment and haematological, biochemical, cardiac and pulmonary investigations will be used.

d) Approximately 30% of patients are suitable for oesophageactomy. The three approaches are an Ivor Lewis oesophagectomy (laparotomy and right thoracotomy) for a mid or low tumour, a transthoracic or thoracoabdominal approach (left thoracotomy) for a low tumour, and a transhiatal oesophagectomy (laparotomy and left cervical incision) for an upper tumour. A radical lymphadenectomy is also performed.

e) Chemotherapy may be given palliatively or in a neoadjuvant setting with good effect. Squamous cell carcinomas are more radiosensitive than adenocarcinomas and so chemoradiotherapy may be used as primary treatment in the former group. Radiotherapy may be used palliatively.

f) The operative mortality from oesophagectomy is less than 5% in tertiary centres of excellence, with a morbidity of 40%. Complications include anastomotic leak and stricture, wound and chest infection, pleural effusion, chylothorax, intra-abdominal abscess, haemorrhage, splenic injury, recurrent laryngeal nerve palsy, necrosis of the gastric conduit and delayed gastric emptying.

Case 2

A 40-year-old man has a four-year history of heartburn. It is particularly bad when lying down at night and is made worse by bending over. Occasionally he is awoken at night by coughing and choking. Over-the-counter antacids provide some relief. His general practitioner has diagnosed him as having gastro-oesophageal reflux disease (GORD).

a) What are the clinical features of GORD?
b) What is the pathophysiology of GORD?
c) What are the complications of GORD?
d) What is the initial investigation of choice?
e) How can GORD be treated?
f) What are the possible complications of surgery?

Answers

a) The typical symptoms of GORD are heartburn, regurgitation and dysphagia. Atypical symptoms include retrosternal chest pain, hoarseness, hiccups, ear pain, loss of dental enamel, night sweats, chronic wheeze or cough, globus sensation, hypersalivation and halitosis.

b) A small degree of gastro-oesophageal reflux is physiological but once the presence of gastric juice results in symptoms or complications (e.g. oesophagitis, stricture, Barrett's metaplasia) it is termed pathological. Failure of oesophageal, gastric and duodenal protective mechanisms are responsible for GORD; oesophageal — loss of the high pressure zone of the lower oesophageal sphincter, reduced oesophageal peristalsis, and decreased salivary and oesophageal mucosal bicarbonate production; gastric — gastric distension, increased intra-abdominal pressure; duodenal — alkaline reflux.

c) Prolonged exposure of the oesophageal mucosa to gastric juice may result in inflammation, erosions, ulceration and stricture. Metaplasia of the lower oesophagus may occur with replacement of the normal squamous epithelium by columnar intestinal epithelium (Barrett's oesophagus). This condition is premalignant and can lead to dysplasia and cancer.

d) An upper gastrointestinal endoscopy is the initial test to assess the extent and severity of the disease. The endoscopy also allows biopsies to be taken if necessary.

e) Initial lifestyle changes include weight loss, cessation of smoking, avoiding foodstuffs that precipitate symptoms, not eating a large meal late at night and elevating the head of the bed. Medical treatment involves antacids or alginates, H2 receptor antagonists (cimetidine, ranitidine, nizatidine and famotidine), proton pump inhibitors (omeprazole, lansoprazole, pantoprazole, rabeprazole and esomeprazole) and prokinetic agents (metoclopramide, domperidone and erythromycin). Surgery includes open or laparoscopic fundoplication. After closure of the hiatal defect the mobilised fundus is wrapped to a various extend around the lower oesophagus either posteriorly or anteriorly.

f) The operative complications include splenectomy, oesophageal perforation and pneumothorax. Post-operative complications include persistent reflux, dysphagia, gas bloat syndrome and increased passage of flatus.

Case 3

A 32-year-old female attends the A&E department vomiting bright red blood and feeling faint. She was commenced on a course of diclofenac for back pain three weeks ago and has experienced indigestion ever since. She smokes 20 cigarettes a day and drinks occasionally.

a) How should this patient initially be managed?
b) What are the causes of upper gastrointestinal haemorrhage?
c) What are the risk factors for peptic ulcer disease?
d) What are the complications of peptic ulcer disease?
e) What is meant by "triple-therapy"?
f) What are the alternatives to medical management of peptic ulcer disease?

Answers

a) This patient is in shock from an upper gastrointestinal haemorrhage and requires resuscitation. Oxygen needs to be administered via a face mask with a reservoir bag at 15 litres per minute, and two wide bore intravenous cannulae inserted for the immediate infusion of two litres of normal saline. Blood must be sent for urgent cross-matching of six units of red blood cells as well as full blood count, coagulation, and urea and electrolytes. A urinary catheter and nasogastric tube need to be inserted. Arrangements must be made for an emergency upper gastrointestinal endoscopy.
b) Most upper gastrointestinal haemorrhages are from gastric or duodenal ulcers. Other causes are oesophagitis, oesophageal or gastric varices, Mallory-Weiss tear, acute erosive gastritis, gastric angiodysplasia, Dieulafoy's malformation, duodenitis and tumours.
c) There is a very strong association between the presence of *Helicobacter pylori* and peptic ulceration — 95% of duodenal and 70%–80% of gastric ulcers. Other risk factors include non-steroidal anti-inflammatory drugs, steroids, cigarette smoking, alcohol, blood group O and Zollinger-Ellison syndrome. Curling's

ulcers are associated with major body surface burns. Cushing's ulcers are associated with head injuries.

d) The main complications of upper gastrointestinal ulcers are haemorrhage (haematemesis, melaena, iron deficiency anaemia), perforation, and obstruction (pyloric stenosis).

e) The long-term healing of gastric or duodenal ulcers can be rapidly achieved by eradicating *Helicobacter pylori*, the causative factor in many cases. A "triple-therapy" regimen is a combination of a proton pump inhibitor (e.g. lansoprazole) and two antibiotics (e.g. amoxicillin and clarithromycin) administered for one week. It is efficacious in 80%–90% of cases.

f) With the advent of the proton pump inhibitors elective surgery for peptic ulcer disease is rarely indicated. Zollinger-Ellison syndrome must be excluded in patients with duodenal ulcers refractory to medical treatment. Selective vagotomy and antrectomy, or subtotal gastrectomy may be employed with refractory duodenal ulcers. Refractory gastric ulcers are even rarer, but when they do occur may be treated with either excision of the ulcer accompanied by a highly selective vagotomy or a subtotal gastrectomy.

Case 4

A 73-year-old woman presents with anorexia, early satiety and significant weight loss. The symptoms have gradually worsened over the previous three months. She is otherwise fit and well but has been found to have iron deficiency anaemia.

a) What is the differential diagnosis for this lady?
b) What are the risk factors for gastric cancer?
c) How should this patient be evaluated?
d) What eponymous signs are related to the metastatic spread of gastric cancer?
e) What are the surgical options for managing the patient?
f) What are the complications of surgery?

Answers

a) Considering this woman's age and symptoms an upper gastrointestinal tract neoplasm, in particular gastric cancer, needs to be excluded. Peptic ulcer disease can also present with similar symptoms.

b) Risk factors for gastric cancer include — chronic atrophic gastritis and intestinal metaplasia; pernicious anaemia; gastric remnant (a cancer arising in the remaining stomach after a previous gastric resection); adenomatous gastric polyps; gastric ulcers (especially non-healing ones); *Helicobacter pylori* infection.

c) Upper gastrointestinal endoscopy enables a histological diagnosis to be made. A CT scan of the chest, abdomen and pelvis will identify any nodal (N stage) and haematogenous metastatic spread typically to the liver or the lungs (M stage). An endoscopic ultrasound scan will assess the depth of gastric wall invasion (T stage) and local lymph node involvement (N stage). A staging laparoscopy will also be required to detect peritoneal spread of the cancer.

d) Virchow's node or Troisier's sign — a palpable lymph node in the left supraclavicular fossa. Irish's node — a palpable node in the left axilla. Sister Mary Joseph's node — a metastatic nodule in the umbilicus. Krukenberg's tumour — ovarian metastases. Blumer's shelf — pelvic peritoneal metastases that are palpable during a rectal or pelvic examination.

e) A surgical technique aimed at curing gastric cancer must consider the amount of stomach removed to obtain local clearance, the degree of nodal dissection and the method of reconstruction. Proximal cancers are best managed with a radical total gastrectomy — *en-bloc* removal of the omentum, stomach, first part of duodenum, and surrounding lymph nodes. A distal cancer is managed by a radical subtotal gastrectomy — *en-bloc* resection of the omentum, 80% of the stomach, first part of the duodenum and surrounding lymph nodes. In the past Billroth I (duodenal stump anastomosed to remainder of the stomach) or Billroth II (duodenal stump oversewn and gastric remnant anastomosed to proximal jejunum) reconstructions have been used, but a Roux-en-Y technique is now preferred.

f) Operative mortality should be less than 8% for a total gastrectomy and 5% for a subtotal gastrectomy. Early complications include bleeding, infection and anastomotic leak. Later complications include vitamin B_{12} deficiency, anaemia, metabolic bone disease, blind loop syndrome, chronic diarrhoea, and early and late dumping syndromes.

Case 5

A 55-year-old man presents with a four-day history of colicky abdominal pain and vomiting. Over the last two days he has not opened his bowels and he has not passed flatus for 24 hours. In the past he underwent an appendicectomy for perforated appendicitis.

a) What is the probable diagnosis?
b) What are the common causes of small bowel obstruction?
c) What are the physical findings in small bowel obstruction?
d) What abnormalities might be found on initial investigations?
e) What is the initial treatment of a patient with small bowel obstruction?
f) What are the indications for surgery?

Answers

a) This patient has small bowel obstruction until proven otherwise. Other diagnoses include ileus, large bowel obstruction, volvulus, gastroenteritis, pancreatitis and mesenteric ischaemia.
b) Post-operative adhesions account for up to two-thirds of small bowel obstruction, with incarcerated hernia and neoplasm being the next most common causes. Less common causes include diverticulitis, gallstone ileus and inflammatory bowel disease.
c) The most common findings in the patient with small bowel obstruction relate to dehydration — tachycardia, dry mucous membranes and reduced skin turgor. Usually abdominal examination is unremarkable with moderate discomfort. Scars and hernial orifices need to be examined carefully.
d) Vomiting and sequestration of fluid within the loops of small bowel can result in dehydration. Haematocrit and urea may be raised. There may be a hypochloraemic hypokalaemic metabolic acidosis due to vomiting. A plain abdominal radiograph may show multiple loops of distended small bowel with absence of air in the colon. If the film is taken in the upright position air-fluid levels will be seen in these loops of small bowel. An erect chest radiograph should be examined for the presence of free gas under the diaphragm in the case of perforation.
e) A nasogastric tube is inserted to decompress the stomach. Aggressive intravenous fluid therapy is required to address the dehydration. To monitor the effect a urinary catheter is inserted aiming for a urine output of 0.5 ml per kg per hour. A frail elderly

patient with cardiac co-morbidities may require central venous pressure monitoring. The response to intravenous fluid therapy and the general condition of the patient needs to be continually re-assessed.

f) Surgery is required for bowel strangulation, closed-loop obstruction and ischaemic bowel. Increasing abdominal tenderness, fever, raised white blood cell count, acidosis, peritoneal irritation and shock are all signs of bowel necrosis. However, even without these worrying clinical signs unresolving small bowel obstruction usually necessitates an operation.

Extended Matching Questions

EMQ 1

a. Stroke
b. Scleroderma
c. Candidiasis
d. Boerhaave's syndrome
e. Achalasia
f. Oesophageal cancer
g. Gastro-oesophageal reflux disease
h. Gastric cancer
i. Small bowel obstruction
j. Crohn's disease

From the list above choose the most likely diagnosis for the following clinical situations:

1) A 40-year-old lady complaining of intermittent dysphagia to liquids more than solids with Raynaud's phenomenon.
2) A 60-year-old man with vomiting, abdominal distension and a tender non-reducible lump in his right groin.
3) A 70-year-old man with severe indigestion, weight loss, a palpable mass in his epigstrium and palpable left supraclavicular lymphadenopathy.
4) A 55-year-old man who experiences severe chest pain after repeated vomiting and retching.
5) A 35-year-old man presenting with heartburn and regurgitation.

Answers

1) b.
This patient has systemic sclerosis or scleroderma. The signs and symptoms can be remembered by CREST: Calcinosis — calcium deposits in the skin; Raynaud's phenomenon — spasm of the blood vessels in response to cold or stress; Esophageal dysfunction — acid reflux and decreased motility of the oesophagus; Sclerodactyly — thickening and tightening of the skin on the fingers and hands; and Telangiectasia — dilatation of capillaries causing red marks on the surface of the skin. A minimum of two is needed to make the diagnosis.

2) i.
This man has an incarcerated inguinal hernia resulting in small bowel obstruction.

3) h.
An advanced gastric cancer will produce a palpable mass in the upper abdomen. An involved left supraclavicular node is called a Virchow's node which is referred to as Troisier's sign.

4) d.
Repeated vomiting may rupture the lower oesophagus and cause gastric contents to contaminate the mediastinum. Pleural effusions and empyemas may also develop.

5) g.
These are the typical symptoms of gastro-oesophageal reflux disease.

EMQ 2

Options

a. CT scan
b. Angiography
c. Endoscopy
d. Barium swallow
e. Gastric emptying study
f. Meckel's scan
g. Barium meal
h. MRI scan
i. Oesophageal manometry
j. Ambulatory 24-hour pHmetry

Choose an answer from the list above which is the most appropriate initial investigation for the following patients:

1) An 84-year-old female with intermittent dysphagia to solids and a normal endoscopy.
2) A 50-year-old man presenting with light headedness and melaena.
3) A 35-year-old man with repeated episodes of melaena and a normal endoscopy.
4) A 65-year-old man with progressive dysphagia and weight loss.

5) A 40-year-old woman with intermittent progressive dysphagia to liquids in particular. She also experiences regurgitation of undigested food.

Answers

1) d.
The normal endoscopy has ruled out any mucosal cause for the dysphagia such as cancer or oesophagitis. The barium swallow will demonstrate the oesophageal dysmotility resulting in the symptoms (i.e. poor peristalsis, tertiary contractions and "yo-yoing" of the bread bolus. This lady will have the non-specific oesophageal motility disorder called presbyoesophagus.

2) c.
Melaena implies bleeding from the upper gastrointestinal tract and if the patient feels faint a significant quantity of blood has been lost. Peptic ulceration is the most common cause of such bleeding and an urgent endoscopy is the most appropriate investigation. A bleeding gastric or duodenal ulcer can also be treated at endoscopy (e.g. adrenaline injection, diathermy or heater probe).

3) f.
A Meckel's diverticulum may contain heterotopic gastric mucosa which can ulcerate and bleed. The parietal cells present in this mucosa concentrate 99mTc-sodium pertechnetate which can be detected by scintiscanning (i.e. a Meckel's scan).

4) c.
This man has the "alarm" symptoms of dysphagia and weight loss in a person who is older than 55 years of age. He needs an urgent endoscopy to identify an oesophageal cancer. Not only can the position of the tumour be located but a biopsy can be taken to enable histological confirmation.

5) d.
Achalasia, due to absent oesophageal peristalsis and poor relaxation of the lower oesophageal sphincter, may cause intermittent dysphagia, regurgitation and retrosternal chest pain. A barium swallow will demonstrate a distended oesophagus above a smooth distal narrowing (i.e. bird's beak deformity).

EMQ 3

a. Radical total gastrectomy
b. Endoscopic haemostasis
c. *Helicobacter pylori* eradication therapy
d. Roux en-Y anastomosis
e. Heller's myotomy
f. Small bowel resection
g. Nissen fundoplication
h. Under-running of a bleeding duodenal ulcer
i. Pyloric stent and palliative chemotherapy
j. Oesophagectomy

Select the most appropriate treatment for the following patients from the above list:

1) A 79-year-old man with gastric outlet obstruction from an adenocarcinoma and severe COAD. His staging CT has demonstrated liver metastases.
2) A 40-year-old woman with a longstanding history of dyspepsia. At upper gastrointestinal endoscopy moderate duodenitis was seen and a urease test was positive.
3) A proximal gastric adenocarcinoma in a previously fit and well 64-year-old man. Staging investigations have demonstrated no local nodal or distant haematogenous metastases.
4) A 29-year-old man has had several years of heartburn and regurgitation. His symptoms are improved but not completely relieved by a proton pump inhibitor. He does not wish to take tablets for the rest of his life.
5) A 44-year-old woman who has been diagnosed with achalasia.

Answers

1) i.
This patient has incurable gastric cancer and his symptoms would be best palliated by a pyloric stent and chemotherapy. The former can be placed endoscopically.

2) c.
A positive urease test confirms the presence of *Helicobacter pylori* in the stomach, a significant risk factor for peptic ulcer disease. Eradication of the organism will most likely cure the woman's symptoms.

3) a.
This man appears to be fit enough to undergo a gastrectomy for his cancer. Its proximal location requires a total gastrectomy. A radical procedure will involve *en-bloc* removal of the omentum, stomach, first part of duodenum, and surrounding lymph nodes. It is the best hope of cure. If lymph node metastases were detected by the pre-operative staging investigations, neoadjuvant chemotherapy would be considered.

4) g.
Antireflux surgery would be appropriate in this patient. After suitable pre-operative investigations, a Nissen fundoplication (360°) would be appropriate. Most surgeons would perform this procedure laparoscopically.

5) e.
Achalasia is a motor disorder of the oesophagus resulting in aperistalsis of the oesophagus with a hypertensive, incompletely relaxing lower oesophageal sphincter. A Heller's myotomy of the lower oesophageal sphincter aims to relieve the symptom of dysphagia. It can however result in reflux symptoms and so is commonly combined with a partial fundoplication. The procedure is usually carried out laparoscopically.

EMQ 4

a. Anastomotic leak
b. Wound infection
c. Deep vein thrombosis
d. Chyle leak
e. Pneumothorax
f. Pleural effusion
g. Duodenal stump leak
h. Dumping syndrome
i. Vitamin B_{12} deficiency
j. Gas bloat syndrome

Which of the above postoperative complications apply to the following clinical scenarios?

1) The feeling of upper abdominal fullness and inability to belch after a laparoscopic Nissen fundoplication.

2) Two days following an oesophagectomy, milky-coloured fluid starts to appear in the chest drains. Its volume increases as the patients enteral feeding is commenced.
3) Bile-stained fluid appears in the right abdominal drain a few days after a subtotal gastrectomy.
4) Having re-established oral nutrition after a total gastrectomy the patient experiences episodes of dizziness, palpitations, sweating and diarrhoea immediately after eating.
5) Two and a half years after a subtotal gastrectomy a patient presents to their general practitioner with fatique. Clinically they are anaemic and a blood test confirms this. Their MCV is elevated.

Answers

1) j.
Patients post a Nissen fundoplication (360º wrap) are unable to belch swallowed air. This accumulates in the stomach giving a bloated or distended sensation. This is gas bloat syndrome.

2) d.
The thoracic duct may be damaged during mobilisation of the oesophagus. Chyle is white in colour due to its high fat content. Small leaks will settle spontaneously especially if the enteral feed is changed to medium chain triglycerides. Larger leaks will require surgical re-exploration and ligation.

3) g.
It is generally recommended that a drain be positioned adjacent to the duodenal stump to detect this complication. Early leaks are due to technical error, small bowel obstruction or ischaemia. Early re-exploration is required.

4) h.
This is early dumping syndrome. These symptoms are associated with gastric bloating and are related to the osmotic effect of a large carbohydrate load in the small intestine. Symptoms are best managed by small frequent meals consisting of low carbohydrate and high protein content.

5) i.
Gastric acid is required to release vitamin B_{12} from food and intrinsic factor is required to absorb it in the terminal ileum. After a gastrectomy there is no capacity to absorb vitamin B_{12} and a macrocytic anaemia can result. These patients need three-monthly intramuscular injections of 1 mg hydroxycobalamin.

EMQ 5

a. Plummer-Vinson syndrome
b. Dysphagia lusoria
c. Myasthenia gravis
d. Rolling hiatus hernia
e. Zenker's diverticulum
f. Sliding hiatus hernia
g. Zollinger-Ellison syndrome
h. Oesophageal varices
i. Boerhaave's syndrome
j. Mallory-Weiss tear

For each of the following conditions select the most appropriate answer above:

1) An intramural cause of dysphagia.
2) A systemic cause of dysphagia.
3) The most common type of hiatus hernia.
4) A cause of widespread peptic ulceration.
5) Presents as mediastinitis after vomiting.

Answers

1) a.
Plummer-Vinson syndrome. This is the development of an oesophageal web in the presence of iron deficiency, most commonly seen in females of middle age or above. Other intramural causes include malignancy and scleroderma. Zenker's diverticulum (pharyngeal pouch) is regarded as an extramural cause of dysphagia.

2) c.
Myasthenia gravis, can affect swallowing as can other systemic disorders such as Parkinson's disease.

3) f.
Sliding hiatus hernia. This constitutes 85% of hiatus hernias with 10% being rolling and 5% mixed.

4) g.
Zollinger-Ellison syndrome. This is the hyper-secretion of gastric acid due to a gastrin-producing tumour (gastrinoma). The classic feature of Zollinger–Ellison syndrome is refractory peptic ulceration, which may involve the whole duodenum and even small bowel.

5) i.
Boerhaave's syndrome. This is spontaneous rupture of the oesophagus occurring after forceful or prolonged vomiting. It results in mediastinitis (infection and inflammation of the mediastinum as a result of food/fluid/microorganisms entering the mediastinum) and is usually fatal if not promptly treated.