023

Chapter 3

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

General points • patients should be strongly advised to stop smoking • some studies suggest an increased risk of relapse secondary to NSAIDs and the combined oral contraceptive pill but the evidence is patchy • dietary advice
 Short-term use of TPN may be helpful in severe cases There is a significant portion of Crohn’s patients who are lactose intolerant, and hence a dairy free diet may reduce the frequency of diarrhoea. Inducing remission

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

• glucocorticoids (oral, topical or intravenous) are generally used to induce remission. Budesonide is an alternative in a subgroup of patients • enteral feeding with an elemental diet may be used in addition to or instead of other measures to induce remission, particularly if there is concern regarding the side-effects of steroids (for example in young children) • 5-ASA drugs (e.g. mesalazine) are used second-line to glucocorticoids but are not as effective • azathioprine or mercaptopurine* may be used as an add-on medication to induce remission but is not used as monotherapy. Methotrexate is an alternative to azathioprine • infliximab is useful in refractory disease and fistulating Crohn's. Patients typically continue on azathioprine or methotrexate • metronidazole is often used for isolated peri-anal disease After a diagnosis of small bowel Crohn’s disease, a patient asked for therapy that is as effective as a course of corticosteroids, but with a better adverse event profile. What would you recommend? Defined formula diet One study showed corticosteroids to have an 80% short-term remission rate, while sole-source liquid diets had a 60% remission rate.
 However, the rate of remission rose to 80% with sole-source liquid diets for those who were able to tolerate a course of therapy.

Maintaining remission • stopping smoking is a priority
 (remember: smoking makes Crohn's worse, but may help ulcerative colitis) • first-line azathioprine or mercaptopurine
 *assess thiopurine methyltransferase (TPMT) activity before offering azathioprine or

mercaptopurine • second-line methotrexate
• if a patient has had previous surgery 5-ASA drugs (e.g. mesalazine) should be considered
Surgery • around 80% of patients with Crohn's disease will eventually have surgery Side effects
 Bile salt malabsorption
 Loss of the terminal ileum frequently leads to bile salt malabsorption commonly presents with watery diarrhoea. diagnosis can be confirmed with a SEHCAT scan.
 treatment with the bile salt chelator cholestyramine
Treatment during pregnancy • For relapse during pregnancy
 1st line Prednisolone is the most appropriate initial treatment 2nd line (in patients who not responds to corticosteroids) Infliximab Infliximab is thought to be low risk in pregnancy although it does cross the placenta.
 Patients on maintenance infliximab therapy should stop treatment by week 26 gestation.
 In patients who require treatment in the last trimester, live vaccines should be avoided in the newborn for the first 6 months. • For maintenance therapy azathioprine or 6MP

Complications: There are 3 main serious intestinal complications in Crohn's disease:

1. Stricture (narrowing) of the bowel intestinal obstruction
2. Fistulas, which are abnormal connections between sections of the bowel, or between the bowel and bladder.
3. colorectal cancer

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

Prognosis :(Nice 2013) Prognostic feature
Crohn's disease ulcerative colitis prolonged remission Only 10% 50% surgery within 10 years of diagnosis 50% 20–30% risk of mortality compared with the general population slightly increased Not increased General outlook worse than ulcerative colitis Better than Crohn's

Renal calculi are increased in Crohn's due to a mixture of dehydration and increased oxalate due to small bowel pathology and previous surgery. (Non-contrast helical CT abdomen is the investigation of choice for suspected renal calculi.)

Crohn's-like enterocolitis with mycophenolate mofetil • Reported in renal transplant patients who have received mycophenolate mofetil.
• Investigations will reveal mucosal ulceration and skip lesions ordinarily seen in Crohn's. • Treatment Withdrawal of mycophenolate resolution of symptoms

---

Ulcerative colitis (Nice guidelines 2013)

• Ulcerative colitis (UC) is a form of inflammatory bowel disease. • Inflammation always starts at rectum (hence it is the most common site for UC),

• never spreads beyond ileocaecal valve and is continuous.
• The peak incidence of ulcerative colitis is in people aged 15-25 years and in those aged 5565 years. Features
The initial presentation is usually following insidious and intermittent symptoms: • bloody diarrhoea • urgency • tenesmus • abdominal pain, particularly in the left lower quadrant • extra-intestinal features (see below)

Severity of ulcerative colitis (Mild, moderate and severe) • In adults the severity criteria are based on the Truelove and Witts' severity index • In children (≤ 11 years) and young people (12 to 17 years) these categories are based on the Paediatric Ulcerative Colitis Activity Index (PUCAI)

Truelove and Witts' severity index

Mild Moderate Severe Bowel movements (no. per day) < 4 4–6 ≥ 6 + at least one of the features of systemic upset (Pyrexia, Pulse > 90, anaemia, ↑ESR) Blood in stools small amounts
Between mild and severe Visible blood Pyrexia (> 37.8°C)
No No Yes

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

Pulse > 90 bpm No No Yes Anaemia Haemoglobin <105 g/L
No No Yes ESR ≤ 30 ≤ 30

> “ 30

C reactive protein
≤ 30 ≤ 30

> “ 30

Pathology • red, raw mucosa, bleeds easily • no inflammation beyond submucosa (unless fulminant disease) • widespread ulceration with preservation of adjacent mucosa which has the appearance of polyps ('pseudopolyps') • inflammatory cell infiltrate in lamina propria • neutrophils migrate through the walls of glands to form crypt abscesses • depletion of goblet cells and mucin from gland epithelium • granulomas are infrequent Barium enema • loss of haustrations • superficial ulceration, 'pseudopolyps' • long standing disease: colon is narrow and short -'drainpipe colon'

Abdominal x-ray from a patient with ulcerative colitis showing lead pipe appearance of the colon (red arrows). Ankylosis of the left sacroiliac joint and partial ankylosis on the right (yellow arrow), reinforcing the link with sacroilitis.
Ulcerative colitis: flares • Non-steroidal anti-inflammatory drugs (NSAIDs) cause flares of

inflammatory bowel disease. • Cytomegalovirus is an uncommon cause of non-responsive colitis. Flares of ulcerative colitis are usually classified as either mild, moderate or severe: Mild Moderate Severe • < 4 stools/day, with or without blood • 4-6 stools/day, with minimal systemic • >6 bloody stools per day, containing blood • Evidence of systemic disturbance, e.g.

Mild Moderate Severe • No systemic disturbance • Normal ESR and C-reactive protein values disturbance fever tachycardia abdominal tenderness, distension or reduced bowel sounds anaemia hypoalbuminaemia Patients with evidence of severe disease should be admitted to hospital.

Risk factors for the precipitation of toxic colonic dilatation ulcerative colitis identify the following as risk factors for the precipitation of toxic colonic dilatation: • Hypokalaemia • Hypomagnesaemia • Under-treatment • Purgative bowel preparations for colonoscopy • Non-steroidals • Opioids • Anti-cholinergics, and • Anti-diarrhoeal agents. • inappropriately delayed

Ulcerative colitis: management (NICE 2013) Treatment can be divided into inducing and maintaining remission.. Inducing remission • treatment depends on the extent and severity of disease • rectal (topical) aminosalicylates or steroids: for distal colitis rectal mesalazine has been shown to be superior to rectal steroids and oral aminosalicylates • oral aminosalicylates • oral prednisolone is usually used second-line for patients who fail to respond to aminosalicylates. NICE recommend waiting around 4 weeks before deciding if first-line treatment has failed • severe colitis should be treated in hospital. Intravenous steroids are usually given first-line Maintaining remission • oral aminosalicylates e.g. mesalazine • azathioprine and mercaptopurine • methotrexate is not recommended for the management of UC (in contrast to Crohn's disease) • there is some evidence that probiotics may prevent relapse in patients with mild to moderate disease Inactive (quiescent) colitis: • (ESR) is not raised in quiescent UC • If the ESR, CRP and platelet counts are not raised, indicating that the patient's symptoms are not due to active disease. • Neutrophilic infiltrate is present if disease is active Involves epithelium of surface and crypts Frequently forms crypt abscesses

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

Step-up approach to treatment based on disease severity. CLINICAL OVERVIEW Ulcerative colitis. Elsevier Point of Care. Updated December 21, 2019. https://www.clinicalkey.com/#!/content/clinical_overview/67-s2.0-0c7ff1f6-29bc-46f1-a7b74bcf12316903?scrollTo=%2367-s2.0-0c7ff1f6-29bc-46f1-a7b7-4bcf12316903-99c15915-a11a-451d-9cb08db17e1930c9-annotated

Gastroenterology

Ulcerative colitis: colorectal cancer Overview • risk of colorectal cancer is significantly higher than that of the general population although studies report widely varying rates • the increased risk is mainly related to chronic inflammation • worse prognosis than patients without ulcerative colitis (partly due to delayed diagnosis) • lesions may be multifocal Factors increasing risk of cancer • disease duration > 10 years • patients with pancolitis • onset before 15 years old • unremitting disease • poor compliance to treatment Colonoscopy surveillance & Risk stratification of IBD • All patients with a diagnosis of colitis should have a screening colonoscopy 10 years after index presentation, preferably when they are in remission. • patients should be decided following risk stratification. Lower risk 5-year follow up colonoscopy Extensive colitis with no active endoscopic/histological inflammation left sided colitis Crohn's colitis of <50% colon Intermediate risk 3-year colonoscopy Extensive colitis with mild active endoscopy/histological inflammation post-inflammatory polyps OR family history of colorectal cancer in a first degree relative aged 50 or over Higher risk 1 year follow up colonoscopy Extensive colitis with moderate/severe active endoscopic/histological inflammation stricture in past 5 years dysplasia in past 5 years declining surgery primary sclerosing cholangitis / transplant for primary sclerosing cholangitis family history of colorectal cancer in first degree relatives aged <50 years

Inflammatory bowel disease: key differences • The two main types of inflammatory bowel disease are Crohn's disease and Ulcerative colitis.
• They have many similarities in terms of presenting symptoms, investigation findings and management options.
• There are however some key differences which are highlighted in table below:

Venn diagram showing shared features and differences between ulcerative colitis and Crohn's disease. Note that whilst some features are present in both, some are much more common in one of the conditions, for example colorectal cancer in ulcerative colitis

Crohn's disease (CD) Ulcerative colitis (UC) Features Diarrhoea usually non-bloody
Weight loss more prominent
Upper gastrointestinal symptoms, mouth ulcers, perianal disease Abdominal mass palpable in the right iliac fossa Extraintestinal Gallstones are more common secondary to reduced bile acid reabsorption
Oxalate renal stones* Complications Obstruction, fistula, colorectal cancer Risk of colorectal cancer high in UC than CD Pathology Lesions may be seen anywhere from the mouth to anus

Skip lesions may be present Histology Inflammation in all layers from mucosa to serosa • increased goblet cells • granulomas Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

Bloody diarrhoea more common Abdominal pain in the left lower quadrant Tenesmus Primary sclerosing cholangitis more common Inflammation always starts at rectum and never spreads

beyond ileocaecal valve

Continuous disease No inflammation beyond submucosa (unless fulminant disease) - inflammatory cell infiltrate in lamina propria • neutrophils migrate through the walls of glands to form crypt abscesses • depletion of goblet cells and mucin from gland epithelium • granulomas are infrequent

Chapter 3

Gastroenterology

Crohn's disease (CD) Ulcerative colitis (UC) Endoscopy Deep ulcers, skip lesions - 'cobble-stone' appearance Radiology Small bowel enema • high sensitivity and specificity for examination of the terminal ileum • strictures: 'Kantor's string sign' • proximal bowel dilation • 'rose thorn' ulcers • fistulae

*impaired bile acid reabsorption increases the loss calcium in the bile. Calcium normally binds oxalate. IBD: histology This histological differences between Crohn's and ulcerative colitis are summarised below: Crohn's • inflammation occurs in all layers, down to the serosa. This predisposes to strictures, fistulas and adhesions • oedema of mucosa and submucosa, combined with deep fissured ulcers ('rose-thorn') leads to a 'cobblestone' pattern • lymphoid aggregates • non-caseating granulomas Ulcerative colitis • inflammation in mucosa and submucosa only (unless fulminant disease) • widespread ulceration with preservation of adjacent mucosa which has the appearance of polyps ('pseudopolyps') • inflammatory cell infiltrate in lamina propria • crypt abscesses • depletion of goblet cells and mucin from gland epithelium • granulomas are infrequent

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

Widespread ulceration with preservation of adjacent mucosa which has the appearance of polyps ('pseudopolyps') Barium enema • loss of haustrations • superficial ulceration, 'pseudopolyps' • long standing disease: colon is narrow and short -'drainpipe colon'

feature Ulcerative colitis Crohn's Most common site Rectum Terminal ileum Distribution Rectum to colon “backwash” ileitis Spread Continuous Discontinuity “skip” lesions Gross features Extensive ulceration Focal aphthous ulcers with intervening normal mucosa Linear fissures Cobblestone appearance Thickened bowel wall “linitis plastic” Creeping fat Micro Crypt abscess Noncaseating granulomas Inflammation Limited to mucosa and Pseudo-polyps

submucosa Complication Toxic megacolon

 Strictures String sign on barium study Obstruction Abscess Fistula Sinus tract Genetic Association HLA-B27

Common Uncommon Extraintestinal manifestation Cancer risk 5-25% Slight 1-3% Presentation Bloody diarrhea Variable : Pain, diarrhea, weight loss

Pseudopolyps are seen in both ulcerative colitis and Crohn's disease.

history of previously well-controlled ulcerative colitis, treated with mesalazine 1.2 g daily. presented with a 5-day history of increasing bowel frequency. A diagnosis of active proctitis was made. What is the most appropriate treatment?
 increase mesalazine dosage

Microscopic colitis (Collagenous colitis and Lymphocytic colitis)
• Microscopic colitis (MC) is an inflammatory condition of the colon that presents with two subtypes: collagenous (CC) and lymphocytic colitis (LC).
• Both types of MC present with watery diarrhea, and normal endoscopic findings. Differentiation is made by histological examination but treatment is the same.
• Risk factors for MC are female gender, higher age, concomitant autoimmune disease, past and current diagnosis of malignancy of organ transplant Among all autoimmune disorders, celiac disease appears to have the strongest association. The use of proton pump inhibitors (PPIs) (lansoprazole), low dose aspirin, βblockers, angiotensin II receptor antagonists, nonsteroidal anti-inflammatory drugs (NSAIDs), selective serotonin reuptake inhibitors (SSRI), statins, and bisphosphonates have all been associated with MC Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

Mouth to anus Transmural

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

• Diagnosis histological evaluation through lower endoscopy. The histology found in MC (both CC and LC) demonstrates lymphocytic infiltration of the lamina propria and the epithelium. CC differs from LC in that there is marked thickening of the subepithelial layer. Intraepithelial lymphocytosis (IEL) can be found in both CC and LC, but is more pronounced in LC: ≥ 20 intraepithelial lymphocyte per 100 surface epithelial cells are needed to make the diagnosis • Both MC respond well to oral budesonide. • Prognosis is good with resolution of symptoms after medical therapy. • 38% of the patients achieve spontaneous remission with either no treatment or with simple anti-diarrheals. Histological features of collagenous colitis and lymphocytic colitis Collagenous colitis Lymphocytic colitis Lamina propria Lymphocytic infiltration of the lamina propria with little or no damage in mucosal architecture Subepithelial layer Thickening of subepithelial layer > 10 µm Subepithelial collagen layer not present or < 10 µm Intraepithelial Intraepithelial lymphocytosis could be present, but necessary for the diagnosis Intraepithelial lymphocytosis (≥ 20 IEL per 100 surface epithelial cells) • Management discontinue any potentially offending drug. mild and intermittent symptoms can be treated with anti-diarrheal medication (loperamide). moderate to severe symptoms: only budesonide has strong supporting evidence and should be the first-line treatment in inducing and maintaining clinical remission in both CC and LC Prednisone is an alternative corticosteroid that has shown some efficacy in treating MC. however it is less effective than budesonide.

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

Collagenous colitis
• Collagenous colitis is one of the forms of microscopic colitis, i.e. a condition in which the colon appears normal on colonoscopy, but where the diagnosis is made based on the abnormal histology of colonic biopsies.
• predominantly affects women (male: female of 1: 4) in the fifth and sixth decades of life.
• aetiology is unknown,
• although associated with
 several medications – in particular, non-steroidal anti-inflammatory drugs
 coeliac disease and other autoimmune disorders. • chronic watery diarrhoea (which tends to be worse during the day than at night), and is also often accompanied by crampy, diffuse abdominal pain.
• normal blood tests, radiological and macroscopic appearances.
• The diagnosis is made based on the typical histological appearances of a thickened subepithelial collagen band, a moderate inflammatory cell infiltrate, and an increase in intraepithelial lymphocytes. • Treatments include antidiarrhoeal agents (such as Loperamide), 5-aminosalicyclate drugs, corticosteroids, and bile acid sequestrants, all of which are variably effective.

Lymphocytic colitis
• Associations occur in patients with other forms of GI pathology, including Crohn’s and Coeliac.
 Sertraline also appears to be associated with the development of lymphocytic colitis.
• Management

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

 Withdrawal of the offending agent is preferable,
 loperamide is often used as a first line therapy to reduce the severity of diarrhoea, with cholestyramine an alternative if there is bile salt malabsorption. Other alternatives include immune modulating agents such as azathioprine, although a response to therapy may take many months to appear.

_Toxic megacolon (Toxic dilatation of the colon) DON’T GIVE ANTI-DIARRHEAL Rx FOR ACUTE COLLITIS TOXIC MEGACOLON

Flexible sigmoidoscopy is the best investigation - safer than colonoscopy (relative contraindication in active colitis), allowing biopsies to be taken and the viewing of a possible pseudomembrane. Occasionally the mucosa has a characteristic appearance.

• Usually associated with severe colitis. usually due to severe UC but also with Crohn's colitis and rarely ischaemic or infective colitis • The transverse or right colon is usually the most dilated part in toxic megacolon, often greater than 6 cm and occasionally up to 15 cm on supine films. Diagnostic criteria toxic megacolon transverse colon dilatation ≥ 6 cm + signs of systemic toxicity.

• Radiographic evidence of colonic distension
• plus at least three of the following: Fever >38.6°C Heart rate >120 beats per minute (The most reliable sign is the pulse rate) Neutrophilic leucocytosis >10.5 × 109/L, or Anaemia. • Plus, at least one of the following: Dehydration Altered mental status Electrolyte disturbances, or Hypotension. Investigation • The most helpful investigation is a plain abdominal X-ray.

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

 Radiological colonic dilatation - widest diameter ≥ 6 cm in the transverse colon. Other radiological findings include: loss of haustral pattern, mucosal oedema and thumbprinting. Treatment The treatment of choice for established dilatation is colectomy. • Treatment includes 3 main goals:

1. reduce colonic distention to prevent perforation (5-fold increase in mortality after free perforation) Rolling techniques (knee-elbow and prone) may be performed to assist in redistribution of colonic gas and decompression Medical treatment: antibiotics to cover the colonic bacterial flora, gram-negative and anaerobic bacteria steroids: either hydrocortisone 100 mg IV every 6 hours or methylprednisolone 60 mg IV every 24 hours is acceptable. The latter has greater relative anti-inflammatory potency and less relative mineralocorticoid potency. cyclosporine may be effective colectomy: Most authors recommend colectomy if persistent dilatation is present or if no improvement is observed on maximal medical therapy after 24-72 hours.
2. correct fluid and electrolyte disturbances fluid replacement, electrolyte repletion, and transfusion should be aggressive.
3. treat toxemia and precipitating factors. Broad-spectrum (IV) antibiotics with coverage equivalent to ampicillin, gentamicin, and metronidazole should be initiated. Possible triggers for TM should be stopped, including: narcotics antidiarrheals anticholinergics Prognosis • The mortality rate for non-perforated, acute toxic colitis is about 4%; if perforation occurs, the mortality is approximately 20%. Gastroenteritis and food poisoning Radiation enteritis Overview • Radiation injury to the rectum and sigmoid colon is commonly seen following treatment of cancers of the cervix, uterus, prostate and bladder. • It often occurs 9–14 months following radiation exposure and results in a chronically ischaemic intestinal segment that may lead to stricture. • Symptoms include diarrhoea, obstructed defecation, bleeding, rectal pain or urgency.

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

Diagnosis
• can be confirmed with colonoscopy, and mucosal features consistent with radiation injury include pallor, friability and telangiectasias.
• Biopsy is not diagnostic but is helpful to exclude other causes.

Treatment • systemic review of available trials shows promising results for rectal sucralfate and metronidazole combined with topical anti-inflammatory treatment and heater probe.

Gastroenteritis

Travellers' diarrhoea
• defined as at least 3 loose to watery stools in 24 hours with or without one of more of abdominal cramps, fever, nausea, vomiting or blood in the stool. • The most common cause is Escherichia coli • Ciprofloxacin is recommended for first line antibiotic therapy (when needed) before stool culture results are available.

Acute food poisoning • Sudden onset of nausea, vomiting and diarrhoea after the ingestion of a toxin. • typically caused by Staphylococcus aureus, Bacillus cereus or Clostridium perfringens. • Clostridium perfringens:
 a Gram-positive, rod shaped, anaerobic, spore-forming bacterium.
 The spores can withstand (مواقير) cooking temperatures, so if food (meat and poultry) is left to stand for a long time, germination of spores can occur, causing food poisoning.
 The CPE (clostridium perfringens enterotoxin) can be detected in food that has been improperly prepared.
 Clostridium perfringens can also cause gas gangrene, a necrosis of tissues with gas production. The toxin responsible for gas gangrene is called alphatoxin. • reservoir for this pathogen Vibrio species are most commonly found in seafood (Fish), are commashaped, and prefer alkaline media.
 Improperly canned foods are reservoirs for Clostridium botulinum. This is an anaerobic gram-positive organism that creates spores. If the can is bulging, it is probably contaminated and should not be eaten. Honey can be a reservoir for Clostridium botulinum. Newborn babies are at risk for contracting spores from eating honey since their immune systems are poorly developed. This can lead to “floppy baby” syndrome. Meats, mayonnaise, custard and other cream-based dishes are food sources commonly associated with Staphylococcus aureus food poisoning.

Diarrhoea
• Osmotic diarrhoea occurs in patients with diabetes who ingest too much sorbitol (a common substitute for glucose in so-called 'diabetic foods'.
• Secretory diarrhoea commonly occurs in response to endotoxin-producing bacteria, (eg cholera or Escherichia coli).

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

• Chronic radiation enteritis is diagnosed if diarrhoea and abdominal pain persist for 3 or more months following irradiation.

Stereotypical histories Infection Typical presentation Escherichia coli Common amongst travellers Watery stools Abdominal cramps and nausea Giardiasis Prolonged, non-bloody diarrhoea Cholera Profuse, watery diarrhoea Severe dehydration resulting in weight loss Not common amongst travellers Shigella Bloody diarrhoea Vomiting and abdominal pain Staphylococcus aureus Severe vomiting Short incubation period Campylobacter commonest cause of bacterial gastroenteritis in

the UK
A flu-like prodrome is usually followed by crampy abdominal pains (often a prominent feature), 'pseudoappendicitis' (RIF pain), fever and diarrhoea which may be bloody. Treatment: • the most appropriate therapy IV fluids
• most units advocate no antibiotic treatment. • Antibiotic of choice in this infection is erythromycin, though ciprofloxacin and tetracycline may also be appropriate. Complications include Guillain-Barre syndrome Salmonella • After Campylobacter, Salmonella is the most commonly isolated bacterial pathogen when laboratory diagnosis of diarrhea is sought. • acute onset of fever, diarrhea, and cramping • antibiotic treatment of patients with nontyphoidal salmonellosis may actually prolong, rather than limit, fecal shedding of these organisms. • the likely sources are poultry (دواجن) and eggs. Bacillus cereus Two types of illness are seen • vomiting within 6 hours, stereotypically due to rice • diarrhoeal illness occurring after 6 hours Amoebiasis Gradual onset bloody diarrhoea, abdominal pain and tenderness which may last for several weeks Incubation period • 1-6 hrs: Staphylococcus aureus, Bacillus cereus* • 12-48 hrs: Salmonella, Escherichia coli • 48-72 hrs: Shigella, Campylobacter

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

•

> 7 days: Giardiasis, Amoebiasis Amoebic dysentery
> • Acute amoebic dysentery is managed with:

1. a course of oral metronidazole or tinidazole,
2. followed by a ten day course of diloxanide to eradicate colonisation of the gut. • Amoebic liver abscess may appear at any time from eight weeks after infection, and presents with night sweats, anorexia and right upper quadrant pain. • mortality from amoebiasis is less than 1%.

Biochemical abnormalities in persistent vomiting • persistent vomiting ↓↓ gastric hydrochloric acid hypochloraemia and metabolic Alkalosis
• In the early stages the urine has low chloride and high bicarbonate levels in order to compensate for the loss of gastric hydrochloric acid and is appropriately alkaline.
• With the continued dehydration, sodium is preferentially reabsorbed over the potassium and hydrogen ions which are excreted by the kidneys.
• The urine becomes paradoxically acidic, hypokalaemia develops, and alkalosis leads to lower circulating levels of ionised calcium.

To quickly remember the PH changes associated with GI losses, think:
• With vomiting, both the PH and food come up. • With diarrhoea, both the PH and food go down.

Giardiasis

Pathogenesis
• Giardiasis is caused by the flagellate protozoan Giardia lamblia.
• Giardia lamblia is capable of causing epidemic or sporadic diarrheal illness.
• It has two morphological forms: cysts and trophozoites. Cysts are the infectious form of the parasite; following cyst ingestion, trophozoites are released in the proximal small intestine. Trophozoites that do not adhere to the small intestine move forward to the large intestine where they revert to the infectious cyst form; these cysts are passed back into the environment in excreted stool. • Transmission: via the faeco-oral route.
• The incubation period is 1-2 weeks. Feature • Often asymptomatic
 ≈ 50% clear the infection without symptoms ≈ 15% shed cysts asymptomatically (carriers) • Symptomatic infection ≈ 35% lethargy, bloating, abdominal pain non-bloody diarrhoea malabsorption and acquired lactose intolerance can occur → chronic diarrhoea, steatorrhoea & weight loss

Diagnosis • stool microscopy
 initial investigation, but frequently not positive , need 3 samples, 2- 3 days apart as cyst and trophozoites are shed intermittently

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

• Stool antigen tests: immunoassays (eg: ELISA) using antibodies against cyst or trophozoite antigen
 the best test for giardia more sensitive and faster than stool microscopy.
• duodenal samples for microscopy: can be obtained by: the 'string test' (swallowing a gelatin capsule on a string) endoscopy → duodenal aspirates or biopsy.

Treatment • Antiprotozoal (tinidazole, nitazoxanide or metronidazole) Metronidazole has been the first-line; however, a single-dose tinidazole is superior and the best treatment now (shorter course and fewer side effects) • For pregnant: 1st trimester → paromomycin (Non-absorbable aminoglycoside) 2nd & 3rd trimester → either paromomycin or metronidazole

---

Clostridium perfringens The food poisoning with Colicky abdominal pain and diarrhoea without vomiting after incubation period between 9-13 hours is typical of Clostridium perfringens.

Bacillus cereus typical case of Bacillus cereus, profuse vomiting occurs one to five hours after eating (rice).

• B.cereus can cause two patterns of disease:

1. classic emetic form: caused by the ingestion of toxin
    Characterised by nausea and vomiting, similar to Staphylococcus aureus.
    Rice products are generally the cause of this form.

2. diarrhoeal form: less common
    Caused by the ingestion of the organism, which releases toxin within the stomach. Produce an illness similar to C. perfringens (but the incubation period is classically shorter (1-6 hours) with watery diarrhoea and abdominal cramps.
    Meats, milk, vegetables and fish have been associated with this form.

Shigella • causes bloody diarrhoea, abdominal pain • severity depends on type: S sonnei (e.g. from UK) may be mild, S flexneri or S dysenteriae from abroad may cause severe disease • treat with ciprofloxacin • Reactive arthritis and Reiter's syndrome can develop following infection with a number of enteric pathogens including Shigella, Salmonella, Campylobacter and Yersinia.

Yersinia enterocolitica
• gram-negative bacillus • the second most common cause of bacterial gastrointestinal infection in children. • most frequently associated with enterocolitis, acute diarrhea, terminal ileitis, mesenteric lymphadenitis and pseudoappendicitis

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

• Pseudoappendicitis syndrome is more common in older children and young adults. • Enterocolitis, the most common presentation of Y enterocolitica, occurs primarily in young children, Most cases are self-limited. • Y enterocolitica is potentially transmitted by contaminated unpasteurized milk and milk products, raw pork, tofu, meats, oysters, and fish. • The usual presentation of Y enterocolitica infection includes diarrhea (the most common clinical manifestation of this infection), low-grade fever, and abdominal pain lasting 1-3 weeks. Diarrhea may be bloody in severe cases. Vomiting is present in approximately 1540% of cases • Stool culture is the best way to confirm the diagnosis • Ultrasonography or computed tomography (CT) scanning may be useful in delineating true appendicitis from pseudoappendicitis • Complications After an incubation period of 4-7 days, infection may result in mucosal ulceration (usually in the terminal ileum and rarely in the ascending colon), necrotic lesions in Peyer patches, and mesenteric lymph node enlargement.
 In persons with human leukocyte antigen (HLA)–B27, reactive arthritis is not uncommon, possibly because of the molecular similarity between HLA-B27 antigen and Yersinia antigens.
• First-line drugs used against the bacterium include aminoglycosides and trimethoprimsulfamethoxazole (TMP-SMZ). Other effective drugs include third-generation cephalosporins, tetracyclines (not recommended in children < 8 y), and fluoroquinolones (not approved for use in children < 18 y).

• Yersinia pestis is the causative agent of the plague. • Yersinia bacteria has an ability to survive, and actively proliferate at temperatures as low as 1–4°C (e.g., on food products in a refrigerator).
• Yersinia is one of the causes of reactive arthritis
• Yersinia may be associated with Crohn's disease Iranian sufferers of Crohn's disease were more likely to have had earlier exposure to refrigerators at home, consistent with its unusual ability to thrive at low temperatures. • Which bacteria can multiply and produce endotoxin even in

refrigerated blood? Yersinia it is a prominent cause of life-threatening post-transfusion infection. Endotoxins can result in septic shock

---

Gastrointestinal parasitic infections Common infections Organism Notes Enterobiasis • Due to organism Enterobius vermicularis • Common cause of pruritus ani • Diagnosis usually made by placing scotch tape at the anus, this will trap eggs that can then be viewed microscopically • Treatment is with mebendazole Ancylostoma duodenale • Hookworms that anchor in proximal small bowel • Most infections are asymptomatic although may cause iron deficiency anaemia • Larvae may be found in stools left at ambient temperature, otherwise infection is difficult to diagnose

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

Organism Notes • Infection occurs as a result of cutaneous penetration, migrates to lungs, coughed up and then swallowed • Treatment is with mebendazole Ascariasis • Due to infection with roundworm Ascaris lumbricoides • Infections begin in gut following ingestion, then penetrate duodenal wall to migrate to lungs, coughed up and swallowed, cycle begins again • Diagnosis is made by identification of worm or eggs within faeces • Treatment is with mebendazole Strongyloidiasis • Due to infection with Strongyloides stercoralis • Rare in west • Organism is a nematode living in duodenum of host • Initial infection is via skin penetration. They then migrate to lungs and are coughed up and swallowed. Then mature in small bowel are excreted and cycle begins again • An auto infective cycle is also recognised where larvae will penetrate colonic wall • Individuals may be asymptomatic, although they may also have respiratory disease and skin lesions • Diagnosis is usually made by stool microscopy • In the UK mebendazole is used for treatment Cryptosporidium • Protozoal infection • Organisms produce cysts which are excreted and thereby cause new infections • Symptoms consist of diarrhoea and cramping abdominal pains. Symptoms are worse in immunosuppressed people • Cysts may be identified in stools • Treatment is with metronidazole Giardiasis • Diarrhoeal infection caused by Giardia lamblia(protozoan) • Infections occur as a result of ingestion of cysts • Symptoms are usually gastrointestinal with abdominal pain, bloating and passage of soft or loose stools • Diagnosis is by serology or stool microscopy • First line treatment is with metronidazole

---

Exotoxins and endotoxins Definition • Exotoxins are secreted by bacteria whereas endotoxins are only released following lysis of the cell.
Exotoxins
• Exotoxins are generally released by Gram positive bacteria with the notable exceptions of Vibrio cholerae and some strains of E. coli • It is possible to classify exotoxins by their primary effects: pyrogenic toxins enterotoxins neurotoxins tissue invasive toxins miscellaneous toxins

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

Pyrogenic toxins • Pyrogenic toxins stimulate the release of endogenous cytokines resulting in fever, rash etc.
• They are super-antigens which bridge the MHC class II protein on antigen-presenting cells with the T cell receptor on the surface of T cells resulting in massive cytokine release. Organism Toxin Notes Staphylococcus aureus Toxic shock syndrome (TSST-1 superantigen) toxin Results in high fever, hypotension, exfoliative rash Streptococcus pyogenes Streptococcal pyrogenic exotoxin A & C Results in scarlet fever Enterotoxins • Enterotoxins act on the gastrointestinal tract causing one of two patterns of illness: diarrhoeal illness vomiting illness ('food poisoning') Organism Toxin Notes Vibrio cholerae Cholera toxin Causes activation of adenylate cyclase (via Gs) leading to increases in cAMP levels, which in turn leads to increased chloride secretion and reduced sodium absorption Shigella dysenteriae Shiga toxin Inactivates 60S ribosome → epithelial cell death Escherichia coli

1. Heat labile toxin
2. Heat stabile toxin
3. Activates adenylate cyclase (via Gs), increasing cAMP → watery diarrhoea
4. Activates guanylate cyclase, increasing cGMP → watery diarrhoea Staphylococcus aureus Staphylococcus aureus enterotoxin Vomiting and diarrhoeal illness lasting < 24 hours Bacillus cereus Cereulide Potent cytotoxin that destroys mitochondria. Causes a vomiting illness which may present within 4 hours of ingestion

Neurotoxins • Neurotoxins act on the nerves (tetanus) or the neuromuscular junction (botulism) causing paralysis.

Organism Toxin Notes Clostridium tetani Tetanospasmin Blocks the release of the inhibitory neurotransmitters GABA and glycine resulting in continuous motor neuron activity → continuous muscle contraction → lockjaw and respiratory paralysis

Clostridium botulinum Botulinum toxin Blocks acetylcholine (ACh) release leading to flaccid paralysis

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad

Tissue invasive toxins

Organism Toxin Notes Clostridium perfringens α-toxin, a lecithinase Causes gas gangrene (myonecrosis) and haemolysis Staphylococcus aureus Exfoliatin Staphylococcal scalded skin syndrome

Miscellaneous toxins Organism Toxin Notes Corynebacterium diphtheriae Diphtheria toxin ADP ribosylates elogation factor (EF-2), resulting in inhibition, causing a 'diphtheric membrane' on tonsils caused by necrotic mucosal cells. Systemic distribution may produce necrosis of myocardial, neural and renal tissue Pseudomonas aeruginosa Exotoxin A Also inhibits EF-2 by the same mechanism as above Bacillus anthracis Oedema factor (EF) Forms a calmodulin-dependent adenylate cyclase which increases cAMP, impairing the function of neutrophils/macrophages → reduced phagocytosis Bordetella pertussis Pertussis exotoxin Inhibits Gi leading to increases in

cAMP levels, impairing the function of neutrophils/macrophages → reduced phagocytosis

Endotoxins • Endotoxins are lipopolysaccharides that are released from Gram-negative bacteria such as Neisseria meningitidis.

Pseudomembranous colitis (Clostridium difficile)

Pathogen
• Clostridium difficile is a Gram-positive anaerobic rod • It produces an exotoxin which causes intestinal damage leading to a syndrome called pseudomembranous colitis. Causes
• Clostridium difficile develops when the normal gut flora are suppressed by broad-spectrum antibiotics.
 Clindamycin is historically associated with causing Clostridium difficile but the aetiology has evolved significantly over the past 10 years.
 Second and third generation cephalosporins are now the leading cause of Clostridium difficile. penicillins and quinolones.

Features • Symptoms can occur up to 10 weeks following antibiotic therapy. • Diarrhoea

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

 The commonest symptoms
 profuse watery diarrhoea (usually without blood or mucus) • abdominal pain • a raised white blood cell count is characteristic • if severe toxic megacolon may develop

Severity of C. difficile infection • Mild infection: ˂ 3 episodes of loose stools per day, no ↑WCC.
• Moderate infection: 3 to 5 loose stools per day, WCC ˂15 × 109 per litre.
• Severe infection:
 WCC ˃15 × 109 per litre,
 Acutely ↑CRP ˃50% above baseline, Temperature ˃38.5
 Evidence of severe colitis (abdominal or radiological signs), lactic acidosis The number of stools may be a less reliable indicator of severity. • Life-threatening infection: hypotension, partial or complete ileus, toxic megacolon or CT evidence of severe disease.

Diagnosis
• Clostridium difficile toxin (CDT) in the stool (the most widely used diagnostic tool).
• ELISA tests are specific but not as sensitive.
• Culture is sensitive but often does not differentiate between toxigenic and non-toxigenic strains.
• Sigmoidoscopy may show → multiple white plaques adhered to the gastrointestinal mucosa (pathognomonic). 90% of cases can be detected macroscopically by flexible sigmoidoscopy mild cases may not be evident macroscopically → microscopic examination of a biopsy sample Toxic dilatation should be excluded prior to sigmoidoscopy by doing plain abdominal x-ray. not used routinely • Plain AXR is useful for diagnosing toxic dilatation would be the investigation of

choice if there is abdominal distension.
 To exclude toxic dilatation prior to sigmoidoscopy.
 However it does not establish the diagnosis.

Management

Antibiotic treatment for Clostridium difficile (NICE guideline/July 2021) Treatment Antibiotic First-line for a first episode of mild, moderate or severe C. difficile infection Vancomycin:125 mg orally four times a day for 10 days Second-line for a first episode of mild, moderate or severe C. difficile infection if vancomycin is ineffective Fidaxomicin: 200 mg orally twice a day for 10 days Third-line: if first- and second-line are ineffective Vancomycin: Up to 500 mg orally four times a day for 10 days With or without Metronidazole:

500 mg intravenously three times a day for 10 days For relapse: (a further episode of C. difficile infection within 12 weeks of symptom resolution) Fidaxomicin: 200 mg orally twice a day for 10 days For recurrence: (a further episode of C. difficile infection more than 12 weeks after symptom resolution) Vancomycin:125 mg orally four times a day for 10 days Or Fidaxomicin: 200 mg orally twice a day for 10 days For life-threatening C. difficile infection
(Need urgent surgical assessment) Vancomycin: 500 mg orally four times a day for 10 days With Metronidazole: 500 mg intravenously three times a day for 10 days

• Do not offer antimotility medicines such as loperamide. • For a recurrent episode (2 or more previous episodes) → Consider a faecal microbiota transplant. Prognosis • Mortality is high in elderly patients it may be as high as 10%

Top tips

The main Clostridium species
• Clostridium botulinum: produce botulinum toxin in food or wounds and can cause botulism. This same toxin is known as Botox and is used in cosmetic surgery to paralyze facial muscles to reduce the signs of aging; it also has numerous other therapeutic uses. • Clostridium difficile can flourish when other gut flora bacteria are killed during antibiotic therapy, leading to pseudomembranous colitis
• Clostridium perfringens causes food poisoning to cellulitis, fasciitis, and gas gangrene. • Clostridium tetani causes tetanus. • Clostridium sordellii can cause a fatal infection in exceptionally rare cases after medical abortions

---

Gastroenteritis (GI)

Causes
• Viral: Most common causes of GI. norovirus is the most common cause of acute gastroenteritis and the second most common cause of hospitalisation for acute gastroenteritis.
 Characteristics of the history that suggest a viral aetiology of acute gastroenteritis include:

intermediate incubation period (24–60 h), short infection duration (12–60 h) and high frequency of vomiting.
• Amoebiasis: caused by Entamoeba histolytica (an amoeboid protozoan)
 10% of the world's population is chronically infected.
 can be asymptomatic, may cause mild diarrhoea

Notes & Notes for MRCP
By Dr. Yousif Abdallah Hamad Chapter 3

Gastroenterology

 amoebic dysentery →profuse, bloody diarrhoea, stool microscopy may show trophozoites treatment by metronidazole Complication → Amoebic liver abscess usually a single mass in the right lobe (may be multiple) features: fever, RUQ pain serology positive in > 90%

Scombrotoxin food poisoning
• Caused by the ingestion of foods that contain high levels of histamine and possibly other vasoactive amines and compounds. • Histamine and other amines are formed by the growth of certain bacteria and the subsequent action of their decarboxylase enzymes on histidine and other amino acids in food, by spoilage of foods such as; fishery products, particularly tuna or mahi mahi. dark meat fish such as tuna, mackerel and marlin. The most common cause of scombroid poisoning is due to ingestion of spoiled fish following inadequate refrigeration or prolonged time at room temperature. Cooking does not inactivate the toxin/histamines. • Incubation period 10-60 minutes. • Feature The symptoms are due to ingestions of amines, predominantly histamines, produced by bacterial decarboxylation of histidine in fish meat. Onset is usually 10-30 minutes post-ingestion of the implicated fish but a delayed onset may occur up to two hours. Patients with pre-existing conditions such as bronchial asthma, and those taking isoniazid (a histaminase inhibitor) may be more symptomatic. Presented with diarrhoea, flushing, sweating and a hot mouth, minutes after eating Urticarial rash, Bronchospasm Treatment • usually self-limiting • In severe cases, symptoms respond rapidly to antihistamines, for example, chlorpheniramine and intravenous cimetidine by slow intravenous injection over at least five minutes.

Perforated viscus the most appropriate next step in making the diagnosis abdominal CT scan

Ascitic fluid is normally sterile and any growth of organisms is indicative of infective pathology. Mixed growth suggests a large communication of micro-organisms into the abdominal cavity, which makes perforation the most likely cause.

• Ascitic fluid analysis:
 very bloody ascites
 secondary bacterial peritonitis
 very inflammatory (very high neutrophil count)
 exudate (low serum albumin ascites gradient - <11 g/L).
 Gram stain demonstrates multiple bacteria.
• X-ray

- distended bowel loops (dilated, oedematous)

Revision #1
Created 2026-01-06 17:51:27 UTC by Omar Ayman
Updated 2026-01-06 17:51:28 UTC by Omar Ayman