



Late presentation of isolated caecal perforation following blunt abdominal trauma: The utility of point-of-care ultrasound

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Dear Editor,

Colonic injuries after blunt trauma abdomen are a rare entity which may sometimes have a delayed presentation (1). In the intensive care unit (ICU), various interventions like sedation, analgesia and paralysis may confound clinical examination findings pertaining to abdominal pathology. Computed tomography (CT) provides an excellent diagnostic modality in blunt trauma abdomen (2) but requirement of high ventilatory support and/or vasopressors may preclude safe transfer of patients from ICU to radiology suites. Point of care ultrasound (POCUS) provides an excellent adjunct in diagnosis of hollow viscus perforation and is considered as a reliable alternative to plain radiograph for the diagnosis of pneumoperitoneum.

A 34-year-old male presented to the emergency department with severe traumatic brain injury with facial and base of skull fractures, blunt chest trauma and bilateral scapular fractures following a motor vehicular injury. Focused assessment with sonography for trauma (FAST) and CT scan were negative for any abdominal injuries. The patient was transferred to ICU for mechanical ventilation and supportive care. Enteral nutrition was initiated on the 2nd day. On the 7th day of admission, the chest radiograph revealed air under the diaphragm. The possibility of colonic shadow presenting as a radiological artifact was considered by the surgical team due to the absence of any clinical signs of peritonitis, negative findings in previous abdominal CT and

acceptance of enteral nutrition by the patient. POCUS was performed by the ICU team using a linear transducer (10 MHz) over the right hypochondrium. Abdominal POCUS showed multiple echogenic lines (reverberation artifacts similar to A lines on lung ultrasound) suggestive of a pneumoperitoneum that was subsequently confirmed on an abdominal CT scan. The patient underwent an exploratory laparotomy which revealed a small caecal perforation with minimal peritoneal contamination for which an extended hemicolectomy with end ileostomy was performed.

Blunt abdominal trauma, that is encountered as a part of polytrauma, may pose a diagnostic challenge because of the associated head injury or other distracting injuries. Isolated colonic injury following blunt trauma is rare and is usually associated with injuries to small bowel or other intra-abdominal organs. Incidence of large bowel injuries following blunt trauma abdomen is around 0.5% with ascending and descending colon injuries being more common than the transverse and sigmoid colon (3). Blunt colonic injuries are usually caused by road traffic accidents followed by other causes like direct blows, accidental falls etc. which can cause injury either due to compression (between anterior abdominal wall and vertebra) or deceleration. Colonic perforations are associated with high morbidity and mortality which are determined by the extent of peritoneal soiling and the delay in intervention (4).

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Table 1. Signs of hollow viscus perforation in various imaging modalities (6-8)

Erect chest radiography	Computerized tomography	Point of care ultrasound
Air under diaphragm		
Rigler sign – Gas on either side of the bowel	Direct sign:	
Football sign - Abdominal cavity is outlined by gas from a perforated viscus	<ul style="list-style-type: none"> • Discontinuity in bowel wall (most specific finding but less sensitivity) • Presence of extra luminal free air 	<ul style="list-style-type: none"> • Enhanced peritoneal stripe sign (EPSS) • -Reverberation artefacts at the interface of soft tissue and air
Cupola or Moustache sign – Air under central tendon of the diaphragm	Indirect signs:	Indirect signs
Lucent liver sign – Reduced opacity of liver shadow	<ul style="list-style-type: none"> • Abnormal bowel wall enhancement • Janus sign – Adjacent enhancing and non-enhancing intestinal loop • Focal bowel wall thickening 	<ul style="list-style-type: none"> • Free fluid • Thickened bowel loop
Silver sign –Outlining of falciform ligament parallel to right side of spine	<ul style="list-style-type: none"> • Presence of abdominal free fluid • Mesenteric infiltration or stranding • Contrast extravasation 	
Inverted V sign – Visualization of lateral umbilical ligament		

Physical examination is important but has its own inherent limitations in critically ill patients. The hallmark signs of peritonitis (abdominal pain, guarding, rigidity) may be masked using pharmacological interventions like sedation and paralysis in ICU. CT is the most sensitive modality for the detection of intraperitoneal air. However, its use is limited by availability, cost, portability, radiation hazard, risk of contrast associated kidney injury and complications of intrahospital transportation in critically ill patients.

POCUS is used widely in the emergency departments in polytrauma patients but its use in the recognition of abdominal pathologies is still somewhat overlooked. In a study of 178 patients with suspected pneumoperitoneum, ultrasound was found to be superior in terms of sensitivity (92% vs 78%), negative predictive value (39% vs 20%) and accuracy (88% vs 76%) without compromising specificity (53% for both modalities) compared to radiography (5). The signs of pneumoperitoneum using various imaging modalities are summarized in the Table 1 (6-8).

The advantages of abdominal POCUS include ease of performance, low cost, being fast, avoidance of hazards associated with radiation and contrast and ability to diagnose other causes of acute abdomen (like cholecystitis and appendicitis). Operator dependency, obesity, poor acoustic window, artifacts caused by colonic interposition and subcutaneous emphysema are some of the limitations of abdominal POCUS for the detection of pneumoperitoneum (9). To conclude, abdominal POCUS provides an excellent adjunct in the diagnosis of hollow viscus perforation and may be used as a reliable alternative for the diagnosis of pneumoperitoneum in the ICU.

Authors' contributions

Conceptualization: VR. Data curation: BR, SN. Writing – original draft: BR. Writing – review & editing: BR, SN, SK, DB, RS, VR. All authors have approved the final version of the manuscript.

Ethical issues

Not applicable.

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