

Pediatric POCUS: 4 month old infant with a timely diagnosis

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Case Presentation

A healthy, four month-old female infant presented to a local emergency department with a 12-hour history of decreased activity, non-bilious vomiting and one episode of dark red blood in the stools. There was no history of fever. Telephone consultation was completed and the patient was transferred to a tertiary, pediatric centre for further evaluation. On arrival, the infant appeared pale and was lethargic during the exam. Heart rate was 137 bpm, respiratory rate was 50/min, blood pressure was 118/61, oxygen saturation was 99%, and rectal temperature was 37.0 degrees Celsius. Bedside glucose was 4.6 mmol/L. The mucous membranes were moist and the anterior fontanelle was flush. Pupils were equal and reactive to light and the throat was clear. The chest was clear and heart sounds were normal. The patient's abdomen was slightly distended with a palpable mass in the mid-abdomen just below the umbilicus. Rectal examination was positive for fecal occult blood.

The patient was resuscitated with a 20 mL/kg normal saline bolus. Bloodwork obtained revealed a hemoglobin of 122 g/L, platelets of 418 x10⁹/L and a white blood cell count of 21.6 x10⁹/L with a neutrophil count of 17.9 x10⁹/L. Electrolytes showed a sodium of 135 mmol/L and potassium of 3.8 mmol/L and a chloride of 102 mmol/L and a bicarbonate of 19 mmol/L.

A Point of care ultrasound (POCUS) performed by the staff pediatric emergency medicine physician revealed the following image: (Figure 1)

Discussion

Upon obtaining the above image, the diagnosis of intussusception was suspected and consultations to radiology and pediatric surgery were requested simultaneously. The

patient was assessed by the general surgical team within 30 minutes of consultation, however the radiology team felt that a formal ultrasound was necessary prior to the completion of an air enema reduction. Approximately two hours post-presentation, a formal ultrasound was completed by the on-call ultrasound technician who was called in from home, which revealed an ileocolic intussusception in the paraumbilical region. Doppler interrogation confirmed flow to the periphery with minimal central flow. Free fluid was noted in the abdomen. No lead point was identified.

Approximately three hours later, two intussusception reduction attempts were made, with the administration of an air enema, however reduction to the level of the sigmoid colon was not evident. An exploratory laparotomy six hours post-presentation was performed and although the colon was able to be reduced manually from the sigmoid all the way to the cecum, the cecum appeared ischemic. A segmental resection of the cecum was subsequently performed. The patient remained in hospital for three additional days and there was no recurrence of the intussusception.

Intussusception is the most common cause of bowel obstruction apart from pyloric stenosis. Given that the telescoping bowel can cause and may result in obstruction, necrosis and possible perforation, a timely diagnosis and treatment is of paramount importance since any delay in either the diagnosis or treatment of intussusception may compromise the bowel's blood supply. Studies have shown that the sensitivity of ultrasound for intussusception ranges from 96.6% to 100% while the specificity ranges from 88% to 100%. The use of Point of care ultrasound for intussusception has been previously

described.

Many Canadian pediatric emergency medicine physicians have training in bedside ultrasound consistent with the Canadian Emergency Ultrasound Society's core certification. Some pediatric emergency medicine physicians may have additional training to identify pathology such as intussusception. [1] The technique we used in our patient involved a 5-2-MHz curvilinear probe was placed transversely in the Right lower quadrant following the path of the large intestine. (A linear probe would also be appropriate). The depth was set to 6cm, and the identification of the psoas muscle was used as a landmark. Graded compression was utilized until a mass was identified. In the transverse view, a target sign was identified shown in Figure 1, and in the longitudinal plane, the pseudokidney sign was identified.

The early model of emergency bedside ultrasound equipped the emergency physician with ultrasound findings (ie.) enlarged abdominal aortic aneurysm that would trigger a surgical response before a formal ultrasound was completed by diagnostic imaging in patients with a time-sensitive diagnosis.

Intussusception is a time-sensitive diagnosis with a surgical intervention rate of approximately 15-20%. Ideally a positive POCUS for intussusception would trigger a dual response from surgery and diagnostic imaging with the latter being asked to complete an air enema reduction. In the majority of patients with intussusception, the response from diagnostic imaging is the rate-limiting step.

This is very important especially in the context of a patient who is at risk for possible failed air enema and operative intervention. Potential risk factors for failed enema reduction and operative intervention have

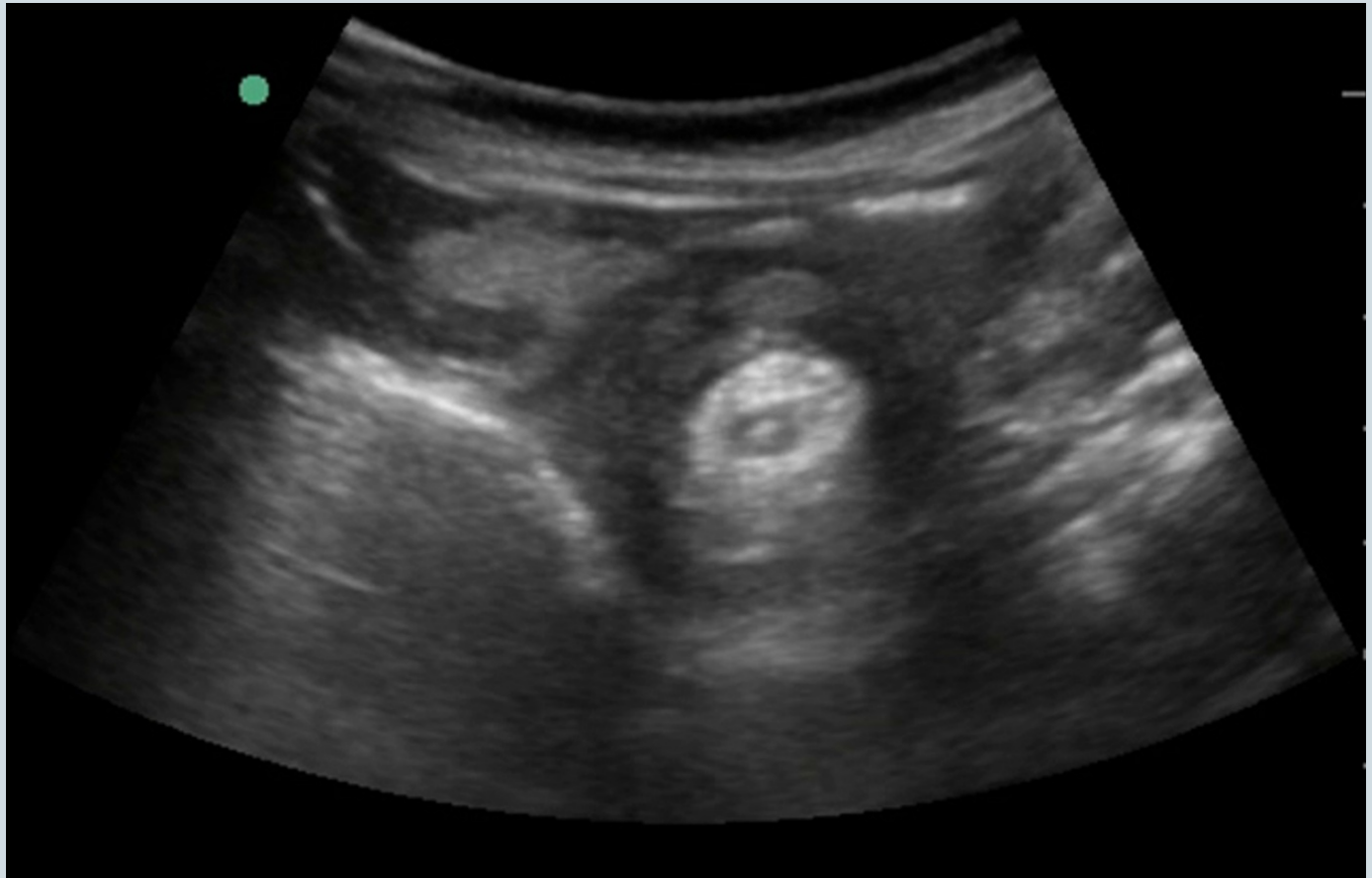


Figure 1. POCUS image from Right Lower Quadrant of Abdomen in transverse view.

been identified in the literature in several different studies [2]. Patients younger than six months of age have been shown to have higher enema failure rates, as well as patients who have had symptoms for over 24 hours, bloody diarrhea, and with documented lethargy.

We would advocate for operators trained in Intussusception POCUS detection, for use in their respective emergency departments. Patients that are at increased risk of surgical intervention may benefit even more than a patient deemed to be at lower risk from POCUS provided an operator trained in this skill is readily available. At a local level, it would make sense for a POCUS champion to educate the diagnostic imaging department that all positive reads should trigger a rapid response for an air enema especially for patients at increased risk for operative intervention.

Clinical Pearls

1. Intussusception is an important and common cause of bowel

obstruction in children that may not have the classic triad of colicky abdominal pain, bilious vomiting and “currant jelly” stool.

2. High risk patients at risk of failed air enema reductions should have a greater awareness to decrease delays in time to treatment.

3. POCUS is an evolving technology with numerous applications that can aid in rapid detection and subsequent shortening of treatment times in high risk patients.

References

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2. Fike, F, Mortellaro V, Holcomb G, St. Peter, S. Predictors of failed enema reduction in childhood intussusception. *Journal of Pediatric Surgery* (2012) 47, 925–927.

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