PATHOLOGY
TEAM 436

MEDICINE
KING SAUD UNIVERSITY

Revision Questions

- Black: Doctor's slides & answers
- Red: Questions!

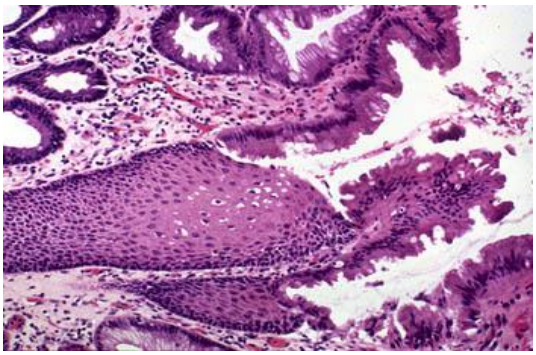
Peptic Ulcer and GERD

CASE1

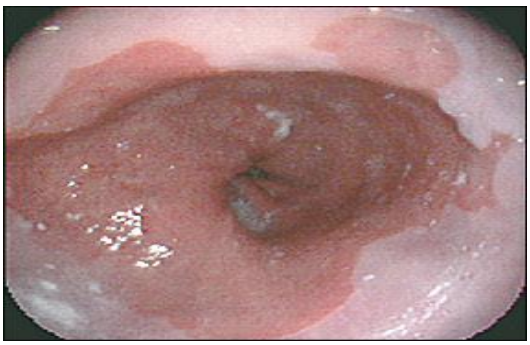
A 57-year-old presents with a history of a retrosternal burning sensation, particularly after large meals, and often on retiring to bed at night. Treatment with antacids has had little effect and he has been referred for endoscopy.

Upper gastrointestinal tract endoscopy reveals reddening of the lower esophageal mucosa

There is no evidence of a hiatus hernia. The proximal border of the reddened area is irregular, and this area is biopsied.



The biopsy shows intestinal-type glandular mucosa.



1. What is the likely cause of the symptoms?

- The symptoms of 'heartburn' are suggestive of gastroesophageal reflux disease (GORD), with or without the presence of a hiatus hernia. Other important causes of retrosternal pain should not be overlooked, including cardiovascular causes, especially myocardial ischaemia, as well as other rarer causes including pneumothorax and musculoskeletal pain.

2. What is you final diagnosis?

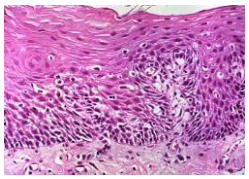
- The endoscopic and biopsy appearances confirm a Barrett's oesophagus. This is a metaplastic process which develops as a result of persistent reflux of gastric contents into the esophagus, the normal squamous mucosa being replaced by glandular mucosa of intestinal type.

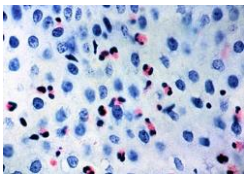
3. What further information do you require from the biopsy report?

- It is important to look for dysplastic change in the biopsy which may herald the development of adenocarcinoma

CASE2

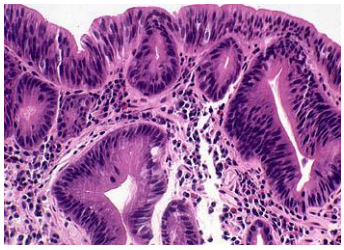
The patient is a 51-year-old white man who presented 10 years before surgery with a history of heartburn, regurgitation, and epigastric pain. Endoscopy was performed, and a large erythematous area involving the distal esophagus was noted. Biopsy specimens were taken



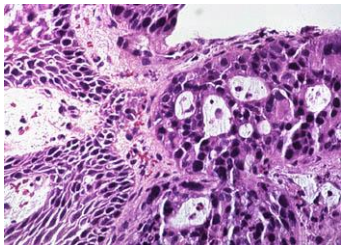


- The patient was treated with antireflux drugs and given a follow-up appointment in 1 year. The patient returned 3 years later, complaining of dysphagia, heartburn, and epigastric pain. Endoscopy was performed again and revealed that the normal white squamous mucosa lining the distal esophagus was replaced by pink mucosa. Biopsy specimens were taken.

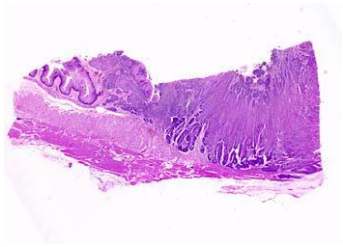
Because of the diagnosis of Barrett esophagus, the patient was enrolled in a surveillance program, and yearly endoscopic procedures were recommended. Endoscopy showed extensive Barrett esophagus 6 years before surgery, and biopsy specimens showed features of DYSPLASIA.



He failed to return for subsequent surveillance endoscopy. The patient was admitted with increasing dysphagia 1 month before surgery. An upper GI series (radiographs) revealed distal narrowing of the esophagus. Endoscopic examination of the esophagus revealed an ulcerating mass in the distal esophagus. A biopsy specimen was obtained.



The patient was taken to surgery, where an esophagogastrectomy was performed.



CASE3

A 49-year-old secretary presents to medical outpatients with a 7-month history of epigastric pain. She has been treated with antacids by her GP, but this has not controlled the symptoms. In the clinic, she complains of epigastric pains which are sharp and burning and radiate her subcostal margin to the right. The pain is worse at night and is relieved by food. On examination, there is epigastric tenderness and clinical signs of anaemia.

1. What is the possible cause of this clinical presentation?

- Duodenal Peptic ulceration

2. What are the predisposing causes?

- H PYLORI INFECTION
- ACID HYPERSECRETION

3. What are the major complications?

- The major complication is perforation of a vessel with subsequent gastro-intestinal hemorrhage. This can present as either hematemesis, melena or iron deficiency anemia. Other complications include fibrosis and adhesions.

4. What investigations should be performed?

- Endoscopy

5.What is the treatment?

- Proton pump inhibitors.
- H^2 receptor antagonists.
- *H. pylori eradication therapy*

CASE4

The patient is a 72-year-old white man with a history of homelessness, chronic obstructive pulmonary disease, chronic alcohol abuse, chronic dementia, and **multiple episodes of upper GI bleeding**.

He was admitted to the hospital with complaints of **dizziness**, **syncope, and abdominal pain**.

The abdominal examination revealed **mild epigastric pain** on palpation.

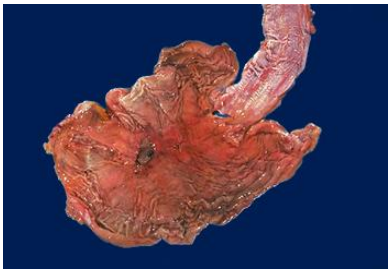
The rectal examinations…… black stool.

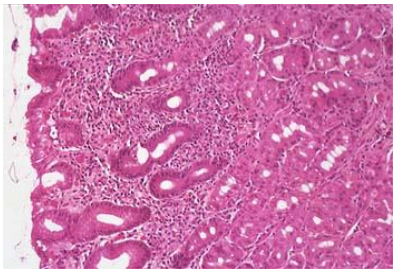
The patient was admitted to the medical intensive care unit, where a **nasogastric tube** lavage produced **coffee-ground gastric contents** that tested **positive** for blood. He was transfused with 6 U of packed RBCs, which increased his hematocrit to 38% (normal 40% to 52%).

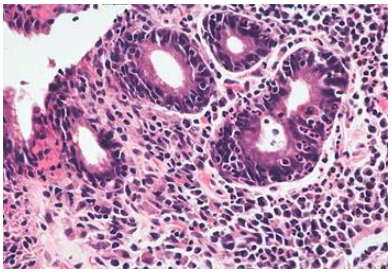
TEST	RESULT
Hemoglobin	4.1 gm/dL
Hematocrit	12.9%
Albumin	2.6 gm/dL
WBC	11,900/mm^3
Ethanol	<10 mg/dL (normal: <10mg/dL)

What is your next step?

- An upper GI tract endoscopy was performed, which showed a **large (5 _ 5 cm) gastric ulcer** in the antrum along the lesser curvature. Biopsy specimens were taken of the ulcers and surrounding mucosa.







Q1:A 52-year-old male presents with epigastric pain that improves with meals. Endoscopy demonstrates a 2 Cm ulcerated area located 3 cm distal to the pyloric junction. Which of the following is most likely to have made the strongest contribution to the development of this disease?

A.Aspirin use

B. Chronic antacid use

C. Drinking alcohol

D. Helicobacter pylori infection

Explanation :

- The correct answer is D. The patient has a duodenal peptic ulcer. The strongest risk factor for duodenal peptic ulcer is Helicobacter pylori infection, which is found in almost 100% of these cases (contrast to 70% Infection rate in gastric peptic ulcer).
- Aspirin use (choice A) and ethanol use (choice C) are more strongly implicated in gastric ulcer disease than duodenal ulcer disease.
- Chronic antacid use (choice B) is seen as a result of peptic ulcer disease, not as a cause of it.
- Smoking (choice E) may also be a lesser contributing factor to the development of peptic ulcer.

Q2:All of the following are causes of acute peptic ulcer except

A. Severe burns
B. Helicobacter pylori infection
C. Major trauma
D. Zollinger-Ellison syndrome

Q3:All of the following are Defensive Factors against gastric ulcer development except:

A. Mucus
B. Bicarbonate
C. Bile salts
D. Prostaglandins
E. Phospholipid

ANSWERS: 1=D | 2=B | 3=C

Match

1) H. pylori
2) Phospholipid
3) Drugs (NSAIDs)
4) Mucus
5) bicarbonate
6) Blood flow
7) Acid
8) pepsin
9) Bile salts
10) cell renewal
11) Prostaglandins

B. Defensive Factors

1,3,7,8,9.

A. Aggressive Factors

2,4,5,610,11.

Malabsorption

CASE1

A 44 year-old man is admitted to the hospital with an acute upper GI bleed due to several gastric and duodenal ulcers seen on an urgent upper endoscopy. One of the duodenal ulcers in the 3rd portion of the duodenum. The patient also complains of a 1 year history of frequent non-bloody diarrhea. A fecal osmotic gap is very low.

1. What type of chronic diarrhea does this patient have?

- Secretory.

2. What is the most likely cause?

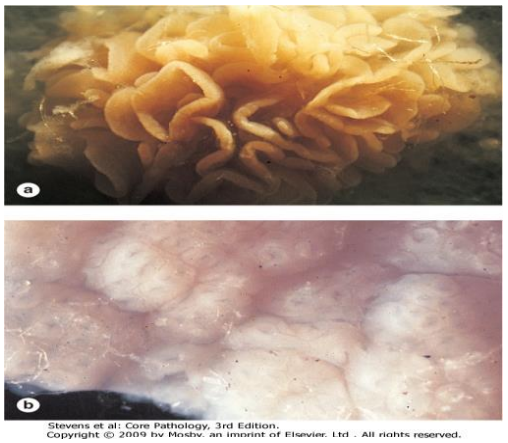
- Zollinger-Ellison syndrome due to a gastrinoma.

3. What is the mechanism to explain the diarrhea?

- Acid inactivation of pancreatic enzymes and bile salts
- Excess intestinal fluid.

4. What blood test can you check to make the diagnosis?

- Gastrin level.



Endoscopy Findings of malabsorption.

Picture A is normal.

CASE2

A 10-month-old, previously healthy male infant develops a severe, watery diarrhea 2 days after visiting the pediatrician for a routine checkup.

1. The most likely diagnosis is

a. Rotavirus infection
b. Enterotoxigenic *E. coli infection*
c. *Entamoeba histolytica infection*
d. Lactase deficiency
e. Ulcerative colitis

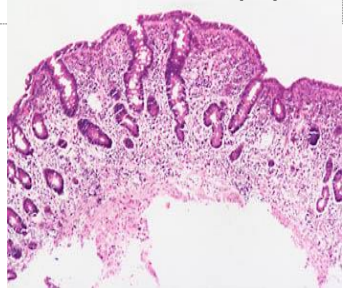
CASE3

A 44-year-old white male presented with a seven-month history of diarrhea. The frequency of his bowel movements had increased to 5-7 per day, and his stools were yellow and floated at the top of the water in the toilet. He had occasional abdominal cramping, but no tenesmus, melena, or bleeding. His appetite was good, but he had experienced gradual weight loss. His bowel movement frequency would decrease upon fasting and would increase with food intake.

Stool tests revealed a stool output of 4128 g/d (nl 100-200 g/d) with fat excretion of 17 g/d (nl <5 g/d).

Microscopic examination for ova and parasites and cultures for bacterial pathogens and acid-fast bacilli were negative.

Duodenal Biopsy.



1. Exposure to what dietary antigen is thought to be the cause of these changes?

Exposure to gluten (specifically, the gliadin constituent of this protein)

2. What food components contain this antigen?

Wheat, barley, flour, and possibly oats contain gluten.

3. Would these histologic changes resolve with dietary modification?

Yes.

CASE4

A 6-year-old boy has been brought to outpatients by his mother because he has abdominal pain after some meals. This has been getting increasingly frequent and it sounds, from his description, somewhat colicky in nature. You discover that he has always had very smelly, loose, pale bulky stools, which his parents have put down to the fact that he likes milk. On examination, he is pale, underweight, and of short stature.

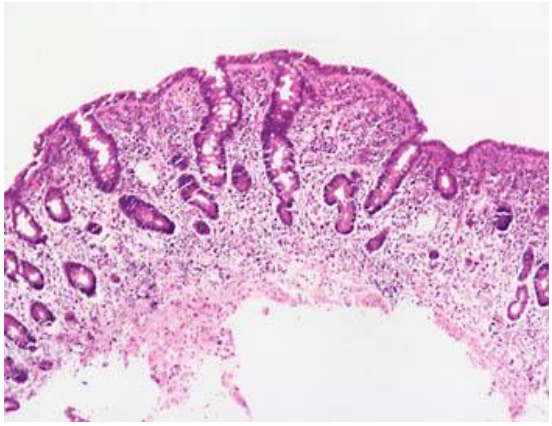
What are the important differential diagnoses on presentation?

Celiac disease is the most likely diagnosis. Parasitic infection (e.g. giardiasis) and pancreatic insufficiency (e.g. due to chronic pancreatitis or cystic fibrosis) may give rise to a similar presentation, but these are not supported by the results of the investigations.

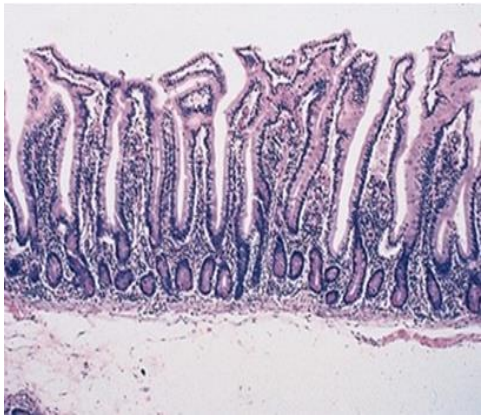
Blood tests reveal a mild macrocytic anemia. There is a low level of vitamin B12, and folate is at the lower end of normal. Autoantibody screens reveal a positive reaction to antigliadin antibodies. Do these tests help to narrow down the diagnosis?

These results are very suggestive of celiac disease due to the low levels of vitamin B^{12} and the hypersensitivity reaction to α-gliadin, a component of gluten. The finding of villous atrophy would support the diagnosis, and this is achieved by endoscopic biopsy of the first part of the duodenum.

The final diagnosis is celiac disease, provided the patient's symptoms respond to a gluten-free diet and the histological changes relapse on re-challenge. Such criteria are necessary before confining a patient to a lifelong gluten-free diet.



Duodenal Biopsy VS Normal Biopsy



1. What treatment options are available?

Treatment is by adhering to a strict gluten-free diet.

Lactose intolerance

Pathophysiology of Lactose Intolerance:

Lactose is Metabolized into Glucose + Galactose **BY** Lactase enzyme ***AT*** the brush border of enterocytes.
Lactose Intolerance describes having low or absent activity of the lactase enzyme.
In lactose Intolerance, the lactose is mixed with water in the small intestine, then the bacteria ferment this compound creating gases, organic acids & other osmotically active molecules which in turn cause irritation & increase of motility.

Causes Of lactose intolerance:

1. Congenital Lactase deficiency: Extremely rare.
2. Childhood-onset and adult-onset lactase deficiency: more common and genetically programmed progressive loss of the activity of the small intestinal lactase enzyme.
3. Acquired Lactase Deficiency: Transient. Secondary lactase deficiency due to intestinal mucosal injury by an infectious, allergic, or inflammatory process. Eg, Gastroenteritis: infectious diarrhea, particularly viral gastroenteritis in younger children may damage the intestinal mucosa enough to reduce the quantity of the lactase enzyme.

Diagnosis of Lactose intolerance:

Empirical treatment with a lactose-free diet, which results in resolution of symptoms.
Hydrogen breath test.
Treatment: Lactose-free diet.

Diarrhea

CASE1

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Q1: A 44 yesr-old man is admitted to the hospital with acute upper GI bleed due to several gastric and duodenal ulcers seen on an urgent upper endoscopy. One of the duodenal ulcers is in the 3rd portion of the duodenum. The patient also complains of a year history of frequent non-bloody diarrhea. A fecal osmotic gap is very low

1. What type of chronic diarrhea does this patient have?

- Secretory (due to low osmotic gap + non-bloody diarrhea)

2. What is the most likely cause?

Zollinger-Ellison syndrome due to a gastrinoma (that stimulate gastrin which lead to increase acid secretion causing hyperacidity)

3. What is the mechanism to explain diarrhea?

- Acid inactivation of pancreatic enzyme and bile salts
- Excess intestinal fluid

4. What blood test can you check to make the diagnosis?

Gastrin level (also X-Ray or CT Scan)

Q2: A 10-month-old, previously healthy male infant develops a severe, watery diarrhea 2 days after visiting the pediatrician for a routine checkup. The most likely diagnosis is:

A) Rotavirus infection

B) Enterotoxigenic E. coli infection

C) Entamoeba histolytica infection

D) Lactase deficiency

E) Ulcerative colitis

ANS:A

Q3: What are the complications of diarrhea?

1. Fluids loss → Dehydration.
2. Electrolytes loss → Electrolytes imbalance
3. Sodium bicarbonate loss → Metabolic acidosis.
4. If persistent → Malnutrition.

Q4: match the correct answers

A	B
1.Fasting improve the condition (b) 2. inflammatory bowel diseases (c) 3. High stool output (a) 4. Presence of WBC in stool (c) 5. Irritable bowel syndrome (d) 6. bacterial toxin (a) 7. Malabsorption (b) 8. High fecal osmotic gap. (b)	a) Secretory b) Osmotic c) Exudative (inflammatory) d) Motility-related

A	B
1. Irritable bowel syndrome (b) 2. Giardia lamblia (b) 3. Viral gastroenteritis (a) 4. Inflammatory bowel disease (b) 5. Food poisoning (a) 6. Antibiotic-Associated Diarrheas (a) 7. Malabsorption (b)	a) Acute diarrhea b) Chronic diarrhea

IBD

CASE1

A 22-year-old woman has had recurrent episodes of diarrhea, crampy abdominal pain, and slight fever over the last 2 years. Other symptoms have included mild joint pain and sometimes red skin lesions. On at least one occasion, her stool has been iron-positive, indicating the presence of occult blood. Colonoscopy reveals several sharply delineated areas with thickening of the bowel wall and mucosal ulceration. Areas adjacent to these lesions appear normal. Biopsies of the affected areas show full-thickness inflammation of the bowel wall and several noncaseating granulomas.

1. **What is the most likely diagnosis?**

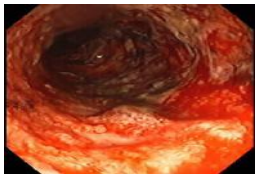
Crohn disease

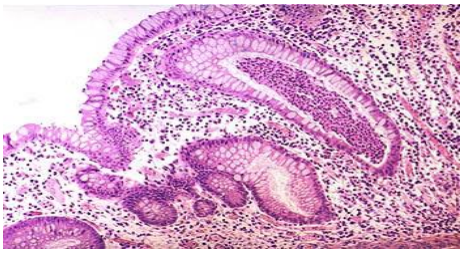
2. **What are the common complications of this disease?**

Malabsorption and malnutrition, fibrous strictures of the intestine, and fistulae to other organs, such as from bowel to skin or bowel to bladder.

CASE2

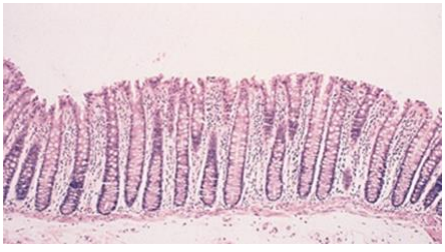
- A 25-year-old man experiences the gradual onset of intermittent diarrhea, which over years, progresses to sever A 25-year-old man experiences the gradual onset of intermittent diarrhea, which over years, progresses to severe diarrhea, alternating with constipation, rectal bleeding, and passage of mucus.
- On physical examination, the abdomen is tender over the colon.
- e diarrhea, alternating with constipation, rectal bleeding, and passage of mucus.
- Stool examination fails to reveal no parasites or bacteria
- Colonoscopy demonstrates inflammation limited to the rectum,





Biopsy showing:

Active chronic colitis.



1. What histologic feature is seen in Crohn disease that is not seen in ulcerative colitis?

Granulomas and transmural inflammation in the resected specimen.

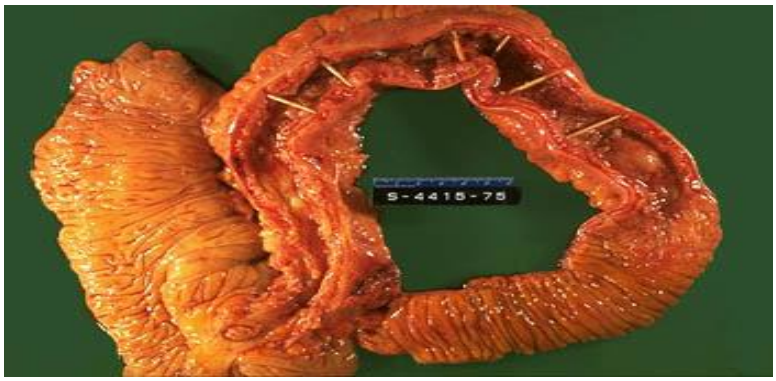
2. What are the complications of ulcerative colitis?

The most serious complication is the development of carcinoma. The cancers are preceded by dysplasia, which tends to arise in multiple sites. The risk of cancer is highest in patients with pancolitis of ten or more years duration, in whom it is 20 to 30 fold higher than in a control population. Other life-threatening complications include severe diarrhea and electrolyte disturbances, severe colonic dilation (toxic megacolon) with potential for perforation and peritonitis, and massive hemorrhage.

CASE3

35 y/o male , known case of inflammatory bowel disease, presented in ER with severe colicky abdominal pain. Barium enema study show features of intestinal obstruction .

He was taken to OR , and Excision of terminal ileum and proximal colon was performed.



The specimen is a section of normal ileum, thickened ileum, and right colon. The intestinal wall is thick, the result of edema, inflammation, fibrosis, and hypertrophy of the muscularis propria. Linear ulcers are typically present in the diseased segment of bowel. In diseased bowel segments, the serosa is thickened and fibrotic, and often the mesenteric fat wraps around the bowel surface (creeping fat).

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1. A 25-year-old man presents to a rheumatologist with complaints of joint pain involving the large joints of the legs. On questioning, the patient indicates that exacerbations in the joint pain are frequently accompanied by diarrhea. Which of the following gastrointestinal diseases is most likely to be implicated as the cause of the patient's joint problems?

A. Amebic colitis

B. Chronic appendicitis

C. Diverticulosis

D. Pseudomembranous colitis

E. Ulcerative colitis

- Mucosal ulceration is seen in both Crohn's disease and ulcerative colitis. The ulcers of Crohn's disease are generally described as linear fissures, following the longitudinal axis of the intestine. Ulcerative colitis typically produces broad, extensive areas of ulceration. Pseudopolyps are most commonly associated with ulcerative colitis, and represent the islands of spared mucosa between the broad ulcerations. Rectal involvement in inflammatory bowel disease is more typical of ulcerative colitis than of Crohn's disease. Whereas ulcerative colitis is a "pancolitis," that is usually most severe in the rectum and right colon, Crohn's disease is usually a disease of the small intestine, and may involve the small intestine alone (40%) or both the small intestine and colon (30%).
- Crohn's disease is frequently associated with "skip lesions," discontinuous areas of active disease in the colon and small intestine with intervening segments that appear normal. This is in marked contrast to ulcerative colitis, which most commonly shows continuous mucosal involvement. Both ulcerative colitis and Crohn's disease can show mucosal atrophy. . Chronic mucosal inflammation produces glandular atrophy, and a loss of mucosal folding.

2. A patient has had years of intermittent diarrhea and abdominal pain, but has never consulted a physician. Eventually, he begins to pass fecal material in his urine and he seeks medical attention. Which of the following diseases is most likely to cause this complication?

A. Celiac disease

B. Crohn's disease

C. Diverticulitis

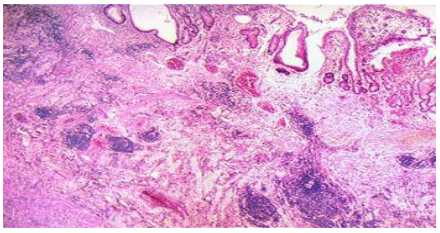
D. Ulcerative colitis

E. Whipple's disease

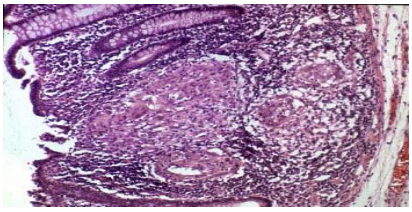
- The correct answer is B. Passing fecal material in urine strongly suggests the possibility of a fistula between the bowel and bladder. Of the diseases listed, only Crohn's disease (a type of inflammatory bowel disease) commonly produces fistulas. Fistulas are produced in Crohn's because the disease affects the entire thickness of the bowel wall, rather than being restricted to the mucosa (e.g., ulcerative colitis).

- ANSWERS: 1=E | 2=B |

Crohn's disease



Biopsy showing:



crypt distortion and

Submucosal edema, fibrosis.

Noncaseating granulomas .

1. What are the complications of Crohn disease?

Fissures in the mucosa can extend through the wall and form sinus tracts, resulting in fistula formation to other loops of bowel, urinary bladder or vagina; there may be localized peritonitis and abdominal abscesses;

Fibrosis of the gut wall may lead to strictures and obstruction.

Extensive involvement of the small bowel may cause marked loss of albumin (protein-losing enteropathy) or malabsorption.

2. Are any other organs affected in Crohn disease? In ulcerative colitis?

Both Crohn disease and ulcerative colitis are systemic diseases, associated with varied extraintestinal manifestations of immunologic origin.

These include polyarthritis, sacroiliitis, ankylosing spondylitis, uveitis, sclerosing cholangitis, erythema nodosum, and clubbing of the fingertips.

3. A 39-year-old male presents with bloody diarrhea. Multiple stool examinations fail to reveal any ova or parasites. A colonoscopy reveals the rectum and sigmoid portions of the colon to be unremarkable. A biopsy from the terminal ileum reveals numerous acute and chronic inflammatory cells within the lamina propria. Worsening of the patient's symptoms results in emergency resection of the distal small intestines. Gross examination of this resected bowel reveals deep, long mucosal fissures extending deep into the muscle wall. Several transmural fistulas are also found. What is the best diagnosis for this patient?

a. Ulcerative colitis

b. Lymphocytic colitis

c. Infectious colitis

d. Eosinophilic colitis

e. Crohn's disease

CD is classically described as being a granulomatous disease, but granulomas are present in only 25 to 75% of cases. Therefore, the absence of granulomas does not rule out the diagnosis of CD. CD may involve any portion of the gastrointestinal tract and is characterized by focal (segmental) involvement with "skip lesions." Involvement of the intestines by CD is typically transmural inflammation, which leads to the formation of fistulas and sinuses. The deep inflammation produces deep longitudinal, serpiginous ulcers, which impart a "cobblestone" appearance to the mucosal surface of the colon. Additionally, in Crohn's disease, the mesenteric fat wraps around the bowel surface, producing what is called "creeping fat," and the thickened wall narrows the lumen, producing a characteristic "string sign" on x-ray. This narrowing of the colon, which may produce intestinal obstruction, is grossly described as a "lead pipe" or "garden hose" colon.

In contrast to CD, UC affects only the colon, and the disease involvement is continuous. The rectum is involved in all cases, and the inflammation extends proximally. Since UC involves the mucosa and submucosa, but not the wall, fistula formation and wall thickening are absent (but toxic megacolon may occur). Grossly, the mucosa displays diffuse hyperemia with numerous superficial ulcerations. The regenerating, nonulcerated mucosa appears as "pseudopolyps.

1. Colon only (b)
2. Diffuse involvement of mucosa (B)
3. Superficial ulcers (b)
4. Any part of the GIT (A)
5. Skip areas of normal mucosa (A)
6. Mucosal inflammation only (B)
7. Fistula formation (A)
8. Transmural inflammation (A)
9. Granulomas(A)
10. Deep ulcers (fissure)(A)
11. Dysplasia is common(B)
12. Carcinoma is more common (10%)(B)

A. Crohn's

B. Ulcerative

Colonic Polyps And Carcinoma

CASE1

A 68-year-old woman presents with intermittent constipation, weight loss, and a swollen abdomen. She has had two previous polypectomies: one showed a tubular adenoma and the other was a tubulovillous adenoma. Double-contrast barium enema shows an irregular stricture 4 cm long in the ascending colon. A tumor is diagnosed and surgery is advised. The tumor is resected and is found to have invaded through the thickness of the bowel wall, but is completely excised. Three of 15 lymph nodes identified contained metastatic tumor.

1. What is the most likely diagnosis with this presentation?

The most likely diagnosis is colorectal adenocarcinoma.

2. What stage is this tumor and what is the prognosis?

This is a Dukes' C carcinoma (T3, N1, MX)

3. What is the association between adenoma and carcinoma?

There is much evidence to suggest that most carcinomas of the colon arise in pre-existing adenomas (adenoma–carcinoma sequence). Patients with familial adenomatous polyposis (FAP) have a very high risk of developing colorectal carcinomas.

4. Where is the metastatic spread most likely?

Colorectal carcinomas metastasize mainly to regional lymph nodes and liver, less commonly developing other systemic metastases such as brain, bone and lung.

CASE2

52 y/o female presented with fatigue and weakness. She experienced 6 kg wt loss in a 6 six months

CBC .....Hg 7.5 g/dl, hematocrit 26 %

Serum ferritin 8 ng/dl

Iron deficiency anaimia

Rx oral iron treatment

1. Stool and urine analysis……blood in the stool?

ascending colon 6 cm mass

blood in the stool

2. Colonoscopy shows ?

ascending colon 6 cm mass

3. Biopsy Shows ?

adenocarcinoma

3. Match

1. Colonic polyposis A,B,C
2. Multiple osteoma B
3. Central nervous system tumors C
4. Fibromatosis B,C
5. 100% risk of carcinoma A,B,C
6. Cutaneous cysts B

A. Familial polyposis coli
B. Gardner's syndrome
C. Turcot's syndrome.

4. Mention the types for A&B :

A. **Non-neoplastic polyps 90%**

Hyperplastic polyps

Hamartomatous polyps

Inflammatory polyps

Lymphoid polyps

B. **Neoplastic polyps 10%**

Adenoma

CASE3

A 26-year-old man presents with intermittent crampy abdominal pain, diarrhea without noticeable blood, and weight loss of 15 lb over 10 months. The bowel symptoms, including the diarrhea, wake him from sleep; he resumed smoking cigarettes a year ago. His older brother has had similar symptoms but has not yet been evaluated. Stool leukocytes are present. Results of examination with sigmoidoscopy are normal.

1. Which of the following is the most likely diagnosis for this patient?

A. Irritable bowel syndrome

B. Acute appendicitis

C. Crohn disease

D. Ulcerative colitis

E. Colon cancer

2. Which of the following statements regarding the relationship between colon cancer and polyps is false?

A. Most colorectal cancers arise from preexisting adenomas

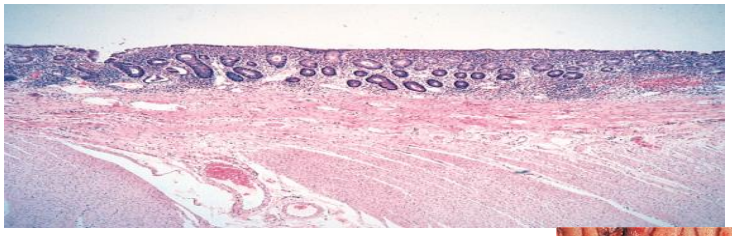
B. Adenomatous polyps, as well as juvenile polyps, hamartomas, and

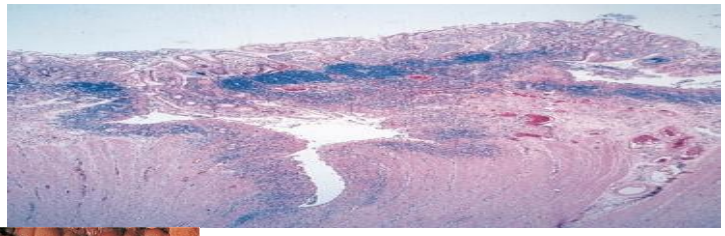
inflammatory polyps, progress to colorectal carcinoma

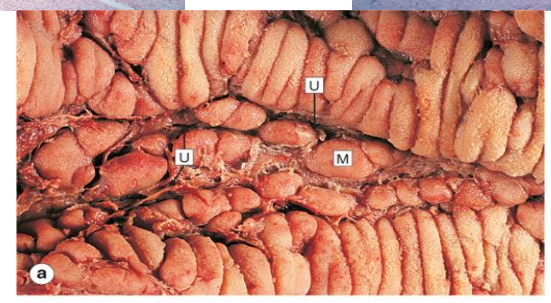
C. Larger polyps, especially those larger than 1 cm, are more likely to contain invasive carcinoma

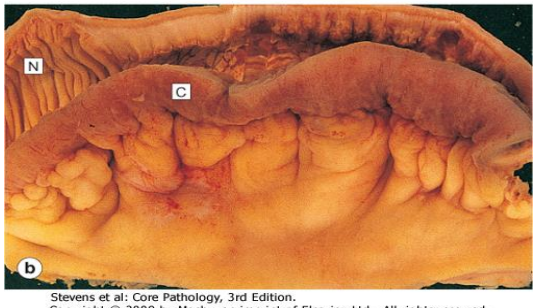
D. On the basis of histology, villous polyps are more likely to contain invasive carcinoma than are tubular polyps

ANSWERS: 1=C| 2= B









حسبي الله لا إله إلّا هو عليه توكلت وهو رب العرش العظيم

- مها الغامدي
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References: Doctor's slides + notes, Robbins basic pathology 10th edition.