



## CASE REPORT

# Acute mesenteric ischaemia: A case of expedited diagnosis and management using point-of-care ultrasound

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## ABSTRACT

**Introduction:** The term *acute abdomen* refers to a clinical syndrome of sudden onset, severe abdominal pain. The differential diagnosis for this presentation is broad, but most cases require emergent medical or surgical management. Especially in cases of ischaemic bowel, time to diagnosis can mean the difference between survival and death. As a result, mortality remains high in resource-limited settings.

**Case report:** We describe the case of a 28-year-old male who presented to an urban Ethiopian emergency centre with three days of vomiting, bloody diarrhoea, and abdominal pain. He collapsed in triage with weak pulses and an undetectable blood pressure. Point-of-care ultrasound revealed a hyperechoic, mobile mass in the left ventricle of the heart. Small bowel dilation and thickening was visualised throughout the abdomen. Mesenteric ischaemia was rapidly identified as the working diagnosis, prompting early surgical consultation and aggressive, goal-directed resuscitation.

**Discussion:** Short of elucidating a definitive diagnosis, ultrasound narrowed the focus of an undifferentiated presentation and supported mobilisation for exploratory laparotomy. Ultimately, this circumvented several hours of time which is conventionally required to obtain computed tomography at this institution. As demonstrated in this case, point-of-care ultrasound can be life-saving in resource-limited settings where acquisition time for definitive imaging is often prohibitive.

## African relevance

- The differential diagnosis for an acute abdomen is broad and time to diagnosis can mean the difference between survival and death.
- Many low- and middle-income country hospitals have limited access to radiology.
- Prolonged acquisition time for definitive imaging can be prohibitive.
- Point-of-care ultrasound can expedite critical management within these settings.

## Introduction

The term *acute abdomen* refers to a clinical syndrome of sudden onset, severe abdominal pain [1]. The differential diagnosis for this presentation is broad, but most cases require emergent medical or surgical management [1–3]. Acute abdominal pain is one of the most common complaints in emergency departments worldwide. It is the

most common surgical emergency, and the most common reason for non-trauma-related hospital admission [2,4,5].

In recent years, ultrasound has gained popularity as a point-of-care tool for the rapid assessment and triage of critical patients. Protocols such as the Focused Assessment with Sonography in Trauma (FAST) [6] and Rapid Ultrasound in Shock (RUSH) [7] exams allow clinicians to evaluate patients at the bedside, quickly narrow broad differentials, and focus resuscitative efforts. To illustrate a modern paradigm in resource-poor clinical settings, we describe the case of a patient who presented to the emergency centre of an academic hospital in Addis Ababa, Ethiopia. Even in the country's quaternary referral centre where advanced imaging is available, it is often of limited value in time-sensitive diagnoses. Furthermore, barriers to safe patient transport may prohibit its use in unstable patients. In these circumstances, ultrasound may be the diagnostic imaging modality of choice for a broader range of clinical indications than is customary at institutions where computed tomography is easily accessible.

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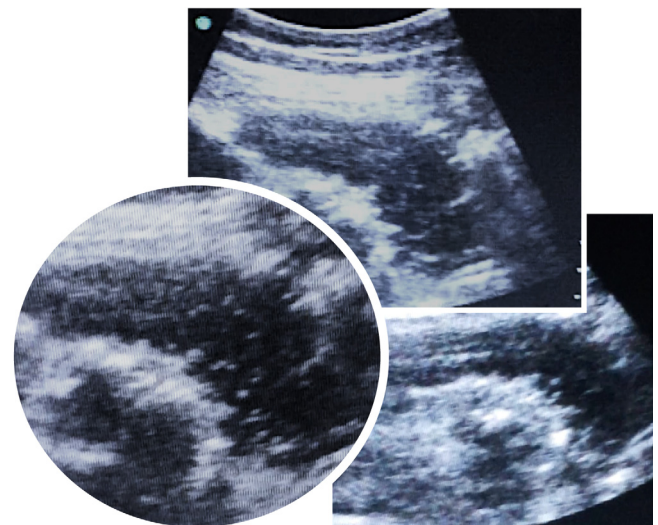
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**Case report**

A 28-year-old male with a history of peptic ulcer disease presented to the emergency centre of Black Lion Hospital in Addis Ababa, Ethiopia. He complained of three days of burning epigastric pain, abdominal distention, nausea, vomiting, bloody diarrhoea, and fevers. Presenting vitals were: Blood pressure 90/60, heart rate 111, respiratory rate 34, oxygen saturation 91% on room air. The patient was pale and diaphoretic, ultimately collapsing in triage. He was carried to a resuscitation bed with weak pulses and an undetectable blood pressure. Respiratory rate was 40 with a saturation of 90% on ten litres of oxygen by face mask. Physical examination revealed a rigid and distended abdomen with absent bowel sounds, and a decreased level of consciousness. Cardiac monitor showed an irregularly irregular, wide complex tachycardia. Intravenous (IV) fluids were bloused through peripheral IVs. A push dose of IV dextrose was given for empiric treatment of hypoglycaemia. Available laboratory results included: Haemoglobin 15.8 g/dl, haematocrit 50.1%, white blood cell count  $24 \times 10^3/\text{mm}^3$ , segmented neutrophils 52.6 %, lymphocytes 17.4%, and platelets  $175 \times 10^3/\text{mm}^3$ .

Emergency physicians performed a point-of-care echocardiogram to evaluate the patient’s gross cardiac function, but discovered a large hyperechoic, semisolid, mobile mass within the left ventricle (Fig. 1aa). Abdominal ultrasound showed dilated and thickened loops of bowel, with absence of peristalsis. Small echogenic foci, located circumferentially within the bowel wall suggested pneumatosis intestinalis (Fig. 1b). These new findings, in conjunction with the patient’s haemodynamic instability, raised concern for mesenteric thromboembolism with resultant bowel ischaemia. Surgery was consulted and arrived at the bedside only 30 min from the time of patient triage. After review of point-of-care ultrasound images, the operating room (OR) was mobilised. Meanwhile, the patient was prepared for exploratory laparotomy with antibiotics and aggressive IV fluid resuscitation. Cross-sectional imaging was never obtained.

In the OR, laparotomy revealed gangrenous necrosis of nearly the entire small bowel with extension to the cecum and ascending colon. Twenty centimetres of the proximal jejunum remained viable in addition to the transverse, descending, and sigmoid colon. On further inspection, the pancreas appeared normal, a middle colic artery pulse was palpable, but the distal superior mesenteric artery pulse was absent. Six-hundred millilitres of foul-smelling haemorrhagic fluid was evacuated from the peritoneum followed by copious lavage with warmed saline. Bowel resection was deferred as the extent of bowel involvement was deemed incompatible with survival. Post-operatively, the patient

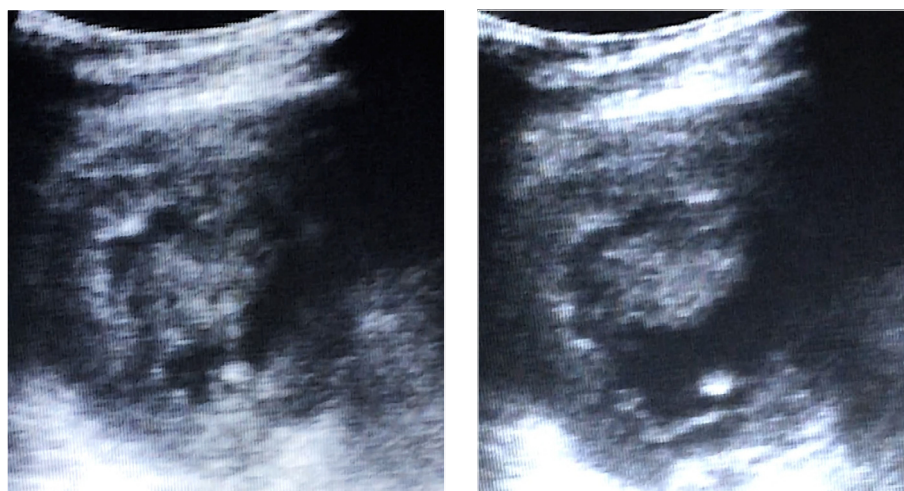


**Fig. 1b.** Small bowel obstruction and pneumatosis: point-of-care abdominal ultrasound. *Note:* Periumbilical view showing dilated loops of small bowel with thickened and inflamed bowel wall. Plicae circulares extending into distended bowel lumen. Intraluminal contents did not demonstrate peristaltic flow. Punctate hyperechoic enhancements within the bowel wall suggests intramural air.

was transferred to the intensive care unit where he remained intubated on broad spectrum antibiotics and vasopressors. Unfortunately, he succumbed to overwhelming sepsis with multi-organ failure expiring from cardiopulmonary arrest on hospital day two.

**Discussion**

Hospitals burdened by excessive patient volume face numerous barriers to safe and timely acquisition of advanced radiologic studies. Portable CT scanners may be located off-site, in trailers parked outdoors; necessitating high-risk, unmonitored transports subject to inclement weather and uneven terrain. Ultrasound represents a favourable alternative when utilised for rapid triage or diagnosis, at the bedside. Similar to the FAST [6] protocol, (utilised to bypass CT in unstable trauma patients with sonographic evidence of intraperitoneal haemorrhage), we propose the use of point-of-care ultrasound for initial evaluation in patients with an acute abdomen. Cases can, then, be triaged for early operative management and, when appropriate, may



**Fig. 1a.** Left ventricular thrombus: Point-of-care echocardiogram. *Note:* Parasternal short axis mid-chamber view of left ventricle showing large hyperechoic, semisolid, mobile mass within the ventricular chamber in systole and diastole.

subvert the requirement for diagnostic CT. A formalised protocol would screen for small bowel obstruction, cholecystitis, and appendicitis. Secondary findings of pneumoperitoneum, free fluid, or portal venous gas would further delineate cases with greater surgical urgency. Acknowledging ultrasound's limitations, we offer that a sacrifice in diagnostic precision may be preferential to the dangers of diagnostic delay. As in this case of mesenteric ischaemia, (for which CT is a clearly favoured diagnostic modality), sonographic findings raised the pre-test probability of acute surgical pathology to a threshold that warranted operative exploration, even without a definitive diagnosis. Despite early recognition and operative management, our patient expired on day two of hospitalisation. The advanced degree of bowel necrosis with extensive involvement of the small bowel was incompatible with life in the absence of resources for extended care. Physicians must make difficult decisions with regard to resource allocation in countries with a fixed amount of life-supporting care and devices. Had the segment of infarction been smaller, we believe the patient could have survived to full recovery following a resection and re-anastomosis. We hope future patients may benefit as a result of practice changes inspired by this case.

Further research should focus on development of ultrasound protocols specifically designed for resource-limited clinical settings. We advocate for the expansion of point-of-care ultrasound infrastructure and education as one means to address the rapidly expanding demand for emergency medicine in global health.

#### Dissemination of results

Results from this study were shared with emergency centre staff at Black Lion and University of Wisconsin Hospitals through informal presentations.

#### Conflict of interest

The authors declare no conflict of interest.

#### Authors' contributions

JC conceived the original idea for the case report. JC, DT, and TZ collected data and images. JC prepared the manuscript. JS revised the intellectual content. TZ gave final approval for the version to be published.

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