

Chronic Diarrhea in PEDs

Background

1. Definitions:

- Diarrhea
 - Looser consistency and increased frequency of stools
 - Total stool output > 10g/kg/24 hrs in infants
 - Total stool output > 200g/24 hrs in children
- Chronic
 - Daily symptoms > 2-3 weeks in duration

2. General information

- Results from altered intestinal water and electrolyte transport
- May subdivide into the categories of osmotic and secretory diarrhea

Pathophysiology

1. Pathology

- Osmotic diarrhea
 - Caused by the presence of nonabsorbable solutes in the GI tract which result in an osmotic load causing excess water to be excreted into the lumen
- Secretory diarrhea
 - Secretion of electrolytes and water exceeds absorption, or absorption of water and electrolytes is impaired

2. Incidence and prevalence

- 500 million cases of pediatric acute & chronic diarrhea in the world

3. Approx. 220,000 admissions annually for diarrhea in the U.S. (10% of all young children who are hospitalized)

- Osmotic diarrhea
 - Excessive intake of nonabsorbable solutes
 - Excessive intake of carbonated fluids
- Secretory diarrhea
 - Infectious
 - Travel to regions with endemic diarrheal illness
 - Ill contacts at home or daycare center/school
 - Exposure to animals
 - Drinking non-portable water (well water, water from streams while camping)
 - Medications
 - Laxatives
 - Recent use of antibiotics

4. Morbidity/ mortality

- Diarrhea is a major cause of childhood morbidity and mortality
- In the developing world, it is estimated that pediatric diarrhea accounts for 4 million deaths per year
- In the US, 300-500 children die from diarrhea each year

Diagnosis

1. History

- Duration of daily diarrhea
- Number, volume, and character of stools compared with usual bowel habit
 - Cycles of loose stools interspersed with periods of constipation occurs in irritable bowel syndrome (IBS)
 - Small volume, frequent stools, tenesmus, and urgency suggest distal colon inflammation
 - Large volume, less frequent stools suggest disease in the small bowel or proximal colon
 - Sweet-smelling stools suggest carbohydrate malabsorption
 - Unusually foul-smelling stools suggest steatorrhea
- Presence or absence of blood or mucus
 - Presence of blood suggests infectious or inflammatory conditions of the colon
 - Presence of mucus may suggest colitis, IBS, or allergy
- Weight gain
 - Cystic fibrosis causes decreased growth velocity in the neonate
 - Celiac disease patients gain weight until 4-6 months of age when gluten-containing cereals are introduced
 - Poor growth in infants/toddlers or weight loss in the older child/adolescent suggests malabsorption, inadequate intake, or chronic disease
- Associated GI or systemic symptoms
- Risk factors for infection as listed above
- Thorough dietary history including a 3-day diet record with juice, fiber, fat intake and evidence for intolerance to specific foods such as dairy
- Factors that worsen or improve the diarrhea
- Previous medical history
 - Recurrent respiratory, skin, or ear infections may suggest altered immunity
- List of medications including prescription, OTC, home remedies
- Previous surgery
- Family history
 - Inflammatory bowel disease (IBD), colonic polyps, or early colon cancer increases the patient's risk of IBD
 - HIV or high risk behaviors such as drug abuse may prompt consideration of HIV in the differential diagnosis

2. Physical exam

- Assess nutritional status and trends by plotting growth
- Vital signs including temperature, pulse, respirations
- Signs and severity of dehydration including evaluation of mucous membranes, tears, anterior fontanelle, skin turgor, capillary refill, distal pulses, mental status
- Skin and nails
 - Bruising may indicate Vitamin K deficiency
 - Clubbing may be a sign of cystic fibrosis, Crohn's disease, or celiac disease

- Oropharyngeal exam, as ulcers could indicate Crohn's
- Thyroid exam (could indicate hyperthyroidism)
- Abdominal exam including evaluating bowel sounds, tenderness, distension
 - Abdominal distension may indicate disaccharide malabsorption, Hirschsprung, constipation, or obstructive disorder
- Rectal exam with evaluation of anal sphincter tone
 - Rectal prolapse may occur in celiac disease or cystic fibrosis
 - Perianal tags, fissures, or fistula may be seen in Crohn's disease
 - Chronic constipation with overflow bowel leakage is a common cause of chronic diarrhea

3. Diagnostic testing

- **Laboratory evaluation**
 - Carry out in a stepwise fashion beginning with less invasive, less expensive tests and progressing to more specific tests prn
 - **Normal weight gain**
 - Work-up is minimal
 - Stool for heme, WBC, ova & parasites, culture, and C diff toxin
 - U/A and urine culture
 - **Weight loss, or poor weight gain**
 - First level of evaluation
 - Stool for heme, WBC, ova & parasites, culture, and C diff toxin
 - U/A and urine culture
 - Stool for fecal fat analysis
 - Stool for pH and reducing substances testing for carbohydrate malabsorption
 - Blood for CBC, BMP, and albumin
 - HIV testing if indicated
 - Sweat chloride test
 - Urinalysis and possible urine culture
 - Quantitative serum IgA and serum tissue transglutaminase (TTG) for celiac disease screening
 - Increased balanced dietary intake: if child gains weight well on 25-30% more calories, clinically significant malabsorption is unlikely
 - Second level of evaluation is indicated if dx still not clear
 - Blood for calcium, phosphorus, magnesium, zinc, folate, vitamins B12, A, D, E, K, and quantitative immunoglobulins
 - RAST or skin testing for common food allergens such as milk, soy, egg, nuts
 - Stool for 72 hour fecal fat or spot stool sample for fecal elastase, which may be elevated in pancreatic insufficiency caused by cystic fibrosis, bile salt abnormalities, bacterial overgrowth, small intestine mucosal disease, or an abnormality of the terminal ileum

- Breath hydrogen test for lactose intolerance, fructose malabsorption, and bacterial overgrowth (controversial; variable sensitivity/specificity of test)
- **Endoscopic evaluation**
 - Upper GI endoscopy and biopsy
 - Performed when there is evidence of weight loss or malabsorption of unclear etiology, or confirmation of celiac disease is necessary
 - Colonoscopy
 - Helpful in cases of bloody diarrhea when considering IBD
- **Radiographic evaluation**
 - Upper GI & small bowel follow-through (SBFT)
 - Screens for anatomic abnormalities associated with small bowel overgrowth, IBD, and pseudo-obstruction
 - CT scan
 - Used to evaluate for tumors

Differential Diagnoses

1. Key DDx

- Infectious
 - Bacterial
 - Salmonella, Shigella, Campylobacter, Yersinia, Aeromonas, Plesiomonas, E.coli
 - Parasitic
 - Giardia, Cryptosporidium, Entamoeba
 - Clostridium difficile
 - Viral
 - Rotavirus, adenovirus, Norwalk agent
- Drug-induced diarrhea
 - Antibiotics
 - Laxative abuse
 - Chemotherapy
- Dietary causes
 - Intolerance to specific foods
 - Sorbitol
 - Formula
 - Malnutrition
 - Intake of high osmotic loads (apple juice)
- Primary or secondary lactose intolerance
- Encopresis
- Irritable bowel syndrome
- Milk-protein/soy allergy
- Nonspecific diarrhea of infancy
- Inflammatory bowel disease
- Celiac disease
- Anatomic abnormalities
 - Malrotation

- Short-bowel syndrome

2. Extensive DDx

- Acrodermatitis enteropathica
- Congenital carbohydrate malabsorption
- Congenital villous atrophy
- Endocrine disorders
 - Hyperthyroidism
 - Congenital adrenal hyperplasia
 - Diabetes
- Eosinophilic gastroenteritis
- Familial polyposis
- Hemolytic-uremic syndrome
- Henoch-Schonlein purpura
- Hepatobiliary tract disease
- Hirschsprung's enterocolitis
- Hormone-secreting tumors
 - Neuroblastoma
 - Ganglioneuroma
 - Gastrinoma
 - VIP-secreting tumors
- Immune deficiency
 - HIV
 - Hypogammaglobulinemia syndromes
 - Neutrophil defects
- Intestinal pseudo-obstruction
- Microvillus inclusion disease
- Munchausen's / Munchausen's by proxy
- Necrotizing enterocolitis
- Pancreatic disorders/fat malabsorption
 - Cystic fibrosis
 - Shwachman's disease
 - Chronic pancreatitis, pancreatic insufficiency

Weight, Height, Nutrition Normal

1. Consider chronic non-specific diarrhea in a toddler
 - Reduce fluid intake to <90 ml/kg/24hr
 - Decrease excessive fruit juice ingestion
 - Increase fat intake to 35-40% of total calories per day if limited in the past
 - Add fiber to diet
 - Consider lactose or sucrose intolerance if diarrhea related to carbohydrate intake
 - Initiate trial period of decreased lactose or sucrose
 - Add lactase or sacrosidase tablets
 - If diarrhea persists, initiate trial of lactose-free or sucrose-free diet

2. Consider IBS if altered bowel habits associated with abdominal discomfort which may be relieved by defecation
 - Goals of therapy should focus on patient reassurance, education, and symptom improvement
 - No single consistently successful therapeutic approach
 - Recommend food diary to help patients identify and avoid dietary triggers, lactose and caffeine in diarrhea-predominant IBS
 - Anti-spasmodic, loperamide, or peppermint oil for moderate symptoms
 - In severe diarrhea-predominant IBS, consider tricyclic antidepressants, psychotherapy

Weight Loss and Stool Positive for Fat

1. Chronic diarrhea is secondary to malabsorption
2. Postinfectious gastroenteritis is most common cause in infants
 - Treat with elemental formulas
 - Lactose-free, contain hydrolyzed amino acids, and have medium-chain triglycerides
 - Closely monitor infant's weight
 - Acute weight loss or dehydration will require hospitalization
 - Severe cases may require continuous NG feeding or parenteral hyperalimentation
3. Short bowel syndrome if Hx of small bowel resection
 - Early and aggressive enteral Tx is most important stimulus for intestinal adaptation & eventual discontinuation of parenteral Tx
 - PPN or TPN may be required
 - Monitor for deficiencies of:
 - Vit A, D, E
 - Iron, zinc, calcium, magnesium
 - Check PT every 3-6 months
 - Parenteral vitamin B12 may be required
 - Treat bacterial overgrowth with oral gentamicin or metronidazole alone or in combination with TMP-SMX
4. Celiac dz (Gluten enteropathy)
 - Tx is dietary gluten restriction (wheat, rye, barley) for life
 - Lactose is poorly tolerated in acute stage
 - Supplemental calories, vitamins, and minerals are indicated in acute phase
 - Clinical improvement usually begins within one week, but complete clinical recovery and histologic normality may require 3-12 months
 - Corticosteroids are only indicated in very ill patients with profound anorexia, malnutrition, diarrhea, edema, abdominal distention, and hypokalemia

Crohn's Dz and UC

1. Nutrition
 - Liquid or elemental enteral feedings may reduce inflammation in Crohn's disease
 - TPN may be required when fistulas are present in Crohn's disease

2. Medications

- Antiinflammatory agents
 - Steroids
 - Mainstay for severe disease
 - Do not maintain remission
 - 5-Aminosalicylates
 - Sulfasalazine, Olsalazine, Mesalamine
 - Useful in colonic disease
 - Can help maintain remission
- Immunomodulators
 - Azathioprine, 6-Mercaptopurine, Cyclosporin A
 - Used if unable to maintain remission with aminosaliculates alone
 - Useful as steroid-sparing agents, in healing fistulas, or when patient has contraindications to surgery
- Antimicrobials
 - Metronidazole
 - Can be effective in the treatment of perirectal disease

3. Surgery

- Absolute indications
 - Toxic megacolon
 - Perforation
 - Hemorrhage
- Relative indications
 - No response to optimal medical management
 - Cumulative effect of disease on quality of life
- Outcome
 - Ulcerative colitis
 - Surgery is curative
 - Total colectomy is always done
 - Crohn's disease
 - Surgery is performed for complications such as strictures, fistulas, bleeding rather than for the disease itself
 - Lesions requiring limited resection have the best outcome

Follow-Up

1. Return to office
 - Varies with severity of diarrhea, weight loss, etc
 - Close follow-up of cases of poor weight gain and/or weight loss is essential
2. Refer to specialist
 - If endoscopy or surgery is required
 - If poor weight gain and underlying etiology not apparent after initial work-up
 - If patient is severely ill
3. Admit to hospital
 - If severely ill or dehydrated
 - If parents/caregivers non-adherent to evaluation and/or care
 - If outpatient evaluation and/or treatment fails

Prognosis

1. Varies depending on the cause

Prevention

1. Raise educational level of the family
2. Improve the quality and quantity of drinking and cooking water
3. Raise the standards of sanitation and hygiene
4. Early nutritional interventions

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