Gastrointestinal System: Malabsorption and Inflammation

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Malabsorption Syndromes

Maldigestion
  – Failure of the chemical processes of digestion

Malabsorption
  – Failure of the intestinal mucosa to absorb digested nutrients

Common Causes
  – Gluten Intolerance
  – Cystic Fibrosis
  – Pancreatic insufficiency
  – Lactase deficiency/Lactose Intolerance
  – Crohn Disease
Malabsorption Syndromes
Gluten-Sensitive Enteropathy

Definition

– Autoimmune disorder
– Ingestion of gluten damages small intestinal villous epithelium

• Atrophy
• Flattening/destruction of villae
• Hypertrophy of crypts $\Rightarrow$ excess H$_2$O secretion
  $\downarrow$
  Osmotic diarrhea
  Secretory diarrhea

$\Rightarrow$ Bald mucosa
Malabsorption Syndromes
Gluten-Sensitive Enteropathy

Pathophiology

Flowchart showing the primary and secondary effects of gluten.

- Primary effects:
  - Villus injury
    - Decreased surface area
      - Inflammatory enteritis
        - Osmotic diarrhea
        - Secretory diarrhea
  - Decreased carbohydrate absorption
  - Decreased protein absorption
  - Decreased fat absorption

- Secondary effects:
  - Mucosal damage (proximal bowel)
    - Decreased intestinal hormones
    - Decreased pancreatic function

- Malnutrition

McCance & Huether, 2014, Figure 42-7
Malabsorption Syndromes
Gluten-Sensitive Enteropathy

Age of development
– Infant
– Childhood
– Adolescence
– Adulthood
– Pregnancy

Treatment
– Removal of gluten from diet
Malabsorption Syndromes
Cystic Fibrosis

Genetics:
– Autosomal recessive trait
– Chromosome 7
– Abnormal CFTCR
– Defective ion transport through Cl⁻ channels in epithelial cells

Pathophysiology Triad:
1. Overproduction of respiratory mucous
2. Pancreatic enzyme deficiency → malabsorption
3. Abnormally elevated Na⁺ and Cl⁻ in sweat
Malabsorption Syndromes
Cystic Fibrosis

GI Pathophysiology

Obstruction of pancreatic ducts with thick mucous

Obstructed flow of pancreatic enzymes

Degenerative and fibrotic pancreatic changes

\( \downarrow \beta\)-cell inadequacy

\( \downarrow \) Type II DM

Malabsorption:

- Proteins
- Fat
- CHO

\( \downarrow \) Vitamin A,D,E & K absorption

\( \downarrow \) Malnutrition

Fatty, bulky stools

Malnutrition
Malabsorption Syndromes: Pancreatic Insufficiency

Definition
– Deficient production of pancreatic enzymes required for digestion of CHO, proteins, and fat
  • Lipase, amylase, trypsin, chymotrypsin

Causes
• Pancreatitis, pancreatic carcinoma, pancreatic resection, and cystic fibrosis

Clinical manifestation
– Fat maldigestion
  • Steatorrhea
  • Weight loss
Malabsorption Syndromes: Lactase Deficiency

Definition
- Inability to break down lactose into monosaccharides
- Prevents lactose digestion and monosaccharide absorption

Cause
- Primary - Congenital defect in lactase gene
  - African Americans, Hispanic Americans, Native Americans, Asian Americans
- Secondary
  - Diarrheal Intestinal Disorders

Clinical Manifestations
- Gas
- Bloating and cramping
- Osmotic diarrhea
Malabsorption Syndromes: Bile Salt Deficiency

Definition
– Insufficient presence of bile salts necessary for fat digestion and absorption

Causes
– Advanced liver disease \(\downarrow\) synthesis of bile salts
– CBD obstruction \(\downarrow\) flow from CBD into duodenum
– Reduced intestinal motility \(\downarrow\) conjugation by intestinal bacteria
– Diseases of the ileum \(\downarrow\) reabsorption by ileum

Clinical Manifestations
– Fatty stools
– Diarrhea
– Loss of fat-soluble vitamins
  • A - Night blindness
  • D - \(\downarrow\) calcium absorption
  • E - neurologic changes
  • K - clotting
Inflammatory Bowel Diseases
Ulcerative Colitis

Definition
- Chronic ulceration of colonic mucosa
- Extends proximally from rectum into sigmoid colon

Suggested causes
- Infections, immunologic, dietary, genetic

Pathophysiology
- Continuous inflammation – no skip lesions
- Thinned mucosal layer
- Degradation of epithelial barrier
Inflammatory Bowel Diseases
Crohn’s Disease

Idiopathic inflammatory disease
- Affects any part of the digestive tract, from mouth to anus
- Difficult to differentiate from ulcerative colitis

Pathophysiology
- Produces skip lesions
- Lesions spread across entire intestinal wall
- Neutrophils infiltrate crypts (glands)
- Ulcerations produce longitudinal and transverse fissures
- Inflammation extends into lymphatics
- Vitamin $B_{12}$ and folic acid malabsorption $\rightarrow$ anemia
Inflammatory Bowel Diseases

Comparison of Inflammatory Bowel Pathology

Normal  Crohn’s Disease  Ulcerative Colitis
Inflammatory Bowel Diseases
Diverticular Disease

Definition
– Sac-like outpouchings of mucosa through muscle layers of colon wall
– Diverticulosis
  • Asymptomatic – disease is present
– Diverticulitis
  • Inflammation of diverticula

Pathophysiology
– Form at weak points in colon wall
– Can lead to abscess, peritonitis, obstruction or fistula
Inflammatory Bowel Diseases

Irritable Bowel Syndrome

Definition

– Functional bowel disorder producing abdominal pain and alterations in bowel habits
– No inflammation or degradation in bowel tissue.

Clinical manifestations

– Abdominal pain, cramping or bloating,
– Gas
– Diarrhea and/or constipation

Classified by primary symptom presentation

– Abnormal GI motility and secretions
– Visceral hypersensitivity
– Post infectious
– Overgrowth of intestinal flora
– Food allergy/intolerance
– Psychosocial
Gastrointestinal System Disorders: Malabsorption and Inflammation