CASE RECORDS of the MASSACHUSETTS GENERAL HOSPITAL

Case 25-2012: A 15-Year-Old Boy with Abdominal Pain, Hematochezia, and Anemia

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PRESENTATION OF CASE

A 15-year-old boy was admitted to this hospital because of recurrent abdominal pain and diarrhea.

The patient had been well until approximately 8 months earlier, when episodes of midline low back pain developed, which were worse in the morning and improved with activity and flexion. During the next few months, intermittent, stabbing periumbilical and left upper abdominal pain occurred, associated with nausea and diarrhea. The pain occurred once or twice a week, developed suddenly, and lasted from a few hours to a week, but typically 1 to 2 days. The pain had no relationship to eating, was unaffected by position or the passing of stool, and was not associated with nausea or vomiting. Acetaminophen provided slight relief.

Six weeks before admission, the patient saw his pediatrician for a follow-up examination related to obesity. The patient rated the abdominal pain at 6 to 7 on a scale of 0 to 10, with 10 indicating the most severe pain. He reported that between 8 months and 6 months before admission he had had decreased appetite and had lost 4.5 kg while following a weight-loss diet; during the next 4 months, his appetite had improved, and he had gained approximately 1.8 kg.

On examination, the blood pressure was 136/82 mm Hg, the pulse 85 beats per minute, the weight 88.4 kg, and the body-mass index (BMI; the weight in kilograms divided by the square of the height in meters) 28.1. The abdomen was obese and soft, with normal bowel sounds and mild tenderness in the left upper quadrant and periumbilical areas, without rebound or guarding. The blood level of carbon dioxide was 31.4 mmol per liter (reference range, 23 to 29), and the white-cell count was normal, as were the levels of other electrolytes, glucose, calcium, total protein, albumin, and globulin and tests of renal and liver function. Other test results are shown in Table 1. Three stool specimens were positive for blood; stool culture showed no enteric pathogens, and examination for ova and parasites was negative. A radiograph of the thoracic spine was normal. Referral to a gastroenterologist was made, and computed tomography (CT) of the abdomen and pelvis was scheduled. Episodes of abdominal pain and diarrhea continued during the next several weeks.

On the morning of admission, CT of the abdomen and pelvis performed with the administration of oral and intravenous contrast material revealed an ileoco-

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Table 1. Laboratory Data.*

Variable	Reference Range, Age-Adjusted†	6 Yr before Admission	6 Wk before Admission	On Admission
Hematocrit (%)	35.0–45.0 (age 9 yr); 37.0–49.0 (age 15 yr)	35.9	39.3	36.9
Hemoglobin (g/dl)	11.5–15.5 (age 9 yr); 13.0–16.0 (age 15 yr)	11.2	12.1	11.3
Mean corpuscular volume (μm^3)	77–95 (age 9 yr); 78–98 (age 15 yr)	63	61	61
Erythrocyte count (per mm^3)	4,000,000–5,200,000 (age 9 yr); 4,500,000–5,300,000 (age 15 yr)	5,690,000	6,500,000	6,080,000
Mean corpuscular hemoglobin (pg/red cell)	25.0–33.0 (age 9 yr); 25.0–35.0 (age 15 yr)	19.7	18.6	18.6
Mean corpuscular hemoglobin concentration (g/dl)	31.0–37.0	31.2	30.7	30.6
Red-cell distribution width (%)	11.5–14.5	15.4	17.9	17.9
Platelet count (per mm^3)	150,000–450,000	465,000	327,000	323,000
Reticulocyte count (%)	0.5–2.5	1.5	1.4	
Erythrocyte sedimentation rate (mm/hr)	1–13 (age 9 yr); 0–11 (age 15 yr)	16	7	
Iron (μg/dl)	45–160	31	27	
Total iron-binding capacity (μg/dl)	228–428	392	489	
Ferritin (ng/ml)	30–300	62	4	
Hemoglobin electrophoresis				
Hemoglobin A (%)	94.3–98.5 (age 9 yr); 95.0–98.0 (age 15 yr)	93.7	94.7	
Hemoglobin A_2 (%)	1.5–3.5 (age 9 yr); 2.0–3.3 (age 15 yr)	5.6	4.9	
Hemoglobin F (%)	0.0–2.0	0.7	0.4	
Amylase (U/liter)	3–100			126

* To convert the values for iron and iron-binding capacity to micromoles per liter, multiply by 0.1791.
† Reference values are affected by many variables, including the patient population and the laboratory methods used. The ranges used at Massachusetts General Hospital are age-adjusted for patients who are not pregnant and do not have medical conditions that could affect the results. They may therefore not be appropriate for all patients.

lonic intussusception extending approximately 8 cm cranially from the ileocecal valve, without a soft-tissue mass or cystic lesion. There was no bowel obstruction and no abnormal-appearing bowel loops. Later that day, abdominal pain recurred, and the patient came to the emergency department at this hospital.

In the emergency department, the patient reported left upper quadrant pain, headache, and diarrhea and no fever, nausea, or vomiting. Six years before admission, he had been evaluated at this hospital for an episode of painless rectal bleeding (bright red blood in the toilet bowl twice in 1 day), without constipation or diarrhea. On examination at that time, the vital signs and abdominal examination were normal, there were no hemorrhoids, and the stool was guaiac-positive; laboratory-test results are shown in Table 1. Culture of the stool for enteric pathogens, analysis of the stool for ova and parasites, and a technetium-99m pertechnetate scan of the abdomen for Meckel's diverticulum were negative, and colonoscopic examination showed no bleeding or mucosal abnormality. Ferrous sulfate was prescribed. A few episodes of periumbilical pain occurred subsequently and resolved spontaneously; no further bleeding occurred.

The patient had iron-deficiency anemia, β-thalassemia minor, obesity, borderline hypertension, mild asthma, allergic rhinitis with a nasal polyp for which he underwent a polypectomy, and eczema. Medications included ferrous sulfate (daily) and an albuterol metered-dose inhaler (as needed for asthma); immunizations were up to date. He had no known allergies. He was born in the United States, attended school, and lived with his mother, who had emigrated from Southeast Asia, and a sibling. He had not traveled recently and had had no contact with ill persons.

On examination, the blood pressure was 140/64 mm Hg, the pulse 74 beats per minute, and the weight 91 kg; the temperature, respiratory

rate, and oxygen saturation (while the patient was breathing ambient air) were normal. The abdomen was soft, with normal bowel sounds, and without distention or tenderness; the remainder of the examination was normal. The white-cell count, differential count, and platelet count were normal, as were blood levels of electrolytes, glucose, calcium, magnesium, phosphorus, total protein, globulin, albumin, and lipase and tests of coagulation and renal and liver function; other test results are shown in Table 1. The patient was admitted to this hospital. Oral intake was stopped, and intravenous crystalloid was administered.

A diagnostic procedure was performed.

DIFFERENTIAL DIAGNOSIS

Dr. Garrett C. Zella: This 15-year-old boy with an 8-month history of intermittent abdominal pain, nausea, and diarrhea has a mildly tender abdomen, guaiac-positive stool, and iron deficiency. In light of the patient's history before blood was found in the stool, we should think broadly about what might cause episodes of pain, nausea, and diarrhea in a teenager.

CAUSES OF EPISODIC ABDOMINAL PAIN, NAUSEA, AND DIARRHEA IN A TEENAGER

Disaccharidase deficiency, particularly lactase deficiency, should be considered in this case, since pain may occur intermittently after lactose exposure. As colonic bacteria ferment undigested lactose, hydrogen and other gases are produced that may cause abrupt cramping. Diarrhea occurs, since the lactose serves as a luminal osmotic agent. The patient's Southeast Asian ancestry increases the likelihood of lactose intolerance, since lactase persistence after infancy is less common in Asian populations than in populations of European descent.[1]

Celiac disease may cause symptoms similar to those in this patient and is being increasingly recognized in children and adolescents. The prevalence approaches 1% worldwide.[2] Associated gastrointestinal symptoms are varied, testing is noninvasive, and treatment is well established; therefore, screening for celiac disease should be performed in children and teens such as this one who have abdominal pain and diarrhea.

Bacterial overgrowth in the small bowel should be considered, since small-bowel bacteria deconjugate bile acids and hydroxylate fatty acids, leading to osmotic diarrhea with associated cramping. Pain may worsen after meals, when carbohydrates and fats enter the small bowel. The patient reported no worsening of pain after meals, but the timing may be difficult to sort out, given the variations in gastric emptying and small-bowel motility in accordance with the fat content of a meal.

Paradoxically, constipation may also cause episodic diarrhea if a fecal impaction allows only loose stool to move around it. Usually this loose stool is small in volume and frequent, in contrast to more voluminous osmotic diarrhea. The patient's pain that coincides with diarrhea may represent intermittent fecal impaction, but he reports no relief of pain with bowel movements and no large, formed stools, which are often seen intermittently in this situation. No fecal mass was palpated, but such a mass may be difficult to find in an obese adolescent.

Irritable bowel syndrome may be considered; the patient meets the Rome III criteria[3] for the diagnosis, with pain more than once per week for 2 months and a change in the frequency and appearance of stool, despite the lack of relief with defecation. Other inflammatory, neoplastic, anatomical, and metabolic processes must be ruled out before concluding that irritable bowel syndrome is the sole cause of symptoms.[3]

CAUSES OF BLOOD IN THE STOOL

Once occult blood in the stool and iron deficiency are discovered, the differential diagnosis changes. Blood could be found in the stool of a patient with constipation if anal fissures or hemorrhoids are present. However, this patient had a normal rectal examination; the absence of gross blood and the presence of iron deficiency suggest that intestinal blood loss has been somewhat chronic.

Inflammatory bowel disease (IBD) should be at the top of a differential diagnosis when pain, nausea, and bloody diarrhea are found together. The diagnosis of IBD is further supported by the iron deficiency and the chronicity of symptoms. Although hypoalbuminemia is a classic finding in IBD, the albumin level can be normal, as it was in this patient. His low back pain could have been due to sacroiliitis associated with IBD, a process that may be difficult to identify on plain radiographs. However, a diagnosis of IBD is not supported in this patient because of the normal

erythrocyte sedimentation rate and platelet count and the periods of wellness and normal stools.

Infectious colitis may be considered, but few bacteria cause such chronic symptoms and occult blood in the stool in an otherwise well-appearing teenager. *Yersinia enterocolitica* is one such organism; when it affects the terminal ileum, it may mimic Crohn's disease, with stool blood and leukocytes, diarrhea, and abdominal pain. Although a stool culture was reportedly negative, the organism is difficult to isolate from commensal bowel flora in stool culture, and a single stool culture may not be sufficient for identifying the bacteria. Many microbiology laboratories do not routinely look for yersinia in stool cultures, so it is important to specify this request if *Y. enterocolitica* is suspected.

A Meckel's diverticulum might account for the subtle bleeding, but pain and nausea are not common in patients with this condition. Pain may occur if there is diverticulitis at the site or in rare cases of "Meckel's ileitis," which may also mimic ileal Crohn's disease.[4] A scan for Meckel's diverticulum had been negative in the past.

An intussusception could account for this patient's intermittent symptoms. Periods of pain alternating with periods of wellness are typical; however, bleeding is not common in classic childhood intussusception and usually occurs only when there is bowel ischemia. This patient appears well in the office, and laboratory tests do not show acidosis or leukocytosis, findings that strongly suggest an absence of ischemia. Intussusception is rare at this patient's age; 80% of cases occur in children less than 24 months of age, and only 5% of cases occur in adults.[5,6] Because the patient is so far from toddlerhood, it is important to consider adult-type physiology in thinking about this case. The major difference between childhood and adult intussusception is that a precipitating lesion is found in approximately 10% of childhood cases and 90% of adult cases.[7] Although this patient is pediatric by age, his body size is more adultlike; thus, he may have a "lead point" for intussusception, such as a polyp, which could be bleeding. Polyps rarely cause pain, but a polyposis syndrome may be associated with abdominal pain, hematochezia, and diarrhea, which are similar to this patient's symptoms. Abdominal and pelvic imaging studies are indicated.

Dr. Michael S. Gee: CT of the abdomen and pelvis with oral and intravenous contrast material (Fig. 1) reveals a soft-tissue mass, approximately 10 cm long, filling the lumen of the proximal colon and involving and surrounding the ileocecal valve. The mass is contiguous with the terminal ileum, which on multiple images appears to invaginate into the lesion. There is also fat attenuation present within the mass, most likely representing intussuscepted mesenteric fat. This appearance is most consistent with ileocolonic intussusception. No bowel obstruction is associated with this intussusception; the loops of small bowel proximal to the mass are normal in caliber, and enteric contrast material is seen passing into the colon distal to the mass. In addition, multiple enlarged mesenteric lymph nodes adjacent to the intussusception are most likely reactive in nature.

The long length of the segment of involved bowel raises concern that there may be a lead-point mass, either in the bowel wall itself or in the adjacent mesentery, causing the intussusception. However, no lead-point mass is clearly visualized.

CAUSES OF ILEOCOLONIC INTUSSUSCEPTION

Dr. Zella: Once the ileocolonic intussusception has been seen, the differential diagnosis can focus further on conditions that predispose to intussusception.

Polyps

We return to the possibility that a polyp is creating a lead point for the patient's intussusception. He had an episode of painless rectal bleeding 6 years earlier, suggesting the presence of a polyp at that time. A common presentation of the Peutz–Jeghers syndrome is polyps in the small bowel, which may cause chronic bleeding and intussusception.[8,9] This patient is missing the mucocutaneous pigmentation that is present in 95% of patients with this syndrome. However, in attempting to fit the patient's history of nasal polyposis into the scenario, it should be noted that two of the original seven siblings in the family originally described with the Peutz–Jeghers syndrome had nasal polyposis.[10] Other polyposis syndromes with hamartomatous histologic features (the juvenile polyposis syndrome, Cowden's syndrome, and the Bannayan–Riley–Ruvalcaba syndrome) may cause the same small-bowel polyps and symptoms and thus are also possible diagnoses.

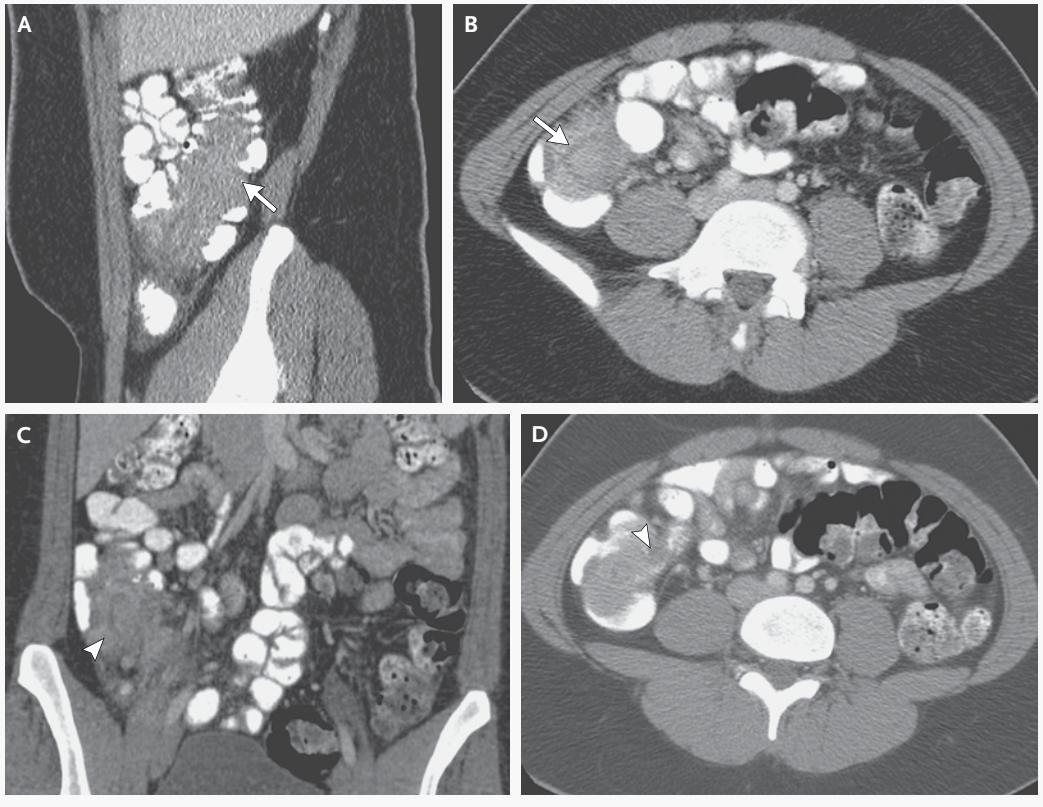

Figure 1. CT of the Abdomen and Pelvis.

A long, intraluminal cecal mass (Panel A, arrow), measuring approximately 10 cm, encases the ileocecal valve (Panel B, arrow). Tethering and invagination (Panels C and D, arrowheads) of the terminal ileum adjacent to the mass are features suggestive of ileocolonic intussusception.

Of all patients with familial adenomatous polyposis, 20% present with ileal adenomas,[11] but there are typically sheets of colonic polyps, which are not visualized with CT in this patient and were not seen when he underwent previous endoscopic examination. Small-bowel polyposis could be obscured by the edema of the bowel wall and by the intussusception itself. The results of colonoscopic examination were normal 6 years earlier, but we do not know whether the ileum was examined. A normal ileum 6 years earlier does not eliminate the possibility of a distal ileal polyp or the development of polyposis years later.

Cystic Fibrosis

The presence of a nasal polyp brings cystic fibrosis into the realm of possibility. Nasal polyps are present in approximately 30% of children with cystic fibrosis, and intussusception will develop in nearly 1% of patients with cystic fibrosis.[12] Cystic fibrosis–related intussusception is commonly ileocecal and thought to be due to inspissated feces.[12] With the use of more advanced genetic testing, cases of cystic fibrosis associated with obesity are being identified.[13] However, the chronic bleeding seen in this patient would be unusual for cystic fibrosis unless there was evidence of liver disease that might lead to bleeding varices.

Vascular Lesions

Small-bowel hemangiomas may act as lead points for intussusception[14]; they may be capillary, cavernous, or mixed and typically bleed slowly, resulting in anemia. They are usually present since birth, so it would not be surprising for a small-bowel hemangioma to have caused the patient's painless rectal bleeding when he was 9 years of

age. Such hemangiomas may be missed by imaging; the patient had no CT evidence of hemangiomas.[15] Small-bowel hemangiomas are best seen endoscopically, but the lesion may have been proximal to where the previous colonoscopy ended.

Another lesion that may account for chronic intestinal bleeding and act as an intussusception lead point is a congenital arteriovenous malformation. The most extensive lesions are typically found in the sigmoid and rectum in adults, but there are reports of polypoid arteriovenous malformations being found in small-bowel mucosa in children and causing intussusception.[16] An arteriovenous malformation may account for the chronic gastrointestinal blood loss in this patient, but it is an unlikely cause of ileocolonic intussusception.

Other Causes

Heterotopic gastric mucosa (without Meckel's diverticulum) that causes small-bowel intussusception has been described.[17] The lesions may be difficult to visualize by imaging; one case was revealed only by intraoperative endoscopy.[18] Results of this patient's scan for Meckel's diverticulum were normal 6 years earlier, when such a congenital lesion should have been discovered, but the sensitivity of this test is not 100%.

Small-bowel lymphoma should also be considered. In one series, lymphomas accounted for 17% of the 65 identified lead points among 1200 children with intussusception.[19] Lymphoma would not account for the bleeding when the patient was 9 years of age, since it would not be likely to remain asymptomatic until he was 15 years of age.

SUMMARY

This patient had painless rectal bleeding and normal colonoscopic results 6 years earlier and more currently has evidence of chronic blood loss with iron deficiency, a generally well appearance, a lack of systemic symptoms, and an abdominal CT scan showing intussusception without a distinct mass. It seems likely that the patient has an ileocolonic intussusception with a pathological lead point — possibly a small-bowel polyp or a vascular lesion not visible on imaging — requiring surgical intervention.

Dr. Nancy Lee Harris (Pathology): Dr. Stratton, would you tell us your clinical impressions when you saw the patient?

Dr. Lawrence W. Stratton (Everett Family Care): This boy has red–green colorblindness and was unable to report whether stools were visibly bloody. When his earlier episode of rectal bleeding occurred, he was at an age when his mother could observe his stools and noted blood. It was unclear whether his current symptoms represented a recurrence of his previous problem or a new process. IBD was my leading concern, but I was also concerned about other forms of colitis and anatomical causes that may not have been apparent on his earlier studies. Before his scheduled gastroenterology appointment, he reported recurrent abdominal pain and a low-grade fever; I ordered a CT scan, which showed intussusception, and he was referred to the emergency department at Massachusetts General Hospital.

CLINICAL DIAGNOSIS

Ileocolonic intussusception with a pathological lead point.

DR. GARRETT C. ZELLA'S DIAGNOSIS

Ileocolonic intussusception with a pathological lead point — either a polyp or a vascular lesion.

PATHOLOGICAL DISCUSSION

Dr. Harris: Dr. Doody, would you describe the diagnostic procedure?

Dr. Daniel P. Doody (Pediatric Surgery): Because we presumed that this was an intussusception with a pathological lead point, the patient was taken to the operating room. An exploratory lower-midline incision was made, and the intestine was examined. There was evidence of omental and peritoneal inflammation surrounding a mass in the right lower quadrant. The bowel was otherwise normal in appearance. The ileocecal region was brought into the abdominal incision, and the area was inspected. I was surprised not to find an intussusception and thought perhaps a partial cecal intussusception had reduced spontaneously. There was definitely an intraluminal cecal mass. I performed an ileocecal resection for what I presumed to be a neoplastic process, either benign or malignant. A primary end-to-end anastomosis was then performed, and the abdomen was closed in layers. The patient had an uneventful recovery.

Dr. Kamran Badizadegan: The ileocecal resection consisted of a 5-cm segment of the terminal il-

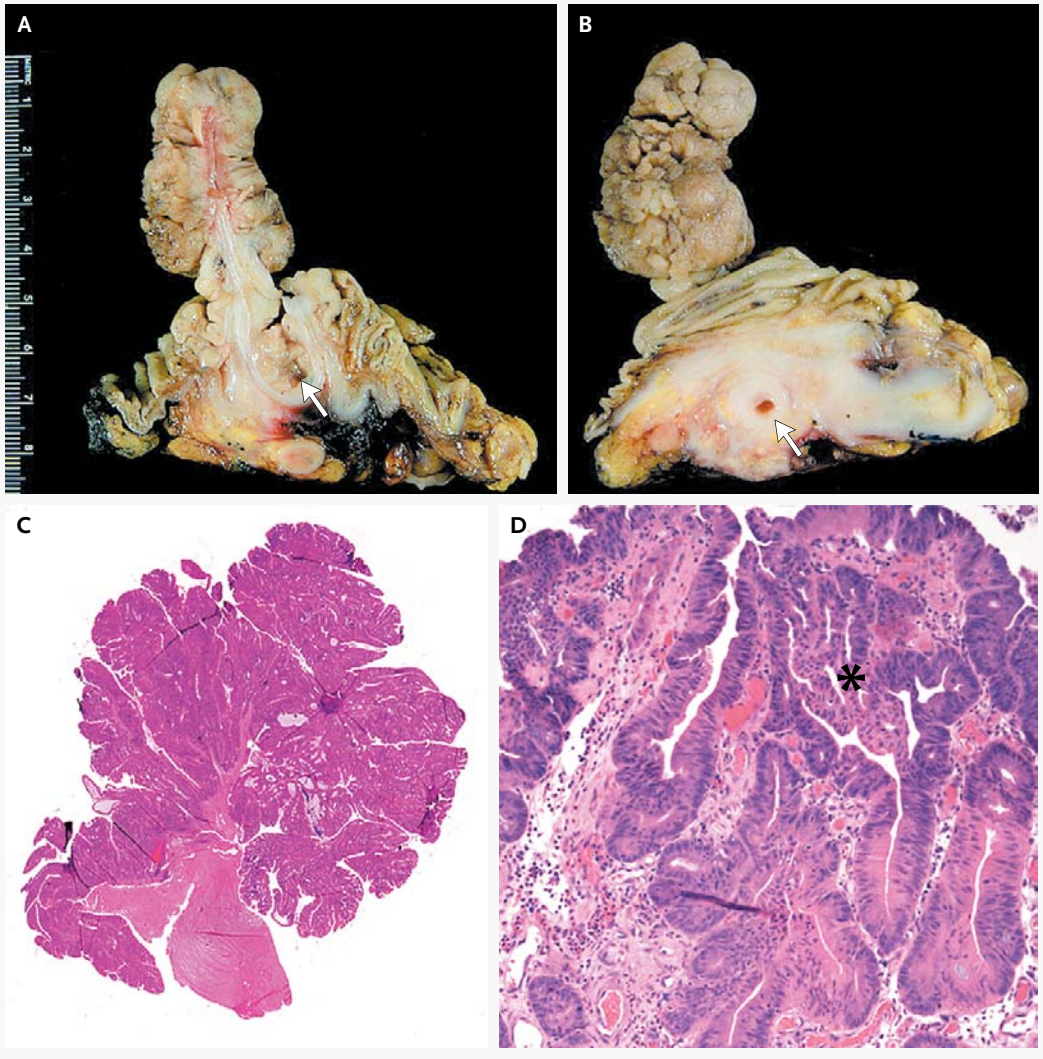

Figure 2. Ileocolonic-Resection Specimen.

On gross examination, longitudinal sections of the ileocolonic-resection specimen after formalin fixation show a pedunculated polyp arising from the cecal mucosa. The polyp appears to be predominantly epithelial, with no appreciable stromal or smooth-muscle component. The appendiceal orifice (Panel A, arrow) is buried deep behind the stalk of the cecal polyp. Further sectioning parallel to the plane of section (Panel B) reveals a cross section of the appendix (arrow), which is embedded in indurated and somewhat fibrotic mesenteric adipose tissue. Microscopical examination at low magnification (Panel C, hematoxylin and eosin) reveals an epithelial polyp with a somewhat lobular architecture formed by tightly packed glands. Examination at higher magnification (Panel D, hematoxylin and eosin) reveals the dysplastic nature of the glands, with nuclear crowding and stratification, loss of cellular maturation, and abnormal architecture. Focally, there is a cribriform pattern of the glands, with nuclear enlargement and loss of polarity (asterisk), features consistent with an early stage of high-grade dysplasia.

eum and a 7-cm segment of the cecum and ascending colon. The ileocecal junction was distorted by a mass of indurated mesenteric adipose tissue that encased and concealed the appendix. There was no evidence of an intussusception.

Dissection of the specimen revealed a solitary, pedunculated cecal polyp, 5 cm by 2.5 cm by 2.2 cm, arising close to the appendiceal orifice. The polyp was lobulated and, on cross sectioning, showed no evidence of invasion into the colonic submucosa (Fig. 2A). The appendiceal orifice was obstructed by the body of the polyp

(Fig. 2A), resulting in appendiceal inflammation with mural thickening and induration of the periappendiceal soft tissues (Fig. 2B).

Microscopical examination of the polyp showed a dysplastic epithelial polyp with no stromal component, consistent with a tubular adenoma (Fig. 2C). There were areas of increased glandular complexity and moderate cytologic atypia, features diagnostic of early high-grade dysplasia (Fig. 2D). There was no evidence of carcinoma. Microscopical examination of the appendix confirmed the presence of acute suppurative appendicitis and periappendicitis. Surrounding colonic and ileal mucosa, as well as multiple regional lymph nodes, revealed no other diagnostic abnormalities.

Isolated colonic adenomas occur in the pediatric age group but are exceedingly rare, with a reported incidence of less than 1 to 3% among all nonsyndromic intestinal polyps.[20-25] The pathogenesis and natural history of isolated pediatric adenomas are not well understood. Billingham et al.[25] found no cancers in 10 patients under 20 years of age who had solitary colorectal adenomas and were followed for an average of 10 years, suggesting that most isolated adenomas are truly incidental. More recently, however, isolated adenomas have been described in patients with variant forms of hereditary nonpolyposis colorectal cancer. Heterozygous germline mutations in DNA mismatch-repair genes are characteristically associated with hereditary nonpolyposis colorectal cancer and the onset of adenomas and carcinomas with microsatellite instability in early-to-middle adulthood. In contrast, homozygous mutations in mismatch-repair genes may present with a variant of the disease that is characterized by café au lait spots, early onset of colorectal neoplasia, glioblastoma, and lymphoma.[26,27] Because of this possibility, the patient's adenoma was tested for microsatellite instability. Immunohistochemical staining for MLH1, MSH2, MSH6, and PMS2 showed intact nuclear expression, and polymerase-chain-reaction analysis for common microsatellite markers revealed no evidence of microsatellite instability.

Dr. Harris: Do you think that the polyp could have been present at endoscopy 6 years ago as a smaller lesion?

Dr. Badizadegan: I would guess that it could have been there as a small or incipient lesion, but there is no way to be sure, since the rate of growth of incidental adenomas is not known.

Dr. Harris: The patient has been followed by Dr. Stratton and was also seen by Dr. George Russell of Pediatric Gastroenterology.

Dr. Stratton: Approximately 2 months postoperatively, results of outpatient colonoscopy and upper endoscopy were normal. One month later, another episode of abdominal pain and diarrhea developed that was reminiscent of the patient's presenting symptoms. At that time, results of an upper gastrointestinal series with small-bowel follow-through were normal, as was a video obtained by capsule endoscopy. At a routine digital rectal examination about 2 years after the operation, the stool was guaiac-positive. Results of upper and lower endoscopic studies were again normal, with only an anal fissure and nonbleeding hemorrhoids noted. The patient has reported no further abdominal pain, diarrhea, or rectal bleeding and is doing well. He has continued his efforts at weight reduction, and his BMI is now stable at 26.

Dr. Harris: Do you think the patient was having spontaneously reducing intussusceptions? Dr. Gee, do you think that the fat line you saw was the adenoma and not an intussusception?

Dr. Gee: The CT scan shows fat in the mass; it is difficult to say whether some of the fat attenuation is attributable to the cecal adenoma itself or to intussuscepted mesenteric fat. The large intraluminal cecal mass most likely represents a combination of the cecal adenoma and intussuscepted terminal ileum. However, in view of the length of the cecal mass, it is possible that we could have been visualizing tethering of the cecum and terminal ileum, without frank intussusception.

Dr. Doody: I think the cecum was actually intussuscepted, but because of the pericolic and retroperitoneal attachments, it could only go so far and then would fall back. If a small-bowel polyp had led to the intussusception, it would not tend to reduce. This was a very long polyp, so even if there was a small intussusception, it probably looked longer on imaging than it actually was. The other odd thing was that in the operating room, we couldn't find the appendix, so it was interesting to learn that it was obscured by inflammation.

ANATOMICAL DIAGNOSES

Adenomatous polyp with focal high-grade dysplasia. Postobstructive acute appendicitis and periappendicitis.

This case was discussed at the Pediatric Grand Rounds.

Dr. Badizadegan reports receiving compensation from law firms for expert testimony regarding gastrointestinal pathology. No other potential conflict of interest relevant to this article was reported.

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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