

Evaluation of Abdominal Pain in the Adolescent

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Objectives

Discuss the differential diagnosis for an adolescent patient presenting with abdominal pain

Define functional gastrointestinal disease

List red flag signs and symptoms that point towards true (mucosal) gastrointestinal pathology

State 'can't miss this' adolescent gastrointestinal problems (3 Cs and an E)

Develop a first line evaluation strategy and triage algorithm for those with red flags

Develop a first line treatment strategy for those without red flags

Construct a plan for when to refer to gastroenterology

Chronic Adolescent Abdominal Pain

In community-based studies of adolescents, between 10-20% report chronic abdominal pain

The vast majority is occult (ie not correlating with clear GI pathology)

20% of those with chronic abdominal pain report it is severe and it detracts from activities

High school class of 500, 100 have some belly pain, 20 are notably limited by it

Hyams JS, Burke G, Davis PM, et al. Abdominal pain and irritable bowel syndrome in adolescents: a community-based study. *J Pediatr* 1996; 129:220.

Up to 5% of all pediatric primary care visits are for recurrent abdominal pain

Gieteling MJ, Lisman-van Leeuwen Y, van der Wouden JC, Schellevis FG, Berger MY. Childhood nonspecific abdominal pain in family practice: incidence, associated factors, and management. *Ann Fam Med*. 2011;9(4):337–343.

A typical case (in our practice)

CC: 'my stomach is killing me!'

HPI: A.P. is a 16 year old female who presents with 3 months of near constant abdominal pain. She has had issues with 'sour stomach' on and off during childhood, but this is her first targeted visit for assessment.





Pain focused history

P (palliation/provocation): worse with eating, but also gets nauseated if skipping meals, uncomfortable with vigorous exercise, hot packs/rest/laying down help a little, no aid from OTC meds

Q (quality): usually dull, but can escalate in waves to the point where she has to cease all activities and she curls up on the ground and cries

R (region/radiation): sometimes belly button focused, sometimes higher middle, can radiate to RUQ/LUQ under ribs

S (severity): pain is always there (parents are concerned she's gotten used to feeling terrible), 6-8/10 at baseline, 10/10 in flares. Never to ED but very close. 17 missed school days this year thus far. Has dropped off competitive dance team.

T (timing): nausea/sick to stomach in AM, pain builds with activity and intake throughout the day



Pertinent History

She has tried 1 week of milk free diet and 1 week of gluten free diet, neither of which helps

She has tried a few doses of each with no aid: APAP, Motrin, Pepcid, Tums, essential oils (topical)

Stools are 'normal, gross, I really don't keep track,' no straining or pain but parents say she's in the bathroom a long time and she won't go at school

No major change in pain after stool is produced

She feels she's been unable to eat a normal diet, and has lost 5-10 pounds without trying

Breakfast: sometimes eats dry cereal, often skips and just has water or juice, feels bloated for whole day if she eats too much early on

Lunch: granola bar, chips, 'something on the go'

Dinner: sits with family, seems to eat well, but often complains of feeling full easily/early



Pertinent negatives

Has vomited a few times (about once a month) in the past three months, but has daily nausea carries a trash can around with her in AM and before bed

She states she wants to eat but feels like she can't, no desire to lose weight or be thinner

No blood in emesis or stool

No fevers

No diarrhea or loose stools

No joint pain/swelling or new rashes

No recent travel or camping

No pets

Medical history

No regular medications, No allergies

Exercise induced asthma, takes PRN Albuterol

Mild eczema during winter's, controlled with emollients

Menarche at age 14, now having regular periods, pain not clearly tied to menstrual cycles

Not sexually active but has a boyfriend that's in her class, feels safe, denies recent social stress

Straight As in school, making up her work when missing

Mom struggles with sensitive stomach, miserable but just lives with it, normal 'scopes'

Physical Exam

Noted 6 pound weight loss from WCC 3 months prior

H: 87% (5'7), W: 55% (121 pounds), BMI 30% (19)

Normal cardiopulmonary exam, <2 sec CR, no pallor

Abdomen is soft and non-distended, +BS

Patient reports diffuse tenderness, mild, with light palpation

No HSM, no rebound

Mild cystic facial acne, no other rashes

The one-liner

This is a 16 year old previously healthy/robust female, now with chronic midline (periumbilical/epigastric) abdominal pain, no red flags elicited on history or exam, presenting for initial evaluation



Differential diagnosis

Most likely: functional gastrointestinal disorder (~10% of pediatric population)

Based on Rome IV Criteria

Universal criterion: after appropriate evaluation (more on this later), symptoms not fully explained by another medical condition

Functional dyspepsia: >two months, >1 symptom for >4 days per month:



1) postprandial fullness, 2) early satiety, 3) epigastric pain/burning not associated with pooping

Functional abdominal pain NOS: >two months, >4 times per month:



1) Episodic or continuous abdominal pain that does not occur solely during physiologic events (eg, eating, menses), 2) Insufficient criteria for irritable bowel syndrome or abdominal migraine

Hyams JS, Di Lorenzo C, Saps M, et al. Childhood functional gastrointestinal disorders: Child/adolescent. *Gastroenterology* 2016; 150: 1456

This is not IBS (technically)

Irritable bowel syndrome: universal criterion + >2 months of abdominal pain associated with 1 or more of the following, >4 days per month:

- 1) Pain related to defecation (worse before defecation, better after)
- 2) Change in frequency of stool
- 3) Change in form (appearance) of stool

Typically IBD categorized by predominant stool type, as IBS-D, IBS-C, IBS-mixed

Can be very hard to fully characterize stool pattern in a teenager, especially one with constipation

Hyams JS. Irritable bowel syndrome, functional dyspepsia, and functional abdominal pain syndrome. *Adolesc Med Clin* 2004; 15:1.

This is not functional constipation (probably)

Functional constipation (population-based pediatric prevalence also ~10%): universal criterion + >2 of the following >1 time per week for >1 month with insufficient criteria for IBS:

- 1) <3 poops in toilet per week for child >4
- 2) 1 or more fecal incontinence episodes
- 3) Withholding behavior / retentive posturing
- 4) Large fecal mass in the rectum
- 5) Large diameter stools that can obstruct the toilet

Saps M, Velasco-Benitez CA, Langshaw AH, Ramírez-Hernández CR. Prevalence of Functional Gastrointestinal Disorders in Children and Adolescents: Comparison Between Rome III and Rome IV Criteria. *J Pediatr* 2018; 199:212.

FGID Pathophysiology

Issue with the enteric nervous system, which has bidirectional communication with CNS (brain-gut axis), often involving an initial insult

Abnormal bowel reactivity to physiologic stimuli (meal, gut distension, hormonal changes)

Stretch from gas, liquid distention: visceral pain / visceral hyperalgesia

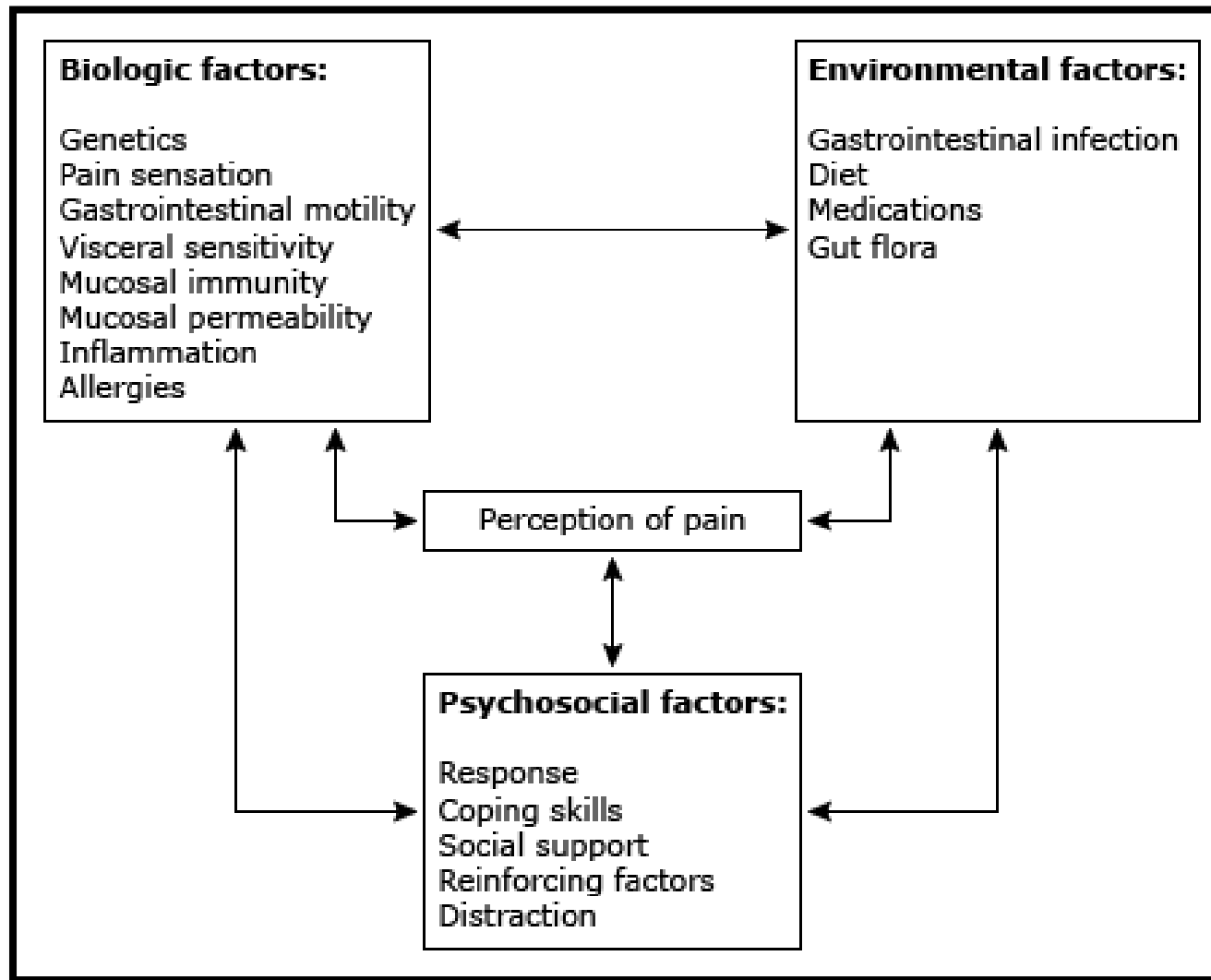
Central sensitization, recruitment of non-involved neurons

Psychologic stressful stimuli (anxiety)

Worsened by altered motility (post-viral dysmotility, familial slow / fast transit, spasm)

Halvorson HA, Schlett CD, Riddle MS. Postinfectious irritable bowel syndrome--a meta-analysis. *Am J Gastroenterol* 2006; 101:1894.

Di Lorenzo C, Colletti RB, Lehmann HP, et al. Chronic abdominal pain in children. *JPGN* 2005; 40 (3): 245-8.



Fishman M, Aronson M, Chacko M. Chronic abdominal pain in children and adolescents: Approach to the evaluation. Uptodate.com, last updated July 2019.



GI Red Flags or Alarm Signs

Reported GI Symptoms

Notable weight loss beyond typical variation

Recurrent dysphagia, heartburn or food sticking sensation

Focal GI complaints, especially RUQ/RLQ pain

Chronic diarrhea (variably defined, generally >200g/day and/or 3+ loose stools/day)

Blood in stool

Nocturnal stools (waking from sleep)

Recurrent vomiting and/or blood in emesis

Restrictive eating pattern

? *Missing school / activities ?*

? *Parent / child distress over the issue ?*

? *Fall off in performance (school, sports, ECs) ?*

ROS

Constitutional symptoms: fever, notable weight loss

Known associates with GI inflammation: joint pain, rash, visual complaints, other autoimmune disease

Exam

Unintentional weight loss

Notable height deceleration

Focal abdominal exam

RUQ tenderness, RLQ tenderness/mass, notable distention/tympany, organomegaly, vascular findings

Oral (ulcers) or perianal findings (fissure, tag, fistula)

'Can't Miss This' Chronic GI Diagnoses

3 Cs

Crohn Disease

Ulcerative Colitis

Celiac Disease

1 E

Eosinophilic esophagitis/gastrointestinal disease

Many others in scope of your general practice:

Deep tissue infection

GYN issues / STIs

Cancers

Mental health disease / abuse

Crohn Disease in 1 slide

Autoimmune disease, with poorly defined pathophysiology

Genetic component as well as dietary and infectious triggers

Adolescence is most common age of onset (very uncommon <5); prevalence ~5/10,000

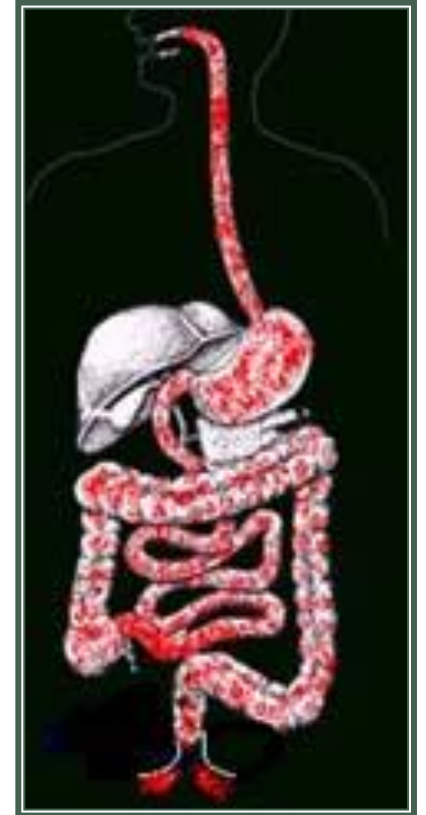
Variable pediatric phenotypes:

1) Pancolitis (hard to differentiate from UC), 2) stricturing/penetrating (often ileocecal focused, can have stricture/abscess), 3) perianal

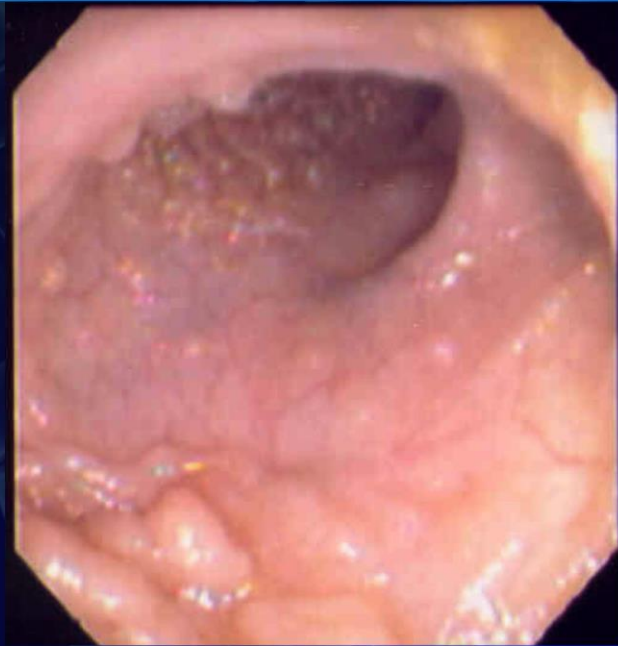
Can have inflammation anywhere from mouth to anus (often in skips)

Depending on phenotype, can lead to anemia, hypoalbuminemia, elevated CRP

Histopathologic key: granulomas, penetration into deeper layers



Crohn's Ileitis



**Normal ileum
(Peyer's patches)**



**Crohn's ileitis
(linear ulcers, exudate)**

Ulcerative Colitis in 1 slide

Autoimmune disease, with poorly defined pathophysiology

Genetic component as well as dietary and infectious triggers

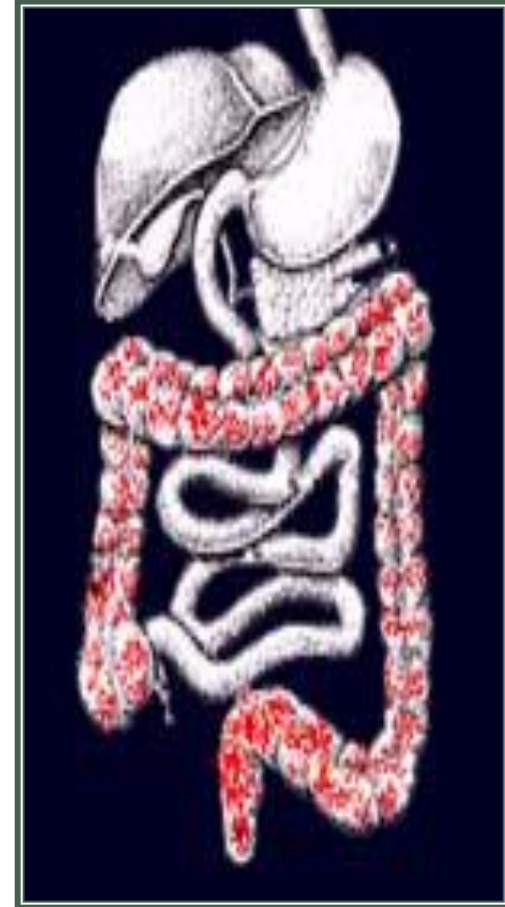
Less common in children/adolescents than crohns (1:3); prevalence ~2/10,000

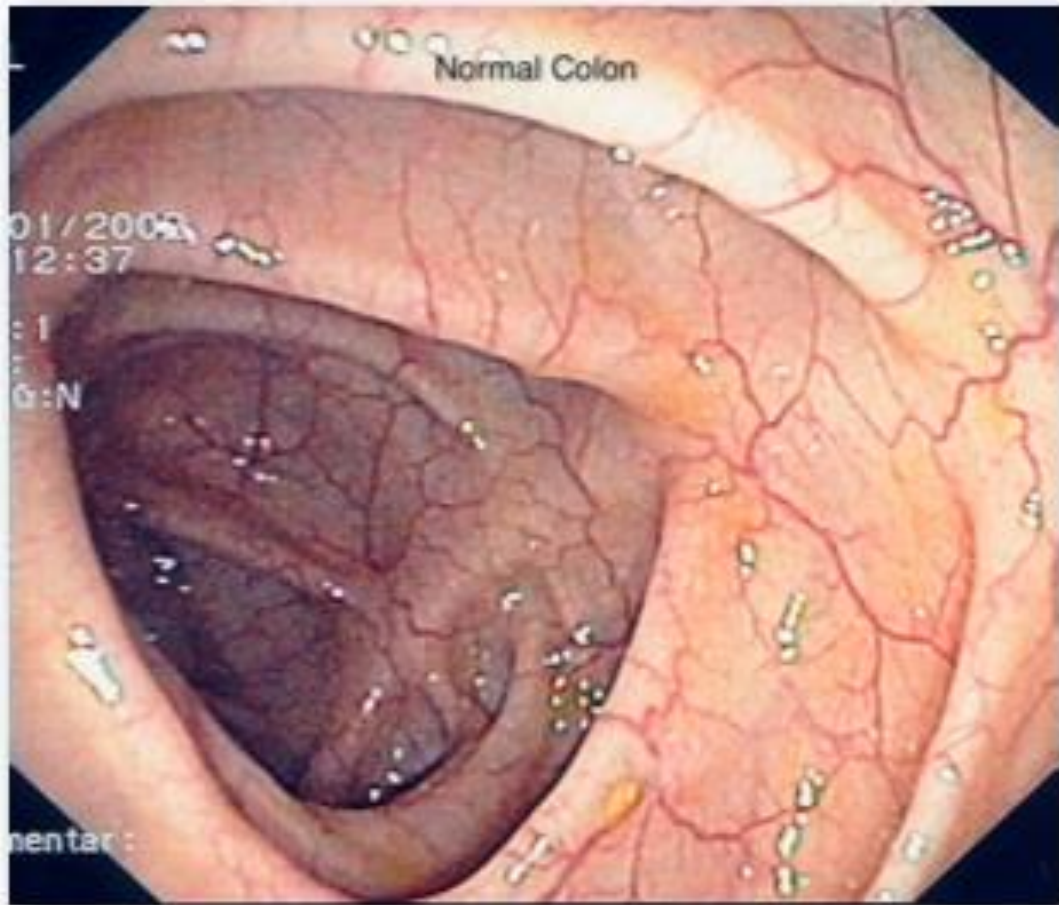
Symptoms more clear (diarrhea, tenesmus, blood in stool, nocturnal stools)

Continuous inflammation starting in rectum (can be pancolitis or partial), no perianal disease or chronic ileal inflammation

Anemia, hypoalbuminemia (depending on nutritional status), elevated CRP, less likely to have vitamin deficiencies, protein loss than CD

Histopathologic key: neutrophilic colitis with crypt changes, no granulomas





Celiac Disease in 1 slide

Autoimmune mediated small bowel inflammation (not a wheat allergy!)

In people with genetic predisposition (plus some other inciting event), gluten triggers a progressive lymphocytic destruction of villi

With progressive villous blunting comes malabsorption

Common disease: 1/100 in general population

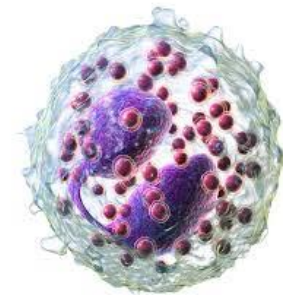
Younger children present with poor growth and hypoalbuminemia, adolescents more non-specific (constipation or diarrhea, pain)

Endoscopic biopsy is gold standard, but recent philosophy shift to diagnose celiac without endoscopy in patients with symptoms and very elevated celiac specific labs

Histopathologic keys: villous atrophy, crypt hyperplasia, increased lymphocytes







Eosinophilic Esophagitis in 1 slide

(Presumed) delayed, T-cell mediated hypersensitivity to food and/or environmental antigens

Strong genetic component, M>F (2-3:1), commonly presents in childhood

The most common disease you've never heard of (1 in 1,000 children diagnosed with EoE in Utah in past 5 years alone)

Typically have co-morbid atopy

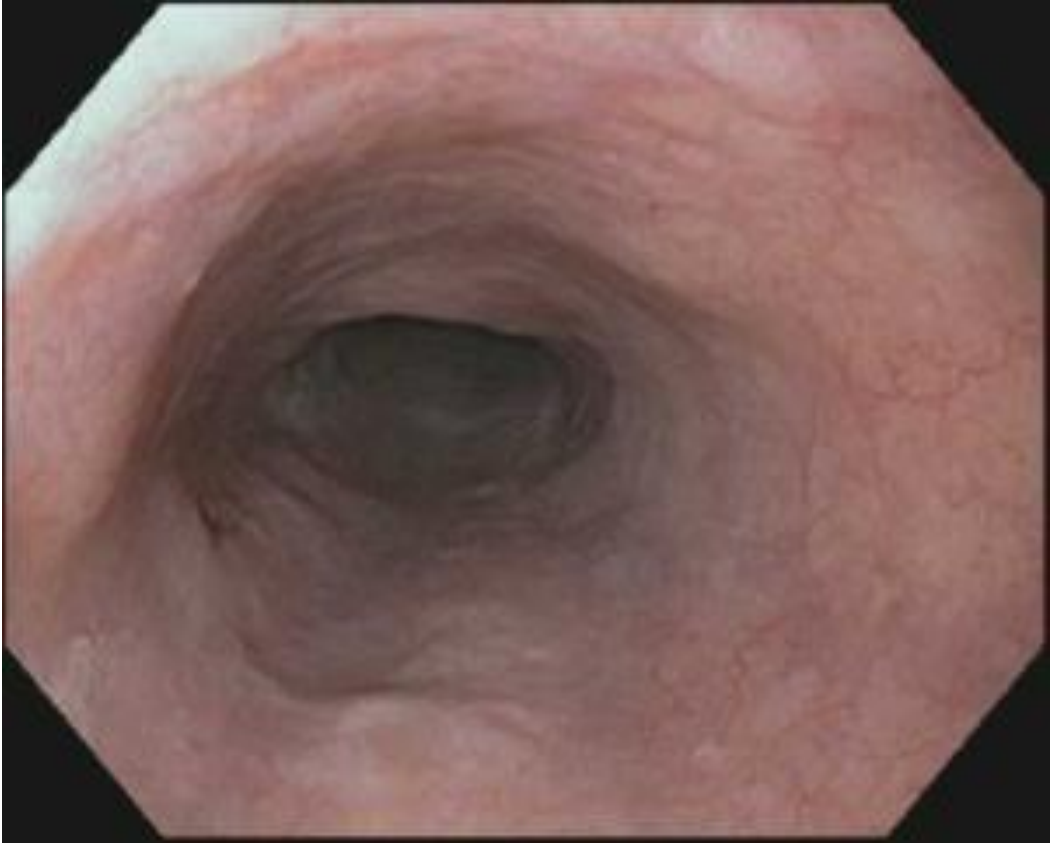
Symptoms vary in children (can present as a feeding problem or generalized abdominal pain), but adolescents usually complain of dysphagia, food stuck or reflux/heartburn/chest pain

No reliable serum labs or allergy testing, only diagnose by endoscopy (at this time)

Histopathology keys: eosinophils in epithelium with abscesses, lamina propria fibrosis

Newly available: Let's Talk About Eosinophilic Esophagitis

https://intermountainphysician.org/_layouts/Custom/KnowledgeRepository/KrDocumentFetch.aspx?target=document&ncid=529631245&tfrm=default



Proposed Evaluation with Concerns/Flags

Basic serum screen: 4 C labs to screen for 3 Cs!

Speech #1

CBC (can see anemia in IBD, mild in celiac; thrombocytosis common in IBD)

CMP (hypoalbuminemia can be seen in crohn>UC, mild hepatitis in IBD, celiac)

CRP (sensitive but not specific for IBD, now much cheaper)

Celiac reflexive cascade (can be pricey, but one stop shop for patients that have low IgA)

- Most sensitive, cost effective test is TTG IgA (but you need adequate IgA for this)
- Reflexive cascade will automatically run other screens if IgA is low, but they are IgG based (much less specific than IgA)

Ermarth A, Bryce M, Woodward S, et al. Identification of Pediatric Patients With Celiac Disease Based on Serology and a Classification and Regression Tree Analysis. CGH 2017, 15 (3): 396-402.

Other considerations for evaluation

No routine stool or imaging tests, but in the right clinical context:

1) Stool studies: GI PCR (camping, travel, sick contacts, reptiles/pets, exposures)

Rarely:

- a) fecal elastase (new onset EFI very rare in adolescence)
- b) fecal calprotectin (good screen for IBD, rarely get at first visit / early endoscopy indicated also, high out of pocket cost)
- c) Fecal alpha-1-antitrypsin (good to evaluate new edema with suspicion for protein losing enteropathy)
- d) H pylori stool ag (only in a very specific clinical context with appropriate exposures/symptoms)
- e) Guaiac / occult blood (high false negative rate and positive not always indicative of sinister disease)

2) Abdominal US: can pick up IBD, liver masses, gallstones, malrotation, obstructive masses (lots of incidentalomas)

Never (almost never):

- a) KUB to assess stool burden
- b) HIDA scan to assess 'gallbladder' function

Proposed Treatment

No flags and/or initial evaluation negative

Get comfortable making an analogy and setting the teenager up for success

Also heads off parents concern about wanting to find 'the cause' so it can be treated

{Unabashedly stolen (mostly) from Walt Sipe at UCSF (pediatric gastroenterologist and psychiatrist)}

“You’re at school and the fire alarm goes off one morning. Not a planned fire drill. Everyone files out. 30 minutes later, after fire department has inspected and not found anything, everyone comes back in, confident the school is not on fire. The next morning the same thing happens. The teachers and students follow the protocol again, but this time a little more reluctantly. Again, the fire department checks the school and there is no fire or other emergency. The third day, when the fire alarm goes off, no one reacts to the alarm, but instead the school makes an announcement that there is an electrician working on fixing the fire alarm. Everyone agrees it would be silly to keep calling the fire department. With your pain, based on my evaluation (exam, labs, history, etc), we’ve ruled out a fire. Now you and I need to work together to be the electrician. I’ll give you the ‘tricks of the trade’ that work for most people, but you need to help me understand what is and what is not working for you.”

Proposed Treatment

No flags and/or initial evaluation negative

Get comfortable making an analogy and setting the teenager up for success

A much shorter analogy:

“You’re hammering a nail and you miss and smash your thumb. It hurts like the dickens for a few days, but eventually it gets better and you know it’s not broken or permanently damaged. But, strangely, just thinking about your thumb and that incident for days to weeks after it’s healed, still makes your thumb throb and hurt! Based on my assessment, this is what’s going on in your belly right now and it’s going to take some time and help to get better.”

Proposed Treatment

No flags and/or initial evaluation negative

Medication considerations:

Periumbilical pain related to meals, spasm pain in nature:

Hyoscyamine (Levsin): 0.125 mg PRN a few times a day

Dicyclomine (Bentyl): 10-20 mg TID standing

Amitriptyline (Elavil): used in refractory cases, titrated up from starter dose after EKG, very dangerous in OD, unclear utility/safety in adolescents on other psychotropics

Mild reflux, heartburn:

Famotidine (Pepcid): 20mg once or twice daily, PRN

Nausea, post-prandial fullness:

Cyproheptadine (Periactin): 4mg qHS, can add AM dose as well if not oversedating

- Appetite stimulant, watch out in kids who are already overweight

Proposed Treatment

No flags and/or initial evaluation negative

Bowel program considerations:

Basically never wrong in a child with concern for FGID, when you aren't getting a great history

Softeners & stimulants:

Miralax (1-2 caps per day or start with cleanout)

Ex-lax (1-2 squares PRN to aid in squeeze, or add to cleanout)

Bulk forming agents:

Dietary fiber (Age + 5 grams per day)

Metamucil, Benefiber, Citrucel (can be useful in IBS-D to prevent frequent, small, loose stools)



Proposed Treatment

No flags and/or initial evaluation negative

Diet considerations:

Low FODMAP diet:

Evidence based, teen directed, eye opening for all

Minimizes gas, minimized liquid / fast transit, resets microbiome, can be adjusted over time

Decreases lactose, highly processed foods, junk food/candy, sugar sweetened beverages

Be very careful with this in teens with possible trend towards restrictive eating – following this to the letter leads to insufficient caloric intake in the vast majority of teens

Halmos EP, Power VA, Shepherd SJ, et al. A diet low in FODMAPs reduces symptoms of irritable bowel syndrome. *Gastroenterology* 2014, 146 (1): 67-75.

https://intermountainphysician.org/_layouts/Custom/KnowledgeRepository/KrDocumentFetch.aspx?target=document&ncid=521404312&tfrm=default

Proposed Treatment

No flags and/or initial evaluation negative



Behavioral considerations/CAM:

Progressive relaxation: Let's talk about, Primary Children's Hospital

https://intermountainphysician.org/_layouts/Custom/KnowledgeRepository/KrDocumentFetch.aspx?target=document&ncid=529631855&tfrm=default

Mindful eating: No IHC handout on this yet, but lots on the web

https://www.move.va.gov/docs/NewHandouts/BehavioralHealth/B11_MindfulEating.pdf

Peppermint oil capsules: Effective in small studies, 'natural,' not FDA regulated, can be pricey

<https://ibgard.com/>



Common Patient Concerns (not MD)



Gallbladder disease / biliary dyskinesia (not cholelithiasis, choledocholithiasis or cholangitis)

Eval for cholestasis with CMP, consider limited RUQ US, then stop

~10% of patients with concern for gallbladder disease/biliary dyskinesia get relief from surgery

Treat as FGID

Gluten sensitivity (you feel bad when you eat wheat, but don't have celiac disease)

Probably FGID, exacerbated by fructans (wheat sugar)

Ehlers Danlos Syndrome (EDS), Postural Orthostatic Hypotension (POTS), Median Arcuate Ligament Syndrome (MALS), Mast Cell Activation Syndrome (MCAS), 'silent' Food Allergies

Generally poorly understood and without effective targets treatment (in vast majority of cases)

Treat as FGID and enlist consultants as needed

The final speech

Building an alliance with parents as you say this (they usually appreciate the help):

“Your getting an early lesson on being an adult, your body doesn’t always feel 100% great, especially if you don’t treat it right. Some of these changes are hard work. So it’s really your call at this point...start working to figure out what gets you back to normal. Or, keep doing what you’re doing, but stop complaining to your parents about it and accept that this is going to be a part of your life at school, sports, band, etc, so just get back to it!”



When to refer

1) Evaluation / consideration of the 3 Cs and 1 E has yielded a positive and further workup or management is needed

Diagnosed celiac

Needing endoscopy to diagnose crohns, celiac, colitis or EoE

Unpacking mildly abnormal labs along with further history

2) Needing support for a refractory / difficult case

We have 40 minutes for the visit, we understand that you don't!

3) Hunch that something rare / concerning is going on



Thank You!!!

We appreciate all that you do!

We have a designated GI doctor on call to field urgent questions / outpatient issues 8-5 on weekdays (page through PCH Physician Access Line)

- Can briefly discuss cases and aid in triaging patients to endoscopy, urgent GI visit, standard GI visit, etc
- We have a separate team via transfer center that deals with requests for admission

