Chronic Diarrhea in Children

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Slides - Doctors Notes - **Important** - Book Notes

Tutorial Objectives:

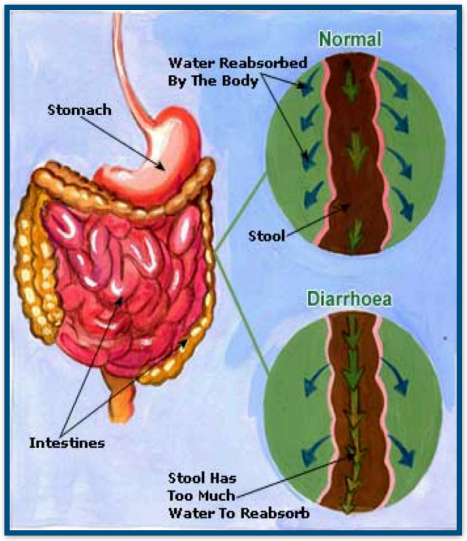
1. Know how to evaluate a child who has chronic diarrhea, including appropriate elements of history, physical examination, stool analysis, and blood testing.
2. Be familiar with the many disorders that cause chronic diarrhea, both with and without failure to thrive.
3. Know the therapies for the many causes of chronic diarrhea.

Introduction

- Recurrent, chronic, infantile diarrhea with malnutrition, causes the death of 4.6 million children globally each year.
- In the last 25 years, the following specific preventive measures have reduced further the number of infants who have this condition:
  - Renewed emphasis on breastfeeding reduction in the use of partial starvation regimens during diarrheal episodes and increased availability of age-appropriate infant food for children living in poverty encourage feeding infants with diarrhea
- I want you to think: early diarrhea is either congenital or infection

Pathophysiology

- Osmotic diarrhea is caused by a failure to absorb a luminal solute, resulting in secretion of fluids and net water retention across an osmotic gradient.
- Secretory diarrhea occurs when there is a net secretion of electrolyte and fluid from the intestine without compensatory absorption.
- Intestinal dysmotility (e.g. hyperthyroidism) typically occurs in the setting of intact absorptive abilities. Intestinal Transit time is decreased, the time allowed for absorption is minimized, and fluid is retained within the lumen.
- Inflammatory diarrhea may encompass all of the above pathophysiologic mechanisms

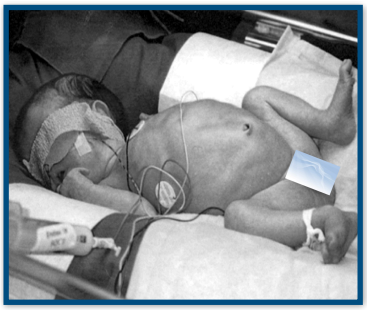
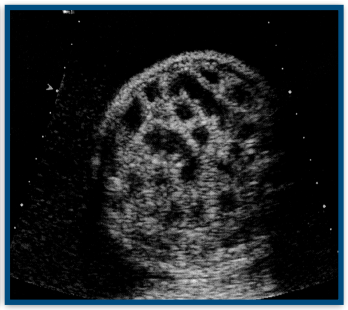
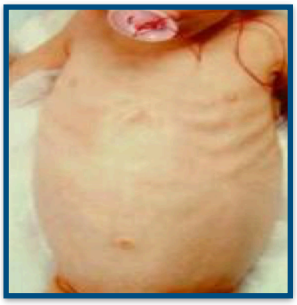


-Now we'll go over ten scenarios from the doctor and workup their differentials-

Case One

My baby whom I just deliver developed diarrhea from day 1 after birth, what is the cause?
Always remember early diarrhea = secondary infection or congenital

DDx 1: Congenital Chloride Diarrhea


Presentation

- An autosomal recessive disease, caused by a defect in chloride transport
- Maternal polyhydrammics
- Prematurity
- Abdominal Distention
- Diarrhea

Findings

- Hypokalemia
- hypochloremic Metabolic alkalosis
- Fecal chloride greater than fecal sodium and potassium
- hyperbilirubinemia in 90%

Treatment

Na + Kcl supplement

Reference

A Study in Arab Children J Clin Gastroenterol 1994

DDx 2: Congenital Sodium Diarrhea

Features

- An autosomal recessive disease, caused by a defect in a jejunal sodium/proton exchange that results in severe watery diarrhea.
- SPINT2* gene located on 19q13.1 (a serine-protease inhibitor) Skipped

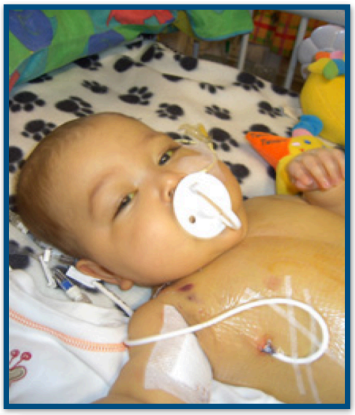
Presentation

- Polyhydramnios (first manifestation of CSD)

Findings

- Hyponatremia
- **Metabolic Acidosis**

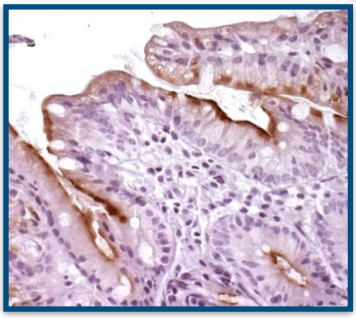
DDx 3: Microvillous Atrophy-Inclusion Disease (Familial Microvillous Atrophy)

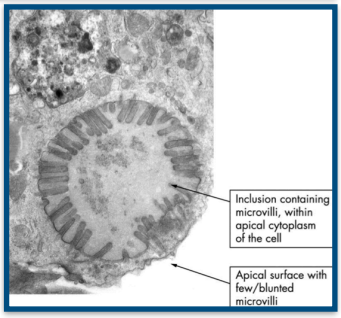


Presentation
Watery diarrhea despite patients NPO

Clinical forms
1. **Congenital:** the onset of the diarrhea in the first week of life
2. **Late onset**: when diarrhea start after neonatal period 1-2 months

Diagnosis
Based on the finding of villus atrophy and **intracytoplasmic inclusions** lined by intact microvilli in intestinal biopsy



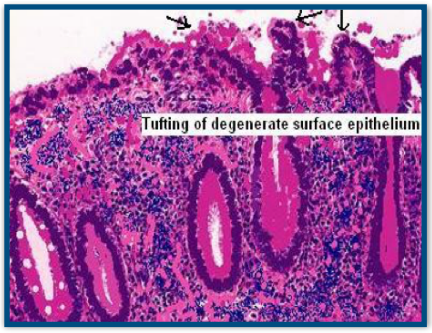


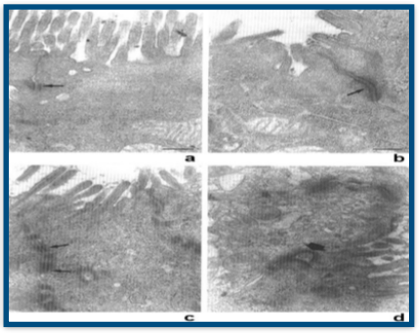
Treatment
- Total parenteral nutrition
- Intestinal transplantation

DDx 4: Intestinal Epithelial Dysplasia (Tufting Enteropathy)

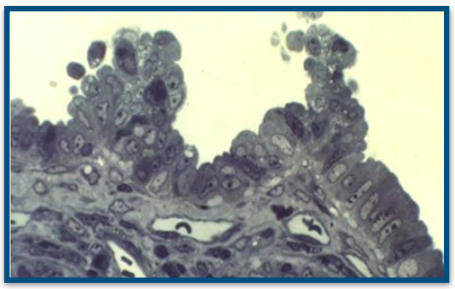
Presentation
- **A congenital enteropathy presenting with early-onset severe intractable diarrhea**
- Watery diarrhea within the first days after birth
- Growth is impaired
- **No past history of hydramnios suggesting congenital chloride diarrhea or sodium malabsorption**
- Affected children are reported to have dysmorphic features
- Associated with choanal or esophageal atresia or imperforate anus

Diagnosis
Biopsy showing:
- Villous atrophy (persistent)
- Abnormalities are localized mainly in the epithelium, includes disorganization of surface enterocytes with focal crowding.





- Specific features include:
  - Focal enterocyte crowding observed in crypt epithelium. resembling tufts
  - Crypts are dilated with features of pseudo cysts.



Treatment
- Total parenteral nutrition
- Intestinal transplantation

DDx 5: Autoimmune Enteropathy

Presentation
- Severe protracted watery diarrhea during infancy or toddlerhood
- Diarrhea may be isolated or may occur in association with diabetes mellitus as part of the IPEX syndrome (Immune dysregulation, Polyendocrinopathy and Enteropathy, X-linked), associated with mutations in the FOXP3 gene
- Circulating antibodies to enterocytes anti- smooth, antithyroid and islet-cell antibodies

Treatment
- Total parenteral nutrition
- Prednisone
- Cyclosporine
- Azathioprine
- Intestinal transplant

Case Two

I delivered this baby and I start to feed him/ her my breast milk and/ or bottle milk, since I start feeding the baby developed diarrhea. What is the cause?

What are the contents of milk? 1. carbs > in the form of lactose > broken into glucose and galactose 2. proteins 3. vitamins 4. Immunoglobulins 5. lipids 6. water 7. ashes

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DDx 1: Monosaccharide Malabsorption or glucose galactose malabsorption

Presentation
- Autosomal recessive, rare
- Early onset presenting with the introduction of milk (either breast or bottle)
- Watery diarrhea
- Dehydration and metabolic acidosis
- Diarrhea stops within one hour of removing the oral intake of lactose, glucose, and galactose

- The diarrhea returns with introduction of lactose, glucose and galactose
- associated with hypernatremia (dehydration) and **nephrocalcinosis**
- malabsorption and malnutrition
- a cause of very febrile infant

Treatment

Fructose is mandatory fructose based formula, immediate response since fructose gets absorbed passively

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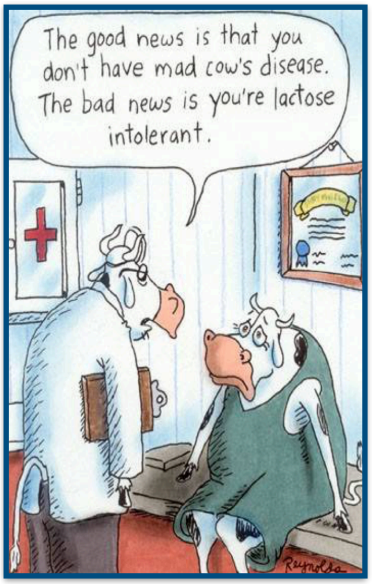
DDx 2: Developmental Lactase Deficiency (Lactose Intolerance)

1. Developmental Lactase Deficiency



- The relative lactase deficiency observed among preterm infants of less than 34 weeks gestation or low birth weight
- The immature gastrointestinal tract, lactase and other disacharidases are deficient until at least 34 weeks gestation

2. Primary Lactase Deficiency

- Relative or absolute absence of lactase
- Develops in childhood at **various ages** in different racial groups.
- The most common cause of lactose malabsorption and lactose intolerance

3. Secondary Lactase Deficiency

- Results from small bowel injury such as:
  - Acute gastroenteritis
  - Persistent diarrhea
  - Small bowel overgrowth
  - Cancer chemotherapy
  - Other causes of injury to the small intestinal mucosa
- Present at any age but is more common in infancy

Treatment

- Aimed at reducing or eliminating lactose, by eliminating it from the diet or by "predigesting" it with supplemental lactase-enzyme replacement LF (Lactose Free formula)
- Calcium must be provided by alternate nondairy dietary sources or as a dietary supplement to individuals who avoid milk intake

- chemical dermatitis in diaper area can be secondary to disaccharide malabsorption

Case Three

I am feeding my baby milk feed and I start to feed him fruit juices, since I start the fruit juice my infant start to have diarrhea. What is the cause?

Dx: Congenital Sucrase - Isomaltase Deficiency

Presentation

- Watery diarrhea (osmotic) when given fruits, fruit juice, gummies or sweets
- **Abdominal distension**
- Older children irritability
- Growth may be normal

Treatment

- Avoid sucrose or fructose containing diet
- supplement with SACROSIDASE not available here

Another possible differential is sorbitol ingestion (the diabetic sweetener), they market it as a healthy alternative when it can cause diarrhea, distention and gases.

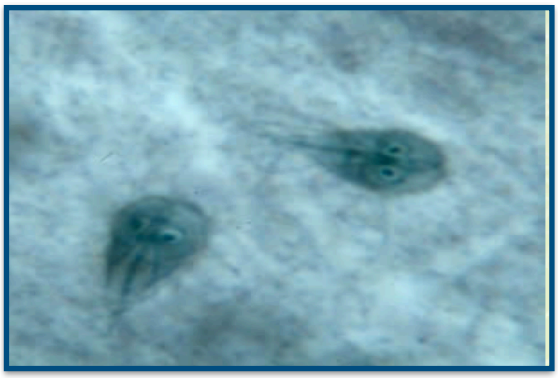
Case Four

My infant developed vomiting and diarrhea and then I took him to the ER and the doctor diagnosed him as Acute Gastroenteritis. He gave me different medications and/ or fluid and then sent me back home. Since that time, my infant **continue to have diarrhea**.
What is the cause? this is post gastroenteritis syndrome

DDx1: Bacterial Cause of Chronic Diarrhea

Organism	Source	Duration
Aeromonas sp	Untreated water	1 wk to 1 yr
Campylobacter sp	Raw poultry, diarrheic animals, unpasteurized milk, birds, water, ferret	5 days to chronic
Clostridium difficile	Antibiotic use; can be nosocomial	10% have relapses
Plesiomonas shigelloides	Untreated water, shellfish	2 wks to mos
Salmonella sp	Poultry, fecal-oral, water	5d to mos in infants
Yersinia enterocolitica	Handling of raw pig intestines (chitterlings)	3 wk to 3 mos

Escherichia Coli (E-Coli)



1. **Enteric pathotypes of E-Coli diarrhea:**
   - may evolve to a chronic course due to persistent injury to the bowel.
2. **Enterotoxic and mucosa-adherent E-Coli:**
   - cause a watery diarrhea.
   - May lead to prolonged diarrhea due to mucosal damage of persistence of the primary infection.
3. **Enterohemorrhagic pathotype:**
   - that produces toxin causes acute colitis and the hemolytic-uremic syndrome.

- Most common bacterial etiologies are E.coli, salmonella and shigella
- **When to investigate a child/infant? 1. pale 2. low weight**
- When i see a pink baby with normal weight, i reassure and discharge
- the doctor did not read the tables, he only mentioned what's in red

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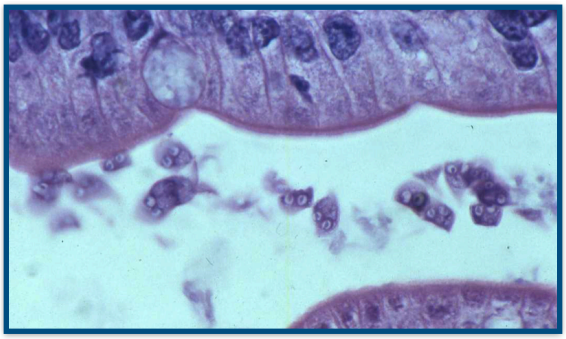
DDx 2: Parasitic Causes of Chronic Diarrhea

Organism	Source	Duration
Giardia lamblia	Diapered infants, fecal-oral, water supplies	2 wks to yrs
Cryptosporidium parvum	Child care, petting zoos, swimming pools	1 to 2 wk w/ occasional reports of 6 wk
Cyclospora cayetanensis	Raspberries from Central America, water, unpasteurized apple cider	1 wk to 1 mo or more
Entamoeba histolytica	Fecal-oral, water	Weeks
Isospora belli	Fecal-oral, water	Chronic
Strongyloides stercoralis	Developing countries, Appalachia,fecal-oral	Chronic
Blastocystis	Uncertain if a pathogen	

- Entamoeba histolytica is widely misdiagnosed, they find amebic cysts in stool and diagnose with amebiasis and start infants on metronidazole for 5 weeks!. This is wrong, amebic cysts would never cause diarrhea, they are found in 80% of population. Cysts mean nothing, **true amebiasis is diagnosed based on visualizing ameba ingesting RBCs.**
- the doctor did not read the tables, he only mentioned what's in red

Giardiasis skipped

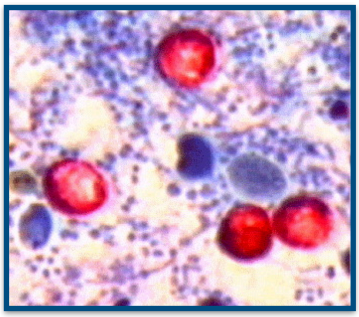
Presentation
- Diarrhea (64 to 100%)
- Malaise, weakness (72 to 97%)
- Abdominal distention (42 to 97%)
- Flatulence (35 to 97%)
- Abdominal cramps (44 to 81%)
- Nausea (14 to 79%)
- Foul-smelling, greasy stools (15 to 79%)
- Anorexia (41 to 73%)
- Weight loss (53 to 73%)
- Vomiting (14 to 35%)



Rare Presentation
- anasarca (protein-losing enteropathy).

Diagnosis
- miscroscopic examination of feces.
- Organism sometimes is seen in intestinal biopsies.

Cryptosporidium Parvum skipped

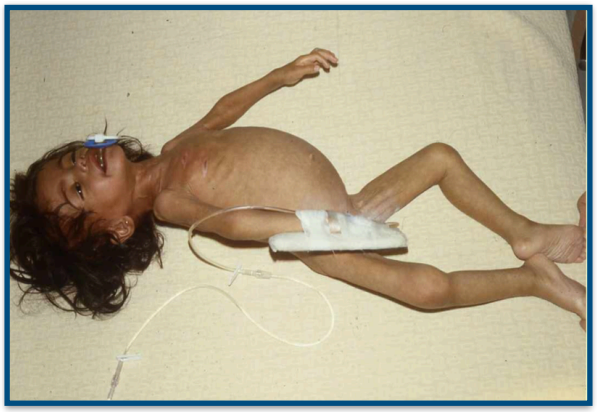


- The infection results from ingestion of the organism from fecal contamination of the hands.
- Giardia-Cryptosporidium antigen tests have better sensitivity.

DDx 3: Intractable Diarrhea of Infancy (IDI)

Enteric infection and associated compromise of intake and absorption lead to variable loss of digestive and absorptive capacity in infants.

Also Known As
- Postenteritis enteropathy
- Protracted diarrhea of infancy
- Secondary disaccharidase deficiency



As you can see this child has SEVERE malnutrition as a cause of malabsorption

Presentation

- Recurrent episodes of diarrhea and failure to regain weight in an infant.
- Suspicion should be raised further by:
  - absence of breastfeeding
  - administration of diluted or clear liquid
  - feedings
  - restriction of intake in a misguided effort to reduce diarrhea or vomiting.

Treatment

- Lactose free-sucrose free formula
- IV hydration for short period
- If no improvement total parenteral nutrition

Case Five

A 6 – month old infant with diarrhea for few weeks and chronic cough and recurrent skin abscesses. What is the cause of the diarrhea?

Dx: Immune Deficiency Diseases (IDD)

- Chronic diarrhea is a common complication of IDD
- **Evaluation should include examination of lymph nodes, spleen, skin and peripheral blood smear** and the joints

Immunodeficiency diseases associated with chronic diarrhea

- HIV infection
- SCID (Raq1, Ra12, JAK3, ZAP 70, Omenn-S)
- X-linked agammaglobulinemia
- Hyper IgM immunodeficiency
- Common variable immunodeficiency
- Chronic granulomatous disease
- Wiskott Aldrich
- Major HLA class IIdeficiency
- Selective IgA deficiency
- Immunodysregulation, polyendocrinopathy, enteropathy, X-linked syndrome

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Case Six

I have a 6 – month old infant who was well then I started to give him some milk formula and fruits, since that time he start to have diarrhea with **skin rashes and recurrent wheezes.** What is the cause of his diarrhea?

Dx: Dietary Protein Enteropathy

Onset

- Dependent on age of exposure to antigen
- Cow's milk and soy: up to 2 years failure to thrive

Proteins implicated

Cow's milk (most common), soy, cereal, egg, fish

Pathology

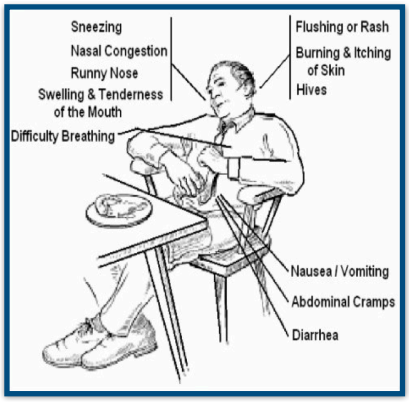
- Variable small bowel villous injury and
- increased crypt length; often patchy, sub-total intraepithelial lymphocytes; few eosinophils
- Associated with IgA deficiency and subclass IgG abnormalities as well as atopy

Presentation

- Diarrhea bloody even
- Malabsorption
- Failure to thrive
- Emesis
- Abdominal distension
- Anemia
- Edema
- Hypoproteinemia (Protein-losing enteropathy)
- skin rashes and wheezes
- 40% of children with cow milk protein allergy will also be allergic to soy

Diagnosis

- Anti-endomysium antibody negative
- Radiographic: small bowel edema
- Food challenge: (normal then HA formula) vomiting and/or diarrhea in 40 to 72 hours 65
- food allergy test
- serum IgE raised + eosinophilia
- can be made with a trial of cow milk protein elimination for 2 weeks without biopsy



Treatment

- Strict elimination of offending antigen Hypoallergic (HA) formula and watch for improvement
- Most cases resolve in 2 to 3 years

- The child might also be allergic to breast milk if the mom in allergic to certain foods, and it is malpractice to ask the mom to avoid chicken, fish, milk that way the mother will become malnourished. So before jumping to treating the mom, go over the baby first and if the mom is the problem ask her to avoid only the food she's allergic to, not everything.
- **Post gastroenteritis intolerance** is a transient condition occurring after gastroenteritis, resulting in persistent diarrhea (>14 days). it is caused by a temporary intolerance to lactose secondary to cow milk protein sensitization and villous damage. diagnosed with a positive clinitest and negative clinistix (glucose in stool). Resolves with cow milk protein and lactose free diet

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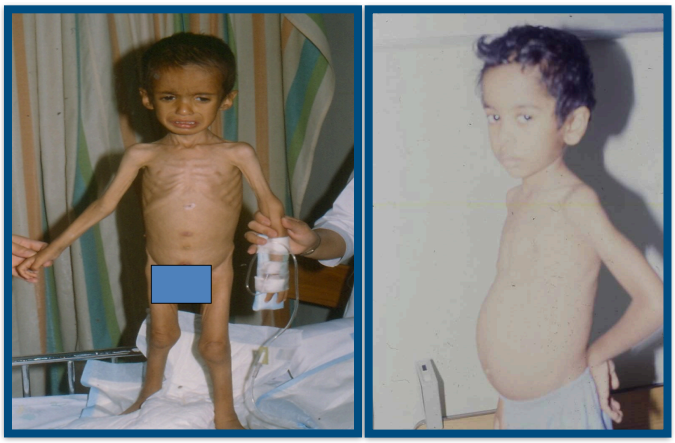
Case Seven

My 8 month old infant was well up to 6 month of age when I start to introduce cereals and baby biscuits then he started to have diarrhea since that time.
What is the cause of the diarrhea?

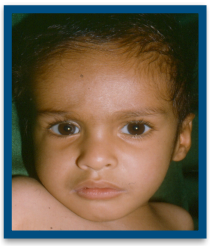
Dx: Celiac disease

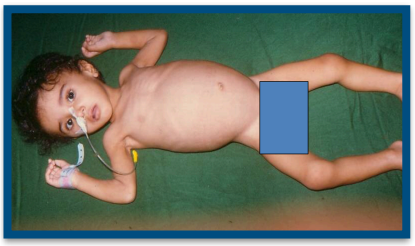


Onset
- dependent on timing of gluten introduction
- **typically >6 months**

Proteins implicated
Gluten found in wheat, rye, barley and possibly oats

Pathology
- Extensive villous atrophy
- Elongated crypt length
- Increased intraepithelial lymphocytes

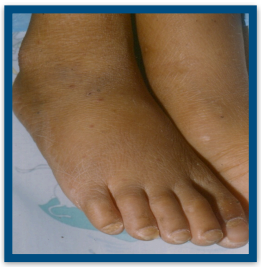




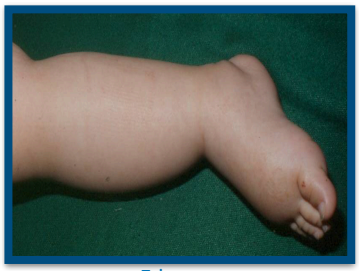
This child presented to us from the north, with marasmus and abdominal distention

Genetics
HLA-DQ2 (and DQ8)

Presentation
- Chronic diarrhea nowadays they don't present with diarrhea, even when they do it's never bloody
- Abdominal distension
- **Short stature**
- Iron deficiency anemia or folate
- Rickets
- Failure to thrive / growth failure
- Complications of malabsorption

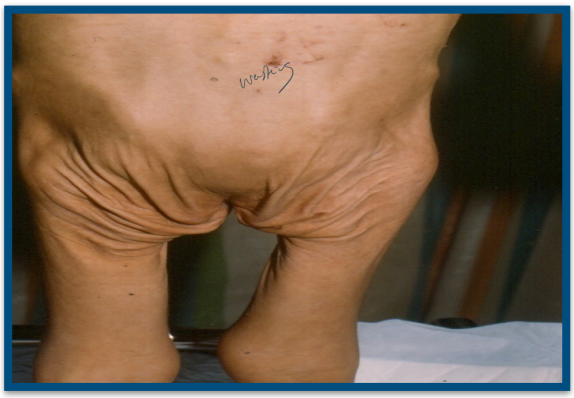


Here there is petechia
(vit K deficiency)



Edema
(proteinlosing enteropathy)

- Abdominal pain
- Hepatomegaly and increased LFTs
- Associated diseases: dermatitis herpetiformis, diabetes mellitus, thyroid disease, Down syndrome, IgA deficiency celiac disease is often found when screening those patients
- **Buttock wasting**, abnormal stools and general irritability



Wasting

Diagnosis

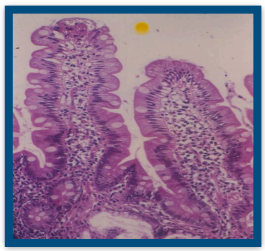
New criteria:

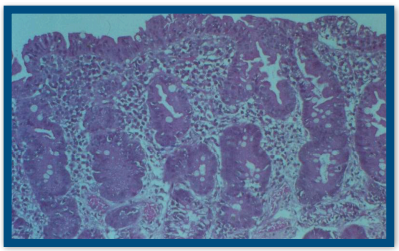
1. Positive anti-issue transglutaminase or endomysium antibodies

2. Villous atrophy on small bowel biopsy

Old criteria:

They used to confirm the Dx based on 3 biopsies, first one showing the characteristics of celiac, then the second after following a gluten free diet (recovered bowel) then they challenge the bowels with gluten and obtain a third biopsy to document a relapse.





Here we can see normal villi
after following a glutei free diet

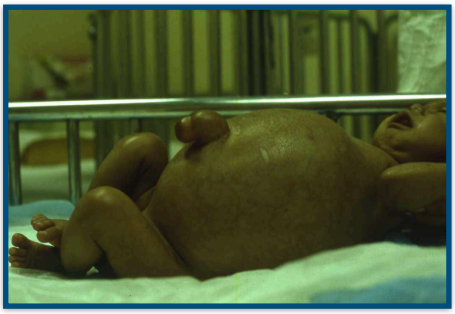
Treatment

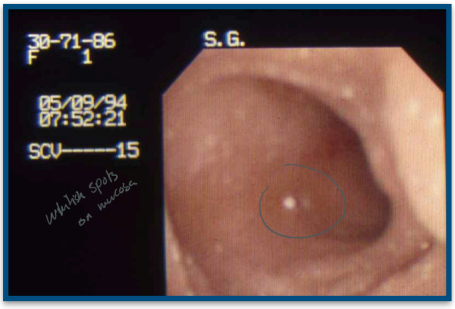
Gluten elimination

Case Seven

A 2 – year old child with chronic diarrhea which is associated with **lymphedema or ataxia.**
What is the cause?

DDx 1: Intestinal Lymphangiectasia





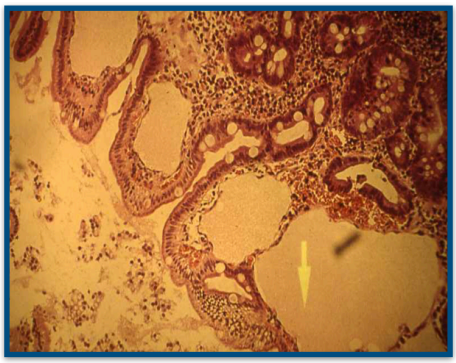
Whitish spots on mucosa

Features

- **Disorder of the intestinal lymphatics** (dilatation)
- Impaired fat absorption
- Primary disease can be familial
- Secondary to fibrosis

Presentation

- protein losing enteropathy
- Lymphedema and diarrhea
- hypoalbuminemia
- hypogammaglobulinemia
- low lymphocyte count



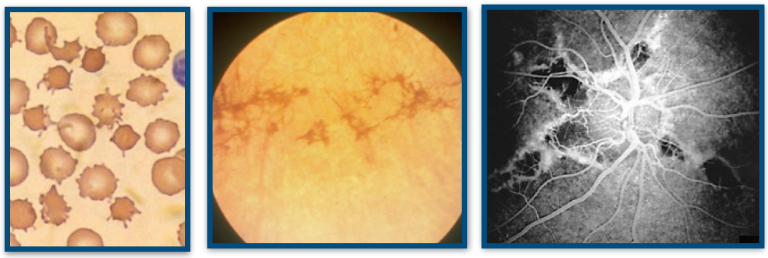
- chylous **ascites**
  - systemic infections
  - generalized lymphatic abnormalities

Diagnosis

- Follow-through demonstrates edema of the intestine
- Protein loss by Cr- labeled albumin
- Biopsy confirms lymphangiectasia
- Characteristic lymphatic dilatation

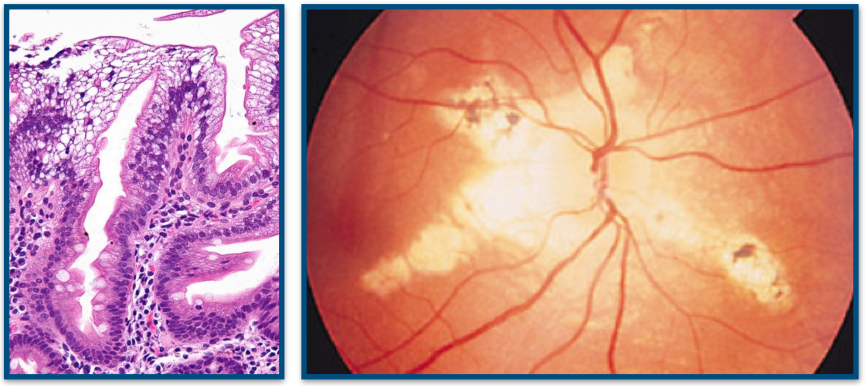
- last night i consulted a newborn with fistula and pleural effusion, there was leakage and a drain was put. The baby had abdominal distention, albumin was low despite replacement, and lymphopenia. I diagnosed him with lymphangiectasia as it can cause a fistula from the bowel to the pleura.

DDx 2: Abetalipoproteinemia



Features

- Autosomal recessive trait
- MTP gene located on 4q22 (function is transferring lipid to apolipoprotein B)

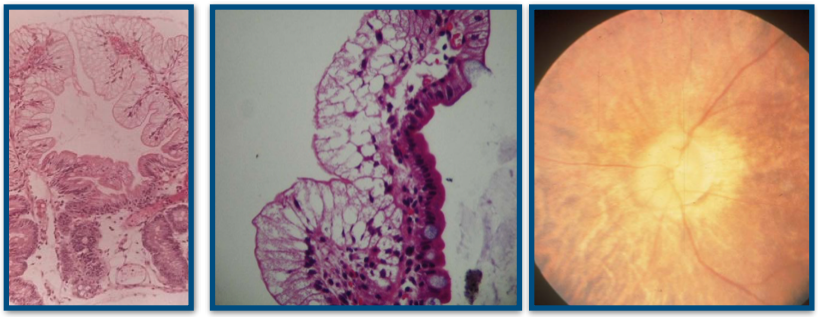


Presentation

- **Ataxia and retinitis pigmentosa**
- Fat malabsorption failure to thrive

Diagnosis

- **Markedly decreased plasma levels of cholesterol triglycerides and phospholipids** very low cholesterol
- **Acanthocytosis** on blood smear
- Small intestinal biopsy
  - Normal villous architecture
  - Fat droplets in the enterocytes in villi



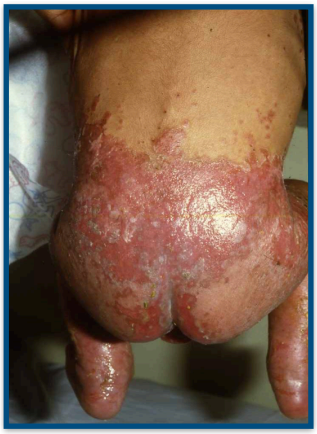
Treatment

- Low-fat diet with medium-chain triglycerides (MCT)
- **Vitamins A, D, E and K (fat soluble)**

Case Eight

A 1 – year old child with chronic diarrhea and skin rashes around the orifices and hair loss.
What is the cause?

Dx: Acrodermatitis Enteropathica

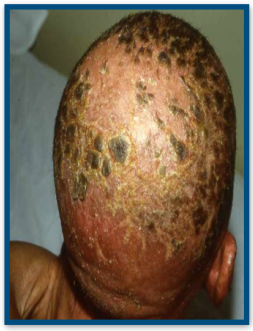


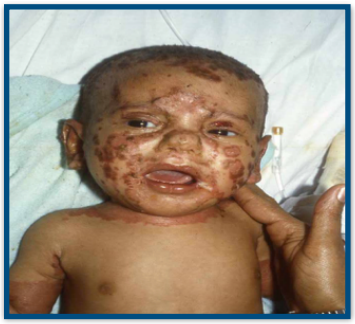
Features

- Autosomal Recessive
- SLC39A4 located on 8q24.3 (functions as a Zn2+ transporter)

Presentation

- Chronic diarrhea and failure to thrive
- Dermatitis involving perioral and perianal regions
- **Alopecia**





Diagnosis

- Low plasma zinc levels
- Alkaline phosphatase is low

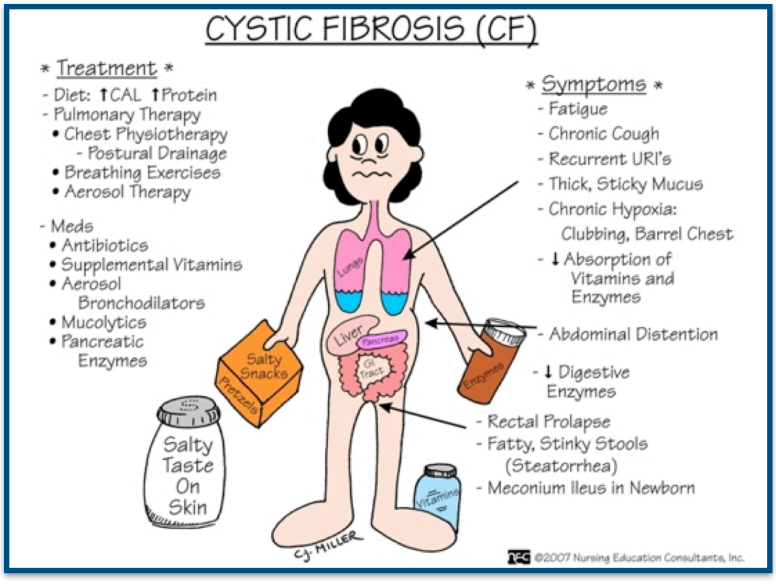
Treatment

zinc sulfate 150 mg/d orally

Case Nine

A 3 – year old child with chronic diarrhea and growth failure and recurrent chest infection.
What is the cause? One cause can be immunodeficiency and the other in cystic fibrosis

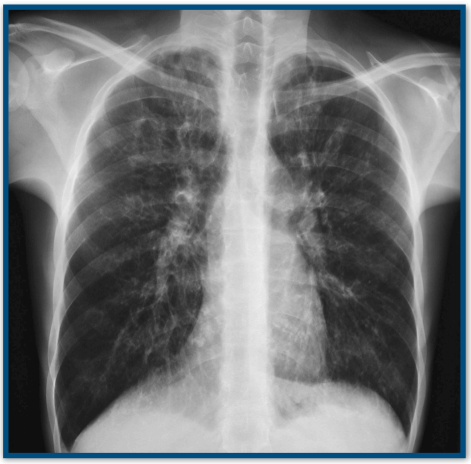
DDx 1: Cystic Fibrosis



Presentation

- In the neonatal period, with intestinal obstruction; **meconium ileus** or perforation of the bowel and intrauterine? calcification in the abdomen or iliac atresia or neonatal cholestais.
- With recurrent or persisting cough often associated with wheeze staphylococcal pneumonia
- older children present with either chest or

bowel disease, or both. they often present with meconium ilius equivalent which is abdominal distention and constipation.
- nasal polyposis, male sterility or arthritis
- Malabsorption; large, pale, bulky and offensive stools watery or fatty
- Failure to thrive
- Rectal prolapse
- electrolyte imbalance and hyponatremia
- Rarely, heat stroke
- CF is autosomal recessive, we see it in the northern and southern parts of the kingdom, it is very common in the west



Diagnosis
- **Sweat chloride concentration** >70
- or genetic testing
- Staphylococcus + pseudomonas aeruginosa

Treatment
- Physiotherapy + Abx for chest infection
- Enzyme replacement + high caloric diet
- Hot weather ?
- Fluid and salt intake

DDx 2: Short Gut Syndrome

Causes
- Surgical resection of the small intestine
- Volvulus
- Adhesions

DDx 3: Vasoactive Intestinal Polypeptide- Secreting Tumors

Pediatric:
- Ganglioneuroma rare
- Ganglioneuroblastoma
- Pheochromocytoma
- Mastocytoma
- Non-beta cell hyperplasia
- Medullary thyroid carcinoma

VIPoma skipped

Presentation

- Age range from 1 to 3 year olds.
- Chronic, high-volume, watery diarrhea, hypokalemia, and alkalosis (WDHA)

Diagnosis

- VIP is strikingly elevated
- imaging studies that show a mass in the adrenal gland or along sympathetic ganglia in abdomen or thorax

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Case Ten

A 1 ½ year old child with chronic diarrhea and food particles in the stool with normal growth.
What is the cause of the diarrhea?

Dx: Chronic Nonspecific Diarrhea (CNSD)/ Irritable Bowel Syndrome (IBS) Toddler diarrhea

Presentation

- Onset: 6 to 18 months of age
- Loose, explosive bowel movement **containing food particles**
- Bowel movement frequency: 6 to 12/d
- **Growth: Normal (if not on restrictive diet)**
- they are pink and not pale
- we say it is chronic diarrhea if it persists > 2 weeks

Red Flags (not compatible with CNSD)

- Hematochezia or melena
- Persistent fever
- Weight loss or growth arrest
- Anemia

Diagnosis skipped

- Diet:
  - Restrict apple juice (trial only)
  - Restrict lactose (trial only)
- Laboratory Studies:
  - tTg or EMA
  - Fecal Giardia antigen

Treatment

- Reassurance
- Lifestyle modifications try to reduce sugar and milk
- Avoidance of restrictive diets

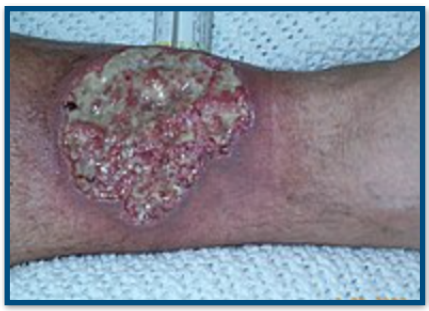
Case Ten

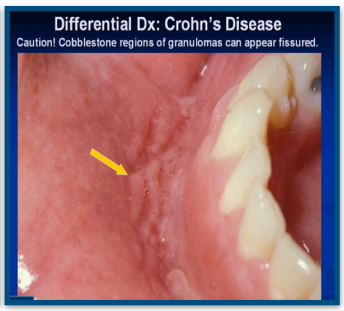
A 5 – year old child with chronic bloody diarrhea and growth failure.
What is the cause?
Inflammatory diarrhea used to be very rare, nowadays, we receive 2-3 cases per week

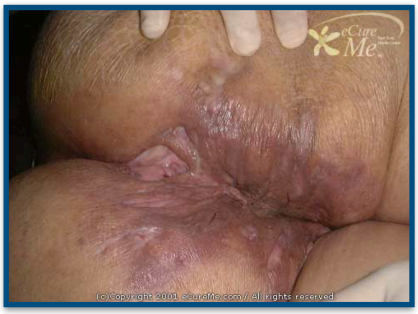
Dx: Inflammatory Bowel Disease (IBD)

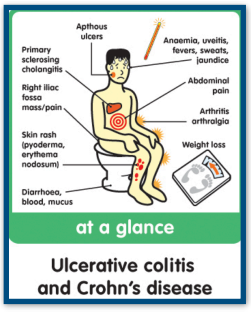
Feature	Ulcerative Colitis	Crohns Disease
Relative incidence of symptoms	common	rare
Rectal bleeding (gross)	Often severe	absent
Diarrhea	Less frequent	Almost always
Pain	Mild or moderate	Can be severe
Anorexia	Moderate	Severe
Weight loss	Usually mild	Often pronounced
Growth retardation	Common	Common

- Crohn's: from mouth to anus, unknown cause, oral ulcers, esophageal ulcers, daily affecting terminal ulcers, can cause ulcers, perianal disease, pyoderma gangrenosum, arthritis, iridoileitis, children can present with unexplained fever and short stature. granuloma on biopsy
- Ulcerative colitis: colon only, children can keep normal weight, crypt abscesses on biopsy









General Measures

Differential Diagnosis of Prolonged Diarrhea of Infancy

- Congenital chloride diarrhea
- Congenital Sodium Diarrhea
- Microvillus inclusion disease
- Tufte enteropathy
- Autoimmune enteropathy
- Immunodeficiency disease
- A-beta-lipoproteinemia
- VIPoma
- Cystic Fibrosis
- IBD
- Carbohydrate malabsorption
- Cow milk protein allergy
- Celiac disease
- Intractable diarrhea in infancy
- Enteric infection
- Intestinal Lymphangectasia
- Congenital short gut (malrotation)
- Acrodermatitis enteropathica
- Chronic Non-Specific diarrhea

Investigations

Investigation	To Diagnose	Investigation	To Diagnose
Identification of bacterial, viral and protozoal agent in stool	Infectious enteritis	Intestinal Biopsy	Milk protein allergy by pre and post milk challenge histology Celiac disease, lymphangiectasia
Stool PH and reducing substances; breath H2 excretion; oral sugar tolerance tests	Carbohydrate malabsorption	Urinary catecholamines; immunoassay for VIP	Secretory tumors
Stool electrolyte	Chloride losing diarrhea	Serum zinc	Acrodermatitis enteropathica
Lymphocyte count & immunoglobulin, profile; macrophage function, serum opsonic activity	Immunodeficiency, intestinal lymphangiectasia	Lipid profile	A beta liproteinemia
Sweat chlorides; pancreatic function tests	Cystic fibrosis and other pancreatic deficiency disorders	PT, PTT	Vitamin K malabsorption
Duodenal intubation	Bacterial overgrowth, excess deconjugated bile salts, enteric infections	Stool fat	Fat malabsorption

colonoscopy	Inflammatory bowel disease	Alpha-1-antitrypsin in stool	Protein loosing enteropathy
Barium studies	Surgical disorders, inflammatory bowel disease		

Malnutrition

- Sufficient calories should be provided to allow for catch-up weight gain. When oral intake is inadequate or malabsorption precludes adequate intake, continuous enteral feedings or parenteral nutrition maybe necessary.
- Micronutrient and Vitamin supplementation are part of nutritional rehabilitation:
  - Vitamin A
  - Zinc
  - Folic Acid
  - Copper
  - Selenium
- Deficiencies in these micronutrients can impair the function of the immune system.

Medications

- **Probiotics**
  - Administration of probiotic bacteria and the administration if antibiotics
  - The utility if treatment with antibiotics is unclear.
- **Antidiarrheal drugs**
  - Children with protracted diearrhea
  - Important side effects: sedation and risk for toxic megacolon
  - Prolong excretion of the organism or promote the development of hemolytic-uremic syndrome in patients infected with enterohemorrhagic E. coli.
- **Somatostatin**
  - Treatment may be directed at modifying specific pathophysiologic processes.
  - In severe secretory diarrheas for instance: neuroendocrine tumors microvillous
  - inclusion disease and enterotoxin-induced severe diarrhea

Sumamary

- The differential diagnosis for chronic diarrhea in children is broad. Pediatric clinicians can narrow these possible diagnoses beginning with a detailed history and physical examination.
- Particular attention should be paid to growth measurements to distinguish between chronic diarrhea with and without associated growth failure.
- Understanding the four basic pathophysiologic mechanisms of diarrhea also may aid in making a diagnosis.
- The four categories are osmotic, secretory , dysmotility associated, and inflammatory.
- Although specific therapies vary for each disease, the importance of maintaining nutrition demands particular emphasis.
- Whatever the cause of the diarrhea, each patient requires adequate caloric intake to allow healing of the initial insult, or at least take to support the child while pursuing diagnostic and therapeutic interventions.

-The doctor gave us a paper with multiple cases to workup-