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Recurrent Abdominal Pain: An Update

J. Timothy Boyle, MD*

IMPORTANT POINTS

1. **Recurrent abdominal pain (RAP) is not a diagnosis; it is defined as paroxysmal abdominal pain in children between the ages of 4 and 16 years that persists for more than 3 months and affects normal activity.**
2. **There are three clinical presentations of RAP: isolated paroxysmal abdominal pain, abdominal pain associated with dyspepsia, and abdominal pain associated with an altered bowel pattern.**
3. **Diagnostic evaluation depends on the clinical presentation of RAP and the presence of specific findings that suggest the possibility of an organic disorder.**
4. **The most common cause of all presentations of RAP in children is a functional bowel disorder.**
5. **A functional bowel disorder in children is a positive diagnosis.**
6. **Therapy of functional bowel abdominal pain is directed primarily toward environmental modification.**

Introduction

The definition of recurrent abdominal pain (RAP) derives from the seminal description by Apley of paroxysmal abdominal pain in children between the ages of 4 and 16 years that persists for more than 3 months and affects normal activity. RAP is not a diagnosis. It may be the predominant clinical manifestation of a large number of precisely defined organic disorders, but in the majority of cases, RAP is due to a functional bowel disorder. The modifier "functional" is used in gastroenterology if no specific structural, infectious, inflammatory, or biochemical cause for the abdominal pain can be determined. It is the delicate interface between organic and functional forms of pediatric RAP that challenges the primary care pediatrician. Because the exact etiology and pathogenesis of the pain are unknown and because no specific diagnostic markers exist, a diagnosis of functional bowel disorder often is viewed as a diagnosis of exclusion. Yet, functional abdominal pain can and should be a diagnosis that meets specific criteria. The diagnosis is established

by a constellation of criteria based on a careful history, physical examination, and minimum laboratory investigation. Management can be instituted if these criteria are met, and appropriate follow-up is assured.

Epidemiology

RAP has been reported to occur in 10% to 15% of children between the ages of 4 and 16 years. At least as many children experience chronic pain but maintain normal activity and rarely come to the attention of the physician.

Apley observed that males and females are affected equally in early childhood up until the age of 9, at which point the incidence decreases in males. The incidence in females continues to increase until age 11 to 12 years, such that between 9 and 12 years of age the female-to-male ratio approaches 1.5 to 1. Onset of chronic pain in a child younger than 4 years old requires a more in-depth organic evaluation, particularly for structural abnormalities. Gender, intelligence, and personality traits do not distinguish patients who have functional pain from those who have organic pain. The majority of patients are of average intelligence. The generalization that patients who have functional abdominal pain are

superintellecs, perfectionists, overachievers, bad mixers, or constant worriers is without foundation.

Clinical Presentations

Children who have RAP tend to exhibit one of three clinical presentations: 1) isolated paroxysmal abdominal pain, 2) abdominal pain associated with symptoms of dyspepsia, and 3) abdominal pain associated with an altered bowel pattern. Symptoms of dyspepsia include: pain associated with eating; epigastric location of pain; and nausea, vomiting, heartburn, oral regurgitation, early satiety, excessive hiccups, and excessive belching. Symptoms of altered bowel pattern include: diarrhea, constipation, or a sense of incomplete evacuation with bowel movements. Functional abdominal pain is by far the most common cause of each presentation. The differential diagnosis, however, includes a heterogeneous group of anatomic, infectious, noninfectious inflammatory, and biochemical disorders.

Pathophysiology of Functional Abdominal Pain

The etiology and pathogenesis of functional abdominal pain are unknown. It is generally agreed that the pain is genuine and not simply social modeling, imitation of parental pain, or a means to avoid an unwanted experience (eg, school phobia or malingering). It is not clear whether the different clinical presentations of functional abdominal pain result from a heterogeneous group of disorders or represent variable expressions of the same disorder. The frequent occurrence of upper and lower bowel symptoms in the same patient (particularly nonulcer dyspepsia and irritable bowel in an adolescent) suggests that the latter scenario may be the case. The prevailing viewpoint is that the pathogenesis of the pain involves disordered gastrointestinal motility or visceral hypersensitivity. There appears to be a genetic vulnerability because

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of the high frequency of complaints of pain in family members. A family history of irritable bowel syndrome, peptic ulcer, previous appendectomy, or migraine headaches is common. That most children "outgrow" pain symptoms also suggests neuroendocrine development as a factor in the pathophysiology. In some patients, associated symptoms, including headache, pallor, and dizziness, suggest a generalized dysfunction of the autonomic nervous system.

Motility disturbances have been described in children by using manometric evaluation, measurements of intestinal transit, and surface electrophysiologic recordings. Studies to date in heterogeneous patients who have functional abdominal pain have described increased intensity of intestinal muscle contraction in both the small bowel and colon and delayed intestinal transit time. A characteristic motility disturbance has yet to be identified for any of the subgroups of functional abdominal pain. The concept of visceral hypersensitivity is derived from studies in adults who have irritable bowel syndrome and report enhanced awareness of balloon distention in all segments of the gastrointestinal (GI) tract from esophagus to rectum. Adult studies also suggest an increased awareness of normal intestinal motor activity in some patients. An altered threshold of gut-wall receptors, an altered modulation in the conduction of the sensorial input, or an altered conscious threshold in the central nervous system (CNS) could explain visceral hypersensitivity. Altered motor response or altered visceral sensation to gut distention caused by certain luminal contents such as lactose, fructose, sorbitol, fatty acids, and bile acids may explain why selected patients who have functional abdominal pain experience a qualitative improvement in pain symptoms when treated with dietary restrictions. Altered conscious threshold in the CNS may explain why concurrent stressful life events such as death or separation from a significant family member, physical illness or chronic handicap in parents or siblings, school problems, poverty or financial

problems, and recent geographic moves may provoke or reinforce the pain behavior.

The role of inflammation or immunomodulation in the pathogenesis of functional abdominal pain must be considered in view of the frequent finding of nonspecific inflammatory changes in intestinal biopsies at all levels of the GI tract. Inflammatory changes may be the cause or the effect of altered intestinal motility. Immune responses alter neural and endocrine function; in turn, neural and endocrine activity modify immunologic function. Activated immunocompetent cells such as monocytes, lymphocytes, and macrophages that take up residence in the intestinal tract may secrete a repertoire of cytokines and inflammatory mediators that can lead to profound changes in enteric neural function. The enteric or central nervous systems also may modulate intestinal immune

responses. Activation of the sympathetic nervous system causes leukocytosis, sequestration of lymphocytes, and inhibition of natural killer cell activity. Sensory neurons also contain a variety of neurotransmitters and neuropeptides that can affect lymphocyte function, including substance P, vasoactive intestinal polypeptide, angiotensin II, calcitonin gene-related peptide, and somatostatin. Personality, behavior, coping style, and emotional state also influence immune responses and may have implications in functional abdominal pain.

Pain Consequences Affecting Morbidity

The morbidity associated with RAP affects psychosocial function. It interferes with normal school attendance and performance, peer relationships, participation in organizations and sports, and personal and family activities. Studies have shown that only 1 in 10 children who have RAP attends school regu-

larly and that absenteeism is greater than 1 day in 10 in 28% of patients. The environmental consequences of the pain also contribute significantly to the morbidity. The usual parental, school, and medical management of RAP focuses on symptom relief, which reinforces the pain behavior via attention, rest, and medication. This approach fails to reinforce non-pain responses such as normal activity. The pain behavior frequently is reinforced by social attention at the time of pain, rest periods during pain, medication at the time of pain, absence from school on days of pain, and the allowing of normal activity during pain-free periods on days of school absence. Some parents respond to the report of pain by requesting that the child lay down; providing TV, toys, books, drinks, or food to distract the child; and administering symptomatic therapy, either tactile (massaging abdomen or applying heating pad) or medica-

tion (acetaminophen, dicyclomine). Although the pain usually lasts less than 1 hour, the child is kept home all day from school. Usually the child resumes his or her normal home routine after the pain subsides. School personnel reinforce the pain consequence behavior when they send the child home when he or she complains of pain. The pediatrician may reinforce the pain consequence behavior by prescribing a variety of medications to treat the pain.

Recent studies suggest that patients who have functional abdominal pain and are referred to a subspecialist commonly exhibit "internalizing" behavior characterized by anxiety, mild depression, withdrawal, and low self-esteem. Such a behavior profile may be primary and part of the genetic vulnerability of such patients. Alternatively, it has been postulated that such internalizing behavior is fostered within a family structure that is characterized by maternal depression, enmeshment, overpro-

For children who have recurrent abdominal pain, a family history of irritable bowel syndrome, peptic ulcer, previous appendectomy, or migraine headaches is common.

tectiveness, rigidity, and lack of conflict resolution. A third possibility is that the internalizing behavior is a common psychological adaptation to both organic and nonorganic chronic conditions. Whether primary or secondary, the behavior pattern of the child and the family structure both may influence how the disorder is experienced and addressed.

Paroxysmal Periumbilical RAP

CASE STUDY

An 11-year-old otherwise healthy girl has experienced recurrent periumbilical pain for 6 months. The pain occurs several times each week, is variable in severity, and interrupts normal activity. She often has difficulty falling asleep at night because of the pain. When episodes occur at school, the school nurse usually calls the parents to take her home. She has missed 10 days of school during the last semester because of the pain. Results of multiple complete physical examinations have been normal. Stool guaiac, complete blood count (CBC), erythrocyte sedimentation rate (ESR), and urinalysis are normal. Empiric dietary recommendations, including restriction of dairy products and increased intake of dietary fiber, have not changed the pattern and frequency of the pain. The severity of pain may improve by treatment with anticholinergic medication.

CHARACTERISTICS OF ISOLATED PAROXYSMAL PAIN

Pain typically is periumbilical in location and variable in severity. In the individual patient, pain episodes tend to cluster, alternating with pain-free periods of variable length. Associated GI symptoms characteristically are denied by the patient.

CHARACTERISTIC FEATURES OF FUNCTIONAL ABDOMINAL PAIN

Functional abdominal pain is the most common cause of paroxysmal periumbilical pain in children. Pain episodes begin gradually and last less than 1 hour in 50% of patients and less than 3 hours in 40%. Continuous pain is described in fewer than 10% of patients. The child usually is unable to describe the pain. When asked to point with one finger to the site of maximal severity, the

child will move his or her whole hand around the periumbilical region. Radiation of the pain to the back, chest, or hips is rare. A temporal relationship to meals, activity, and bowel habits is unusual. Rarely do children give a history that particular foods cause the symptoms. The pain rarely awakens the child from sleep, but it is common for pain to occur in the evening and to affect the ability to fall asleep. Parents describe the patient as miserable and listless during most episodes of pain. During severe attacks, the child may exhibit a variety of motor behaviors, including doubling over, grimacing, crying, or clenching and pushing on the abdomen. Commonly associated symptoms include headache, pallor, nausea, dizziness, and fatigue, at least one of which is

observed in 50% to 70% of cases. Many parents will report “fever” that, on questioning, turns out to mean between 37.2°C (99°F) and 37.7°C (100°F).

DIFFERENTIAL DIAGNOSIS

Table 1 lists the major differential diagnoses of recurrent paroxysmal periumbilical abdominal pain in children.

Fecal impaction should be suspected if a left lower quadrant or suprapubic fullness or mass effect is palpated on abdominal examination, and the rectal examination reveals evidence of firm stool in the rectal vault or soft stool in a dilated rectal vault with evidence of perianal soiling. Often a history of constipation or encopresis is unknown to the parent.

TABLE 1. Differential Diagnosis of RAP Presenting as Paroxysmal Periumbilical Abdominal Pain

• Functional abdominal pain
• Fecal impaction
• Parasitic infection
• Partial small bowel obstruction <ul style="list-style-type: none"> – Crohn disease – Malrotation with or without volvulus – Intussusception with lead point – Postsurgical adhesions – Small bowel lymphoma – Infection (tuberculosis, <i>Yersinia</i>) – Eosinophilic gastroenteritis – Angioneurotic edema
• Ureteropelvic junction obstruction
• Appendiceal colic
• Dysmenorrhea <ul style="list-style-type: none"> – Endometriosis – Ectopic pregnancy – Adhesions from pelvic inflammatory disease
• Cystic teratoma of ovary
• Musculoskeletal disorders <ul style="list-style-type: none"> – Muscle pain – Linea alba hernia – Discitis
• Vascular disorders <ul style="list-style-type: none"> – Mesenteric thrombosis – Polyarteritis nodosa
• Abdominal migraine
• Acute intermittent porphyria
• Psychiatric disorders

Parasitic infections, particularly due to *Giardia lamblia*, *Blastocystis hominis*, and *Dientamoeba fragilis*, may present with chronic pain in the absence of altered bowel pattern.

Abdominal pain may be the predominant symptom of partial small bowel obstruction. The pain rarely exists in a vacuum; associated symptoms usually include anorexia, nausea with or without vomiting, and weight loss. A number of disorders can cause partial small bowel obstruction. Crohn disease should be suspected when pressure tenderness is localized to the right lower quadrant, a fullness or mass effect is appreciated on abdominal examination, and extraintestinal symptoms such as fever, rash, or joint pains are present. Ninety percent of patients who have Crohn disease will have an elevated ESR. *Yersinia* enterocolitis and tuberculosis can mimic Crohn disease by producing nodularity and mucosal thickening of the terminal ileum. Rare disorders such as polyarteritis nodosa, intestinal ischemia, eosinophilic gastroenteritis, and angioneurotic edema can be indistinguishable from Crohn disease clinically. Suspicion of polyarteritis nodosa rests on evidence of extraintestinal disease, particularly renal involvement. Mesenteric vein obstruction should be considered in adolescents who use oral contraceptives. Clinically, it can present gradually, with progressive abdominal pain over a period of weeks. Pneumatosis usually is a late finding. The clinical presentation of eosinophilic gastroenteritis depends on the depth of the infiltration by the eosinophilic process. Submucosal disease can become manifest with abdominal pain and signs of obstruction. Any region of the GI tract can be involved. Angioneurotic edema can be heralded by recurrent episodes of pain in the absence of cutaneous or oropharyngeal edema. The family history usually is positive for allergy. Meckel diverticulum should not be included in the differential diagnosis of chronic abdominal pain unless there are signs of obstruction or GI bleeding.

Ureteropelvic junction (UPJ) obstruction rarely may present with recurrent episodes of periumbilical or midepigastic crampy pain associated with episodic vomiting. When

pain from UPJ obstruction is episodic, it usually is associated with periods of increased fluid intake. Results of urinalysis may be normal or reveal microscopic hematuria with or without evidence of urinary tract infection.

Appendiceal colic is a controversial cause of chronic abdominal pain. Appendiceal spasm has been postulated to be caused by inspissated casts of fecal material within the appendix. A number of anecdotal surgical reports have described complete resolution of pain symptoms following elective appendectomy. Appendiceal colic should be suspected in patients who have recurrent acute episodes of well-localized abdominal pain and tenderness, most commonly in the right lower quadrant, demonstrated on several examinations.

Typical dysmenorrhea consists of cramping, dull, midline, or generalized lower abdominal pain at the onset of a menstrual period. The pain may coincide with the start of bleeding or precede the bleeding by several hours. Gynecologic disorders associated with secondary dysmenorrhea include endometriosis, partially obstructed genital duplications, ectopic pregnancy, and adhesions following pelvic inflammatory disease. Cystic teratoma has been described in prepubertal patients presenting with right or left lower quadrant pain. The vast majority of such patients have a palpable abdominal mass. Benign ovarian cysts in adolescent females do not cause recurrent abdominal pain. Ovarian torsion or bleeding produces acute abdominal pain.

Muscle pain usually is well localized and sharp and may be triggered by exercise or change in body position. It usually is located near the insertion of the rectus muscle or oblique muscles into the costal margins or iliac crest. Pain from a linea alba hernia also may be exacerbated by exercise. The anatomic defect, which is midline and may be either infra- or supraumbilical, is detected when the child performs situps. Discitis, which actually is an osteomyelitis of the vertebral end plate, may present as a combination of back and abdominal pain. The condition usually is associated with

intermittent fever, an elevated peripheral white blood cell count, and elevated ESR.

Abdominal migraine and acute intermittent porphyria (AIP) are disorders characterized by the temporal association of paroxysmal abdominal pain and a wide variety of CNS symptoms, including headache, dizziness, weakness, syncope, confusion, memory loss, hallucinations, seizures, and transient blindness. Abdominal migraine classically is associated with cyclic vomiting. AIP often is precipitated by a low intake of carbohydrate or by specific drugs such as barbiturates or sulfonamides. A positive family history of these disorders is important in considering them in the differential diagnosis of recurrent paroxysmal abdominal pain.

Psychogenic abdominal pain, triggered by environmental stress or critical life setbacks, is by definition a conversion reaction. Several factors suggest a conversion reaction, including age at onset greater than 12 years, hysterical personality (dramatic, exhibitionist, labile, excitable, egocentric, seductive), and a parent who is clinically depressed.

DIAGNOSIS

The correct diagnosis should not require a series of diagnostic studies to rule out organic causes of pain. Excessive testing may increase parental anxiety and put the child through unnecessary stress. Parental uncertainty only increases the stressful environment that provokes or reinforces the pain behavior. Table 2 lists the diagnostic criteria for making a positive diagnosis of functional abdominal pain. Results of the physical examination, including rectal examination, are normal. Although many children will claim to have pain at the time of office visits, their behavior, affect, and activity seldom are consistent with the degree of expressed discomfort. Poorly localized pressure tenderness frequently is elicited during abdominal palpation. The basic laboratory evaluation listed in Table 2 is targeted at screening for occult systemic inflammatory conditions, urinary tract infection, and parasitic infection. Consistent deviation from the characteristic features of a func-

TABLE 2. Diagnostic Criteria for Functional Periumbilical Abdominal Pain

• Documentation of chronicity
• Compatible age range, age of onset
• Characteristic features of abdominal pain
• Evidence of physical or psychological stressful stimuli
• Environmental reinforcement of pain behavior
• Normal physical examination (including rectal examination and stool guaiac)
• Normal laboratory evaluation (CBC, sedimentation rate, urinalysis, urine culture, stool ovum and parasites)

TABLE 3. "Red Flags" That Could Reflect an Organic Form of Isolated Paroxysmal Abdominal Pain

• Pain awakening the child at night
• Localized pain away from the umbilicus
• Involuntary weight loss or growth deceleration
• Extraintestinal symptoms (fever, rash, joint pain, recurrent aphthous ulcers, dysuria)
• Consistent sleepiness following attacks of pain
• Blood in stools (guaiac-positive)
• Anemia
• Elevated ESR
• Positive family history of peptic ulcer disease, inflammatory bowel disease

tional presentation suggests further organic evaluation. Table 3 lists "red flags" that could reflect an organic form of isolated paroxysmal abdominal pain.

Further diagnostic testing is based on clinical suspicion of particular organic disorders listed in Table 1. An upper GI series and small bowel follow-through usually will be abnormal in such conditions as obstructing peptic ulcer, malrotation, small bowel Crohn disease, lymphoma, angioneurotic edema, mesenteric vein thrombosis with ischemia, eosinophilic gastroenteritis, and pseudo-obstruction. Abdominal ultrasonography has a low diagnostic yield, but may detect rare cases of ureteropelvic obstruction or cystic teratoma of the ovary. Barium enema should be considered in patients who have chronic right lower quadrant pain to evaluate the appendix. Filling defects, focal

globular or diffuse distention of the appendix, or retained barium in the appendix 72 hours after contrast study should raise the question of appendiceal colic. Endoscopy has no role in the diagnostic evaluation of the pediatric patient who has paroxysmal periumbilical abdominal pain in the absence of symptoms of vomiting, dyspepsia, or altered bowel pattern. The consistent presence of CNS symptoms associated with recurrent abdominal pain justifies neurologic consultation for evaluation of migraine and a urine porphyrin determination. The yield of such evaluation is low, however, in the absence of vomiting.

TREATMENT

Management begins at the initial office visit when clinical features, normal growth and development, and normal results of a physical examination suggest the likelihood

of functional pain. Even when the initial evaluation of abdominal pain precedes documentation of chronicity, it is important to introduce the concept of functional pain, emphasizing that it is the most common cause of chronic abdominal pain in childhood, that the pain is real, that the condition may result from a developmental variation of pain threshold or intensity of intestinal muscle response to a wide variety of normal as well as stressful stimuli, and that the condition usually is self-limiting. It is important to review the differential diagnosis to reassure the parents and child that specific organic disorders have been considered and to emphasize the absence of "red flags" in the clinical presentation. A positive diagnosis is made operational by the negative screening evaluation. This approach is enhanced by planned return visits for monitoring symptoms, performing a physical examination, and reviewing the parent's and child's understanding of the pain.

Therapy of functional abdominal pain is directed toward environmental modification. The first goal is to identify, clarify, and reverse stresses that may provoke pain. Equally important is to reverse environmental reinforcement of the pain behavior. Both parents and school personnel must support the child rather than the pain. Lifestyle must be normalized regardless of the continued presence of pain. Regular school attendance is essential. In many cases it is helpful for the physician to communicate directly with school officials to explain the nature of the problem. School officials must be encouraged to respond to the pain behavior but not to let it disrupt attendance, class activity, or performance expectations. Parents should encourage more independence as the child learns to manage the pain. The family should direct less social attention toward the symptoms.

Use of the high-fiber diet or bulk-producing agents is controversial in the management of functional abdominal pain. Although such therapy is a mainstay of irritable bowel syndrome in adults, only one small study in children has suggested that increased fiber intake may be bene-

ficial in terms of pain frequency or severity. Excessive fiber in the diet may result in increased gas and distension and actually provoke pain. The use of bulk-producing agents probably is not indicated in functional abdominal pain unless there is associated constipation.

Malabsorption of dietary carbohydrates may act as provocative stimuli in functional abdominal pain. Most often the patient does not perceive a temporal association between ingestion of a particular sugar and the abdominal pain. Avoiding excessive intake of milk products (lactose), carbonated beverages (fructose), dietary starches (corn, potatoes, wheat, oats), or sorbitol-containing products (vehicle for oral medication, sugar substitute in gum and candy, ingredient in toothpaste, and a plasticizer in gelatin capsules) is not unreasonable. Confirmation of lactose intolerance by a lactose breath hydrogen test should be considered before recommending prolonged lactase enzyme replacement therapy or commercial milk products that have been pretreated with lactase enzyme.

No data support the use of long-term drug therapy (anticholinergics, antispasmodics, anticonvulsants) in patients who have functional abdominal pain. Such therapy probably is one of the major reinforcers of pain behavior in these individuals. Nevertheless, many gastroenterologists report anecdotal evidence of clinical improvement when antispasmodics are given for a finite period of time following diagnosis of functional abdominal pain. Efficacy is hard to evaluate in the context of simultaneous environmental modification in such patients.

Hospitalization rarely is indicated for patients who have functional abdominal pain. Although 50% of patients experience relief of symptoms during hospitalization, no data have shown that the natural history of the pain is affected. Hospitalization does not enhance the fundamental goals of environmental modification; more commonly, it reinforces pain behavior.

Consultation with a child psychiatrist or psychologist may be indicated when there is concern about: 1) conversion reaction; 2) extreme

internalizing behavior in the child (anxiety, depression, low self-esteem); 3) modeling or imitating family pain behavior; 4) maladaptive family coping mechanisms; or 5) initial attempts at environmental modification not resulting in return to a normal lifestyle. To assure continuity, the pediatrician must communicate with the psychiatrist or psychologist and continue to see the patient to explore related issues and to assure parental compliance. If environmental modification is not possible or not successful, a behavioral approach that incorporates the clinical tools of imaging, relaxation, and self-regulation is a practical alternative to reduce pain severity.

RAP Associated with Dyspepsia

CASE STUDY

An 8-year-old boy has experienced recurrent epigastric abdominal pain for 4 months. The pain occurs several times per week and typically interrupts meals. The patient often complains of nausea associated with the pain. On occasion

Hospitalization rarely is indicated for patients who have functional abdominal pain; it may reinforce pain behavior.

he vomits without explanation. He complains of occasional oral regurgitation, but denies heartburn. His past history is significant for chronic "growing pains" for which he occasionally takes ibuprofen. Results of several comprehensive physical examinations, including stool guaiac, have been normal. The CBC, ESR, urinalysis, and general chemistry profile are normal. Empiric treatment with ant-acids has had little effect on his symptoms of pain.

CHARACTERISTICS OF DYSPEPSIA

Abdominal pain localized to the epigastrium, right or left upper quadrants, and episodic vomiting are characteristic features of dyspepsia. Equally important is that these symptoms occur against a clinical background that includes a temporal relationship between meal ingestion and the symptoms and the presence of anorexia, nausea, oral regurgitation, early satiety, postprandial abdominal bloating, indigestion,

and belching. The scenario strongly suggests a dysfunction of the upper GI tract.

CHARACTERISTICS OF FUNCTIONAL DYSPEPSIA (NONULCER DYSPEPSIA)

There are no symptoms or signs that distinguish functional dyspepsia reliably from upper GI inflammatory, structural, or motility disorders. For this reason, symptoms of dyspepsia should generate a more extensive diagnostic evaluation. Functional dyspepsia usually is associated with the same signs of environmental reinforcement of pain behavior described previously for isolated paroxysmal abdominal pain.

DIFFERENTIAL DIAGNOSIS

Table 4 lists the diagnoses that need to be considered in patients who have recurrent abdominal pain and dyspepsia. The differential diagnosis includes etiologies of upper GI inflammation, disordered intestinal motility, and partial intestinal obstruction as well as extraintestinal disorders in which the predominant

clinical manifestation may be signs and symptoms of dyspepsia.

Gastroesophageal reflux disease (GERD) may result from a primary disorder of lower esophageal sphincter dysfunction or develop due to anatomic, inflammatory, or motility disorders that affect gastric emptying. The most common pain symptom produced by GERD is heartburn, defined as a retrosternal burning discomfort that radiates toward the head. The pain can vary widely in quality so that the patient often uses such descriptive terms as "gas pains," "indigestion," "burpiness," and "pressure." Typically, heartburn is aggravated by lying in the recumbent position and ingesting large fatty meals, tomato products, chocolate, or citrus drinks that have a high acid content. Regurgitation of sour or bitter gastric contents is a common complaint of patients who have GERD. However, regurgitation alone must not

TABLE 4. Differential Diagnosis of RAP Associated With Symptoms of Dyspepsia

<ul style="list-style-type: none"> • Associated with upper GI inflammation <ul style="list-style-type: none"> – Gastroesophageal reflux disease (GERD) – Peptic ulcer – <i>Helicobacter pylori</i> gastritis – Nonsteroidal anti-inflammatory drug ulcer – Crohn disease – Eosinophilic gastroenteritis – Menetrier syndrome – Cytomegalovirus (CMV) gastritis – Parasitic infection (<i>Giardia</i>, <i>Blastocystis hominis</i>) – Varioliform gastritis – Lymphocytic gastritis/celiac disease – Henoch-Schönlein purpura
<ul style="list-style-type: none"> • Motility disorders <ul style="list-style-type: none"> – Idiopathic gastroparesis – Biliary dyskinesia – Intestinal pseudo-obstruction
<ul style="list-style-type: none"> • Partial small bowel obstruction (see Table 1)
<ul style="list-style-type: none"> • Extraintestinal disorders <ul style="list-style-type: none"> – Chronic pancreatitis – Chronic hepatitis – Chronic cholecystitis – Ureteropelvic junction obstruction – Abdominal migraine – Psychiatric disorders

be confused with esophagitis. Nausea or vomiting is an uncommon symptom of GERD unless there are associated abnormalities of gastric emptying. Dysphagia or odynophagia (pain with swallowing) in a patient who has heartburn suggests GERD. Extraesophageal symptoms of GERD in older children may include chronic sore throat, otalgia, paroxysms of coughing or wheezing, and laryngitis.

Abdominal pain is the most frequent presenting symptom of chronic peptic ulcer disease in children. It is not uncommon for ulcer pain to awaken a patient at night. Only about 50% of patients associate the pain with eating, either relieved or aggravated by meals. Episodic vomiting usually follows meals and relieves the pain in the majority of patients. Evidence of GI blood loss is common, manifested by positive stool guaiac. A stress factor may be identified in 40% of patients. The most important exogenous stress factors associated with peptic ulcer are *Helicobacter pylori* gastritis and nonsteroidal anti-

inflammatory drug (NSAID) use. *H pylori*, a ubiquitous spiral Gram-negative bacterium, is present in virtually all patients who have histologic evidence of chronic gastritis and frequently is associated with duodenal or gastric ulcer. Studies have shown that the incidence of infection in children is related inversely to socioeconomic class and increases with age and in families in which an adult either has had an ulcer or documented *H pylori* infection. *H pylori* most likely is transmitted from person to person, although infection from a common exogenous source has not been ruled out. Whether *H pylori* gastritis is a disease in children remains controversial. Only one third of pediatric patients who have endoscopically proven peptic ulcer have been reported to have infection with *H pylori*. A recent National Institutes of Health-sponsored consensus conference concluded that there was insufficient evidence in adults that gastritis alone was pathologic in the absence of ulcer to justify treatment. Caution must be exercised in

extending this conclusion to pediatric patients in whom the inflammatory lesion tends to show chronic rather than acute cellular elements.

A careful history is required to detect NSAID consumption in any patient being evaluated for RAP with dyspepsia. NSAIDs such as acetylsalicylic acid, phenylbutazone, indomethacin, ibuprofen, azapropazone, flufenamic acid, mefenamic acid, and naproxen are known to cause both gastritis and mucosal ulceration. The pathophysiology of gastric mucosal damage is multifactorial, including impairment of local production of prostaglandins, inhibition of mucosal bicarbonate secretion, and reduction of surface hydrophobicity of apical membranes on surface epithelial cells. If possible, it is prudent to stop administering NSAIDs in patients complaining of symptoms of dyspepsia. Although there is evidence that concomitant administration of exogenous prostaglandins prevents NSAID-induced gastric inflammation in adults, experience in children is limited.

Gastroduodenal Crohn disease, eosinophilic gastroenteritis (EG), Menetrier syndrome, cytomegalovirus (CMV) gastritis, varioliform gastritis (VG), lymphocytic gastritis (LG), and Henoch-Schönlein purpura (HSP) all may present with abdominal pain associated with dyspepsia. Menetrier syndrome, CMV gastritis, and VG are associated with hypertrophy of rugal folds in the fundus and body of the stomach. EG is more likely to result in a narrowed antrum and thickening of the folds in the duodenum and antrum. The etiology of EG, VG, and LG is unknown. The importance of distinguishing between the entities is based on reports of associated conditions (celiac disease in LG, food hypersensitivity in EG and VG, CMV in Menetrier syndrome) that may affect patient management. Although intervals as long as 150 days have been reported between GI symptoms and skin findings of HSP, the majority of patients exhibit classic skin lesions within 2 weeks of the onset of GI symptoms.

Gastroparesis is defined as delayed gastric emptying resulting from altered gastric motility. Gastroparesis after a presumed viral illness

may persist for months. Recent evidence suggests that such prolonged symptoms are associated with evidence of systemic autonomic dysfunction. Symptoms of gastroparesis often are associated with scleroderma, uremia, and reflux esophagitis and following elective abdominal surgery. Diabetic gastroparesis rarely is seen in the pediatric age range.

Chronic cholecystitis causes recurrent biliary colic, which usually is acute in onset, is localized to the epigastrium or right upper quadrant, and frequently follows a meal. In small children, pain may be periumbilical. Characteristically the pain rises to a plateau of intensity over 5 to 20 minutes and resolves over 1 to 4 hours. Referred pain is common, particularly to the back. Chronic acalculous cholecystitis and biliary dyskinesia are rare causes of biliary type pain in the absence of cholelithiasis.

Chronic fibrosing pancreatitis, hereditary pancreatitis, and relapsing pancreatitis from abnormalities of pancreatic ductal anatomy are rare causes of recurrent episodes of sharp epigastric or periumbilical pain. Relapsing pancreatitis should be considered only in patients whose episodic pain is associated with vomiting and in whom biochemical or radiographic evidence of pancreatic inflammation can be documented.

DIAGNOSTIC APPROACH

Timing and order of diagnostic evaluation should be based on the pediatrician's concern about an ongoing organic process. In the majority of cases, physical examination findings are normal. Pressure tenderness localized to the epigastrium is common in patients who have dyspepsia, yet is a nonspecific finding. Positive physical findings, including hepatomegaly, splenomegaly, abdominal mass or fullness, guaiac-positive stool, or joint swelling, point toward an organic etiology and help to narrow the differential diagnosis. The basic laboratory evaluation should include a CBC, ESR, serology for *Helicobacter pylori*, serum amylase and lipase, serum transaminases, and stool ovum and parasites. When recurrent vomiting is a significant part of the history, an upper GI series with

small bowel follow-through will help to rule out gastric outlet disorder, malrotation, and inflammatory bowel disease. Abdominal ultrasonography will rule out gallstones, pancreatic edema/pseudocyst, hydronephrosis secondary to UPJ obstruction, and a retroperitoneal mass. Serum amylase, lipase, and abdominal ultrasonography definitely are indicated where the history suggests biliary colic (discrete acute episodes of pain triggered by a meal or localized to the right or left upper quadrants).

Endoscopy is the most sensitive and specific procedure to evaluate inflammation in the upper GI tract. Recognizable objective findings by gross examination include superficial erosions, ulcer, stricture, antral nodularity associated with *H pylori* gastritis, gastric rugal hypertrophy associated with Menetrier syndrome and CMV gastritis, and the small heaped-up, volcanic-like mounds

however, the diagnostic information gained from endoscopy improves the specificity of diagnosis when screening studies have not suggested the patient's problem. Endoscopy performed after documentation of symptom chronicity may facilitate a positive diagnosis of functional dyspepsia, reduce medication costs, and avoid the frustration of invasive testing to prove health after failure of empiric therapy. Future efforts should be concentrated on decreasing the cost of endoscopy rather than excluding endoscopy from the evaluation of children who have RAP and dyspepsia.

Endoscopic retrograde cholangiopancreatography is indicated only in the evaluation of dyspepsia if there is biochemical or radiologic evidence of recurrent pancreatitis or if biliary type abdominal pain follows cholecystectomy.

Criteria for a positive diagnosis of functional dyspepsia in patients

Endoscopy is the most sensitive and specific procedure to evaluate inflammation in the upper gastrointestinal tract.

pocked with a central crater that are associated with chronic varioliform gastritis. Subjective gross endoscopic findings, including erythema, edema, increased vascularity, and friability, become meaningful only in the context of histology. Objective histologic findings may help to diagnose reflux esophagitis, eosinophilic gastroenteritis, CMV gastritis, *H pylori* gastritis, Crohn disease, and celiac disease. In the absence of gross ulcer or histologic evidence of *H pylori*, superficial antral gastritis or duodenitis are of questionable clinical significance and should not dissuade a diagnosis of functional dyspepsia. There is no evidence in children that nonspecific superficial antral gastritis or duodenitis progresses to peptic ulcer.

In adults, chronic dyspepsia often is treated medically with antacids or antisecretory drugs. Endoscopy is performed only if response to treatment is poor or if symptoms recur after a 4- to 6-week course of medication. Such an approach is not unreasonable in adolescents. For children younger than 12 years,

who have RAP and dyspepsia include: 1) a characteristic chronic history and negative physical examination (except for abdominal pressure tenderness); 2) normal CBC, ESR, serum amylase, lipase, and transaminases and negative serology (if available) and stool O&P; 3) a normal upper GI and small bowel series and abdominal ultrasonography if vomiting is a significant part of the history; and 4) an upper endoscopy that reveals no gross evidence of reflux esophagitis or peptic ulcer or microscopic evidence of Crohn disease, *H pylori*, eosinophilic gastroenteritis, or reflux esophagitis.

TREATMENT

The management of functional dyspepsia begins with a positive diagnosis, education, and establishment of realistic expectations of treatment. Therapy also includes environmental and dietary modification and selected drug treatment. Environmental modification is the same as described for functional periumbilical abdominal pain. In

selected cases, psychotherapy, hypnotherapy, and biofeedback have the same supportive roles. Although objective data are lacking to implicate smoking with dyspepsia, parents are strongly advised to maintain a smoke-free house. Patients also are advised to avoid caffeinated beverages and nonsteroidal analgesics. A low-fat diet may help some patients, particularly those who have significant nausea and upper abdominal bloating.

Uncertainty still exists regarding the role of drug therapy in patients who have functional dyspepsia. In adults, therapy often is based on classification of patients into symptomatic subgroups. Patients who have ulcer-like dyspepsia (predominant symptoms of localized epigastric abdominal pain occurring before meals, relieved by food, or causing awakening at night) are treated for 4 to 6 weeks with histamine₂-receptor antagonists. Patients who have dysmotility-like dyspepsia (predominant symptoms of nausea, vomiting, early satiety, and upper abdominal bloating) are treated for 4 to 6 weeks with prokinetic agents (metaclopramide or cisapride). In fact, there are no objective data to support such a treatment. Use of histamine₂-receptor antagonists or prokinetic agents as part of the primary therapy of functional dyspepsia often sends mixed messages about the functional nature of the problem. Short-term therapy with anticholinergic agents, similar to that described for recurrent periumbilical pain, may be used in conjunction with environmental and dietary modification. Histamine₂-receptor antagonists and prokinetic agents should be reserved for selected patients who continue to exhibit symptoms that affect normal activity on follow-up.

RAP Associated With Altered Bowel Pattern

CASE STUDY

A 14-year-old girl has experienced recurrent lower abdominal pain for 6 months. The pain, described as crampy, occurs several times per week and typically is relieved by a bowel movement. The patient describes two to three loose bowel movements per day, but complains of a sense of incomplete

evacuation following bowel movements. She denies rectal bleeding or extraintestinal symptoms, including fever, rash, and joint pains. Results of a comprehensive physical examination, including stool guaiac, are normal. CBC, ESR, and urinalysis are normal. Stool O&P are negative.

CHARACTERISTICS OF PAROXYSMAL PAIN ASSOCIATED WITH ALTERED BOWEL PATTERN

Altered bowel pattern refers to diarrhea, constipation, or sense of incomplete evacuation following bowel movement. Abdominal pain, which varies in severity, may be either relieved or exacerbated by bowel movement. Pain typically is localized to the lower abdomen. The association of the pain with altered bowel pattern suggests colonic dysfunction. The most common cause is functional irritable bowel syndrome. Rectal bleeding, weight loss, growth deceleration, and extraintestinal symptoms suggest an organic disorder.

CHARACTERISTICS OF FUNCTIONAL IRRITABLE BOWEL SYNDROME

This presentation of RAP is more common in adolescents and mimics irritable bowel syndrome in adults. The character of the abdominal pain

is similar to that described for paroxysmal periumbilical abdominal pain. Abdominal pain is relieved by defecation or is associated with an irregular pattern of defecation, including change in frequency or consistency of stool, straining or urgency, feeling of incomplete evacuation, passage of mucus, or a feeling of bloating or abdominal distention. Periods of diarrhea often alternate with periods of constipation. Abdominal distention is a common associated symptom. Some patients also have symptoms of dyspepsia. Irritable bowel usually is associated with the same autonomic type symptoms and signs of environmental stress and reinforcement of pain behavior described for isolated paroxysmal pain.

DIFFERENTIAL DIAGNOSIS

Table 5 lists the major differential diagnosis of chronic abdominal pain associated with altered bowel pattern. The major red flags in the history in patients who have this presentation include pain that interferes with normal sleep patterns, diarrhea that awakens the patient from sleep, visible or occult blood in the stool, weight loss, growth retardation, and extraintestinal symptoms such as fever, rash, and joint pain. Pertinent physical findings suggesting an

TABLE 5. Differential Diagnosis of RAP Associated With Altered Bowel Pattern

<ul style="list-style-type: none"> • Idiopathic inflammatory bowel disorders <ul style="list-style-type: none"> – Ulcerative colitis – Crohn disease – Microscopic colitis with crypt distortion – Lymphocytic colitis – Collagenous colitis
<ul style="list-style-type: none"> • Infectious disorders <ul style="list-style-type: none"> – Parasitic (<i>Giardia</i>, <i>Blastocystis hominis</i>, <i>Dientamoeba fragilis</i>) – Bacterial (<i>Clostridium difficile</i>, <i>Yersinia</i>, <i>Campylobacter</i>, tuberculosis)
<ul style="list-style-type: none"> • Lactose intolerance
<ul style="list-style-type: none"> • Complication of constipation (megacolon, encopresis, intermittent sigmoid volvulus)
<ul style="list-style-type: none"> • Drug-induced diarrhea, constipation
<ul style="list-style-type: none"> • Gynecologic disorders
<ul style="list-style-type: none"> • Neoplasia (lymphoma, carcinoma)
<ul style="list-style-type: none"> • Psychiatric disorders

organic process include an abdominal mass, joint swelling, perianal fistula, fissure or ulceration, or positive fecal occult blood test.

Abdominal pain, diarrhea, and rectal bleeding are the most frequent presenting symptoms of inflammatory bowel disease. Tables in review articles and original reports usually list the symptoms separately, making it difficult to appreciate the association between them. In fact, although abdominal pain may be the presenting symptom in patients who have ulcerative colitis, a complete history and physical examination always reveal signs of GI bleeding. In contrast, signs of GI bleeding may occur in only 40% to 50% of patients who have Crohn disease. Abdominal pain associated with diarrhea is the most common presentation of Crohn disease, which always should be suspected in patients who have associated perianal skin tags, fistula, or abscess. Ninety percent of patients who have Crohn disease will have an elevated ESR.

Parasitic infections, particularly those caused by *Giardia lamblia*, *Blastocystis hominis*, and *Dientamoeba fragilis*, are the most common infections associated with chronic pain and altered bowel pattern. Chronic *Clostridium difficile* enteritis may present with crampy pain and mucousy diarrhea. Fever and rectal bleeding are rare. *C difficile* cytotoxin determination in the stool is diagnostic. Recurrent or chronic episodes of bacterial enterocolitis are rare. *Yersinia enterocolitis* can mimic Crohn disease, including nodularity, mucosal thickening of the terminal ileum and colon, and the presence of aphthous ulcers.

"Microscopic colitis" is an umbrella term covering any case of colitis in which there is histologic but no colonoscopic or barium enema-documented abnormality. Three specific subclassifications should be considered: 1) a form of chronic idiopathic inflammatory bowel disease in which intraepithelial lymphocytes and chronic inflammation of the lamina propria are associated with gland distortion, 2) lymphocytic colitis in which the lamina propria contains an inflammatory infiltrate of plasma cells and

neutrophils and the epithelium is invaded by lymphocytes and occasional neutrophils, and 3) collagenous colitis, which is histologically similar to lymphocytic colitis, with the addition of subepithelial collagen thickening. Microscopic colitis presents with chronic watery diarrhea, commonly associated with crampy abdominal pain. The large volume of diarrhea (400 to 1,200 g/day) distinguishes patients who have lymphocytic or collagenous colitis from those who have irritable bowel syndrome where stool weight in excess of 300 g/day is rare. The significance of microscopic colitis in the pediatric population remains unknown.

Lactose intolerance and irritable bowel syndrome are common and may coexist. Lactose intolerance should be considered as a potential primary etiology of chronic abdomi-

The large volume of diarrhea (400 to 1,200 g/day) distinguishes patients who have lymphocytic or collagenous colitis from those who have irritable bowel syndrome, where stool weight in excess of 300 g/day is rare.

nal pain in the presence of diarrhea, bloating, and increased flatulence. More commonly, intolerance of dietary lactose, fructose, starches, or sorbitol acts as one of several physical stimuli to provoke altered intestinal function in patients who have functional pain.

DIAGNOSTIC APPROACH

Criteria for a positive diagnosis of functional irritable bowel in patients who have RAP and altered bowel function include a characteristic history; negative physical examination, including rectal examination (except for abdominal pressure tenderness); and negative routine diagnostic studies, including CBC, ESR, stool ovum and parasites X 3, and *C difficile* toxin assay. Empiric dietary lactose restriction or a lactose breath hydrogen test should be employed to rule out lactose intolerance as a primary cause of symptoms.

Colonoscopy is indicated for patients in whom historical or physical signals suggest the possibility

of an inflammatory bowel disease: 1) evidence of GI bleeding, 2) profuse diarrhea, 3) involuntary weight loss or growth deceleration, 4) iron deficiency anemia, 5) elevated ESR, or 6) extraintestinal symptoms. The accuracy of colonoscopy in diagnosing inflammatory conditions of the colon is superior to that of barium enema because of direct visualization of the mucosal surface and the ability to obtain biopsy and culture specimens. Intubation of the terminal ileum can aid in the diagnosis of Crohn disease. Recognizable objective findings by gross examination with a flexible endoscope include edema, erosions, ulceration, pseudomembranes (discrete yellow plaques on the colonic mucosa), polyps, and induced friability appreciated during withdrawal of the instrument. Subjective gross endoscopic findings such as erythema, increased vascu-

larity, and spontaneous friability become meaningful only in the context of histology because they are subject to more interobserver interpretive variation. Objective histologic findings include: 1) cryptitis, crypt abscesses, and crypt distortion with branching and dropout, suggesting ulcerative colitis or Crohn disease; 2) noncaseating granuloma specific for Crohn disease; 3) fibrosis and histiocyte proliferation in the submucosa, suggesting Crohn disease; and 4) epithelial and intraepithelial lymphocytes with or without subepithelial collagen thickening in lymphocytic colitis and collagenous colitis, respectively. The latter should be considered only specific findings in patients who have profuse diarrhea. Mild superficial increases in interstitial lymphocytes in the absence of crypt distortion or significant diarrhea are nonspecific and should not dissuade the physician from diagnosing a functional irritable bowel disorder.

Most physicians no longer perform conventional or air-contrast

radiologic evaluation as a complementary test to colonoscopic evaluation unless they are unable to examine the entire colon and there is a strong suspicion of inflammatory bowel disease. An upper GI series with small bowel follow-through is indicated in any patient undergoing evaluation for possible Crohn disease.

TREATMENT OF IRRITABLE BOWEL SYNDROME

Most patients who have irritable bowel will improve with the management approach outlined previously for isolated paroxysmal abdominal pain. For patients who have an irritable bowel and whose predominant symptom is diarrhea, an antidiarrheal agent (eg, loperamide) or the bile salt-binding agent cholestyramine may be helpful. Treatment with the prokinetic agent cisapride may decrease the severity of constipation and abdominal pain in patients whose predominant symptom is constipation. Excessive gas can be managed by advising the patient to eat slowly, to avoid chewing gum, and to avoid excessive intake of carbonated beverages, legumes, foods of the cabbage family, and foods or beverages sweetened with fructose or sorbitol. Simethicone or activated charcoal may help individual patients.

Prognosis of Recurrent Functional Abdominal Pain in Children

There are no prospective studies of the outcome of any of the various presentations of functional abdominal pain. Reassuringly, retrospective studies suggest that organic disease rarely is masked in the context of a functional disorder. Once functional abdominal pain is diagnosed, subsequent follow-up rarely identifies an occult organic disorder. Interestingly,

TABLE 6. Factors That Affect Prognosis of Functional Abdominal Pain

FACTOR	PROGNOSIS BETTER	PROGNOSIS WORSE
Family	Normal	“Painful family”
Gender	Female	Male
Age of onset	Older than 6 years	Younger than 6 years
Period before treatment	Fewer than 6 months	More than 6 months

Apley J, Hale B. Br Med J. 1973;3:7-9

pain resolves completely in 30% to 50% of patients by 2 to 6 weeks after diagnosis. This high incidence of early resolution suggests that child and parent accept reassurance that the pain is not organic and that environmental modification is effective. Nevertheless, more long-term studies suggest that 30% to 50% of children who have functional abdominal pain in childhood experience pain as adults, although in 70% of such individuals the pain does not limit normal activity. Thirty percent of patients who have functional abdominal pain develop other chronic complaints as adults, including headaches, backaches, and menstrual irregularities. Based on a small number of patients, Apley and Hale have described several factors that influence the prognosis for a lasting resolution of pain symptoms during childhood (Table 6).

Summary

RAP is a broad descriptive term commonly used in pediatrics to define a heterogeneous group of patients who experience episodic attacks of abdominal pain over a period of at least 3 months. The majority of patients who seek medical attention for RAP have a functional disorder thought to be triggered by a motility or sensory

disturbance of the GI tract provoked by a variety of physical and psychological stimuli. There are three distinct clinical presentations of functional abdominal pain in children and adolescents: periumbilical paroxysmal abdominal pain, dyspepsia, and irritable bowel. The medical history, physical examination, and selected laboratory, radiologic, and endoscopic evaluations allow a positive diagnosis of a functional disorder in each type of clinical presentation.

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PIR QUIZ

9. Which of the following suggests a poor prognosis in a patient who has functional abdominal pain?
 - A. Age of onset older than 6 years.
 - B. Father who has peptic ulcer.
 - C. Female gender.
 - D. Intelligence quotient greater than 120.
 - E. Symptoms more than 6 months before diagnosis.
10. A 10-year-old girl has had recurrent abdominal pain for the past year. She has a diagnosis of functional abdominal pain. Of the following, which would be the *best* therapy for her functional bowel disorder?
 - A. Eliminate dairy products from the diet.
 - B. Encourage participation in regular activities.
 - C. Recommend home schooling.
 - D. Recommend psychological counseling.
 - E. Start anticholinergic medications.
11. An 8-year-old boy has been experiencing paroxysmal abdominal pain since his parents separated 6 months ago. Which of the following symptoms would suggest an organic etiology for this pain?
 - A. Headache accompanies abdominal pain.
 - B. Pain causes patient to double over.
 - C. Pain located in the periumbilical region.
 - D. Patient awakens with pain at night.
 - E. Symptoms last for less than 1 hour.
12. A 9-year-old girl has episodic abdominal pain localized to the epigastric region. The pain is associated with nausea, abdominal distension, and occasional vomiting with meals. Results of a comprehensive physical examination are normal. Results of laboratory studies, including a complete blood count, erythrocyte sedimentation rate, urinalysis, and serum chemistries, are unremarkable. The *most* likely cause of this symptom complex is:
 - A. Conversion reaction.
 - B. Growing pains.
 - C. Irritable bowel syndrome.
 - D. Nonulcer dyspepsia.
 - E. Paroxysmal abdominal pain.
13. Primary therapy for functional dyspepsia *always* should include:
 - A. Anticholinergic medication.
 - B. Environmental and dietary modification.
 - C. Histamine₂-receptor antagonists.
 - D. Prokinetic agents.
 - E. Stool-bulking agents.
14. A 14-year-old girl has a 3-month history of diarrhea, bloating, abdominal pain, and tenesmus. Bright red blood is mixed with a mucousy stool. The physical examination reveals a pale adolescent who has diffuse, mild abdominal pain on deep palpation. The stool is grossly bloody and tests guaiac-positive. Of the following, the *best* diagnostic approach to this patient is:
 - A. Eliminate lactose- and sorbitol-containing foods.
 - B. Order an air contrast barium enema.
 - C. Perform colonoscopy.
 - D. Reassure patient and family.
 - E. Request an upper gastrointestinal radiologic series.

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Recurrent Abdominal Pain: An Update

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