

Case Report

A Gut Feeling

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Abstract

We present the case of a two-year-old girl with the chief complaint of fever and a limp who, after seven emergency room visits over 10 days, was ultimately diagnosed with ruptured appendicitis. This case serves an important reminder about the challenge of diagnosing appendicitis in children and reviews the common features of pediatric appendicitis, many of which are uncharacteristic for adult presentations. Key points of discussion raised by this case include the importance of the availability of ultrasounds in pediatric emergency rooms and the critical value of repeat examinations in the diagnosis of appendicitis.

INTRODUCTION

"Appendicitis is a great leveller in surgery, an antidote to diagnostic complacency." [1]

CASE PRESENTATION

A two-year-old girl with no past medical history presented to our pediatric emergency room with a fever and a limp of three days. This was her seventh emergency room visit over the past ten days. These previous emergency room visits, all at outside urban hospitals with pediatric emergency rooms, had resulted in an accumulation of diagnoses, including pharyngitis, laryngitis, hand foot and mouth disease, and gastroenteritis. Her initial symptoms included persistent fever associated intermittent abdominal pain, nausea, and vomiting as well as nasal congestion and sores around her lips.

Over the past three days, the patient had developed pain in her right leg and a limp, which prompted her mother to bring her back to an emergency room. Her mother had given her acetaminophen for fever relief but the pain persisted. Her mother denied any history of injury to the leg or sick contacts. Review of systems was notable for fever and rhinorrhea and negative for joint swelling, erythema, cough, diarrhea, or constipation. The child was the progeny of a full-term pregnancy and was with up to date with immunizations. She had no siblings and began attending day care two months ago.

On the day of presentation, initial physical exam revealed a playful, calm child with rhinorrhea, crusted-over lip lesions, and a soft, non-distended abdomen without guarding, rebound tenderness, or palpable masses. The patient would not bear weight on her right leg and maintained her leg flexed and externally rotated in an antalgic position. Her temperature was 102 degrees Fahrenheit (F), heart rate 127, respiratory rate 32, blood pressure 115/50, and oxygen saturation at room air 96%. Her exam was negative for erythema, swelling, or evidence of trauma in her ankle, knee, or hip. At the top of differential

at this time was post-viral toxic synovitis, septic arthritis, and gastroenteritis. Ibuprofen was given for fever management, an orthopedics consult was called, and laboratory studies including blood culture were ordered for further evaluation along with radiographs of the pelvis and right femur, tibia, fibula, and foot.

Initial labs revealed a leukocyte count of 12,700/ μ L (5.5-15.5 K/ μ L) with 50% (36-66%) neutrophils and 25% (15-44%) lymphocytes, hematocrit 31.7%, platelet count 190,000/ μ L, and erythrocyte sedimentation rate (ESR) 120 mm/h (0-24 mm/hr). Results from a comprehensive metabolic panel, liver function tests, and urinalysis were within normal limits. Radiographs of the lower right extremity found no evidence of fracture, dislocation, effusion, or soft tissue masses. An orthopedics consultation confirmed localization of the pain to the right hip; however, per the consultant, full range of motion pointed away strongly from septic arthritis. With no clear diagnosis but concern for a rampant inflammatory process that had been brewing over the past 10 days, the decision was made to continue to observe the patient before any further interventions.

Four hours after her original evaluation, the patient's exam presented a strikingly different picture. After eating applesauce, the patient's abdomen became tense, distended, and globally tender to palpation. She appeared increasingly uncomfortable and her mother explained that her child had been eating less in spite of a seemingly normal appetite and had been complaining of recurrent pain while pointing to her lower sternal area. At this time, there was new suspicion for a possible abdominal obstruction or pneumonia. Abdominal and chest radiographs were ordered, which were ultimately negative for both an obstructive process and a pulmonary infiltrate.

The patient's exam continued to fluctuate drastically over the next five hours: at times, the child would laugh, smile and even stand on her right leg jumping on the bed; at other moments, she would lie with her right leg fixed in an antalgic position and would not tolerate an abdominal exam because of pain. Her

mother and treating physicians expressed deep concern with this highly variable exam.

When the child spiked a fever of 104.3 F nine hours after presentation, the emergency room attending examined the patient as she lay with her right leg externally flexed, her pain apparent and exam notable for abdominal distension and marked tenderness. It was at this moment that the attending focused her differential on an acute abdomen, specifically ruptured appendicitis or possibly a psoas abscess. The child received ibuprofen and a fluid bolus and a surgical consult was immediately requested.

When the surgery team arrived, however, the child suddenly appeared much more comfortable, playfully jumping up and down on the examination table. She tolerated the exam with only mild discomfort and her abdomen was not impressively distended. The emergency room attending considered a CT scan to evaluate possible appendicitis given the 10-day history of fever and emesis with intermittent but severe abdominal pain and the right-sided process involving the hip. The surgical team, however, expressed a low level of suspicion for a surgical abdomen and avoiding unnecessary radiation in this pediatric patient was paramount. Because it was a weekend, an ultrasound was not available at our hospital.

Ten hours after her first assessment, the patient was examined while sleeping. Palpation of her abdomen in the right lower quadrant resulted in severe pain that instantly awoke the child. The constellation of persistent fever, abdominal pain, vomiting, elevated leukocyte count as well as an ESR of 120 mm/h convinced the Emergency Department attending to proceed with a CT scan; a lively conversation ensued among the emergency room, radiology, and surgery attendings as the radiologist and surgeon were exceedingly hesitant to expose the two year-old patient to radiation, but the scan was indeed pursued. Results revealed perforated appendicitis with a free appendicolith as well as a multi-loculated abscess in the lower right quadrant 6 cm x 5 cm x 37 mm at the level of the iliopsoas junction (Figure 1). An

enlarged spleen was also noted, attributed to the long-standing inflammatory response.

The surgery team was re-consulted and the patient began receiving intravenous antibiotics immediately in the emergency room before admission to our hospital's pediatrics unit. Her fever subsided after one day of hospitalization and on the second day she underwent interventional radiologic drainage of a 25-milliliter purulent appendiceal abscess, culture of which revealed of polymicrobial infection of *Klebsiella*, *Bacteriodes*, and *Lactobacillus*. After a nine-day admission, she was discharged home with oral antibiotics and scheduled for an appendectomy six weeks later as per hospital standard of care. Within the two weeks following discharge, the patient had two additional emergency room visits at our hospital for abdominal pain and hematochezia while she continued her antibiotic course. Her surgery was ultimately uncomplicated and a follow-up phone conversation with the mother several months after her operation confirmed that the patient was doing well and pain free.

DISCUSSION

Though remarkably common, appendicitis in children is inherently difficult to diagnose, especially in the infant and toddler. Pediatric appendicitis cases stand out for their atypical presentations often in combination with the inability of the patient to verbalize symptoms [2]. Challenging aspects of this case include the unusual presenting symptoms, the age of the patient, the perpetually changing physical evaluation of the patient, and the history of numerous previous emergency room visits over the past 10 days without one unifying diagnosis. These particular challenges, however, are closer to the norm than to the exception in pediatric appendicitis [3].

The chief complaint of a limp and fever in a child points initially toward a differential including septic arthritis, trauma or fracture, osteomyelitis, and transient synovitis rather than appendicitis; [4] however, reduced ability to walk is highly conserved feature of pediatric appendicitis cases. One retrospective study of 379 cases concerning for appendicitis in children ages three to twelve reported inability to walk in 82% of patient with true appendicitis [5] and complaints involving the right hip are notably common in children two years of age or younger [6].

Missed appendicitis in the pediatric emergency room is not an uncommon phenomenon; [7,8] multiple studies have identified an inverse relationship between the age of the patient and the likelihood of misdiagnosed appendicitis [8,9] and for patients two years of age or younger that value approaches 100% [6]. The fact that this patient was seen six times before diagnosis is exceedingly rare; one retrospective study analyzing 816 cases found that 28.3 hours was the median duration between the original hospital visit and admission for appendicitis; in our case, it had been over a week [10]. Delayed appendicitis diagnosis is strongly associated with a dramatically increased risk of perforation—and the increased risk of complications and duration of hospitalization that comes with perforation [11]. Our patient not only had seven total emergency room visits, but she also underwent a nine-day admission, drainage of her appendiceal abscess by interventional radiology, two additional emergency room visits in after her original hospitalization, and

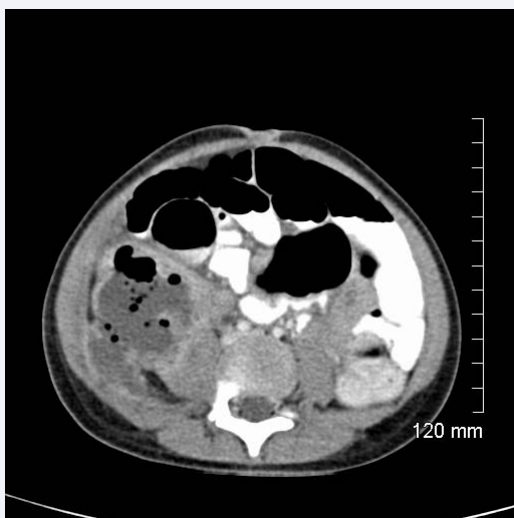


Figure 1 Image from CT scan of abdomen and pelvis showing appendiceal abscess.

a surgery to remove the appendix. The emotional and economic toll of this experience can hardly be quantified.

A critical component of successful diagnosis in this case was the prolonged observations of the child in the emergency room for repeated evaluations and a “gut feeling” of the attending that this could be appendicitis. Using clinical evaluation and judgment, the emergency room physician was not dissuaded by the surgical consult or the resistance of the radiology attending to pursue a CT exam in a two year-old. In pediatric patients, classic signs of adult appendicitis such as right lower quadrant pain, rebound tenderness, fever, and nausea or vomiting are clues that may help point toward a diagnosis, but their absences hardly precludes that diagnosis. Several clinical prediction rules have been developed to accurately identify appendicitis, such as the Pediatric Appendicitis Score (PAS) and the Alvarado Score, however their reliability in the pediatric remains markedly limited [12,13]. Developing a reliable system for the pediatric population to swiftly and accurately diagnose appendicitis must be a top priority. One recent prospective study evaluated a clinical pathway involving the combination of the PAS and ultrasound with promising results [14].

A pervasive tension in emergency rooms is the pressure from both the hospital and patient to move everything quickly, to get everyone in and out as efficiently as safely possible. In children with suspected appendicitis, however, repeat exams and observation over time is often crucial for successful diagnosis. Several reports have substantiated the role for re-examination in children with abdominal pain [15-17] and an algorithm for diagnosing appendicitis published in the journal of the American Academy of Pediatrics specifically includes repeat examination four to six hours after initial presentation [18]. In our case, frequent clinical examination of the patient by the ED attending was crucial in making a clear diagnosis. The role for repeat exams in the process of diagnosing appendicitis and delayed emergency room discharge cannot be overemphasized.

Imaging in young children is a topic of great debate given the potential for the long-term detrimental effects of radiation exposure. Although CT scan has been the gold standard for the evaluation of appendicitis, ultrasound has emerged as a valuable tool with diagnostic specificities comparable to that of CT with an experienced technician [19,20]. Because it was a weekend, ultrasound was not available at our hospital. The importance of all pediatric emergency room pediatricians becoming proficient in ultrasound must be stressed, particularly in community hospitals. Additionally, in necessary cases, such as this one, where there is high clinical suspicion, a CT scan is warranted even in young patients. The resistance from the radiology department to pursue the scan created tension in an already intense situation. If an ultrasound been readily available, diagnosis likely could have been expedited and this negative inter-department interaction averted.

There is an unfortunate stigma associated with patients who frequent many emergency rooms, an immediate assumption that there is some ulterior motive or unusual quality about this patient resulting in repeated visits without any concerning symptoms. In this case, there were several findings that stood out for their severity and demanded further evaluation regardless

of the number of recent hospital visits. Not only did the patient have a fever for days, but the patient's leukocytosis and strikingly elevated ESR of 120 mm/h pointed strongly to an acute inflammatory process that could not be ignored. While there has yet to be identified a specific cut-off point among inflammatory markers that can definitely rule-in or rule-out appendicitis or appendiceal perforation, they can be used in combination with a patient's clinical picture to help point towards the diagnosis [18]. Furthermore, an elevated ESR has been correlated with increased risk of perforation [21]. One of the challenges of emergency room evaluations is the lack of background data such as laboratory studies; abnormal values therefore must be heeded and repeat tests performed if necessary for confirmation.

The role of the mother of the patient in this case should not be overlooked: her understanding of her child's state of health and persistence in pursuing medical attention was invaluable. In spite of the chaos of pediatric emergency rooms, a holistic approach should always be the goal, listening to parents who know their children best and looking at children as a whole rather than as a chief complaint.

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