REVIEW ARTICLE

Evaluation & Management of Functional Abdominal Pain in Children

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Non-organic or functional, abdominal pain is pain that exists free of a pathologic state. This is the most common type of chronic abdominal pain in children. It interrupts a child's normal daily activities and causes stress and anxiety amongst families. In the past, it has been poorly treated due to misconceptions and inadequate knowledge of evaluation and application of treatment. A proper history and physical evaluation of the abdominal pain is required for accurate diagnosis. ROME IV criteria is the diagnostic criteria used for children once organic chronic abdominal pain is ruled out. Treatments that are available for use in non-organic chronic abdominal pain in children consist of behavioral therapies, diet changes, and recently approved pharmaceutical medications.

INTRODUCTION

Chronic abdominal pain is diagnosed by having at least three episodes of pain that interfere with function over at least three months. This is however, skewed in clinical practice. Chronic abdominal pain is clinically diagnosed when pain exceeds one month. Once this diagnosis is made, chronic abdominal pain can then be separated into organic and nonorganic pain. Organic pain is pathologic pain due to a disease process *(Table 1, page 34 and 35)*. Non-organic pain, otherwise known as functional pain, is without evidence of anatomic, neoplastic, inflammatory, or metabolic abnormalities. Non-organic abdominal pain is the most common cause of chronic abdominal pain among children in the US. Once organic causes are eliminated, the recently updated ROME IV criteria is used to differentiate types of nonorganic abdominal pain *(Table 2, page 35)*. Adequate evaluation and treatment of this pain will prevent excessive testing, relieve stress of family, and help a child to remain active in daily living.

EVALUATION OF CHRONIC ABDOMINAL PAIN

A comprehensive history and physical with a quick follow up is critical in the evaluation of chronic abdominal pain in children. Since extensive lab and radiology testing is not warranted in most cases of chronic abdominal pain, the history and physical is critical to gain the parent and child's trust. Gained trust prevents families from having continued anxiety over the condition, finding repeated second opinions, having unwarranted tests done on the child, and causing the child to have a stigma placed on him or her. A complete history and physical is also unmatched in the process of forming a differential. The beginning of the history can immediately set the course for deciding between organic and non-organic causes of abdominal pain. Symptoms documented during the history have a strong predictive value for differentiating organic and non-organic abdominal pain in children. The most common chief complaints of children diagnosed with organic abdominal pain in one study was fever, pain not located in periumbilical area, nocturnal pain, weight loss, growth disorder, and general abdominal pain.[3] Some types of symptoms have been shown to be more commonly consistent with organic disorders. "Alarm findings" are symptoms which have been shown to suggest pain caused by an organic state. The most common "alarm findings" are gastrointestinal bleeding, involuntary weight loss, deceleration of linear growth, significant vomiting, chronic severe diarrhea, persistent right upper or right lower quadrant pain, family history of inflammatory bowel disease, unexplained fever, and unexplained physical exam findings.

Due to the inherent chronic nature of the pain, the guardian and child may be tired of speaking about pain during the history. This can make the subjective portion of the exam more challenging. For this reason, it is important to express empathy during the history and physical, as well as address concerns as they present. The physician can also ask family what they think is causing the pain. This can help the physician to understand what the concerns are of the family in order to better address them. After the family's concerns are met, the child should be questioned and examined alone. This situation helps the child to speak freely and may help to elucidate biopsychosocial characteristics. These characteristics will not help in the differentiation of organic and non-organic pain, however they will add to the story and potentially elucidate an exacerbating cause of the pain. A biopsychosocial model of pain includes factors like mood and behavior as potential causes of pain. Relationship roles are included in this model and play a role in chronic abdominal

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pain in children. Parental attention to a child's abdominal pain has been shown to worsen and cause pain. Pain can also be caused by a psychological response to traumatic events. A common screening tool for psychosocial issues is the HEEADSSS Questionnaire.[4] Once the social history is clear from this extensive survey, it can be compared to the onset of abdominal pain to elucidate correlation and causation.

Regarding the physical exam, there are some important rules to follow for best practice outcomes. Distraction techniques can help to objectify the physical exam. Talking to the patient while palpating the abdomen is one method elicited. It is also important to auscultate the abdomen prior to palpating. It is important to examine the perianal, however rectal exams in children are debated. Some sources state that this is traumatizing to a child, and some state that it is required for a proper stool sample, checking for fistulas, and checking for constipation. It is however, suggested to check for occult blood on perianal examination. Patients with "alarm findings" need to be further evaluated by specific testing. Additional evaluation and testing is not warranted in patients who do not have "alarm findings." Other physical exam findings that should be documented are general appearance, growth parameters, vital signs, sexual maturity rating, and a full abdominal exam. Guarding has more often shown to be absent with deeper sources of pain. Carnett sign can help differentiate abdominal wall pain from visceral pain. Abdominal wall pain will be more consistent with the continued presence of pain upon contraction of the abdominal wall muscles.

The history and physical in children does have limitations. For instance, children may not be aware of anatomical terms, and have yet to understand forms of pain. Children often have difficulty describing the feeling and location of pain. However, the description and location of pain may not play a significant role in diagnosis. Location of abdominal pain in children with chronic abdominal pain was found to be not significantly different from children without chronic abdominal pain who occasionally have abdominal pain.[5] Aside from location of pain and its description, children can have difficulty describing the timeline of the chief complaint. Diaries and journaling are recommended for children with chronic pain with the help of adult supervision. Important factors to journal are time and duration of the pain, possible triggers for the pain, remedies that were tried for the pain, and whether or not the pain prevented activities. Prospective pain and stooling diaries, and parent report of symptoms were predictors of pain maintenance, while child report of symptoms were not.[6] Children also tend to report less episodes of pain compared to their pain diaries.[6] Regarding associated symptoms, they have not been found to be helpful when differentiating functional and organic pain. Increased stress and lifestyle events have also shown to not play a role in differentiating organic or functional abdominal pain. Table 2 *(page 35)* summarizes symptoms and physical exam findings that best differentiate functional from organic pain in children.

DIAGNOSING CHRONIC ABDOMINAL PAIN

Table 1 *(page 34 and 35)* shows the diagnostic technique for the most common presentations of chronic organic abdominal pain. A diagnosis of functional abdominal pain is more elusive, and interestingly more common. The two approaches to take are diagnosis by criteria of lack of alarm findings with a normal physical exam, or by using the ROME IV criteria. The ROME IV criteria are a diagnostic classification system established by expert consensus and has developed adequate validity over years in the diagnosis of chronic abdominal pain.[7]

The most recent update to ROME IV was in early 2016, which suggested a change in terminology. Recurrent abdominal pain should not be used as a diagnosis. It has recently been suggested that this terminology now be used as a symptom due to the potential for etiology to be organic or non-organic. Terminology is also changing based on current stigmas associated with abdominal pain. Prior to 2016, ROME III criteria referred to nonorganic abdominal pain disorders to be interchangeable with functional gastrointestinal disorders (FGID). In May of 2016, ROME IV criteria suggested moving away from the term FGID, and instead using "Disorders of gut-brain interaction" (DGBI) to break away from current stigmas.

DGBI is based on a diagnosis of exclusion using the 2016 ROME IV criteria. The ROME IV diagnostic criteria for DGBI is defined as episodic or continuous pain occurring at least once a week for at least 2 months with insufficient criteria for other chronic disorders. The definition goes on to state that there must be no evidence of inflammatory anatomic, metabolic, or neoplastic process accounting for the patient's symptoms to be diagnosed with functional abdominal pain. Although not related to the ROME IV criteria, there are some common features associated with DGBI. It is unrelated to meals or activities, self-limiting, vaguely localized or isolated, last less than 1 hour in 55% of cases and less than 3 hours in 90% of cases.[8] DGBI is defined as having only a symptom of pain, without other associated symptoms or related issues. This is what differentiates it from other types of chronic abdominal pain. Other types of non-organic abdominal pain are presented in Table 2.

TREATMENT OF CHRONIC ABDOMINAL PAIN

Best treatment outcomes for non-organic abdominal pain are general behavioral strategies, education, and a therapeutic relationship between the doctor and family. General behavioral strategies consist of parental understanding and continuing the child's normal activities as much as possible. Distraction techniques and muscle relaxation techniques have also been shown to have positive outcomes. Having a child create images of the problem, and then focusing on resolving the problem has been shown to be an effective treatment. Similar distraction techniques have been shown in relationships between children and parents. When parents distract children instead of giving attention to the pain, children reported less pain.[5,9] Abdominal pain in children has also been relieved by fortifying the social support system of children with parent stemmed issues.[10] Children have been shown to create passive coping skills which may consist of complaining of abdominal pain. In these cases, Cognitive Behavioral Therapy for both the parent and the child have been effective strategies for relieving chronic abdominal pain.[11] Hypnotherapy has also shown some benefit.[12,13] Besides behavioral therapy, education can have a great impact on outcomes. Education should first consist of addressing the family's concerns. Living with a child with chronic abdominal pain can create many stressors. Addressing the issues the family is facing first will relieve a family's stress, by solving a problem that has been present chronically. Taking concerns seriously will also build respect for the therapeutic relationship and decrease the stress between the parent and child relationship (continued on page 36).

TABLE 1:

Most common chronic organic abdominal pain diagnoses in children.[1] Key: EEG, electroencephalogram; GI, gastrointestinal; Hx, history; IVP, intravenous pyelography; O&P, ova and parasites; PE, physical exam; RLQ, right lower quadrant; RUQ, right upper quadrant.

Pathology	Common Symptoms	Diagnostic Test
GASTROINTESTINAL TRACT		
Chronic constipation	Hx of stool retention, evidence of constipation on examination	Hx and PE; plain x-ray of abdomen
Lactose intolerance	Symptoms may be associated with lactose ingestion; bloating, gas, cramps, and diarrhea	Trial of lactose-free diet; lactose breath hydrogen test
Parasite infection *(especially Giardia)*	Bloating, gas, cramps, and diarrhea	Stool evaluation for O&P; specific immunoassays for *Giardia*
Excess fructose or sorbitol ingestion	Nonspecific abdominal pain, bloating, gas, and diarrhea	Large intake of apples, fruit juice, or candy or chewing gum sweetened with sorbitol
Crohn disease	abdominal pain, bloody diarrhea, fever, weight loss	biopsy of bowel wall, imaging
Peptic ulcer	Burning or gnawing epigastric pain; worse on awakening or before meals; relieved with antacids	Esophagogastroduodenoscopy, upper GI contrast x-rays, or MRI enteroscopy
Esophagitis	Epigastric pain with substernal burning	Esophagogastroduodenoscopy
Meckel diverticulum	Periumbilical or lower abdominal pain; may have blood in stool (usually painless)	Meckel scan or enteroclysis
Recurrent intussusception	Paroxysmal severe cramping abdominal pain; blood may be present in stool with episode	Identify intussusception during episode or lead point in intestine between episodes with contrast studies of GI tract
Internal, inguinal, or abdominal wall hernia	Dull abdomen or abdominal wall pain	PE, CT of abdominal wall
Chronic appendicitis or appendiceal mucocele	Recurrent RLQ pain; often incorrectly diagnosed, may be rare cause of abdominal pain	Barium enema, CT
GALLBLADDER & PANCREAS		
Cholelithiasis	RUQ pain, might worsen with meals	Ultrasound of gallbladder
Choledochal cyst	RUQ pain, mass ± elevated bilirubin	Ultrasound or CT of RUQ
Recurrent pancreatitis	Persistent boring pain, might radiate to back, vomiting	Serum amylase and lipase ± serum trypsinogen; ultrasound, CT, or MRI-ERCP of pancreas

Pathology	Common Symptoms	Diagnostic Test
GENITOURINARY TRACT		
Urinary tract infection	Dull suprapubic pain, flank pain	Urinalysis and urine culture; renal scan
Hydronephrosis	Unilateral abdominal or flank pain	Ultrasound of kidneys
Urolithiasis	Progressive, severe pain; flank to inguinal region to testicle	Urinalysis, ultrasound, IVP, CT
Other genitourinary disorders	Suprapubic or lower abdominal pain; genitourinary symptoms	Ultrasound of kidneys and pelvis; gynecologic evaluation
MISCELLANEOUS CAUSES		
Abdominal migraine	See text; nausea, family Hx migraine	Hx
Abdominal epilepsy	Might have seizure prodrome	EEG (can require > 1 study, including sleep-deprived EEG)
Gilbert syndrome	Mild abdominal pain (causal or coincidental?); slightly elevated unconjugated bilirubin	Serum bilirubin
Familial Mediterranean fever	Paroxysmal episodes of fever, severe abdominal pain, and tenderness with other evidence of polyserositis	Hx and PE during an episode, DNA diagnosis
Sickle cell crisis	Anemia	Hematologic evaluation
Lead poisoning	Vague abdominal pain ± constipation	Serum lead level
Henoch-Schönlein purpura	Recurrent, severe crampy abdominal pain, occult blood in stool, characteristic rash, arthritis	Hx, PE, urinalysis
Angioneurotic edema	Swelling of face or airway, crampy pain	Hx, PE, upper GI contrast x-rays, serum C1 esterase inhibitor
Acute intermittent porphyria	Severe pain precipitated by drugs, fasting, or infections	Spot urine for porphyrins

TABLE 2:

Most common chronic non-organic abdominal pain diagnoses in children.[2]

Vomiting and aerophagia	Abdominal pain-related functional gastrointestinal disorders	Childhood functional abdominal pain
Adolescent rumination syndrome	Functional dyspepsia	Childhood functional abdominal pain syndrome
Cyclic vomiting syndrome	Irritable bowel syndrome	Constipation and incontinence
Aerophagia	Abdominal migraine	Functional constipation
		Nonretentive fecal incontinence

This is also a form of treatment for the child because the parent child relationship has been known to exacerbate or initiate pain. Another form of education is reassurance when warranted. Reassurance is the ability to induce relief in that a condition is not worrisome. Family members may require repeated reassurance with non-functional abdominal pain, simply due to the chronic nature of the disease. Highlighting the basis of diagnosis being symptomology, rather than a positive finding on a diagnostic test is recommended, as well as pointing out the overall repeatedly normal physical exam findings. This can help reassure the family that this is not a serious condition. Besides behavioral treatments and education, pharmaceutical treatments are also occasionally warranted. Placebo high fiber diets have shown benefit as treatment. In some cases, a probiotic[5,14] laxative[15] or peppermint oil may be warranted.[15] While mechanism of action of these treatments is unclear, the low cost and ability to improve gastric motility is a benefit to the patient, without causing harm. Severely symptomatic patients will have already tried these. Generally, prescription medications are reserved for severe chronic pain. Some of the current options for this include flunarizine,[16] drotaverine hydrochloride,[17] off-label indication for famotidine, and cyproheptadine as an appetite stimulant.

AUTHOR DISCLOSURE

No relevant financial affiliations.

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