Ultrasound in Emergency Medicine

POINT-OF-CARE ULTRASOUND IN A RESOURCE-LIMITED SETTING: DIAGNOSING INTUSSUSCEPTION

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Abstract—Background: Department of Radiology performed ultrasound for patients suspected of having intussusception in resource-limited settings might be either unavailable or significantly time delayed. Objective: Our objective was to present a case of intussusception successfully diagnosed by point-of-care ultrasound and to review the sonographic appearance and diagnostic criteria for intussusception. Case Report: An emergency physician utilized point-of-care ultrasound to diagnose intussusception in a young patient in Haiti. Conclusions: In resource-limited settings, point-of-care ultrasound performed by a physician trained to diagnose intussusception can reduce the time to definitive management and thereby potentially reduce complications such as bowel ischemia and necrosis, dehydration, and sepsis. © 2013 Elsevier Inc.

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INTRODUCTION

A patient presenting with intussusception can be a diagnostic challenge to the emergency physician. The child with acute intussusception classically has vomiting, intermittent abdominal pain, and bloody stools; however, this symptom triad is only seen in 20–40% of cases (1). In addition, the high rates of nutritional disorders, dysentery, amoebic and parasitic infections in tropical countries such as Haiti, can delay and obscure this diagnosis because of the similarity of the presenting complaints (2).

Signs of intussusception might not be apparent on abdominal radiograph studies, with findings such as a mass or bowel obstruction seen in <60% of patients, and up to 25% of patients with intussusception have normal abdominal radiograph studies (3–7). Gierup et al. reported that decreased gas in the right colon was the radiograph study finding most often noted (5). Traditionally, ultrasound examination for intussusception is performed in the Department of Radiology. The sensitivity and specificity of an ultrasound examination range from 98% to 100%, depending on the experience level of the ultrasonographer (8–11).

In resource-limited settings, when a Department of Radiology ultrasound study is either unavailable or significantly time delayed, point-of-care ultrasound could reduce the time to diagnosis and definitive management. There have been case reports of emergency medicine and pediatric emergency physicians utilizing point-of-care ultrasound to make this diagnosis (12–15). Knowledge of the sonographic appearance and diagnostic criteria for intussusception can aid the physician in the early diagnosis of intussusception and potentially reduce complications, such as bowel ischemia and necrosis, dehydration, and sepsis.

CASE REPORT

A previously healthy 7-month-old male presented with 3 days of abdominal swelling and vomiting to an...
emergency department staffed by international emergency physicians in Port au Prince, Haiti. The child was not tolerating feedings and had become less interactive with his parents. The vomitus was nonbloody and bilious, and his parents denied diarrhea, fevers, trauma, toxic ingestions, or previous similar episodes.

His vital signs were heart rate 132 beats/min, respiratory rate 38 breaths/min, systolic blood pressure 80 mm Hg, and rectal temperature 37.0°C. Physical examination revealed a listless infant with a distended abdomen that was soft and diffusely tender, most pronounced in the right upper quadrant. There was no rigidity, rebound tenderness, or guarding. There was gross blood on digital rectal examination. Laboratory blood testing was not available.

The emergency physician developed a differential diagnosis, which included intestinal enterocolitis, tropical intussusception, inflammatory bowel disease, bowel obstruction, appendicitis, intussusception, and pyloric stenosis (2). Supine and upright abdominal radiograph study revealed dilated loops of small bowel with multiple air-fluid levels (Figures 1 and 2), but did not demonstrate

Figure 1. Supine abdominal radiograph study demonstrates dilated loops of small bowel (arrows).

Figure 2. Upright abdominal radiograph study demonstrates air-fluid levels (arrows).

Figure 3. Examination of the patient with point-of-care ultrasound. Patient’s abdomen is distended.

Figure 4. Abdominal ultrasound transverse plane. The intussusception is visible as a circular structure of hyperechoic and hypoechoic concentric rings of bowel aka target sign.
evidence of the inciting etiology. A Department of Radiology ultrasound was not available.

A Sonosite 180 Plus (Bothell, WA) ultrasound machine with a low-frequency curvilinear probe was available for use in the Emergency Department. The emergency physician performed a point-of-care ultrasound of the infant’s abdomen (Figure 3). The examination included graded compression with the probe held in transverse and oblique planes in all four quadrants of the abdomen. In the right upper quadrant, where the patient was most tender, a soft tissue mass was identified in the transverse plane. When viewed with ultrasound, the mass had alternating hyperechoic and hypoechoic rings, suggestive of a target sign (Figure 4). An oblique view of the mass demonstrated a C-shaped configuration of bowel consistent with the pseudo-kidney sign of intussusception (Figure 5).

A surgical consultant was not available in the emergency department or hospital. Telephone call attempts were made to contact a general surgeon; however, no one was available. A central venous catheter was placed in the femoral vein under ultrasound guidance and a fluid bolus was administered. A nasogastric tube was placed and a small amount of bilious gastric content was evacuated. During the next 2 h, the infant showed no clinical improvement. He continued to be tachycardic and toxic appearing. Repeated attempts to contact several general surgeons from local hospitals or aid groups were unsuccessful.

A telephone consultation was made to a radiology consultant in the United States and, after case discussion, the radiologist described detailed instructions on how to proceed with an air or saline enema. Two reduction attempts were made by the emergency physician with air, and one with normal saline. After each reduction attempt, the patient showed no clinical improvement. Repeat point-of-care ultrasound examinations were unchanged.

Eleven hours after presentation, a pediatric surgeon became available and the patient was transferred to a public hospital 20 miles away. Surgical exploration confirmed an intussusception at the ileocecal junction that was successfully reduced. There was no evidence of bowel wall necrosis during operative inspection. The remainder of the hospital course was unremarkable and the infant was discharged home with his parents on postoperative day 3.

**DISCUSSION**

In resource-limited settings, a Department of Radiology performed ultrasound might not be available. In such a circumstance, the emergency physician with training in point-of-care ultrasound can utilize this bedside modality to facilitate diagnosis and treatment. Diagnosis by ultrasound is suggested by the following: a cross section of a complex mass with alternating concentric rings of hypoechoic and hyperechoic bowel wall layers corresponding to the invaginated wall and edema (target sign) and an oblique view of the mass that resembles the echotexture and shape of a kidney (pseudokidney sign). One retrospective report demonstrated that junior residents in the Department of Radiology perform screening ultrasounds for intussusception with similar accuracy and specificity rates as staff radiologists (16). Perhaps health care providers with limited experience or in the process of perfecting the ultrasound technique can still perform the procedure with reasonable accuracy. This lends support to emergency physician performed point-of-care ultrasound, most notably in resource-limited settings.

**CONCLUSIONS**

The emergency physician familiar with the sonographic findings of intussusception and familiar with point-of-care ultrasound may be able to rapidly make the diagnosis and expedite definitive care. A prospective study of emergency physician performed point-of-care ultrasound for the evaluation of patients presenting with symptoms and signs suggestive of intussusception is warranted.

**REFERENCES**