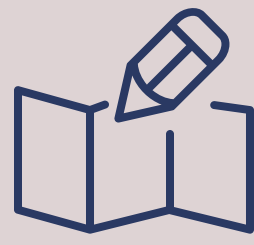


# Blunt Abdominal Trauma (BAT), bowel perforation and CT imaging - a case series

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## Learning Objectives

Recognise computed tomography (CT) signs of mesenteric and intestinal damage following blunt abdominal trauma.  
Recognise the clinical difficulty physicians have in recognising significant injury requiring intervention and the radiological predictors of significant injury  
Understand bowel perforation may not present acutely and radiological signs can prevent prolonged, delayed care and/or significant comorbidity  
Presentation of two cases illustrating the clinical difficulty and significance of imaging as predictor of poor outcomes

## Background

Small bowel and mesentery are infrequently injured following BAT (1-3% of cases). These injuries are often associated with high morbidity and mortality including delayed/missed bowel perforation. BAT is often caused by sudden decelerations such as in vehicle accidents resulting in significant shear forces or direct crush injuries - injury occurring at points of anatomic/constituted fixity.

There is an increasing trend towards conservative management of these patients and thus a high level of suspicion is required to identify deterioration/significant injury. Further this requires knowledge of the limitations and utility of clinical signs, laboratory testing and imaging.

## Clinical Dilemma

Clinical and biochemical markers of significant bowel injury/perforation, following BAT, have low specificity. Small bowel perforation in particular can have a delayed clinical presentation due to its temporal course and low impact until significant deterioration.

With BAT occurs, confounding factors preventing the detection of bowel perforation exist including neurological impairment, concomitant/distracting injuries (e.g. fractures), and pharmacological treatment (e.g. analgesia, partial treatment with antibiotics etc). CT imaging, however, is highly sensitive and predictive of significant injury.

## Case One

A 43 year old female involved in high speed vehicle accident. Distracting pathologies included multiple rib & transverse process fractures, submassive pulmonary embolism and pneumonia. Confounding treatment included antibiotics and analgesia.

Initial CT abdomen findings identified right iliac fossa and right lumbar mesenteric fat stranding (fig 1.).

This was managed conservatively, without laparoscopic diagnosis of bowel injury, and she had nil obvious clinical signs of bowel injury. She was discharged two weeks post this image.

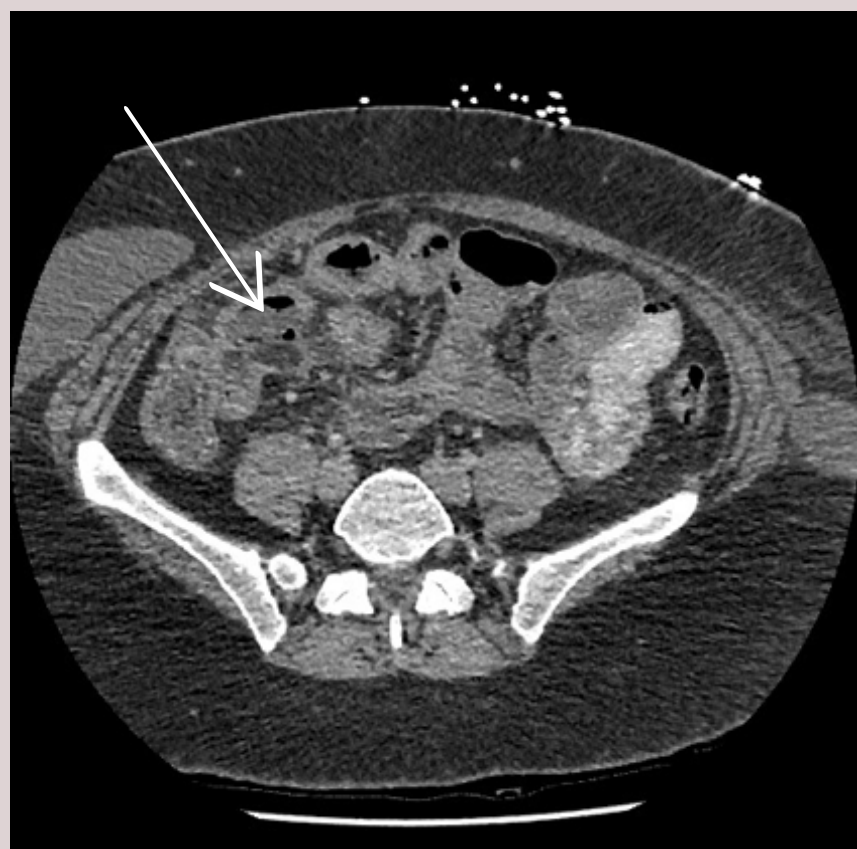


Fig 2. Small extraluminal air locule and bowel wall thickening; contained perforation.

A third, repeat, CT abdomen showed dilated bowel loops, bowel wall thickening and an inflammatory stricture.

Laparotomy with wedge resection and anastomosis was performed. There was a post-operative wound abscess which was drained. She was discharged well one month post representation.

This case highlights how early 'markers' on CT following BAT require close follow-up beyond the clinical examination.



Fig 1. Axial slice showing mesenteric stranding.

This patient represented a week after discharge with abdominal pain and emesis. Repeat CT abdomen showed an extraluminal air locule and mesenteric stranding in the right iliac fossa and free fluid, without pneumoperitoneum. A contained perforation.

She was managed conservatively with bowel rest and antibiotics. Her symptoms progressively worsened.

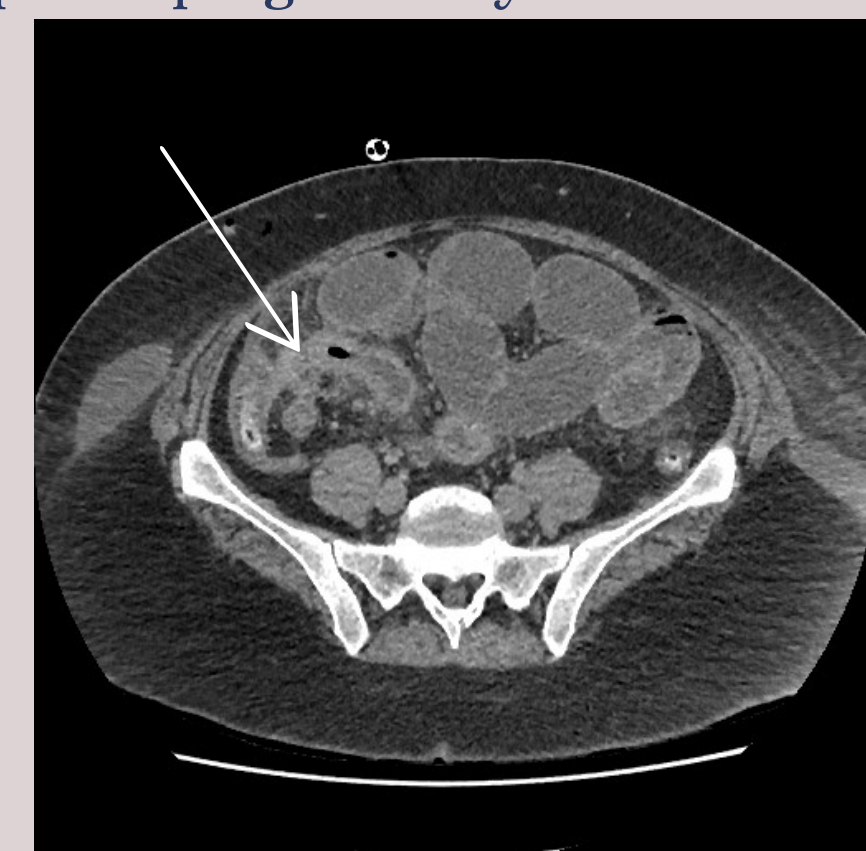


Fig 3. Inflammatory stricture and contained perforation

## Role of CT

CT imaging is considered the gold standard in evaluation of mesenteric and intestinal injuries in the haemodynamically stable patient (negative predictive value of ~99%). Imaging is required for prognosis and management of patients following BAT; including need for parenteral nutrition, antibiotics and laparoscopy/laparotomy.

Specific signs of perforation and/or vascular compromise include discontinuity of bowel wall, extraluminal enteric spillage, intramural haematoma and evidence of avascularity.

These signs often don't appear in the acute setting and early/predictive markers need to be sought. These include extraluminal air collections, intraperitoneal fluid, bowel wall thickening, as well as mesenteric adipose 'stranding'.

The presence of these 'non-specific' signs should arise high suspicion in the treating team and serial imaging and consideration of diagnostic laparoscopy/laparotomy should be encouraged.

Here we present two cases of BAT with these 'early/predictive' markers on CT. Both patients had many distracting factors and treatment that obscured the clinical picture and resulted in delayed/missed diagnosis of perforated bowel.

## Case Two

A 43 year old male involved in high speed motor vehicle accident. Distracting injuries included left rib, radius and ulnar fractures as well as sternal fracture. Confounding treatment included significant analgesic requirement. Clinically the patient presented with a 'seatbelt sign'

Initial CT abdomen (Fig 4) had signs suggestive of significant bowel trauma. These included right sided bowel wall thickening and adjacent mesenteric fat stranding. A small amount of fluid was noted in Morissons pouch and paracolic gutter.



Fig 4. Significant mesenteric fat stranding (white arrows) on first CT post injury. This non-specific finding, following BAT, should prompt clinicians to have high suspicion for potential perforation/avascularisation.

The patient had a significant clinical decline four days later becoming tachycardic and peritonitic four days post BAT. A repeat CT abdomen was performed showing pneumoperitoneum, perihepatic free fluid, dilatation of small bowel loops, and extraluminal spillage (Fig 5.)

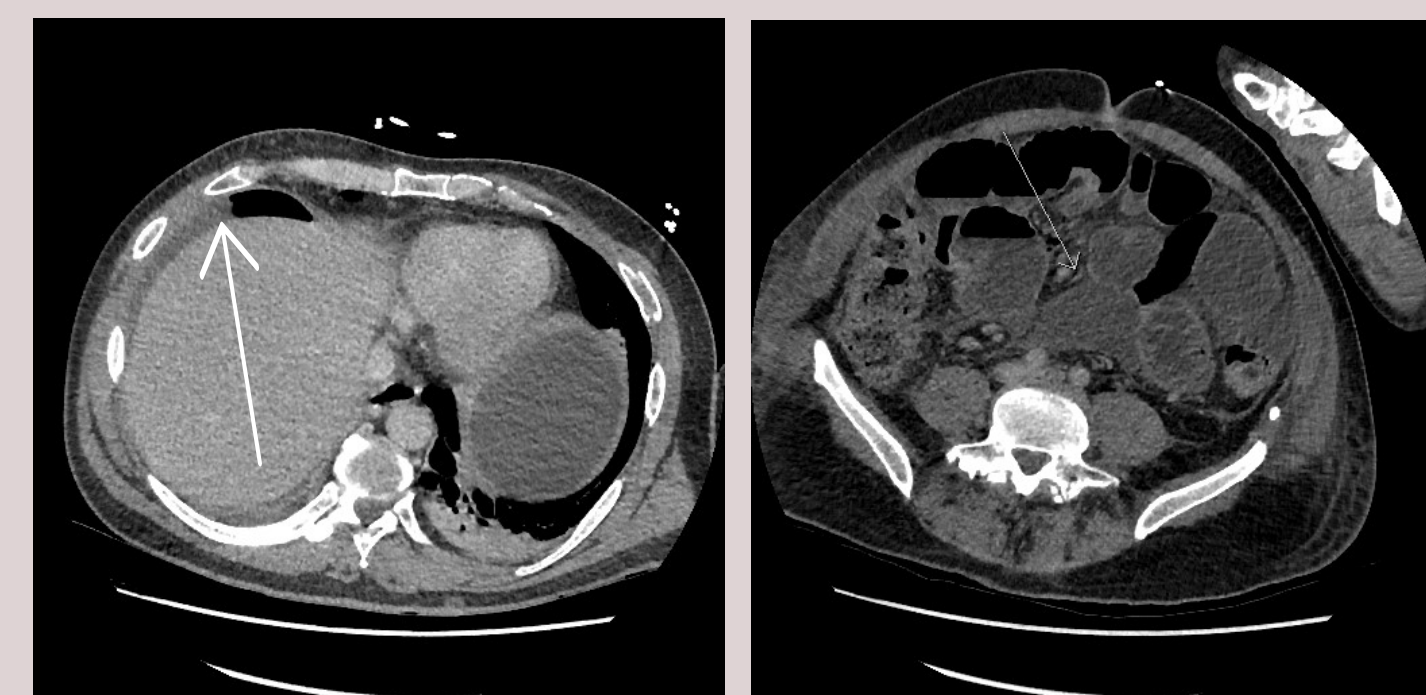


Fig 5. (Left) Perihepatic air and fluid collection secondary to bowel perforation. (Right) Site of discontinuity, bowel distension. These images taken four days post inciting injury. (White arrows)

The patient was emergently sent to theatre and a wedge resection performed. Findings showed a small intestinal burst injury. Again, early radiographic signs were highly suggestive of significant injury and earlier intervention may have prevented significant morbidity, hospital stay and patient distress.