1) Malabsorption Syndrome - Dr. Sabir

Mechanisms

Luminal phase (processing defect)
- Digestive enzyme deficiency or inactivation
- ↓ bile salt synthesis; ↓ Excretion; ↑ loss;
- bile salt de-conjugation
- ↓ gastric acid; ↓ intrinsic factor (p. anemia)
- Bacterial consumption of nutrients
- Protein & fat malabsorption

Mucosal phase
- Epithelial transport defect – inflammations, infections
- Brush border enzyme defect → congenital/acquired disaccharidase deficiency

Post-absorptive phase
- Enterocyte processing – Abetalipoproteinemia
- Lymphatic obstruction – intestinal lymphangectasia

Causes

Exocrine pancreatic insufficiency
- Ch. Pancreatitis
- Pancreatic CA
- Cystic fibrosis

Inactivation of pancreatic lipase
- Gastrinoma (ZES)
- drugs (orlistat)

↓ Bile acid (impaired micelle formation)
- cholestatic liver dis

Bacterial overgrowth
- Anatomic stasis (blind loop, stricture, fistula)
- Functional stasis (DM, scleroderma)

Interrupted enterohepatic circulation of bile acid
- (ileal resection, Crohn’s )

Drugs (bind or precipitate b. salt)
- Neomycin, cholestyramine

Impaired mucosal absorption/mucosal loss or defect
- Intestinal resection or bypass
- Inflammation/infiltration/infect. (celiac, tropical sprue, lymphoma, scleroderma, Crohn’s)

Impaired nutrient transport
- Lymphatic obstruction (lymphoma, lymphangectasia)
- CHF

Genetic disorders
- Disaccharidase deficiency
- Agamaglobulinemia

Endocrine/Metabolic disorders
- DM
- Hyperthyroidism
- Adrenal insufficiency
- Carcinoid syndrome

Clinical features depend on the cause and severity

Global
- Diffuse mucosal- involvement
- Impaired absorption of all nutrients
- Classic manifestation
- Diarrhea(steatorrhea), weight loss
- Majority – sub clinical
- E.g. Celiac disease

Partial (isolated)
- 2° to diseases that interfere with absorption of specific nutrients E.g. Pernicious Anemia, Lactase deficiency

Sings & Symptoms

<table>
<thead>
<tr>
<th>Calorie</th>
<th>Weight loss with normal appetite</th>
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<tbody>
<tr>
<td>Fat</td>
<td>Pale, voluminous, greasy offensive diarrhea</td>
</tr>
<tr>
<td>Protein</td>
<td>Edema, muscle atrophy, amenorrhea</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>Abdominal bloating, flatus, w. diarrhea</td>
</tr>
<tr>
<td>B12</td>
<td>Macrocytic anemia, Subacute combined degeneration of sp. Cord</td>
</tr>
<tr>
<td>Folic acid</td>
<td>Macrocytic anemia</td>
</tr>
<tr>
<td>Vit B (general)</td>
<td>Cheilitis, glossitis, Angular stomatitis</td>
</tr>
<tr>
<td>Iron</td>
<td>Microcytic anemia</td>
</tr>
<tr>
<td>Ca &amp; Vit D</td>
<td>Osteomalacia (bone pain, pathologic#), Tetany</td>
</tr>
<tr>
<td>Vit A</td>
<td>Follicular hyperkeratosis, Night blindness</td>
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<tr>
<td>Vit K</td>
<td>Bleeding diathesis, Hematoma</td>
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Investigations

General

- CBC: microcytosis, macrocytosis, lymphopenia
- RFT: low urea & creatinine, hypokalemia
- Hypocalcemia, low s. albumin
- Prolonged PT
- Low s. Fe, vit B12, folate
- Low s. carotene, cholesterol

Specific

Tests of fat absorption:

- Quantitative fecal fat
  - Patient should be on daily diet containing 80-100 grams of fat.
  - Fecal fat estimated on 72 h collection.
  - 6 grams or more of fat/day is abnormal.
  - May be due to: - Pancreatic dis, - Small intestinal dis, - Hepatobiliary disease
- D-xylose test
  - A Pentose monosacharide absorbed exclusively at the proximal SB. Used to assess proximal SB mucosal function. The test:
    - After overnight fast, 25gm D-xylose p.o.
    - Urine collected for next 5 hrs
    - Abnormal test - <4.5 gm excretion show duodenal / jejunal mucosal dis.

Other tests for carbohydrate malabsorption

- Lactose tolerance test
  - P.o. 50 gm lactose
  - Blood glucose at 0, 60, 120 min.
  - BG <20mg/l + development of S/S – diagnostic
- Breath tests (hydrogen,13Co2)
- Test for bacterial overgrowth
  - Quantitative bacterial count from aspirated
  - SB. Normal count: < 10 /ml (jejunum), > 10 /ml (ileum)
- Tests for pancreatic insufficiency
  - Stimulation of pancreas through adm. of a meal or hormonal secretagogues , then analysis of duodenal fluid
- Tests for protein malabsorption
  - Enteral protein loss → measuring alpha-1 antitirypsin clearance

Radiographic techniques:

- Plain abdominal X-ray
- U/S abdomen
- ERCP
- CT abdomen
- Endoscopy and biopsy
- Capsule endoscopy

Radiography of small intestine:
- Barium swallow and follow-through – to see
- Blind loops, Strictures, Jejunal diverticuli

Intestinal mucosal biopsy:
- by endoscopy and duodenal biopsy
- E.g: Coeliac disease, tropical sprue
Small Intestinal Bacterial Overgrowth (SIBO)

- Normal proximal small intestinal lumen harbors < 100000 bacteria / ml of intestinal contents (relatively sterile) due to:
  - Acidity of stomach
  - Intestinal peristalsis (major)
  - Immunoglobulins
- Cause of bacterial growth:
  - Small intestinal diverticuli
  - Blind loop
  - Strictures
  - DM/ Scleroderma

Pathophysiology

- Bacteria: deconjugate bile salts resulting in:
  - ↓ Bile Salt
  - Impaired intraluminal micelle formation
  - Malabsorption of fat.
- Intestinal mucosa is damaged by:
  - Bacterial invasion
  - Toxin
  - Metabolic products
  - Damage villi - may cause total villous atrophy.

Clinically

- Steatorrhea
- Anaemia
- B12 def.
- Reverse of symptoms after antibiotic treatment.

Diagnosis

- Breath test
- Culture of aspirate (definitive)

Treatment:

- Surgery for correctable abnormalities such as fistulae
- Antibiotic for non-correctable abnormalities:
  - Tetracycline, cipro, metro
- Some pts may need single 2 wk course for prolonged remission, others may need frequent intermittent courses

Postgastrectomy malabsorption

- The risk is greatest after total gastrectomy and progressively decreases after partial gastrectomy and gastrojejunal anastomoses (Billroth II), antrectomy and gastric-duodenal anastomoses (Billroth I)
- Mechanism
  - Several mechanisms, the most common is the "poor mixing and poor timing." Rapid gastric emptying coupled with decreased release of secretin and cholecystokinin results in suboptimal exposure of the nutrient bolus to both bile salts and pancreatic enzymes as it traverses the small intestine.
Intestinal lymphoma

- Primary lymphoma usually not associated with malabsorption.
- Enteropathy-associated T-cell lymphoma (EATL) and Small Intestinal Immuno-Proliferative Disease (IPSID): both cause malabsorption.

IPSID

- IPSID is common in young in Middle East, cause diffuse infiltration of mucosa and submucosa with B lymphocytes and plasma cells
- Abdominal pain, anorexia, diarrhea, wt loss, and as disease progresses ascites and hepatosplenomegaly
- Dx: serum protein electrophoresis
- Rx: prolonged course antibiotics (6 m): tetracycline, metro esp. in early disease, but once frank lymphoma is established: combination chemotherapy± radiotherapy

Protein-losing enteropathy

- Several small intestinal diseases are associated with loss of protein in stools leading to malnutrition, edema and ascites. Causes include:
  - Mucosal erosion or ulceration: IBD, TB, lymphoma, radiation
  - Other mucosal diseases: Tropical sprue, celiac dis, bacterial overgrowth, Menetrier’s dis
  - Lymphatic obstruction: lymphoma, intestinal lymphangiectasia, constrictive pericarditis
- Diagnosis by measurement of fecal α1-antitrypsin.

Intestinal tuberculosis

- Infection with human or bovine strains of Mycob. Tuberculosis may cause chronic inflammation, ulceration and fibrosis of small intestinal mucosa. The terminal ileum is the site of maximal pathology. Malabsorption results from loss of protein and blood from ulcers (protein-losing enteropathy), lymphatic obstruction, bacterial overgrowth due to strictures or ileal disease or resection. The disease is commoner in underdeveloped countries and AIDS patients. Pulmonary disease is usually absent and tuberculin test is frequently negative. Diagnosis by tissue biopsy and culture. The main DDx is Crohn’s disease.

Extensive small bowel resection (short bowel syndrome)

- This is done for Crohn’s dis, extensive ischemia or tumors. Patients need total parenteral nutrition (TPN) at first with risk of dehydration. Adaptation of the remaining bowel occurs within several months.