

Recurrent Abdominal Pain

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Objectives After completing this article, readers should be able to:

1. Characterize the epidemiology and classification of recurrent abdominal pain.
2. List the major clinical conditions that manifest with recurrent abdominal pain.
3. Describe the most important findings in the history and physical examination of the child who has recurrent abdominal pain that suggest an organic medical condition.
4. Outline a targeted approach to ordering investigations that will confirm or disprove suspected organic disease.
5. Delineate the prognosis of recurrent abdominal pain.

Introduction

Recurrent abdominal pain (RAP) is a frequent and troublesome complaint in childhood and adolescence, and the search for a cause and a credible approach to management can be taxing for both family and physician. The term “recurrent abdominal pain” was coined by the British pediatrician John Apley, who first published on the subject in 1958. His definition included at least three attacks of pain occurring over a period of 3 months that were severe enough to affect activities and for which no organic cause was identified. In practice, the definition may include any child or adolescent who has RAP for which the family seeks medical attention and explanation, even if the duration of the pain does not adhere strictly to the Apley definition. The definition explicitly excludes the many causes of acute abdominal pain, which lie outside the scope of this review.

There is wide variation in the threshold of severity and frequency that must be crossed before a family will seek medical attention for a child who has RAP. Inevitably, parents want a clear explanation and reassurance that no sinister causes lurk undetected, and the clinician wants to oblige but often lacks the conviction that organic causes have been excluded. The most difficult challenge for the clinician is to determine to what extent diagnostic studies should be employed before the label “recurrent abdominal pain” is applied. Whereas abdominal pain may be the chief manifestation of a large number of precisely defined illnesses, more than 90% of the time a “disease” will not be defined and the family will be left with a “functional” explanation. In spite of extensive study and a vast literature base, RAP remains an elusive symptom in search of an etiology. How to diagnose and manage this common pediatric problem constitutes the subject of this review.

Epidemiology

RAP has been reported to occur in 10% to 15% of children between the ages of 4 and 16 years. A community-based study of 500 adolescents (mean age, 15.5 y) revealed that 13% to 17% experienced weekly pain, which in 20% of cases was severe enough to affect activities. There clearly is an overlap between the “normal” population that may experience recurrent pain symptoms but not complain sufficiently to seek medical attention and others who have a seemingly similar degree and frequency of pain and do come for assessment. Many sociocultural, familial, and emotional factors determine a child’s response to pain, and these also will affect the likelihood of seeking medical attention to explain and treat the problem. Al-

Abbreviations

IBD: inflammatory bowel disease
IBS: irritable bowel syndrome
RAP: recurrent abdominal pain

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though Apley and others have reported RAP to be the most common pain syndrome of childhood, headaches and limb pains appear to have an equal prevalence.

In a study of 1,000 school-age children, RAP affected males and females equally up to 9 years of age. After 9 years, the incidence in females increased such that between 9 and 12 years, the female-to-male ratio was 1.5:1. The overall incidence appears to peak at 10 to 12 years. RAP is rare among children younger than 5 years of age, and an organic cause must be considered even more carefully in this younger age group. The vast literature published on this subject reveals no evidence of changes in the incidence or clinical profile of this common pediatric pain syndrome; it seems to be here to stay.

Pathophysiology

The origins of abdominal pain are complex and do not lend themselves to a single model of causation. Numerous organic disorders lead to abdominal pain; in most, the pathophysiology is related to inflammation (eg, Crohn disease) or distension or obstruction of a hollow viscus (eg, obstructive uropathy). Most studies indicate that fewer than 10% of children who present with RAP have an identifiable organic etiology.

The exact mechanism of pain remains unclear in the majority of children in whom no organic cause can be identified. The most typical pattern of periumbilical pain so characteristic of RAP appears to be visceral in origin, probably originating in the small intestine or colon. To date, no pattern of consistent motility disturbance has been identified in any subgroup of patients experiencing nonorganic abdominal pain. Emotions, cognitive processes, and other central nervous system influences may modulate the perception of pain to produce an altered awareness of the discomfort from these visceral sensations. This “visceral hyperalgesia” describes a heightened awareness of sensations that might not be perceived or expressed as pain in other children.

Models that try to relate psychological influences in a primary causal manner (emotional stress leads to RAP) are too simplistic. However, stress can cause recognized physiologic effects, such as increased cortisol levels, sympathetic tone, and tachycardia, so it is entirely plausible that it could exert physiologic effects on the gut through altered motility or some other as yet unidentified mechanism.

Often-repeated assumptions that children who have RAP are anxious, perfectionist, socially unskilled, and self-conscious have taken on an aura of validity that is unsupported by objective evidence. Several case-control studies have failed to demonstrate significant differences

for a range of measures of psychological distress between groups of children who have “functional” RAP and those who have a demonstrable organic cause for their pain. Others contradict these studies, showing that those who have RAP have higher levels of anxiety and depression than do “well” children. Illness or pain clearly causes anxiety and distress, but this must be distinguished from invoking “stress” as a source of primary causation. There are no objective methods of measuring stress, and what seems to be a source of stress for one child (eg, birth of a sibling, upcoming athletic or music competition) may be of no apparent emotional consequence for another child of the same age. As in adults, some children seem to “buckle under stress” and become anxious and emotionally distressed; others facing the same challenge become invigorated and rise to new heights of effort and achievement.

For some children, anxiety and emotional stress seem to manifest in a range of pain complaints, of which abdominal pain and headache are the two most common. Parents sometimes can date the onset of the pain to a specific time, such as the beginning of a new school year or a marriage breakup. Family dynamics and individual coping styles influence the way in which children express or even acknowledge their pain. Some families encourage their children to express pain in ways that unwittingly may reinforce the complaint.

The tripartite classification proposed by Barr may be the most helpful method of categorizing children who present with RAP. This classification includes: 1) those who have organic disease, 2) those who have a clear psychogenic etiology such as depression or school phobia, and 3) the traditional “functional” group in which neither organic disease nor a clear psychogenic etiology is manifest.

Clinical Aspects

Functional Abdominal Pain

The majority of children who have RAP are considered to have a functional etiology. The problem of defining functional RAP is daunting. In its simplest form, the concept encompasses all causes that do not have an identifiable organic etiology. Most typically, the pain occurs in episodes that are periumbilical, self-limited, unrelated to meals or activities, and rarely if ever sufficient to awaken the child from sleep. The growth pattern and findings on the physical examination are normal. The degree of interference with normal activities and school attendance may seem out of proportion to the frequency and severity of the episodes as described. It has been

observed wryly that “Organicity of pain is inversely proportional to the number of school absences.”

Irritable Bowel Syndrome

Some children who have RAP manifest many of the characteristics associated with irritable bowel syndrome (IBS), as defined in adults. The criteria for making this diagnosis are: 1) abdominal pain relieved by defecation, 2) more frequent stools at the onset of the pain, 3) altered stool form (hard or loose or watery), 4) passage of mucus, and 5) associated bloating or abdominal distension. To define this syndrome requires a degree of detail regarding bowel function that the clinician will find difficult to elicit from children, who are notoriously reluctant to reveal or discuss their bowel habits. In adults, the division is made between those who have constipation-dominant and diarrhea-dominant symptoms. There is some evidence that altered intestinal motility, mediated by peptides excreted by both gut and brain, plays a role in the etiology of IBS. There are no laboratory markers; the diagnosis rests on the history. Although some clinicians include constipation under the diagnostic category of IBS, most recognize it as a separate diagnosis.

Constipation

Many factors lead to constipation in children, the foremost of which is dietary. Modern diets are replete with highly processed starches, and many children shun fruits, vegetables, and higher-fiber foods. An unwillingness by some children to take the time to evacuate their bowels completely, coupled in some cases with a reluctance to use school washrooms, can seriously compound this problem. Sometimes the role of constipation as a major contributing factor to abdominal pain will be clear, with the parent noting that the child goes days between bowel movements and that the stool is bulky and hard. Often the pediatrician faces the problem of ferreting out this diagnosis in the face of inadequate history; the parent is unaware of the child's bowel pattern and the child is tight-lipped and unwilling to discuss the matter in any detail. Findings on abdominal and rectal examinations may not confirm this diagnostic suspicion; a plain abdominal radiograph may be needed.

Inflammatory Bowel Disease

There may be a long latency between onset of symptoms and a confirmed diagnosis of inflammatory bowel disease (IBD). Although ulcerative colitis often presents with abdominal pain associated with hematochezia and tenesmus, the early symptoms of Crohn disease may be more

insidious and nonspecific. Abdominal pain and diarrhea may be intermittent, and the clinician must be alert to the presence of lethargy, growth and pubertal delay, and extraintestinal manifestations such as oral, joint, and perirectal involvement. With the widespread availability of endoscopy, a diagnosis usually can be made promptly.

Lactose Intolerance

The frequency with which incomplete absorption of lactose and other carbohydrates produces RAP in children is unclear, as are outcomes in several large and well-conducted studies. Initial enthusiasm for this diagnosis as a significant cause for RAP has waned. A wide range of racial/ethnic groups—Asian, Jewish, Mediterranean, and African-Americans—are predisposed to lactase deficiency, with incidences reported as high as 60% to 80%. Lactose ingestion will cause symptoms of bloating, loose stools, and cramping abdominal pain in those who are affected. It appears to be an uncommon cause of RAP in the absence of other gastrointestinal symptoms. The diagnosis is made most reliably by breath hydrogen testing. If this diagnostic tool is unavailable, it is reasonable to use lactase-treated milk products or a complete restriction of milk products for several weeks as a therapeutic trial. It is important to recognize that lactose intolerance results simply in carbohydrate maldigestion; it is not, per se, a cause of malnutrition or growth failure.

Helicobacter pylori Infection

The discovery of *H pylori* has changed the approach to diagnosis and treatment of peptic ulcer disease. Epidemiologic evidence indicates that this infection is more prevalent among those living in low socioeconomic circumstances, so infection rates are significantly higher in less developed nations. Even in developed countries, the prevalence of *H pylori* infection is approximately 40%. However, the great majority of affected individuals have no signs or symptoms; they have *infection* but no *disease*. The intense interest in *H pylori* has generated numerous tests and treatments that, unfortunately, are being used in excess of their established benefits and often counter to the best interests of the patient.

Several lines of evidence indicate that *H pylori* infection alone rarely is the cause of abdominal pain in children unless peptic ulcer disease is present. A meta-analysis of more than 40 published reports shows strong evidence for an association between *H pylori* gastritis and duodenal ulcer disease in children, but weak or no evidence for an association between *H pylori* infection and RAP. Serologic studies have shown that antibodies to *H pylori* occur with similar prevalence among children who

do and do not have RAP. In a large multicenter study from Germany, symptom assessment could not distinguish between children who had *H pylori* gastritis and those who had “functional” RAP. Symptoms improved or resolved in 87% of children in whom *H pylori* was eradicated successfully, but also in 93% of those in whom eradication failed and in 80% of those who had “functional” RAP. *H pylori*-associated peptic ulcer disease should be suspected when abdominal pain is primarily epigastric; when it awakens the child from sleep; and when it is associated with anorexia, nausea, recurrent vomiting, anemia, or gastrointestinal bleeding. Although abdominal pain is common in children, peptic ulcer disease is very uncommon; therefore, testing for *H pylori* should not be part of the preliminary evaluation of a child who has RAP.

Given the important distinction between *H pylori* infection and disease, engaging in a fishing expedition for evidence of *H pylori* infection is not an appropriate strategy for investigating RAP. Antibodies in serum or saliva may remain elevated for years after infection has resolved, making their mere presence unhelpful in initial diagnosis. The urea breath test is reliable for detecting the presence of *H pylori* infection, but many causes of esophagitis, gastritis, and peptic ulcer disease present with similar symptoms. Therefore, when the weight of symptoms suggests the presence of ulcer disease, endoscopy with biopsies is the optimal approach for confirming the diagnosis and guiding treatment. Fecal antigen tests look promising, but their role in children has not yet been defined.

Other Causes of Peptic Ulcer Disease

H pylori causes approximately 70% of primary peptic ulcer disease in children, but about 30% is idiopathic. In addition, secondary ulcer disease may be associated with nonsteroidal anti-inflammatory drug ingestion, Crohn gastritis, and other forms of erosive gastritis.

Nonulcer Dyspepsia

Dyspepsia is a symptom complex of epigastric pain, bloating, and discomfort that may occur with or without demonstrable acid reflux. “Nonulcer dyspepsia” is designated when these symptoms are accompanied by negative endoscopic and biopsy findings.

Abdominal Migraine

The association between migraine and abdominal pain remains mysterious, and many clinicians view the existence of a discreet entity of “abdominal migraine” as dubious. Because migraine is a common problem in both

pediatric and adult medicine, with a prevalence reported to be as high as 5%, some children who have headache due to migraine also will experience RAP. “Abdominal migraine” usually is recognized when episodes of paroxysmal abdominal pain occur in association with nausea and vomiting, with complete recovery between episodes and sometimes with associated headache. A strong family history of migraine lends credibility to the diagnosis. Most pediatricians only accept abdominal migraine as an explanation for RAP when the patient has headaches that are conclusively migraine.

Infestation/Infection

The contribution of parasitic infestation to RAP is elusive. Infection with *Yersinia enterocolitica* can cause enteritis that mimics IBD, albeit usually associated with diarrhea. It is well-recognized that infestation with *Giardia* can cause diarrhea associated with abdominal cramps and pain, but diarrhea usually is the predominant complaint. The possible role of *Dientamoeba fragilis* and *Blastocystis hominis* in causing RAP in the absence of diarrhea has been raised in a small number of studies, but their role remains dubious. With the present state of knowledge, a search for an infectious etiology for RAP is not usually warranted in the absence of diarrhea.

Gynecologic Conditions

Many gynecologic conditions can present with RAP and must be given careful consideration, especially in post-pubertal females. Early menarche, endometriosis, pelvic inflammatory disease, and ovarian cyst are important diagnostic possibilities. Many of these causes can be elucidated by ultrasonographic examination.

Physical and Sexual Abuse

Abuse always requires careful consideration in children who have RAP, and sensitive history taking is required to elucidate its possible role.

Clinical Assessment

It is heartening to reassure clinicians in the 21st century that the most powerful diagnostic tools they bring to the problem of RAP in childhood are a thorough history and physical examination. The proliferation of diagnostic technology threatens to obscure the foremost need that patients and their families be heard, not investigated. A correct diagnosis usually can be suspected following a good history and physical examination. In addition to their diagnostic roles, a complete history and physical examination will help to convince parents that their concerns are taken seriously.

A successful history places the patient and family at ease and allows them to express their concerns unhurriedly. As children advance in age, they are included in the history taking, and part of the interview of an adolescent should take place separately from the parents. It may be wise to conduct the initial interview with the parents alone; this should be discussed with the parents at the outset to reach a mutually agreeable decision. Successful interviewing involves active, empathetic listening followed by explanations given in language and terms that the family understands. The most satisfied parents are those who feel that they have been heard, and the physician who listens well earns a high degree of confidence and credibility.

The history should explore the location, nature, and frequency of the pain, along with associated symptoms. It should be acknowledged that the child's description of the nature of the pain (eg, sharp, dull) is of limited importance in making a diagnosis because children often are unclear as to the meaning of these descriptors. The relationship of the pain to school and social/family stressors is important to elicit. A careful review of systems covers the child's diet, bowel habits, and sleep patterns and explores the context in which the pain occurs. It is essential to define the degree to which the pain actually interferes with the child's activities and how much school has been missed. More challenging is a thorough exploration of nonmedical factors, such as family function, school performance, and manifestations of anxiety, depression, or social maladjustment. Listen carefully for the main concern. Although abdominal pain may be the purported reason for the visit, the hidden agenda may be the child's social isolation or school avoidance. The role of medications in both causing the pain (eg, naproxen) and in attempting to relieve the pain should be explored. The concept of recognizing "red flags" that suggest organic disease has a long and valid tradition, and the salient ones on history are noted in Table 1. It is important to recognize that firm conclusions may not be drawn at the first visit; follow-up visits may be needed.

Physical Examination

The physical examination should be thorough, with particular attention paid to revealing extraintestinal manifestations. The assessment should begin with documentation of the height and weight; comparison to previous growth data is invaluable. Although the child should be asked, "Where does your tummy hurt?", caution should be exercised in relying too much on a young child's response. Instead, the clinician should examine the abdomen gently and thoroughly while speaking with the

Table 1. "Red Flags" on History of Recurrent Abdominal Pain

- Localization of the pain away from the umbilicus
- Pain associated with change in bowel habits, particularly diarrhea, constipation, or nocturnal bowel movements
- Pain associated with night waking
- Repetitive emesis, especially if bilious
- Constitutional symptoms, such as recurrent fever, loss of appetite or energy
- RAP occurring in a child younger than 4 years of age

child and observe the response to palpation. The perianal area should be examined carefully for fissures, skin tags, or signs of sexual abuse. Although a rectal examination may be appropriate, it is highly upsetting to many children and should not be performed routinely. When performed, it is important to progress slowly and gently, to minimize pain and discomfort. Attention should be paid particularly to the "red flags" in Table 2.

Investigations

Accepting that only 10% to 15% of cases of RAP are due to an organic etiology, investigations to identify organic disease should be carefully targeted. The "rule out all possibilities" approach can lead to a spiral of investigations that simply reinforces the impression that some hidden cause has been overlooked and must be unmasked, even when the clinician is convinced of the functional nature of the pain. In most cases, investigations should be limited to a complete blood count, urinalysis, and perhaps examination of a stool specimen for occult blood. In the presence of significant diarrhea, a stool for enteric culture and ova and parasite examination is indicated.

Table 2. "Red Flags" on Physical Examination for Recurrent Abdominal Pain

- Loss of weight or decline in height velocity
- Organomegaly
- Localized abdominal tenderness, particularly removed from the umbilicus
- Perirectal abnormalities (eg, fissures, ulceration, or skin tags)
- Joint swelling, redness, or heat
- Ventral hernias of the abdominal wall

The role of radiographic investigations is important but limited and requires careful consideration. A single view of the abdomen can be valuable in defining the presence of significant constipation, especially when suspicion is high but the history is sketchy and results of the physical examination are inconclusive.

The value of abdominal ultrasonography as a screening tool seems very limited based on available literature. However, it can be valuable for diagnosing certain causes of abdominal pain, particularly when the origin is renal (eg, obstructive uropathy or hydronephrosis), gynecologic (eg, ovarian cysts), or the gall bladder. Rare gastrointestinal causes such as an enteric duplication also may be revealed by ultrasonography. It is an appropriate investigation when the pain is lateralized, when there are abnormalities on urinalysis, or when the pain localizes to the lower quadrants in a female of any age.

If IBD is considered as a possible diagnosis, erythrocyte sedimentation rate, serum protein and albumin levels, and stool for occult blood should be obtained. When this diagnosis is highly suspected, referral for endoscopic and histologic confirmation is essential. Upper gastrointestinal series and small bowel follow-through remains a valuable modality in the diagnosis of Crohn disease. Barium enema almost never is indicated. Elevated fecal calprotectin levels recently have been described as a sensitive screening test for IBD, but their role as a clinical tool remains to be elucidated.

When the pattern of pain strongly suggests peptic ulcer disease, upper gastrointestinal endoscopy with multiple biopsies is the optimal approach to diagnosis. When either IBD or acid peptic disease is given serious diagnostic consideration, referral to a gastroenterologist to assist in diagnosis and management is important.

Given the complex biopsychosocial nature of abdominal pain in children, the clinician needs to have sufficient acumen and experience to know when to pursue and when to halt investigations.

Management

Although many cases of RAP may reveal a probable diagnosis on first encounter, diagnostic certainty in others may be achieved only after several office encounters and the completion of salient investigations. The clinician should adopt an unhurried approach that allows formation of a fully informed diagnostic impression before making management decisions. Language barriers may require appropriate translation.

In the majority of cases, the diagnostic impression will be one of functional RAP. The first and admittedly most challenging task is to explain the concept of functional

abdominal pain to the parents. Many parents will assume that pain that has a “nonphysical” origin implies imagined or contrived pain—that the child is “faking it.” The most convincing method of divesting the parents of this notion is to compare the abdominal pain with headache in adults. Most adults have occasional headaches, and although the cause rarely is associated with any abnormal physical findings or investigations, the pain is undoubtedly real and not imagined. When this concept has been grasped, it is important to guide parents on how to manage the problem.

The parents need to maintain a sympathetic attitude that acknowledges the pain but encourages continued activities and school attendance to the greatest degree possible. It is important to point out that young children are highly suggestible, and parents should refrain from questioning the child about the pain if the child is not complaining. The role of increased dietary fiber in alleviating the pain is unclear; only one published study (albeit a double-blind, randomized, controlled trial) has suggested its therapeutic value. It must be acknowledged, however, that the diets of many children in developed nations are lacking in fiber, and a trial of increasing fiber by dietary modification seems a prudent strategy that will do no harm. The impulse to commence a trial of empiric medication to provide symptomatic relief should be resisted.

The role of mental health professionals in the management of the child who has RAP is controversial, and many families will resist accepting their interventions. However, some children have pain that has clear markers of a psychogenic origin, which interferes repeatedly with school attendance and other activities. These children may be resistant to usual office management, and the intervention of a psychologist or psychiatrist skilled in chronic pain management can provide valuable insight and support.

The suspicion or clear diagnosis of constipation requires treatment with regular stool softeners, which may need to be preceded by an enema to ensure that the lower bowel is adequately evacuated. It should be made clear that the role of constipation in causing RAP cannot be determined with certainty until the child is having regular soft bowel movements for a period of weeks.

When the history suggests lactose malabsorption, most clinicians forego confirmatory investigations and recommend a trial of a lactose-free diet for several weeks. At the minimum, such a diet should eliminate obvious sources of lactose by using lactase-treated milk and avoiding ice cream and cheese. The problem with this approach is the role of the placebo effect; any change that

implies anticipated improvement may alter both the child's and the parent's perception of the pain.

Recognizing that enteric infections or infestations rarely cause RAP, isolation of suspected pathogens requires treatment with appropriate medications.

When the probability of abdominal migraine is seriously entertained, a trial of migraine prophylaxis seems appropriate. One study showed benefit from prophylactic pizotifen; cyproheptidine, propranolol, or amitriptyline also could be considered.

Some families and children persist in the belief that "something is wrong" despite all contrary evidence, a conviction that will be shaken only by consultation with a gastrointestinal specialist.

Prognosis

The degree to which "little bellyachers" become "big bellyachers" has puzzled clinical researchers for decades. In Apley's classic follow-up study (1973), more than one third of former RAP patients continued to complain of abdominal pain 1 to 2 decades later. Fewer than 5% of the follow-up sample were identified as having an organic cause for their pain. In a follow-up of 161 patients who had RAP from the Mayo Clinic (Stickler and Murphy, 1979), nearly 25% maintained the complaint 5 to 17 years after their initial evaluation. A Danish study by Christensen and Mortensen (1975) found that more than one half of 34 former RAP patients still had chronic or recurrent abdominal symptoms as adults, and one third complained of nonabdominal symptoms, especially headaches. Two well-conducted follow-up studies of RAP patients by Walker et al (1995 and 1998) evaluated patients 5 to 6 years after initial evaluation. Those who had RAP reported significantly higher levels of abdominal pain and other somatic symptoms, averaged twice as many absences from work or school, and made significantly more mental health visits during the intervening years than the well patients. Certainly the best attitude the pediatrician can demonstrate is optimism that the pain will be conquered, acknowledging that for some this will not be the outcome.

Everyone who has dealt with RAP is left with some nagging anxiety that a significant organic diagnosis has

been missed that will appear at some future time to direct an accusing finger at the hapless clinician who assumed in error that the cause was functional. This seems to be a rare occurrence. Stickler and Murphy's long-term follow-up found evidence of "missed" organic disease in only 3 of 161 patients, and other studies have shown similar low rates.

Summary

Recurrent abdominal pain in childhood will continue to defy simplistic approaches to diagnosis or treatment. The wise clinician will make a careful evaluation based first and foremost on a thorough history and physical examination, supplemented as appropriate by prudently targeted investigations.

Suggested Reading

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PIR Quiz

Quiz also available online at www.pedsinreview.org

1. You are evaluating a 14-year-old girl who has had RAP for the past 6 months. There is a positive family history for peptic ulcer disease in both the maternal and paternal grandfathers. The parents ask that you investigate the possibility of this condition in their daughter. Among the following, the *best* method to confirm the presence of *Helicobacter pylori* disease is:
 - A. Assay of salivary antibody.
 - B. Assay of serum antibody.
 - C. Endoscopy with biopsy.
 - D. Fecal antigen testing.
 - E. Hydrogen breath test.
2. On taking the history of an 8-year-old child in whom functional RAP is suspected, which of the following characteristics of the pain would be *most* consistent with that diagnosis?
 - A. Accompanied by bilious vomiting.
 - B. Associated with watery stools.
 - C. Awakens the child at night.
 - D. Located around the umbilicus.
 - E. Occurs in the presence of fever.
3. In an 11-year-old patient who has had RAP of 6 months' duration, which of the following laboratory results is *most* consistent with a functional disorder?
 - A. Erythrocyte sedimentation rate of 7 mm/h.
 - B. Hematocrit of 28% (0.28).
 - C. Stool that is positive for occult blood.
 - D. Urinalysis showing 2+ proteinuria.
 - E. White blood cell count of $21 \times 10^3/\text{mCL}$ ($21 \times 10^9/\text{L}$).
4. You are considering a diagnosis of inflammatory bowel disease in a 15-year-old patient. The study of choice to confirm this diagnosis is:
 - A. Barium enema.
 - B. Computed tomography.
 - C. Endoscopy.
 - D. Plain radiography.
 - E. Ultrasonography.