

Mesenteric shearing injury

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Section: Abdominal imaging

Area of Interest: Abdomen Small bowel Trauma

Procedure: Education

Imaging Technique: CT

Special Focus: Acute Ischaemia / Infarction Trauma

Case Type: Clinical Cases

Authors: McQuade C 1, O'Brien C 2, O'Neill M 3, Waters

PS 1, Buckley O 2, Torreggiani W 2

Patient: 37 years, male

Clinical History:

We present the case of a 37-year-old male, admitted to the hospital with severe abdominal pain, having sustained a mechanical fall down 9 stairs two days previously. The patient was haemodynamically unstable on arrival. A FAST (focused assessment with sonography for trauma) scan identified free fluid in the abdomen.

Imaging Findings:

A trauma protocol CT TAP (thorax, abdomen and pelvis) was performed. This demonstrated a large volume of intraperitoneal free air (Figs 1-7), with multiple locules of free air in the left upper quadrant (Fig 1). There was a significant volume of free fluid. Immediately distal to the duodeno-jejunal flexure, there was hypoenhancement of the jejunal wall (Figs 1, 2), with multiple locules of intramural gas (Fig 3). Intra-hepatic gas was visualised (Fig 4). There was no abdominal visceral laceration or haematoma visualised. The abdominal aorta and branching vessels were grossly unremarkable. Both adrenal glands were hyper-enhancing, consistent with a state of shock (Figs 2, 3). Below the level of the renal arteries, the IVC had a slit-like appearance (Fig 5). At the level of the renal arteries, the anteroposterior diameter of the IVC measured 15mm (Fig 6).

Discussion:

Injuries to the bowel and mesentery in the setting of blunt abdominal trauma occur in just 5% of cases [1]. These conditions can carry with them significant morbidity and mortality [2]. Injuries may occur as a result of: (i) A direct force crushing underlying structures (ii), deceleration leading to shearing forces (iii), or a sudden increase in intraluminal pressure [3]. Significant injuries can occur even in the setting of low velocity injuries [4]. Frequent sites of injury in the small intestine are the proximal jejunum close to the ligament of Treitz and near the ileocaecal valve in the distal ileum [5].

Imaging should be performed in patients where there is a suspicion of abdominal injury, provided they have been resuscitated appropriately. Multidetector CT has greater sensitivity and specificity than physical examination and ultrasound scanning in diagnosing injury to the bowel or mesentery [5]. Significant bowel injuries include: (i) A complete bowel wall tear (ii), an incomplete bowel wall tear, involving the serosa and extending to, but not involving, the mucosa. Significant injuries to the mesentery include: (i) Injury to the mesentery with associated bowel

ischaemia (ii), active mesenteric haemorrhage (iii), or disruption of the mesentery [2].

Findings suggestive of bowel injury include:

- (i) Bowel wall discontinuity
- (ii) Extraluminal contrast material
- (iii) Extraluminal air
- (iv) Retroperitoneal air
- (v) Bowel wall thickening
- (vi) Hyperenhancement of the bowel wall: May occur as part of the hypoperfusion complex
- (vii) Hypoenhancement of the bowel wall: May suggest ischaemia
- (viii) Mesenteric features: Foci of air, fluid or fat stranding may all be seen secondary to an isolated bowel injury [2].

Findings suggestive of mesenteric injury include:

- (i) Mesenteric extravasation
- (ii) Mesenteric vascular beading
- (iii) Termination of mesenteric vessels
- (iv) Mesenteric infiltration
- (v) Mesenteric haematoma
- (vi) Bowel features: Thickening of the bowel wall or abnormal bowel wall enhancement may be seen due to mesenteric injuries [2].

This patient had a laparotomy, segmental resection of the ischaemic portion of the small bowel and primary anastomosis. He was discharged after a period of rehabilitation.

Prompt imaging may translate to a faster time to theatre for these patients and improved overall outcomes, particularly where there is a strong clinical suspicion of injury.

Radiologists should have a high index of suspicion for injuries to the bowel and mesentery when there is a history of blunt abdominal trauma, even in the absence of significant clinical findings. Significant injuries can occur even in the setting of low velocity trauma.

Differential Diagnosis List: Jejunal perforation secondary to bowel ischaemia, due to mesenteric shearing, Thromboembolism causing ischaemia, Hypoperfusion secondary to shock, Perforation secondary to peptic ulcer disease

Final Diagnosis: Jejunal perforation secondary to bowel ischaemia, due to mesenteric shearing

References:

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- Brofman N, Atri M, Hanson JM, et al. (2006) Evaluation of bowel and mesenteric blunt trauma with multidetector CT. *Radiographics* 26(4):1119-31 (PMID: [16844935](#))
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Figure 1

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Description: Soft tissue windows. Significant intra-abdominal ascites and pneumoperitoneum. Bilateral adrenal hyperenhancement, consistent with shock. Multiple locules of intramural gas involving the proximal jejunum consistent with ischaemia. **Origin:** McQuade C, O'Brien C, Waters PS, Buckley O, Torreggiani W. Department of Radiology, The Adelaide & Meath Hospital, Tallaght, Dublin 24, Ireland

Figure 2

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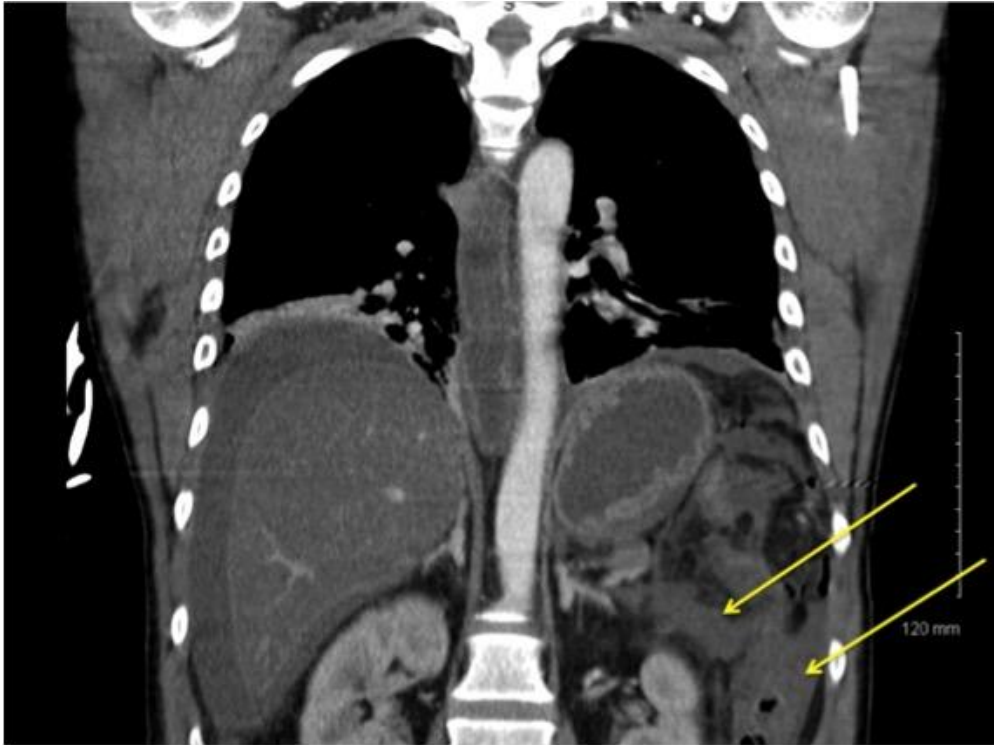


Description: Soft tissue windows. Large volume intra-abdominal fluid & free air, with air-fluid level visible. Adrenal gland hyperenhancement, consistent with shock. The IVC has a slit-like appearance.

Origin: McQuade C, O'Brien C, Waters PS, Buckley O, Torreggiani W. Department of Radiology, The Adelaide & Meath Hospital, Tallaght, Dublin 24, Ireland

Figure 3

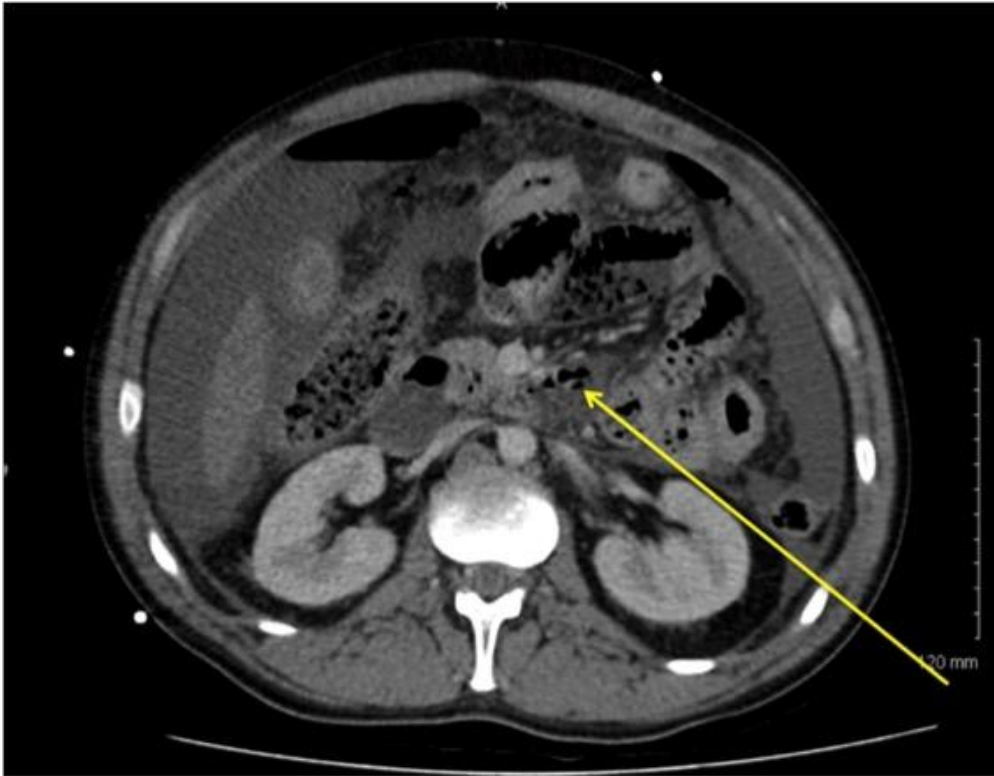
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Description: Soft tissue windows. Large volume of intra-abdominal fluid & free air. Bilateral adrenal gland hyper-enhancement. Jejunal wall thickening and hypoenhancement (yellow arrows). The oesophagus is fluid filled. **Origin:** McQuade C, O'Brien C, Waters PS, Buckley O, Torreggiani W. Department of Radiology, The Adelaide & Meath Hospital, Tallaght, Dublin 24, Ireland

Figure 4

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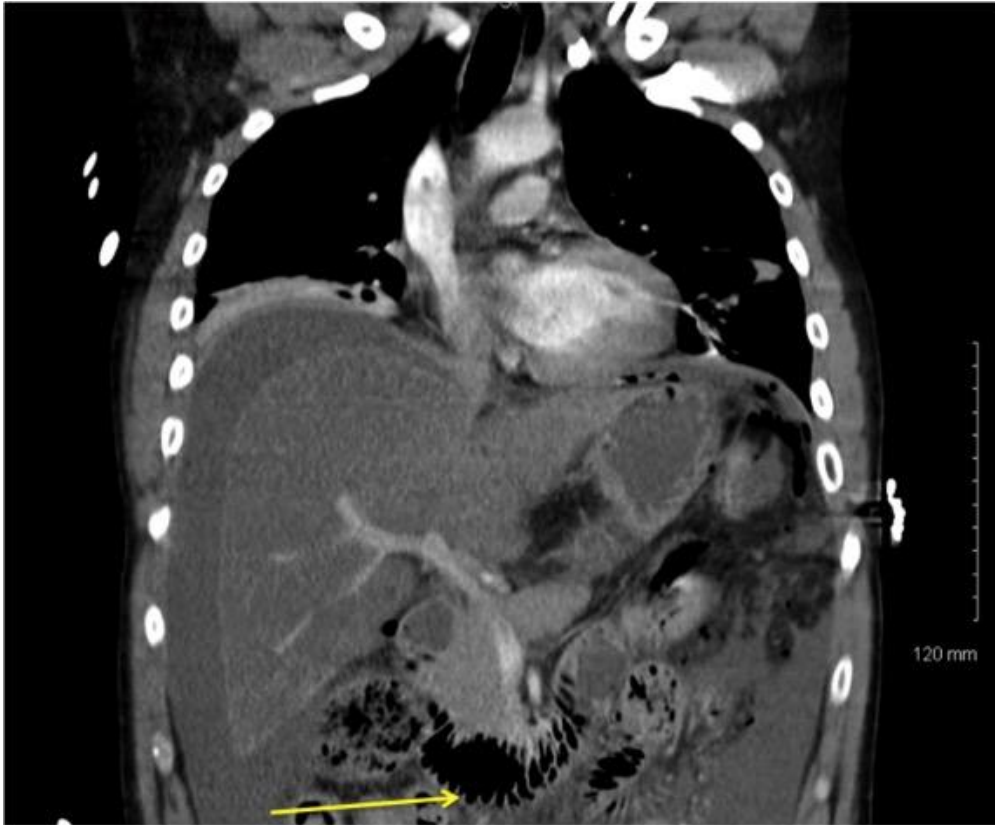


Description: Soft tissue windows. Large volume of anti-dependent free air with associated upper abdominal ascites.

Retroperitoneal locules of free air consistent with a perforation (yellow arrow). **Origin:** McQuade C, O'Brien C, Waters PS, Buckley O, Torreggiani W. Department of Radiology, The Adelaide & Meath Hospital, Tallaght, Dublin 24, Ireland

Figure 5

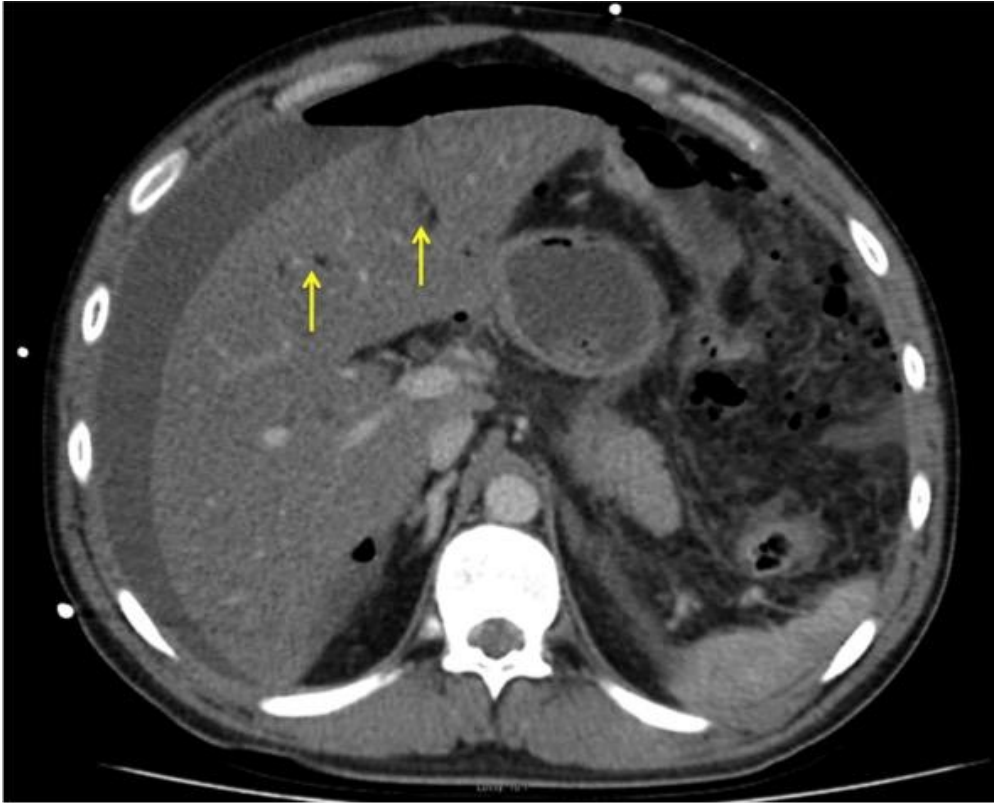
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Description: Soft tissue windows. Large volume intra-abdominal fluid & free air. Multiple locules of subdiaphragmatic free air in the left upper quadrant. Intramural gas involving the proximal jejunum with associated hypoenhancement of the jejunal wall (yellow arrow). **Origin:** McQuade C, O'Brien C, Waters PS, Buckley O, Torreggiani W. Department of Radiology, The Adelaide & Meath Hospital, Tallaght, Dublin 24, Ireland

Figure 6

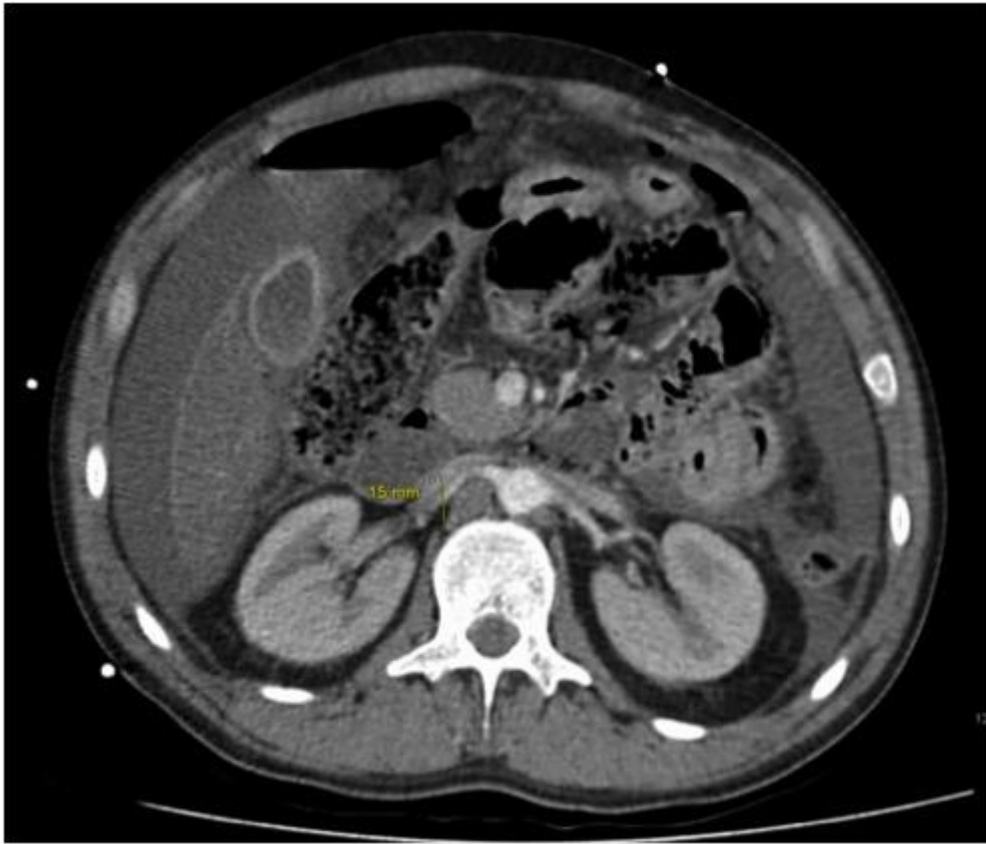
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Description: Axial post contrast CT abdomen on soft tissue windows. Significant intra-abdominal ascites and pneumoperitoneum. There is intra-hepatic portal venous air (yellow arrows). **Origin:** McQuade C, O'Brien C, Waters PS, Buckley O, Torreggiani W. Department of Radiology, The Adelaide & Meath Hospital, Tallaght, Dublin 24, Ireland

Figure 7

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Description: Large volume intra-abdominal fluid & free air. At the level of the renal arteries, the AP diameter of the IVC is 15mm. Literature suggests a 9mm cutoff in identifying a flattened IVC in shock [6].

Origin: McQuade C, O'Brien C, Waters PS, Buckley O, Torreggiani W. Department of Radiology, The Adelaide & Meath Hospital, Tallaght, Dublin 24, Ireland